Appendix 6 - Smoke Management

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App. 6 1. Indiana Burning Regulations

TITLE 326 AIR POLLUTION CONTROL BOARD

ARTICLE 4. BURNING REGULATIONS

Rule 1. Open Burning

326 IAC 4-1-0.5 Definitions

Authority: IC 13-15-2-1; IC 13-17-3-4
Affected: IC 13-12; IC 13-17-9; IC 36-9-27-2

Sec. 0.5. Unless otherwise stated, the following definitions apply to this rule:

(1) "Adequate fire fighting equipment" means equipment sufficient and appropriate under the circumstances to extinguish the fire.

(2) "Clean petroleum products" means an uncontaminated, refined petroleum product, such as kerosene or diesel fuel, not previously used in any application.

(3) "Clean wood products" means wood products, including vegetation, that are not coated with stain, paint, glue, or other coating material.

(4) "Drainage ditch" shall have the meaning of regulated drain or open drain under IC 36-9-27-2.

(5) "Emergency burning" means the burning of clean wood waste or deceased animals caused by a natural disaster or an uncontrolled event such as the following:

(A) A tornado.
(B) High winds.
(C) An earthquake.
(D) An explosion.
(E) A hail storm, a rain storm, or an ice storm.

(6) "Open burn" means the burning of any materials wherein air contaminants resulting from combustion are emitted directly into the air, without passing through a stack or chimney from an enclosed chamber.

(7) "Open burning approval" means an authorization allowing an activity that otherwise is not exempt or allowed by law.

(Air Pollution Control Board; 326 IAC 4-1-0.5; filed Jul 30, 1996, 2:00 p.m.: 19 IR 3340; readopted filed Jan 10, 2001, 3:20 p.m.: 24 IR 1477)

326 IAC 4-1-1 Scope

Authority: IC 13-15-2-1; IC 13-17-3-4
Affected: IC 13-12; IC 13-17-9-3

Sec. 1. The requirements of this rule establish standards for open burning that would result in emissions of regulated pollutants. This rule applies to all open burning except for the following:

(1) Open burning by and at a source that has obtained a registration or permit under 326 IAC 2-5.1, 326 IAC 2-6.1, 326 IAC 2-7, or 326 IAC 2-8 that specifically regulates the open burning to be performed by and at the source. This rule does apply to open burning not addressed in such a registration or permit, or if the registration or permit requires compliance with this rule.

(2) Except as provided in IC 13-17-9-3, where open burning allowed under this rule is prohibited by other state or local laws, regulations, or ordinances.

(Air Pollution Control Board; 326 IAC 4-1-1; filed Mar 10, 1988, 1:20 p.m.: 11 IR 2419; filed Jul 30, 1996, 2:00 p.m.: 19 IR 3340; filed Nov 25, 1998, 12:13 p.m.: 22 IR 1067; readopted filed Jan 10, 2001, 3:20 p.m.: 24 IR 1477)

326 IAC 4-1-2 Prohibition against open burning

Authority: IC 13-15-2-1; IC 13-17-3-4
Affected: IC 13-12; IC 13-17-9

Sec. 2. Open burning is prohibited except as allowed in this rule. The department encourages alternatives to open burning, such as sale or reuse. *(Air Pollution Control Board; 326 IAC 4-1-2; filed Mar 10, 1988, 1:20 p.m.: 11*

IR 2419; filed Jan 6, 1989, 3:30 p.m.: 12 IR 1126; filed Jul 30, 1996, 2:00 p.m.: 19 IR 3341; readopted filed Jan 10, 2001, 3:20 p.m.: 24 IR 1477)

326 IAC 4-1-3 Exemptions

Authority: IC 13-15-2-1; IC 13-17-3-4

Affected: IC 13-12; IC 13-17-9

Sec. 3. (a) IC 13-17-9 exempts certain types of open burning for maintenance purposes listed as follows:

(1) A person may open burn the following:

(A) Vegetation from any of the following:

(i) A farm.

(ii) An orchard.

(iii) A nursery.

(iv) A tree farm.

(v) A cemetery.

(vi) A drainage ditch.

(vii) Agricultural land, if the open burn occurs in an unincorporated area.

(B) Wood products derived from the following:

(i) Pruning or clearing a roadside by a county highway department.

(ii) The initial clearing of a public utility right-of-way so long as the open burn occurs in an unincorporated area.

(C) Undesirable:

(i) wood structures on real property; or

(ii) wood remnants of the demolition of a predominantly wooden structure originally located on real property;

located in an unincorporated area.

(D) Clean petroleum products for the purpose of maintaining or repairing railroad tracks, including the railroad rights-of-way, but not including railroad ties.

(2) All open burning that is allowed under this subsection must comply with the following conditions:

(A) A person who open burns shall extinguish the fire if the fire creates a nuisance or fire hazard.

(B) Burning may not be conducted during unfavorable meteorological conditions such as any of the following:

(i) High winds.

(ii) Temperature inversions.

(iii) Air stagnation.

(C) All fires must be attended at all times during burning until completely extinguished.

(D) All asbestos-containing materials must be removed before the burning of a structure.

(E) Asbestos containing materials may not be burned.

(b) The types of fires identified in subsection (c) are allowed under this rule. Unless specified otherwise, the following conditions apply to any fire allowed by this subsection:

(1) Fires must be attended at all times and until completely extinguished.

(2) If at any time a fire creates a:

(A) pollution problem;

(B) threat to public health;

(C) nuisance; or

(D) fire hazard;

it shall be extinguished.

(3) No burning shall be conducted during unfavorable meteorological conditions such as any of the following:

(A) High winds.

(B) Temperature inversions.

(C) Air stagnation.

(D) When a pollution alert or ozone action day has been declared.

(4) All burning shall comply with other federal, state, and local laws, rules, and ordinances.

(5) Adequate firefighting equipment shall be on-site for extinguishing purposes during burning times.

(6) Burning shall be conducted during daylight hours only, and all fires shall be extinguished before sunset.

(c) The following types of fires are allowed:

(1) Recreational or ceremonial fires, such as fires for scouting activities, and fires used for cooking purposes, such as camp fires, subject to the conditions in subsection (b)(1) through (b)(5) and the following conditions:

(A) Only:

(i) clean wood products;

(ii) paper;

(iii) charcoal; or

(iv) clean petroleum products;

may be burned.

(B) The local fire department and health department must be notified at least twenty-four (24) hours before any burning where the size of the pile being burned is more than one hundred twenty-five (125) cubic feet.

(C) Fires shall:

(i) not be ignited more than two (2) hours before the recreational activity is to take place; and

(ii) be extinguished upon conclusion of the activity.

(D) The pile to be burned shall be less than or equal to one thousand (1,000) cubic feet and only one (1) pile may be burned at a time.

(E) The fires shall not be used for disposal purposes.

(F) Fires shall not take place within five hundred (500) feet of any fuel storage area or pipeline.

(2) Private residential burning, where the building contains four (4) or fewer dwelling units. Burning is prohibited in apartment and condominium complexes and mobile home parks. Beginning June 23, 1995, residential open burning is prohibited in the counties listed in section 4.1(c) of this rule. Burning shall be subject to the conditions in subsection (b) and the following conditions:

(A) Burning shall be in a noncombustible container that:

(i) is sufficiently vented to induce adequate primary combustion; and

(ii) has enclosed sides and a bottom.

(B) Only clean wood products and paper may be burned.

(3) Waste oil burning where waste oil originates from spillage during testing of an oil well and has been collected in a properly constructed and located burn off pit as prescribed in 312 IAC 16-5-11 in the natural resources commission rules. Burning shall be subject to the conditions in subsection (b) and the following conditions:

(A) Each oil pit may be burned once every two (2) months.

(B) The fire must be extinguished within thirty (30) minutes of ignition.

(4) Department of natural resources (DNR) burning, to facilitate prescribed burning on DNR controlled properties for wildlife habitat maintenance, forestry purposes, natural area management, and firefighting or prevention; United States Department of the Interior burning, to facilitate a National Park Service Fire Management Plan for the Indiana Dunes National Lakeshore, for example; and United States Department of Agriculture, Forest Service burning, to facilitate wildlife habitat maintenance, forestry purposes, natural area management, ecosystem management, and fire-fighting or prevention. Burning shall be subject to conditions in subsection (b)(1) through (b)(5) and the following conditions:

(A) If the fire creates a:

(i) nuisance;

(ii) fire hazard; or

(iii) pollution problem;

it shall be extinguished.

(B) No burning shall be conducted during unfavorable meteorological conditions, such as any of the following:

(i) High winds.

(ii) Temperature inversions.

(iii) Air stagnation.

(iv) When a pollution alert or ozone action day has been declared.

(C) Only vegetation and clean petroleum products may be burned.

Burning by the U.S. Forest Service for firefighting or prevention is not subject to the conditions in subsection (b) or this subdivision.

(5) Burning of marijuana by federal, state, and local law enforcement offices. Burning shall be subject to the conditions in subsection (b) and only clean petroleum products shall be used for ignition purposes.

(6) Burning, for the purpose of heating, using clean wood products or paper in a noncombustible container that is sufficiently vented to induce adequate primary combustion, and has enclosed sides and a bottom. Burning shall be subject to the conditions in subsection (b)(1) through (b)(5) and the following conditions:

(A) Burning shall only occur between October 1 and May 15.

(B) Burning shall not be conducted for the purpose of disposal.

(7) Burning of vegetation by fire departments and firefighters to create fire breaks for purposes of extinguishing an existing fire. Such burning is not subject to the conditions in subsection (b).

(8) Burning of clean petroleum products, natural gas, methane, or propane for fire extinguisher training, subject to the conditions in subsection (b) and the following conditions:

(A) The local fire department and health department must be notified at least twenty-four (24) hours in advance of the date, time, and location of the burning.

(B) Except as provided in clause (C), daily fuel volume amounts burned are limited to one (1) of the following:

(i) Fourteen (14) gallons of clean petroleum products.

(ii) Two hundred twelve (212) gallons of propane.

(iii) Twenty-nine thousand seven hundred (29,700) cubic feet of natural gas or methane.

(C) A combination of the fuels listed in clause (B) may be burned each day. The amount of each fuel that can be burned each day shall be determined as follows:

(i) The volume of each fuel to be burned each day shall be calculated as a percentage of the maximum volume allowed in clause (B) for that fuel.

(ii) The sum of the percentages for each fuel burned each day shall not exceed one hundred percent (100%).

(D) All burning of clean petroleum products shall take place in a noncombustible container or enclosure that has enclosed sides and a bottom.

(E) All burning shall be conducted in such a manner so as to prevent any possibility of soil contamination or uncontrolled spread of the fire.

(F) Only one (1) fire may be allowed to burn at a time.

(Air Pollution Control Board; 326 IAC 4-1-3; filed Mar 10, 1988, 1:20 p.m.: 11 IR 2419; filed May 24, 1995, 10:00 a.m.: 18 IR 2408; filed Jul 30, 1996, 2:00 p.m.: 19 IR 3341; readopted filed Jan 10, 2001, 3:20 p.m.: 24 IR 1477; filed Mar 21, 2007, 2:48 p.m.: 20070418-IR-326050268FRA)

326 IAC 4-1-4 Emergency burning

Authority: IC 13-15-2-1; IC 13-17-3-4

Affected: IC 13-12; IC 13-17-9

Sec. 4. Emergency burning with prior oral approval of the commissioner or the commissioner's designated agent may be authorized for the following:

(1) spilled or escaping liquid or gaseous petroleum products when all reasonable efforts to recover the spilled material have been made and failure to burn would result in an imminent fire or health hazard or air or water pollution problem; or

(2) clean wood waste, vegetation, or deceased animals resulting from a natural disaster where failure to burn would result in an imminent health or safety hazard.

The commissioner or the commissioner's designated agent shall issue a written approval within seven (7) days of the oral approval. The written approval shall contain any conditions on emergency burning that the commissioner established in the oral approval. *(Air Pollution Control Board; 326 IAC 4-1-4; filed Mar 10, 1988, 1:20 p.m.: 11 IR 2420; filed Jul 30, 1996, 2:00 p.m.: 19 IR 3343; readopted filed Jan 10, 2001, 3:20 p.m.: 24 IR 1477)*

326 IAC 4-1-4.1 Open burning approval; criteria and conditions

Authority: IC 13-15-2-1; IC 13-17-3-4

Affected: IC 4-21.5; IC 13-12; IC 13-17-9

Sec. 4.1. (a) Burning not exempted by section 3 or 4 of this rule may be authorized by the issuance of an approval by the commissioner or the commissioner's designated agent after consideration of an approval application. Such burning may be authorized for, but not limited to, the following:

(1) Burning for the purpose of fire training.

(2) Burning of natural growth derived from a clearing operation, such as removal of natural growth for change in use of the land.

(3) Burning of highly explosive or other dangerous materials for which no alternative disposal method exists or where transportation of such materials is hazardous.

(4) Burning of clean wood products.

(5) Burning of natural growth for the purpose of land management.

(b) The following criteria may be considered for approval under this section:

(1) The applicant has demonstrated that alternative methods for disposal are impractical or prohibitively expensive.

(2) There are not more than five (5) residences or structures within five hundred (500) feet of the proposed burning site.

(3) There have been no open burning violations at the site of the proposed burning or by the applicant.

(4) If the application involves a structure for fire training, the structure has not been demolished prior to training activities.

(5) The burning site is located in a county not designated as a nonattainment area for PM_{10} or ozone and is not located in Clark or Floyd County. The commissioner or the commissioner's agent may allow open burning in these areas, subject to conditions necessary to protect air quality.

(c) No approval shall be granted at any time for residential burning in Clark, Floyd, Lake, or Porter County.

(d) Any approval shall be subject to the following conditions unless otherwise stipulated in the open burning approval letter:

(1) Only clean wood products shall be burned.

(2) No asbestos-containing material shall be burned.

(3) No burning shall be conducted during unfavorable meteorological conditions, such as:

(A) high winds, temperature inversions, or air stagnation; or

(B) when a pollution alert or ozone action day has been declared.

(4) Burning shall be conducted during daylight hours only and all fires shall be extinguished prior to sunset.

(5) If at any time the fire creates:

(A) an air pollution problem;

(B) a threat to public health;

(C) a nuisance; or

(D) a fire hazard;

the burning shall be extinguished.

(6) The local fire department and health department must be notified at least twenty-four (24) hours in advance of the date, time, and location of the burning.

(7) The approval letter shall be made available at the burning site to state and local officials upon request except during emergency burning.

(8) Adequate fire fighting equipment shall be on-site for extinguishing purposes during burning times.

(9) No burning shall take place within:

(A) one hundred (100) feet of any structure or powerline; or

(B) three hundred (300) feet of a frequently traveled road, fuel storage area, or pipeline.

(10) Fires must be attended at all times until completely extinguished.

(11) All burning must comply with other federal, state, or local laws, regulations, or ordinances, including 40 CFR 61, Subpart M* (National Emissions Standards for Asbestos).

(12) No waste that is regularly generated as a result of a routine business operation shall be burned.

(13) The material to be burned shall not exceed one thousand (1,000) cubic feet.

(e) An approval letter shall be valid for no longer than one (1) year from the date of issuance. However, an approval letter may be valid for as long as five (5) years if the approval application is accompanied by an open burning plan. The plan shall:

(1) contain a description of the open burning proposed for the period of time for which an approval letter is sought; and

(2) be incorporated as a condition of the approval letter under subsection (d) or (f).

Any change in the plan must receive an additional approval letter, unless the change is to reduce open burning or the change is to conduct burning exempted under section 3 of this rule. The plan shall be available for review upon the request by the department.

(f) The commissioner or the commissioner's designated agent may add conditions to an approval letter, as necessary, to prevent a public nuisance or protect the public health or the environment. Such conditions may be based on local air quality conditions, including whether the area is a nonattainment county as defined in 326 IAC 1-4-1 or has been redesignated from nonattainment to attainment status.

(g) A decision on the open burning approval letter is subject to IC 4-21.5 (Administrative Orders and Procedures Act).

*This document is incorporated by reference. Copies may be obtained from the Government Printing Office, 732 North Capitol Street NW, Washington, D.C. 20401 or are available for review and copying at the Indiana Department of Environmental Management, Office of Air Quality, Indiana Government Center-North, Tenth Floor, 100 North Senate Avenue, Indianapolis, Indiana 46204. *(Air Pollution Control Board; 326 IAC 4-1-4.1; filed Jul 30, 1996, 2:00 p.m.: 19 IR 3343; readopted filed Jan 10, 2001, 3:20 p.m.: 24 IR 1477; filed Nov 15, 2002, 11:17 a.m.: 26 IR 1077)*

326 IAC 4-1-4.2 Open burning; approval revocation

Authority: IC 13-15-2-1; IC 13-17-3-4

Affected: IC 13-12; IC 13-17-9

Sec. 4.2. The commissioner or the commissioner's designated agent may revoke an approval letter if the applicant:

(1) violates any requirement of section 4.1(d) of this rule;

(2) violates any condition added to the approval letter under section 4.1(f) of this rule; or

(3) falsifies information on an application for an approval.

(Air Pollution Control Board; 326 IAC 4-1-4.2; filed Jul 30, 1996, 2:00 p.m.: 19 IR 3344; readopted filed Jan 10, 2001, 3:20 p.m.: 24 IR 1477)

326 IAC 4-1-4.3 Open burning approval; delegation of authority

Authority: IC 13-15-2-1; IC 13-17-3-4

Affected: IC 4-21.5; IC 13-12; IC 13-17-9

Sec. 4.3. The commissioner may delegate the authority to issue open burning approval letters in accordance with this section to a local health department, fire department, solid waste management district, or other agency upon a demonstration that the agency:

(1) has the necessary legal authority and resources to implement an approval program that is at least as protective of the public health, welfare, and the environment as the provisions of this rule; and

(2) commits to implement the program described in subdivision (1) and to follow the public notification procedures of IC 4-21.5 in the issuance of approval letters.

The commissioner may establish conditions for the delegation and may revoke any such delegation if the commissioner determines that any condition has not been satisfied or the circumstances under which the delegation was issued have changed. *(Air Pollution Control Board; 326 IAC 4-1-4.3; filed Jul 30, 1996, 2:00 p.m.: 19 IR 3344; readopted filed Jan 10, 2001, 3:20 p.m.: 24 IR 1477)*

326 IAC 4-1-5 Liability for fire

Authority: IC 13-1-1-4; IC 13-7-7

Affected: IC 13-1-1

Sec. 5. Any person who allows the accumulation or existence of combustible material which constitutes or contributes to a fire causing air pollution may not refute liability for violation of this rule (326 IAC 4-1) on the basis that said fire was set by vandals, accidental, or an act of God. *(Air Pollution Control Board; 326 IAC 4-1-5; filed Mar 10, 1988, 1:20 pm: 11 IR 2420; readopted filed Jan 10, 2001, 3:20 p.m.: 24 IR 1477)*

326 IAC 4-1-6 Air curtain destructors; approval; exemptions

Authority: IC 13-15-2-1; IC 13-17-3-4

Affected: IC 13-12; IC 13-17-9

Sec. 6. (a) An owner or operator of an air curtain destructor as defined in 326 IAC 1-2-2.5 shall submit an application to the department to obtain a letter of approval from the commissioner or the commissioner's designated agent prior to its installation or operation at a new site. The owner or operator:

(1) shall not operate the air curtain destructor unless the owner or operator holds a valid letter of approval; and

(2) shall maintain the letter of approval at the air curtain destructor site at all times for verification by state or local officials.

(b) Burning exempted under section 3 of this rule does not require a letter of approval from the commissioner under this section. However, the burning shall comply with the conditions set forth in section 7 of this rule. *(Air Pollution Control Board; 326 IAC 4-1-6; filed Jan 6, 1989, 3:30 p.m.: 12 IR 1126; filed Jul 30, 1996, 2:00 p.m.: 19 IR 3345; readopted filed Jan 10, 2001, 3:20 p.m.: 24 IR 1477)*

326 IAC 4-1-7 Air curtain destructors; approval conditions

Authority: IC 13-15-2-1; IC 13-17-3-4

Affected: IC 4-21.5; IC 13-12; IC 13-17-9

Sec. 7. (a) To obtain an air curtain destructor letter of approval, the owner or operator shall ensure that installation and operation of such air curtain destructor will comply with subdivisions (1) through (22) as follows. Burning shall be terminated immediately at any air curtain destructor site that does not comply with this section.

(1) Only untreated wood products shall be burned, except for minimal amounts of uncontaminated petroleum products that may be used for ignition.

(2) Burning shall not be conducted during unfavorable meteorological conditions, such as high winds or air stagnation or when a pollution alert or ozone action day has been declared.

(3) The air curtain destructor shall not be operated prior to one (1) hour after official sunrise, the fire shall not be fed after two (2) hours before official sunset, the fire must be completely extinguished by official sunset, and at least one (1) foot of dirt must be placed over the ashes in the pit by official sunset.

(4) An air curtain destructor site shall be located no less than two hundred fifty (250) feet from any private residence, public roadway, power line, or structure, and no less than five hundred (500) feet from any pipeline or fuel storage area.

(5) An air curtain destructor site shall not be located within one thousand (1,000) feet of a solid waste land disposal facility as defined in 329 IAC 10-2-176 or transfer station as defined in 329 IAC 11-2-47.

(6) An air curtain destructor shall not be permanently located at any site.

(7) An air curtain destructor shall be attended at all times while burning and until combustion is complete. Adequate firefighting equipment shall be maintained at an air curtain destructor site at all times during operation.

(8) Burning shall not create or contribute to:

(A) an air pollution problem;

(B) a nuisance; or

(C) a fire hazard.

(9) An air curtain destructor and pit shall be maintained and operated according to the manufacturer's specifications and recommendations.

(10) The fan blades of the air curtain destructor shall be regularly cleaned to reduce buildup of dirt and debris.

(11) All canisters must be properly aligned, connected, and maintained so as to prevent leaks between adjacent canisters.

(12) The nozzles must be maintained in good working condition. The minimum average velocity at the nozzle must be nine thousand fifty (9,050) feet per minute, and the air flow at the nozzle must be a minimum of seven hundred fifty (750) cubic feet per minute per foot of length.

(13) The engine running the air curtain destructor fan must be maintained in proper working condition.

(14) The width of the pit shall not extend beyond the length of the nozzle action.

(15) The distance from the air curtain destructor to the opposite wall of the pit shall not exceed ten (10) feet.

(16) The depth of the pit shall be of such distance to allow all burning material to be below the curtain of air created by the air curtain destructor.

(17) All nozzles shall be aligned and directed toward the opposite wall so that the air strikes the opposite wall at least three (3) feet below the grade upon which the air curtain destructor is located so that the air tumbles in the pit.

(18) The air curtain destructor shall not be at a higher elevation than the elevation of the opposite wall.

(19) The pit shall be enclosed on four (4) sides, and the walls shall be perpendicular to level ground.

(20) Material being loaded into the pit shall be picked up and dropped into the pit, and at no time shall the material protrude through the curtain of air while burning.

(21) The approval letter shall be made available at the burning site to state or local officials upon request.

(22) The owner or operator of an air curtain destructor shall provide twenty-four (24) hour notification in advance to the local fire department and the local health department of the dates and times that the air curtain destructor will be in operation.

(b) An air curtain destructor letter of approval shall be valid for no longer than one (1) year.

(c) The commissioner or the commissioner's designated agent may add conditions to an air curtain destructor letter of approval as necessary to prevent a public nuisance or protect the public health.

(d) A decision on the air curtain destructor letter of approval is subject to IC 4-21.5 (Administrative Orders and Procedures Act (AOPA). *(Air Pollution Control Board; 326 IAC 4-1-7; filed Jan 6, 1989, 3:30 p.m.: 12 IR 1127; filed Jul 30, 1996, 2:00 p.m.: 19 IR 3345; errata filed Oct 3, 2000, 2:31 p.m.: 24 IR 381; readopted filed Jan 10, 2001, 3:20 p.m.: 24 IR 147*

326 IAC 4-1-8 Air curtain destructors; approval revocation

Authority: IC 13-15-2-1; IC 13-17-3-4

Affected: IC 13-12; IC 13-17-9

Sec. 8. The commissioner or the commissioner's designated agent may revoke an air curtain destructor letter of approval if the owner or operator:

(1) violates any requirement of section 7(a) of this rule;

(2) violates any condition added to the letter of approval under section 7(c) of this rule;

(3) violates any other state or local rule or ordinance pertaining to the installation or operation of air curtain destructors;

(4) falsifies information on an application for a letter of approval; or

(5) operates an air curtain destructor in a manner that is hazardous to the public health.

(Air Pollution Control Board; 326 IAC 4-1-8; filed Jan 6, 1989, 3:30 p.m.: 12 IR 1127; filed Jul 30, 1996, 2:00 p.m.: 19 IR 3346; readopted filed Jan 10, 2001, 3:20 p.m.: 24 IR 1477; errata filed Dec 12, 2002, 3:35 p.m.: 26 IR 1567)

App. 6 2. Indiana Department of Natural Resources Prescribed Burning Policy

INDIANA DIVISION OF FISH & WILDLIFE

Prescribed Burning

Habitat Management Fact Sheet

Introduction

Prescribed burning can be defined as the thoughtful and skillful application of fire to a specific site under selected weather conditions to accomplish specific land management objectives. Prescribed burning is one of the most cost effective methods for managing plant communities and controlling natural succession. It can be used to reduce the invasion of woody growth in grassland habitats; control the spread of exotic and aggressive plants; remove thick litter layer accumulations that can inhibit wildlife mobility or smother the growth of beneficial grasses, forbs and legumes; stimulate the germination of beneficial plants like wildflowers through seed scarification (breaking down of the seed coat); reduce the accumulation of hazardous ***fuel*** loads; boost pasture productivity by releasing nutrients bound to dead organic material, and reduce the spread of plant diseases. Prescribed burning can also be used as a precursor to herbicide and tillage treatments to remove thick standing vegetation that would otherwise impede the efficient application of these practices.

Prescribed burning has been used as a tool throughout history. Native Americans used fire to maintain clearings and encourage the growth of plants for later harvest. Farmers have used fire to revitalize pasture, aid in crop harvest, and maintain fencerows and ditch banks. Forest managers have used prescribed burning to reduce hazardous fuel loads and encourage the growth of preferred tree species, and naturalists have used it to maintain natural communities such as prairies and savannahs. Wildlife managers, as well, have utilized prescribed burning to maintain early successional habitats for a wide variety of wildlife species. Prescribed burning can be a very useful, cost-effective and safe tool when properly planned and implemented.

Prescribed burns differ greatly from wildfires. Wildfires are accidental and uncontrolled. They threaten lives and property and can do great harm. Prescribed burns, on the other hand, are set intentionally after considering the safety of people and property. Prescribed burns are planned to achieve specific objectives in a specific area under specific weather conditions and at the right time of year. Fire control equipment and fire crews, as well as the use of natural or manmade barriers, are used to keep the fire under control.

Understanding Fire Behavior

In order to implement a safe and successful prescribed burn, it is important to understand how various factors influence fire behavior. Wind, relative humidity, temperature, soil moisture, fuel moisture, air mass stability, and topography are important elements to understand and consider when planning and implementing a burn. These elements influence flame height, rate of fire spread, how smoke produced from the burning vegetation will dissipate, and the overall success of meeting the burn objectives.

Wind - Prescribed fires behave in a more predictable manner when wind speed and wind direction are steady. Wind speed generally increases to a maximum in the early afternoon and then decreases to a minimum after sunset. Ideal ***transport wind speed***, wind measured at 20 feet above ground level, should range from 6 to 18 mph for good smoke dispersion. The 20-foot wind speed, mentioned above, is the wind speed typically forecasted by local weather stations. However, the **preferred surface wind, or wind speed at eye level, should range from 1 to 3 mph** for most fuel and topographic situations. When conducting prescribed burning in vast, wide-open spaces, wind speed at surface or eye level can approach the 20-foot wind speed because there is nothing in the way to slow the surface winds down. Conversely, when conducting prescribed burning in areas where the landscape is dominated by forest cover, surface winds will most often be significantly lower than the 20-foot wind speed.

Of greater importance than wind speed is the length of time the wind blows from one direction. Persistent wind directions occur most frequently following the passage of a cold front when winds are typically from the west or northwest. As these winds slowly shift clockwise over the next few days, they become weaker and less steady. Winds with an easterly component are generally considered undesirable for prescribed burning. However, topography, natural firebreaks, and locations of smoke sensitive areas may have a bearing on which wind directions are most favorable. Regardless of wind direction, wind steadiness is very important and should be forecasted to occur throughout the planned burn time.

Relative Humidity - Relative humidity has a strong influence on the moisture content of the vegetation (fuels) being burned. As relative humidity decreases, fuels become drier. As relative humidity increases, fuels retain more moisture and are less apt to burn. Relative humidity is an expression of the amount of moisture in the air compared to the total amount the air is capable of holding at that temperature and pressure. For each 20^0 rise in temperature (which often occurs during the morning hours on a clear day), relative humidity is reduced by about one-half. Likewise, for each 20^0 drop in temperature (which often occurs in early evening), relative humidity roughly doubles. When a cold front passes over an area, the air behind the front is cooler and drier. The result is a drop in both temperature and humidity. Preferred relative humidity for prescribed burning ranges from 30 to 55 percent. When relative humidity drops below 30 percent, prescribed burning can become dangerous. Fires are more intense under low humidity ranges and sparks from burning fuels may be transported outside the burn area and ignite surrounding vegetation, causing unwanted spot fires. When relative humidity exceeds 55 percent, a fire may leave unburned islands or may not burn hot enough to achieve the desired results. For most situations where a landowner is conducting a prescribed burn without professional assistance on-site, **preferred relative humidity should range from 40 to 55 percent.**

Temperature - Temperature can also strongly influence the moisture content of fuels being burned. High temperatures help dry fuels quickly. In addition, when fuels are exposed to direct solar radiation (sunlight), they become much warmer than the surrounding air. Moisture will move from the warmer fuels into the air even though the relative humidity of the air is high. Air temperature can also directly impact the heat intensity of the fire. Cool fires are typically not hot enough to kill woody vegetation. Under most prescribed burning objectives, the **air temperature for a late winter to early spring burn should range from 20^0 to 60^0 Fahrenheit.** When the objective of the burn is to control woody vegetation, air temperatures above 60^0F may be necessary to raise woody stem tissue to lethal temperature levels.

Rainfall and Soil Moisture - Because rainfall affects both fuel and soil moisture, it's important to have a good idea of how much rain has recently fallen on the area to be burned. The importance of adequate soil moisture can't be overemphasized. Damp soil protects the root zone of grasses, forbs and trees from being killed during a fire. It also protects soil microorganisms. Even when burning to expose a mineral soil seedbed it is desirable to leave a thin layer of organic material to protect the site from erosion. Prescribed burning should cease during periods of drought and resume only after a good soaking rain of at least 1 inch. On clay soils, much of the rainfall is lost through surface runoff, therefore, duration of the rainfall is more important than the amount that falls. For most prescribed burning objectives, **the soil should be damp to moderately wet.**

Fuel Moisture - Fuel moisture, especially the moisture content of fine fuels such as grassy and weedy material, is strongly influenced by relative humidity, temperature, and rainfall. **Fine-fuel moisture (FFM) should range from 10 to 20 percent for optimum burning conditions.** A rough estimate can be obtained by taking the relative humidity (RH) and dividing it by 2: (RH ÷ 2 = FFM). When fine-fuel moisture is below 6 or 7 percent, burning can result in damage to plant roots, microorganisms and even the soil. When fine-fuel moisture nears 30 percent, fires tend to burn slowly and irregularly, often resulting in incomplete burns that do not meet the desired objectives. Fine-fuel moisture is usually at its lowest value when the maximum temperature has been reached for the day (usually in the late afternoon). As the sun sets, the temperature drops and the relative humidity increases. Fine-fuel moisture can also vary considerably depending on the height of the vegetation. Typically, moisture content will increase from the upper portion of the vegetation down to the litter layer. However, a light rain or morning dew following a dry spell can give the false impression that the litter layer and underlying soils are also moist. The bottom of the litter layer should always be checked prior to burning to make sure it feels damp. This is especially important when conducting prescribed burning on organic soils. If the fire dries the surface layer of peat, the organic soils will ignite. These fires are very dangerous and can burn under ground for many weeks in spite of the best control efforts and cause extensive smoke problems. People that have not had extensive training in prescribed fire management should not attempt burning on peat or muck soils.

Airmass Stability - Atmospheric stability is the resistance of the atmosphere to vertical movement and has an important influence on smoke management. A prescribe fire generates vertical air movement as the air is heated. If the atmosphere is unstable, the hot combustion products and smoke will rise rapidly and disperse into the upper atmosphere. Unstable atmospheric conditions promote rapid smoke dispersion. Indicators of unstable conditions include wind gusts, clouds with vertical growth, clear skies, and sometimes dust devils. Under stable atmospheric conditions smoke will be held close to the ground and can cause severe smoke problems and reduced visibility. Indicators of stable conditions include poor visibility due to haze, layered clouds, no wind, or very steady (not gusty) low wind.

Topography - Topography, or the lay of the land, also influences fire behavior and is the most constant of the environmental elements. It is much easier to predict the influences which topography will have on a fire than the influences of fuel characteristics and weather.
Aspect, slope and terrain are the three characteristics of topography that can influence fire behavior. Aspect refers to the direction a slope faces. This determines the amount of heating the fuel gets from solar radiation, as well as the condition and types of fuels present. South and southwest slopes are normally more directly exposed to sunlight, and generally have sparser fuel loads, higher temperatures, lower humidity, and lower fuel moisture. North and northeast slopes generally receive less direct sunlight, and typically have heavier fuel loads, lower temperatures, higher humidity, and higher fuel moisture.
Slope is the degree of incline of a hillside. Fires burn more rapidly uphill than downhill. The steeper the slope, the faster and hotter the fire burns. This is because the fuels above the fire are brought into closer contact with the upward moving flames. Heat from the flames reduces fuel moisture and allows the fuels to catch on fire quickly. Conversely, a fire started at the top of a slope will move down slope slower and cooler.
Terrain refers to the shape, or lay of the land, and can influence the direction and rate of fire spread. Fire in steep narrow ravines can easily spread to fuels on the opposite slope by radiant heat and wind blown sparks. Likewise, fires started at the bottom of ravines may react similar to a fire in a chimney. Air drawn from the bottom of the ravine will create very strong upslope drafts. These upslope drafts will spread the fire rapidly and result in extreme fire behavior that can be very dangerous. In addition, fires immediately adjacent to woodland edges may be affected by wind eddies that may move the fire in the opposite direction of normal wind flow.

Planning a Prescribed Burn

There are four primary components to planning a prescribed burn. These components include: 1) regulation review; 2) an evaluation of the prospective burn site; 3) preparation of a burn plan for the site; and 4) pre-burn site and equipment preparation.

1) Regulation Review - The first step in the planning process should be to review the applicability and requirements of any state, county, and local ordinances that might regulate prescribed burning in your locality. State regulations pertaining to prescribed burning may be obtained by contacting the Indiana Department of Environmental Management, Air Quality Section or by visiting the following website addresses:
http://www.in.gov/legislative/iac/title326.html and
http://www.ai.org/legislative/ic/code/title13/ar17/ch9.html.
A good place to obtain local information is from your county sheriff or local fire department. You might also contact your county's health department.

2) Prospective Burn Site Evaluation - The second step to planning a successful prescribed burn is to evaluate the proposed site. Preferably, this should be done 6 months to a year prior to the intended burning period. This will provide ample time to address any problem areas, establish needed fire breaks, make contacts with neighbors and plan for equipment needs.
The pre-burn evaluation should be used to determine what type of fire prescription is needed. In other words, what is the intended objective of the burn and what conditions are needed to meet the objective. Setting a burn objective will help determine the time frame within which the burn should be conducted and the type of firing method or methods that should be used. Table 1 provides information on the timing of prescribed burning in relation to the site objective.
The pre-burn evaluation should also be used to collect specific information about the site that will be needed for burn plan preparation. Information about the amount and type of fuels to be burned, the amount and type of fuels outside the intended burn area, as well as information on topography and the location of property boundaries should be noted. Take an aerial photo or

map with you and walk the entire site. Mark the location of roads, trails, water bodies, natural fire breaks, smoke sensitive areas, utility lines, utility poles, fences, buildings, homes, fuel tanks, trash piles, poison ivy patches, and other important features.

Table 1. Burn Objective and Relationship to Burning Time Frame

Burn Objective	Time of Burn	Comments
• Prepare tall fescue or other cool season grasses for fall herbicide application	September/October	Time burn to allow fescue to re-grow 6" prior to herbicide appl.
• Prepare tall fescue or other cool season grasses for spring tillage.	September/October February/March	Time burn to reduce the amount of residual regrowth prior to tillage
• Thin a stand of cool season grasses and remove litter layer buildup.	March/April	Burn when cool season grasses begin to green-up
• Thin a stand of native grasses and remove excessive litter layer buildup.	January through April	Burning in March/April will reduce wild flower component
• Control cool season grass invasion in established native grasses.	March/April	Burn when cool season grasses begin to green-up
• Increase forb component in established native grasses.	September/October	Low humidity is needed. Thick thatch needed to obtain a complete burn.
• Revitalize a wildflower planting.	January/February	Burn prior to green-up
• Control woody invasion in cool season grass stand.	March through May	Hot fire required. May need lower relative humidity and higher temperatures to achieve good results.
• Control woody invasion in native grass stand.	March through May	Hot fire required. May need lower relative humidity and higher temperatures to achieve good results.

3) Burn Plan Preparation - The third step is to prepare a burn plan. A burn plan should always be developed for every proposed prescribed burn. A burn plan is an all-inclusive document that includes a description of the site to be burned, the objectives of the burn, preparation needs, areas of special concern or potential hazard, a list of pre-determined parameters within which the burn will be conducted (fire prescription), information on precisely how the burn is going to be accomplished (firing sequence), and detailed maps of the area. A burn plan not only helps the landowner carefully and thoughtfully prepare for a prescribed burn, but the plan also provides detailed information to others that might be involved in implementing the burn or affected by implementation of the burn, such as members of your fire crew, the local fire department, sheriff's department, and neighbors. In addition, there are usually only a few days during most burning seasons when weather conditions meet burn prescription parameters. By developing a burn plan and addressing site and equipment needs prior to the burning season, the landowner can quickly take advantage of burning opportunities when they arise.

The following information should be included in every burn plan:

Maps: Each map should show the boundaries of the planned burn area, adjacent landowners, topography, control lines (both natural fire breaks and those that are to be

constructed), smoke sensitive areas, roads, homes, utility lines, fuel and storage tanks, and other potentially hazardous or combustible materials. One map should be prepared for each acceptable wind direction under which the prescribed burn may be safely conducted. Each of these maps should then show the location and appropriate sequence of fires to be set based on each map's assigned wind direction.

Burn Objective: State as precisely as possible the objective(s) for the burn. This will help you set the parameters (fire prescription) under which the burn should be conducted.

Burn Unit Description: Describe the types of fuels that are proposed to be burned within the burn area as well as the site's topography. Note if there are significant differences between vegetation types and heights within the burn area. Also note if there are areas that typically remain wet or exceedingly dry. All of these factors will influence fire behavior and determine other planning needs and parameters.

Adjacent Land Description: Describe the types of fuels and topography that are adjacent to the proposed burn unit. Specifically note any areas adjacent to or in close proximity to the proposed burn area that might easily catch fire as a result of wind blown sparks.

Areas of Special Concern: Describe all areas in and outside the burn area that might pose safety, health or smoke hazards and list the appropriate measures that will need to be taken to mitigate the concerns. Once again, making note of these areas will assist you and others reading the burn plan to be aware of problem areas and how those concerns will be addressed.

Pre-Burn Site Preparation: Describe exactly what site preparation will need to be completed before the burn can be safely conducted. Do control lines (fire breaks) need to be constructed? If so, are they to be planted to a green crop such as winter wheat, clover, annual rye grass, or spring oats; or are they to be plowed, disked or mown? Do control lines need to be placed around utility poles? Are there tree branches or brush extending over any firebreaks that might catch fire and cause the fire to spread to unintended areas?

Equipment Needs: List all the equipment that should be on-site at the time of the burn. Include things such as cellular phones, 2-way radios, hoses, backpack sprayers, truck-mounted water tanks, vehicles, quad runners, leaf rakes, flappers, drip torches and/or fusees. Never skimp on equipment needs.

Personnel Needs: List all the personnel that will be needed to safely and efficiently carry out the prescribed burn. Never skimp on personnel needs. In general, there should be 3 to 4 people for each control line: one to lay fire, one or two to control the line, and one to assist wherever needed. Additional people may be needed to assist with traffic control if smoke will blow across public roadways.

Persons To Be Contacted: List all neighbor, local law enforcement, and local fire department names and telephone numbers. Each of these entities should be contacted as part of burn plan preparation phase. It is important to contact local law enforcement and fire department personnel during the planning stage to ensure the burn will be in

compliance with local ordinances. It also affords these agencies the opportunity to develop their own advanced planning, coordination, and scheduling. It is also important to contact each neighbor to help assess smoke sensitive areas and address other concerns that they might have. In addition, it affords neighbors the opportunity to potentially coordinate, schedule, and assist each other in conducting prescribed burns in the local area.

Each of the entities on the contact list should also be called the day before the burn is anticipated to occur, and then immediately prior to actually conducting the burn. Again, this notification helps keep local authorities advised and prepared to respond in case of an emergency. It also is a courtesy to neighbors so that they can anticipate seeing and reacting appropriately to any potential smoke that might come their way.

Acceptable Burning Parameters: List in this section the range of conditions that must be met at the time the prescribed burn is to take place. The following parameters should be included in this section:

Time of Year - Generally the best time to conduct a prescribed burn in Indiana is from February 1 to April 15. This is when weather conditions and fuel moisture are most often conducive for conducting prescribed burns. The exact time frame within which the burn should occur will depend on the objective of the burn.

Time of Day - Time prescribed burning so that the entire job, including all follow-up work, can be completed before sunset. Remember, as the sun sets, temperature drops and relative humidity increases. Both of these conditions will increase the likelihood of having smoke management problems. When conditions are favorable, try to start burning between 10 a.m. and noon.

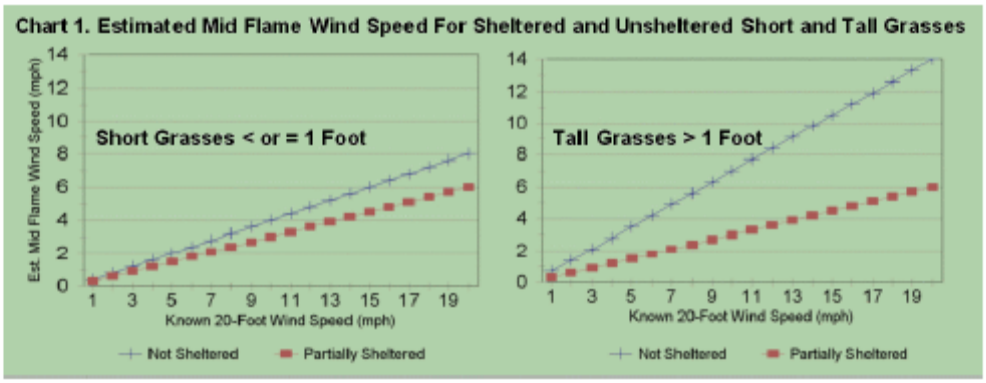
Relative Humidity Range - As stated earlier, relative humidity should range between 40 and 55 percent under most situations where the landowner is conducting a prescribed burn without professional assistance. Burning when relative humidity drops below 30 percent can become dangerous even for experienced prescribed fire crews.

Wind Speed Range - In most situations, the preferred 20-foot wind speed should range between 6 and 18 mph for good smoke dispersion, however, the mid-flame wind speed should generally fall between 1 and 3 mph. See Chart 1 for estimating mid-flame wind speed for sheltered and unsheltered short and tall grasses.

Temperature Range - Under most prescribed burning objectives, air temperature for a late winter to early spring burn should range from 20^0 to 60^0 Fahrenheit.

Soil Moisture - The importance of adequate soil moisture can't be overemphasized. Damp soil protects the root zone of grasses, forbs and trees from being killed during a fire. It also protects soil microorganisms. For most prescribed burning objectives, the soil should be damp to moderately wet.

Allowable Wind Directions - Allowable wind directions will ultimately depend on several factors including: the location of smoke sensitive areas, control lines, and structures; the type of fuels inside and outside the burn area; and topography. Only those wind directions that will achieve the burn objective in a safe manner should be listed.



Firing Methods - Prescribed burns can be conducted using several different firing techniques (alone or in combinations) to achieve specific results. Only those firing methods that will achieve the burn objective in a safe manner should be listed. Specific firing techniques are discussed later in this publication.

Fire Escape Contingency Plan - Write down a step-by-step contingency plan as to who will do what in case fire escapes the burn site. At the minimum, the plan should include (1) the telephone numbers for the local fire department, sheriff's department, and each of the adjacent neighbors; and (2) a section that identifies escape routes and safety zones for your fire crew. All crewmembers should review this section of the plan before the prescribed burn is initiated.

4) Pre-Burn Preparation - Finally, the forth step to planning a successful prescribed burn involves finalizing all the legwork and groundwork necessary to legally, safely and efficiently carry out the burn. Pre-burn preparation includes: fulfilling any requirements mandated by local ordinances; rounding up the proper equipment and making sure it works properly; completing any work that needs to be performed on control lines; enlisting personnel to assist with the burn; and communicating with neighbors, local fire and sheriff's departments.

Establishing Control Lines

Control lines, frequently called firebreaks, are features of the landscape used to stop, slow, or control the spread of a prescribed fire. To be effective, firebreaks should be at least 15 to 20 feet wide and border the entire burn area. Four types of firebreaks are most commonly used. **Natural firebreaks** are existing physical features that inherently do not contain combustible fuels, such as rivers, streams, lakes, ponds, and roads. Caution should be used when using certain wetlands as control lines. Wetlands containing dense stands of emergent vegetation, such as cattails, can carry fire across the top of the water surface. **Constructed firebreaks** are areas where the vegetation has either been completely removed by tillage practices, sprayed with water or a fire retardant, or frequently mown so as to remove any buildup of fine dead fuels within the control line from previous growing seasons and, thereby, consists only of standing "green" vegetation. **Green-crop firebreaks** are control lines that utilize a fire resistant crop, such as winter wheat, barley, annual rye grass, or clovers that are typically "green" during the burning period. As the name implies, green-crop firebreaks consist of bare soil control lines that have been planted recently to an actively growing "green" crop. Existing, crop (corn or soybean) stubble should not be used a firebreak. Although standing crop stubble may be interspersed with copious quantities of bare soil, the fact still remains that the stubble is dead and fire can be transported from one standing stalk to another. Even crop stubble that appears to be wet from a

morning dew can quickly dry out as daytime temperature increases and humidity falls. Convective heat from the advancing fire can also assist in drying and curing the stubble.

If crop fields are going to be used as firebreaks, the edges should either be planted to a green crop or conventionally tilled so as to completely remove or bury all crop residues. Caution should be taken not to just turn the crop stubble over into furrows. Stubble, turned over and concentrated in this fashion, can ignite and burn the entire length of the furrow, even when lightly covered with soil. All stubble should be well incorporated into the soil. The best time of the year to prepare crop field edges for a late winter or spring burn is during the fall prior to the intended burn as part of the crop harvest and tillage operations. This allows an extended period during which crop residue can breakdown and become further incorporated into the soil.

Firebreaks may also be created by establishing **black lines**. Black lines are typically created by setting fire to the leeward portion of a fuel bed, allowing the fire to slowly advance in a controlled fashion against the wind. Once the fuel has been burned off to a specified width the fire is extinguished.

Firing Techniques

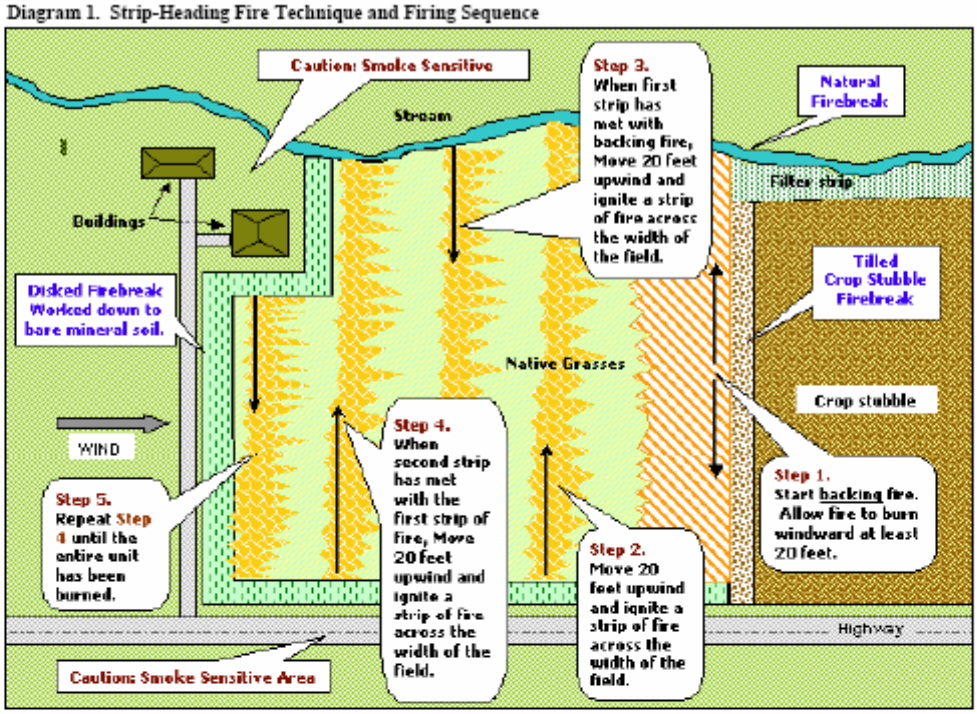
There are many different techniques that can be used to complete a controlled burn. When and where fires are started in relation to the area to be burned and the direction of the wind, can determine how hot the fire becomes and how fast the fires moves. Firing techniques allow the person conducting the fire to control the fire to some extent. The four firing techniques most commonly used are: 1) the backing fire, 2) the strip-heading fire, 3) the flanking fire, and 4) the ring fire.

1) Backing Fire – This firing technique is the easiest and safest method for completing a prescribed burn, provided wind speed and wind direction remain steady. It is generally used by novices of prescribed burning because the rate of spread is relatively slow compared to other firing techniques and more easily controlled. The backing fire is also the most common firing technique use, and should always be the first line of fire set in any prescribed burning sequence. A backing fire is always started along a firebreak or other barrier at the most leeward (downwind) edge of the burn area and allowed to back into the wind. This method can be used successfully provided that a wind is consistently blowing in one direction, relative humidity is low, and there is a continuous source of fine dead fuels throughout the area to carry the burn. Because a backing fire burns slowly against the wind, completing the prescribed burn using only a backing fire may take several hours.

When used with other firing techniques, the backing fire is set first and allowed to burn an area at least equal in width to the expected average flame length, prior to setting any other fires. This helps ensure that any fire moving in a windward direction as a result of additional fires ignited upwind will be contained within the blackened area created behind the backing fire. In general, backing fires should be allowed to burn windward a distance of at least 20 feet from the leeward control line before employing other firing techniques to complete the prescribed burn.

2) Strip-Heading Fire – This technique employs the use of a backing fire, followed by a series of strip fires set in sequential order along lines upwind from the control line and perpendicular to the wind. The timing of ignition and distance between the firing lines are adjusted so that no strip of fire becomes too robust before it meets a downwind firebreak or another line of fire and dissipates. Strip fires are typically set 20 to 50 feet apart. The distance between strip fires is used to control the average flame length, which is dependent on topography, wind speed, fuel height, and fuel load. When using this method, the first step is to set a backing fire along the downwind control line and allow it to burn a strip wide enough to control and contain any upwind strip fires. Strip-heading fires can be used to reduce the amount of time needed to perform a complete burn or help carry fire through areas having low fuel loads or high relative humidity and high fuel moisture.

Diagram 1. Strip-Heading Fire Technique and Firing Sequence

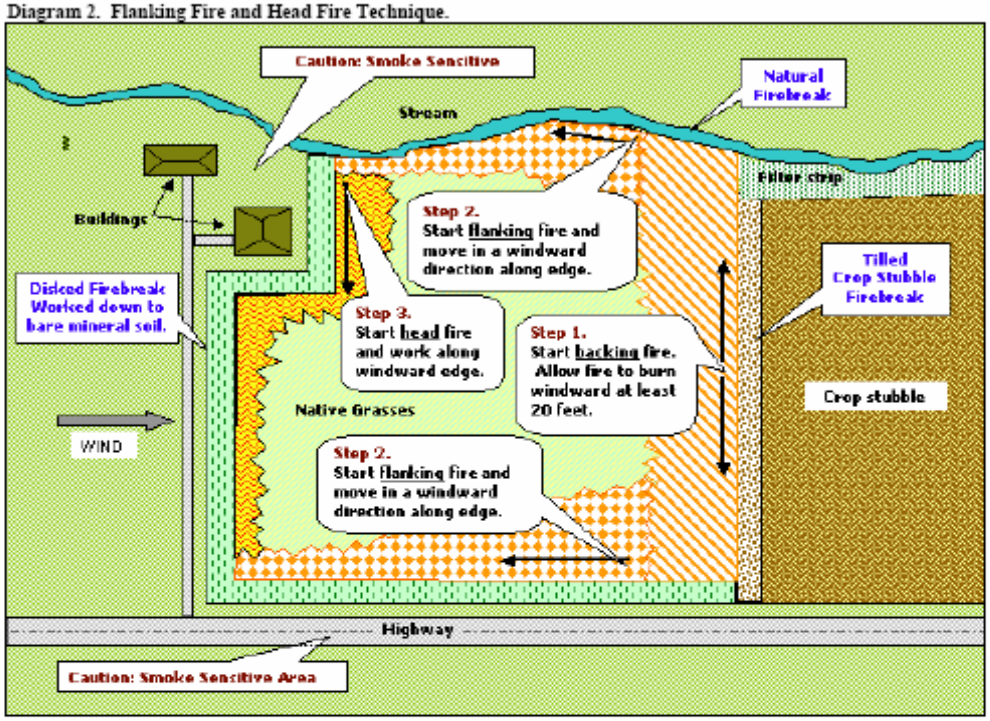


3) Flanking Fire – The flanking fire technique employs the use of fire set in lines parallel (flanking) to the wind. Although flanking fires can be ignited within the central portions of the burn area, extensive knowledge of fire behavior and experience is required, and therefore, it is not recommended for use by most landowners. For the purpose of this fact sheet, discussion is limited to the use of flanking fires along the outer flanks of the area to be burned, along established firebreaks. Flanking fires are typically used along the flanking control lines (firebreaks) to burn vegetation within the burn area away from the control lines, similar to the results obtained by a backing fire. Flanking fires should not be ignited until a backing fire has burned and blackened a strip wide enough along the baseline to control and contain any upwind fire resulting from the ignition of flanking fires. Flanking fires are frequently used in between the ignition of strip-heading fires to reduce flame height along the flanking firebreaks. The use of flanking fires also reduces the amount of time necessary to complete a prescribed burn. To properly employ the flanking fire technique, at least two persons carrying their own ignition source, are needed to simultaneously set the flanking fires.

4) Ring Fire – This firing technique creates the hottest fire and is best used when the burn objective is to control the invasion of woody stems. The ring fire technique is first initiated by using a backing fire to establish a wide, blackened control line at the downwind edge of the burn area. Once the baseline is secured with a wide blackened area, the remainder of the perimeter is ignited, starting at each end of the backing fire and moving in a windward direction. As the perimeter fires merge, flame height and temperature become quite intense and can create a very strong convection column, capable of carrying fire a considerable distance downwind. As a result, ring fires are more apt to start wildfires in neighboring fields. The ring

fire technique should only be used by experienced personnel or where the downwind landscape is composed primarily of bare mineral soils, such as plowed crop fields. To properly employ the ring fire technique, at least two persons carrying their own ignition source, are needed to simultaneously set the fires about the perimeter.

Diagram 2. Flanking Fire and Head Fire Technique.



Smoke Management

It is the responsibility of those conducting a prescribed burn to minimize any detrimental effects that smoke from the fire might create. In fact, persons conducting prescribed burning can be held liable for damages or accidents that occur as a result of smoke from the burn. Therefore, it is very important to make sure smoke management is addressed in all phases of planning a prescribed burn as well as during the actual burn. The following guidelines should be used to reduce the detrimental effects of smoke.

1. Consider all on-site and off-site impacts that smoke might impact when planning a prescribed burn.
2. Use the most up-to-date weather information prior to the burn to help assess smoke behavior and movement.
3. Conduct prescribed burns on days when conditions will allow the smoke to rise and dissipate quickly. Visual indicators of favorable atmospheric conditions include: clouds growing vertically; gusty winds blowing in a consistent direction; smoke from other sources rises quickly and to great heights; good visibility; and the formation of cumulus clouds. Indicators of poor atmospheric conditions include: clouds forming dense layers; steady or little wind; smoke from other sources drifts apart, hangs, or moves downward; poor visibility or haze; fog; and the formation of stratus clouds.

4. Use extreme caution when smoke-sensitive areas are adjacent to or downwind of the proposed burn area. Burning should not be done when the wind will carry the smoke across roadways, airports, dwellings, populated areas, and areas where domestic animals are confined or sensitive to smoke. As a general rule, do not burn if smoke-sensitive areas are downwind of the burn area and within one-half mile.
5. Check the area to be burned for combustible materials that might produce toxic fumes such as tires, asbestos, PCBs, and solvents. Either remove the items from the burn area or adjust the burn area to prevent the area around them from being burned. Remember that poisonous plants, such as poison ivy, can be rendered more toxic as the heat mobilizes the irritating oils and are transported along with the smoke. If poison ivy is present, make sure all members of the fire crew are advised, so that they may judge their own susceptibility.
6. Prior to conducting the actual burn, a small test fire involving the fuels to be burned should be set to evaluate smoke behavior. The test fire should be conducted in an open area away from woodland edges or structures that might create atypical wind currents.
7. Use backing fires whenever possible. Backing fires consume dead fuels more completely and create less smoke.
8. When possible, burn during the middle of the day. Atmospheric conditions at that time of the day tend to be most favorable for smoke dissipation.
9. Try to complete all burns prior to 5:00 pm. As the sun sets, temperature falls, relative humidity increases, and winds decline or cease altogether. Under these conditions, smoke will tend to hang close to the ground in and around the burn area.
10. If conducting a prescribed burn under less than ideal smoke transport conditions, consider breaking the larger burn unit into smaller units and allowing the smoke to dissipate prior to burning each successive unit.
11. Notify adjacent landowners, homeowners, the local fire department, and local law enforcement agencies several days prior to the burn and again on the day the burn is to be implemented. It is not only common courtesy, but local statutes may require an official notification procedure. Response to the notification may also bring unknown problems associated with the proposed burn plan to the burner's attention, such as a neighbor with respiratory problems or a family gathering planned next door. Local authorities need to be notified so that they know it is not a wildfire. It also gives local authorities advanced opportunity to review the burn plan, be better prepared in case the fire escapes, and perhaps coordinate a planned training opportunity for firefighters and other first responders.
12. As part of the actual burn plan, prepare an emergency plan that addresses changes in smoke management. Be prepared to extinguish the fire if the burn is not going according to the plan. Be prepared to contact local law enforcement officials if wind direction changes and the smoke is expected to blow across public roadways, so that traffic can be safely controlled until the smoke dissipates and is no longer a threat.
13. Never conduct prescribed burns on organic soils. Fires on organic soils are almost impossible to put out and can continue to burn underground and create smoke problems for many days if not weeks. Changing weather conditions during that time can create serious smoke problems for miles around.

Appropriate Burning Apparel

All persons assisting with the burn should wear the following apparel at all times during the prescribed burn:

- Hard hat
- Leather gloves
- Eye protection
- Leather boots (lace-up, 8-inch minimum height)
- Handkerchief (for covering mouth and nose)

- Fire resistant trousers and shirt. Use clothing that is 100% natural fiber, such as cotton or wool. Do not use clothing that is 100% synthetic fiber or synthetic fiber/natural fiber blends. Synthetic materials will melt and can cause serious burns.

Ignition Sources

Although a properly functioning drip torch is the most efficient tool for setting fires during a prescribed burn, most landowners do not have access to this equipment. Instead, most landowners utilize fusees and signal flares to set the fires. Fusees are elongated signal flares that last longer and allow the user to remain more upright when using the flare to ignite the vegetation. Flares and fusees are ignited by striking the friction cap (attached to one end of the device) against the exposed end. The precautions, listed below, should always be followed when using these devices:

- Always read and follow manufacturer warnings, precautions, and safety instructions that come with the device.
- Fusees and flares drip extremely hot, molten materials that can burn through clothing and cause serious burns. Always hold fusses and flares downward and well away from your body.
- Fusees and flares emit caustic smoke. Do not breathe the fumes.
- The flames of these devices are extremely bright. Do not look directly at the flame.
- When igniting, always hold the device downward and away from your body, and strike the friction cap away from your body.
- Once lit, these devices drop fire constantly. Do not ignite a fusee or flare in an area that you do not intend to burn. Do not ignite the device until you are ready to burn.
- Keeping burning flares well away form other objects and people.
- Never store these devices with or close to other flammables or ignition sources.
- Do not leave burning flares or fusees unattended.

Pre-Burn Check List

Prior to initiating any prescribed fire the burn crew leader should review all aspects of the official burn plan and ask the following series of questions.

___ Does the weather forecast meet the "Acceptable Burning Parameters" specified in the burn plan? If a weather front is expected to pass through the area on the day the burn is planned, DO NOT BURN.
___ Have all neighbors and appropriate law enforcement and fire department personnel been contacted and properly notified?
___ Have all "Pre-Burn Site Preparations" been completed, checked, and are they functional?
___ Is all the equipment needed to safely carry out the burn on site and is it functioning properly?
___ Do all the personnel know how to safely handle and properly use the ignition sources and other equipment?
___ Are all the personnel necessary to carry out the burn on site?
___ Are all personnel physically fit to perform potentially strenuous activity?
___ Have all personnel been briefed on the prescribed burn plan and know their assignments?
___ Are all personnel wearing appropriate burning apparel?
___ Is the weather forecast expected to be favorable throughout the entire proposed burn time?
___ Do you have a working cellular phone with the telephone number of the local fire department entered?
___ In your opinion, can the burn be carried out according to the burn plan in a safe manner?

If the answer to <u>any</u> of the above checklist questions is "NO", then DO NOT BURN!
If the answer to <u>all</u> of the above checklist questions is "YES", then the next step is to conduct a small, test burn to better assess smoke management and how the actual burn might respond under the current conditions.

Conducting the Prescribed Burn

If the test fire performs satisfactorily, begin the prescribed burn by starting a backing fire along the most downwind (leeward) portion of the field, according to the burn plan. Allow the backing fire to burn inward from the control line to a distance of at least 20 feet; making sure the downwind edge of the control line has been secured, and fire has not crept across the firebreak. As the backing fire continues to burn against the wind, lengthen the peripheral edges of the backing fire by igniting short segments of the flanking control lines. Allow the flanking fires to burn inward and away from the flanking control lines. Never set fire to more area along the flanking control lines than what the fire crew can control. At least one crewmember should routinely check back along the burned control lines to make sure fire has not escaped across the lines. At this point, the ignition of additional lines of fire varies according to what type of firing technique is specified in the burn plan.

If only a backing fire is being used to burn the entire unit, continue setting fire in short distances along the flanking control lines to keep ahead of the advancing backing fire. When flanking fires have been set all the way to the most windward (upwind) section of the field and the flanking control lines are secure, lay fire along the windward control line to complete the prescribed burn.

If the strip-heading technique is going to be employed, stop and reassess current conditions. If it is still appropriate and safe to perform a strip-heading fire, move upwind approximately 20 feet from the advancing backing fire and begin laying a strip of fire in a line parallel to the backing fire and perpendicular to the wind direction. Prior to laying each successive strip of fire across the field, check to see if wind speed, wind direction, and the rate of spread at which the backing fire is advancing are such that the strip-heading technique is still appropriate and safe to use.

If the ring fire technique is prescribed, stop and reassess the current conditions. If it is still appropriate and safe to perform a ring fire continue laying fire along the flanking control lines and allow the fire to burn inward and away from the flanking control lines to a width equal to at least twice the height of the flames or twenty feet, which ever is greater. Once these conditions have been attained, lay fire to the most windward control line to complete the prescribed burn. Ring fires can be very hot and create strong convection columns and wind speeds, which can carry hot sparks across control lines and into neighboring fields. Crewmembers should be on constant lookout for spot fires that might erupt in nearby fields or breach control lines.

Once the prescribed burn has been completed, crewmembers need to ensure that the fire is completely out. Smoldering embers can quickly reignite or be blown into neighboring areas and start wildfires. Check all fields adjacent to the burn area at least twice to ensure the fire hasn't escaped. Drench all smoldering debris and hot embers with water. Check the area again that night and the next day, especially if conditions have turned windy and dry.

In Case of an Emergency

In case of an emergency or escaped fire:

- Call 911 or the local fire department.
- Move all persons to safety zones, such as:
    - Man-made firebreaks,
    - Paved, gravel, or dirt roads,
    - Permanent bodies of water, or
    - Areas already blackened by the fire.
- Contact all neighbors that may be potentially affected.

After the Prescribed Burn

After the burn has completed, inspect the area to see if the prescribed burn met its objectives. Ask questions like: Were the firebreaks wide enough? Were the firebreaks effective? Did I have all the equipment and manpower that I needed? Did I get the results that I was expecting? Make a list of things you would do differently the next time.

Of course, the desired vegetation response may not be apparent immediately after the burn. The assessment of changes in vegetation diversity and density will have to be delayed until the entire growing season can be evaluated. So, it is important to return to the site several times during the growing season to fully assess the results.

Related *Habitat Management Fact Sheets*:

Warm Season Grass Establishment
Warm Season Grass Management
Strip Disking
Fescue Eradication
Strip Spraying
Prescribed Burning
Wildflowers

Prepared by the Indiana Department of Natural Resources, Division of Fish and Wildlife. For up-to-date information concerning the Indiana Division of Fish and Wildlife, or for information on the location of your District Wildlife Biologist, visit our website at www.wildlife.IN.gov
March 2005

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TITLE 326 AIR POLLUTION CONTROL BOARD

Final Rule
LSA Document #09-498(F)

DIGEST

Adds 326 IAC 26-2 to establish best available retrofit technology (BART) emission limitations in order to comply with the federal regional haze rule. Effective 30 days after filing with the Publisher.

HISTORY

First Notice of Comment Period: July 22, 2009, Indiana Register (DIN: 20090722-IR-326090498FNA).
Second Notice of Comment Period: June 30, 2010, Indiana Register (DIN: 20100630-IR-326090498SNA).
Notice of Public Hearing: June 30, 2010, Indiana Register (DIN: 20100630-IR-326090498PHA).
Date of First Public Hearing: September 1, 2010.
Proposed Rule: September 29, 2010, Indiana Register (DIN: 20100929-IR-326090498PRA).
Notice of Public Hearing: September 29, 2010, Indiana Register (DIN: 20100929-IR-326090498PHA).
Date of Second Public Hearing and Final Adoption: November 3, 2010.

326 IAC 26-2

SECTION 1. 326 IAC 26-2 IS ADDED TO READ AS FOLLOWS:

Rule 2. Best Available Retrofit Technology Emission Limitations

326 IAC 26-2-1 Applicability

Authority: IC 13-14-8; IC 13-14-9; IC 13-17-3-4; IC 13-17-3-11
Affected: IC 13-15; IC 13-17

Sec. 1. (a) This rule applies to a BART-eligible source determined to be subject to BART under 326 IAC 26-1-4.

(b) Alcoa in Warrick County is determined to be subject to BART and is required to meet the emission limitations and other requirements as specified in section 2 of this rule not later than February 22, 2013.

(Air Pollution Control Board; 326 IAC 26-2-1; filed Feb 9, 2011, 10:26 a.m.: 20110309-IR-326090498FRA)

326 IAC 26-2-2 Alcoa emission limitations and compliance methods

Authority: IC 13-14-8; IC 13-14-9; IC 13-17-3-4; IC 13-17-3-11
Affected: IC 13-15; IC 13-17

Sec. 2. Alcoa Power Generating Inc. - Warrick Power Plant, Source Identification Number 00002, and Alcoa, Inc. - Warrick Operations, Source Identification Number 00007, shall comply with the emission limitations and compliance methods as follows:

(1) Boiler 1 at Alcoa Power Generating Inc. - Warrick Power Plant shall be in compliance with the following requirements:

(A) PM (filterable) as follows:

(i) The emission limitation is three-hundredths (0.03) pounds per million British thermal units (lb/MMBtu) on a twenty-four (24) hour daily average.

(ii) The compliance method is a continuous emissions monitoring system (CEMS) at the scrubber outlet in accordance with 40 CFR 60, Appendix B, Performance Specification 11 (PS-11)*.

(B) SO_2 as follows:

(i) The removal efficiency is ninety-one percent (91%) SO_2 removal on a twenty-four (24) hour daily average.

(ii) The compliance method is a CEMS at the scrubber inlet and outlet in accordance with 40 CFR 60, Appendix B, Performance Specification 2 (PS-2)*.

(C) NO_x as follows:
(i) The emission limitation is thirty-eight hundredths (0.38) lb/MMBtu on a twenty-four (24) hour daily average.
(ii) The compliance method is a CEMS at the scrubber outlet in accordance with PS-2*.

(2) Boilers 2 and 3 at Alcoa Power Generating Inc. - Warrick Power Plant shall each be in compliance with the following requirements:

(A) PM (filterable) as follows:
(i) The emission limitation is three-hundredths (0.03) lb/MMBtu on a twenty-four (24) hour daily average.
(ii) The compliance method is a CEMS at the scrubber outlet in accordance with PS-11*.

(B) SO_2 as follows:
(i) The removal efficiency is ninety percent (90%) SO_2 removal on a twenty-four (24) hour daily average.
(ii) The compliance method is a CEMS at the scrubber inlet and outlet in accordance with PS-2*.

(C) NO_x as follows:
(i) The emission limitation is thirty-eight hundredths (0.38) lb/MMBtu on a twenty-four (24) hour rolling average.
(ii) The compliance method is a CEMS at the scrubber outlet in accordance with PS-2*.

(3) Boiler 4 at Alcoa Power Generating Inc. - Warrick Power Plant shall be in compliance with PM (filterable) requirements as follows:

(A) The emission limitation is one-tenth (0.1) lb/MMBtu on a twenty-four (24) hour daily average.
(B) The compliance method is in accordance with 40 CFR 60, Appendix A, Method 5*.

(4) Potlines 2 through 6 at Alcoa, Inc. - Warrick Operations shall be in compliance with the following requirements:

(A) PM (filterable) as follows:
(i) The emission limitation is five-thousandths (0.005) grains per standard cubic foot (grains/scf) as measured at the outlet of the primary control devices for potlines 2 through 6.
(ii) The compliance method is in accordance with 40 CFR 60, Appendix A, Method 5* for the:
(AA) Gas Treatment Center control device for potlines 3 and 4; and
(BB) primary control devices for potlines 2, 5, and 6, except that the stacks selected for sampling shall use the method described in the Site Specific Test Plan for measuring annual total fluoride emissions from potroom group primary control devices, as required by 40 CFR 63.847(b).

(B) SO_2 as follows:
(i) The emission limitations in 326 IAC 7-4-10(a)(4)(B) through 326 IAC 7-4-10(a)(4)(F).
(ii) The compliance method is 326 IAC 7-4-10(c) and:
(AA) 326 IAC 7-4-10(b); or
(BB) material balance calculations approved by the department.

***These documents are incorporated by reference. Copies may be obtained from the Government Printing Office, 732 North Capitol Street NW, Washington, D.C. 20401 or are available for review and copying at the Indiana Department of Environmental Management, Office of Air Quality, Indiana Government Center North, Tenth Floor, 100 North Senate Avenue, Indianapolis, Indiana 46204.**

(Air Pollution Control Board; 326 IAC 26-2-2; filed Feb 9, 2011, 10:26 a.m.: 20110309-IR-326090498FRA)

LSA Document #09-498(F)
Proposed Rule: 20100929-IR-326090498PRA
Hearing Held: November 3, 2010
Approved by Attorney General: January 20, 2011
Approved by Governor: February 4, 2011
Filed with Publisher: February 9, 2011, 10:26 a.m.
Documents Incorporated by Reference: None Received by Publisher
Small Business Regulatory Coordinator: Alison Beumer, IDEM Small Business Regulatory Coordinator, MC 60-04 IGCS W-041, 100 N. Senate Avenue, Indianapolis, IN 46204-2251, (317) 232-8172 or (800) 988-7901, ctap@idem.in.gov
Small Business Assistance Program Ombudsman: Brad Baughn, IDEM Small Business Assistance Program Ombudsman, MC 50-01 IGCN 1301, 100 N. Senate Avenue, Indianapolis, IN 46204-2251, (317) 234-3386 or (800) 451-6027, bbaughn@idem.in.gov

Posted: 03/09/2011 by Legislative Services Agency

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Appendix 8 - Public Hearing Process

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Appendix 8a - Legal Notice of Public Hearing

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LEGAL NOTICE OF PUBLIC HEARING

Indiana Regional Haze State Implementation Plan

Notice is hereby given under 40 CFR 51.102 that the Indiana Department of Environmental Management (IDEM) will hold a public hearing on January 11, 2011. The purpose of this hearing is to receive public comment on the Draft Indiana Regional Haze State Implementation Plan. The meeting will convene at 6:00 p.m. (local time) in the Indianapolis-Marion County Library-West Indianapolis Branch, located at 1216 S. Kappes Street, Indianapolis, Indiana. All interested persons are invited and will be given opportunity to express their views concerning the draft document.

The federal Regional Haze Rule (64 FR 35714, July 1, 1999) requires states to submit State Implementation Plans (SIP) to the United States Environmental Protection Agency (U.S. EPA) to reduce visibility impacts in 156 Federally-protected parks and wilderness areas, called "mandatory Class 1 Federal areas" (Class 1) areas. Indiana does not have any Class 1 areas; however, Indiana sources have been determined to impact visibility in Class 1 areas in other states. The Clean Air Act requires Indiana to develop a strategy to mitigate visibility impairment in those areas. This SIP is being drafted and submitted consistent with U.S. EPA guidance.

Copies of the draft documents will be available on or before December 11, 2010 to any person upon request and at the following locations:

- Indiana Department of Environmental Management, Office of Air Quality, Indiana Government Center North, 100 North Senate, Room N1003, Indianapolis, Indiana.
- IDEM Northern Regional Office, 300 N. Michigan Street, Suite 450, South Bend, Indiana
- IDEM Northwest Regional Office, 8380 Louisiana Street, Merrillville, Indiana
- IDEM Southeast Regional Office, 820 West Sweet Street, Brownstown, Indiana
- IDEM Southwest Regional Office, 1120 N. Vincennes Avenue, Petersburg, Indiana

The draft documents will also be available on the following web page:http://www.in.gov/idem/4499.htm

Oral statements will be heard, but for the accuracy of the record, statements should be submitted in writing. Written statements may be submitted to the attendant designated to receive written comments at the public hearing.

IDEM will also accept written comments through January 13, 2011. Mailed comments should be addressed to:

Indiana Regional Haze State Implementation Plan
Scott Deloney, Chief
Programs Branch
Office of Air Quality MC 61-50
100 North Senate Avenue
Indiana Department of Environmental Management
Indianapolis, IN 46206-2251

A transcript of the hearing and all written submissions provided at the public hearing shall be open to public inspection at IDEM and copies may be made available to any person upon payment of reproduction costs. Any person heard or represented at the hearing or requesting notice shall be given written notice of actions resulting from the hearing.

For additional information contact Mr. Ken Ritter, at the Indiana Department of Environmental Management, Air Programs Branch, Office of Air Quality, Room 1001, Indiana Government Center North, 100 North Senate Avenue, Indianapolis or call (317) 233-5682 or (800) 451-6027 ext. 3-5682 (in Indiana).

****

Individuals requiring reasonable accommodations for participation in this hearing should contact the IDEM Americans with Disabilities Act (ADA) coordinator at:

Attn: ADA Coordinator
Indiana Department of Environmental Management – Mail Code 50-10
100 North Senate Avenue
Indianapolis, IN 46204-2251

Or call (317) 233-1785 (voice) or (317) 232-6565 (TDD). Please provide a minimum of 72 hours notification.

Appendix 8b - Certification of Publication

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Prescribed by State Board of Accounts **80315-5747296** General Form No. 99P (Rev. 2009A)

IND DEPT OF ENVIRONMENTAL MANA

MARION COUNTY, INDIANA

To: INDIANAPOLIS NEWSPAPERS
307 N PENNSYLVANIA ST - PO BOX 145
INDIANAPOLIS, IN 46206-0145

PUBLISHER'S CLAIM

LINE COUNT

LEGAL NOTICE OF PUBLIC HEARING
Indiana Regional Haze State Implementation Plan

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Attn: ADA Coordinator
Indiana Department of Environmental Management – Mail Code 50-10
100 North Senate Avenue
Indianapolis, IN 46204-2251

Or call (317) 233-1785 (voice) or (317) 232-6565 (TDD). Please provide a minimum of 72 hours notification.

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APPROVED FOR PAYMENT
BY Kenneth Ritter
DATE 12-14-10
OFFICE OF AIR QUALITY

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paper
a Web site, but due to a technical problem or error, public notice was posted on _____
a Web site but refuses to post the public notice.

Kasey Dodson

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Appendix 8c - Public Hearing Transcript

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BEFORE THE INDIANA DEPARTMENT OF
ENVIRONMENTAL MANAGEMENT

- - -

PUBLIC HEARING REGARDING

THE DRAFT INDIANA REGIONAL HAZE

STATE IMPLEMENTATION PLAN (SIP)

ORIGINAL

- - -

PROCEEDINGS

in the above-captioned matter, before the Hearing Officer Ken Ritter, taken before me, Lindy L. Meyer, Jr., a Notary Public in and for the State of Indiana, County of Shelby, at the Indianapolis-Marion County Public Library, West Indianapolis Branch, 1216 South Kappes Street, Indianapolis, Indiana, on Tuesday, January 11, 2011 at 6:15 o'clock p.m.

- - -

William F. Daniels, RPR/CP CM d/b/a
ACCURATE REPORTING OF INDIANA
12922 Brighton Avenue
Carmel, Indiana 46032
(317) 848-0088

APPEARANCES:

ON BEHALF OF IDEM:
Ken Ritter, Hearing Officer

SPEAKERS PRESENT:
None

- - -

6:15 o'clock p.m.
January 11, 2011

- - -

THE HEARING OFFICER: Good evening. I'm Ken Ritter, Chief of the IDEM Office of Air Quality's Technical Support and Modeling Section.

The purpose of this hearing is to receive public comment on the Draft Indiana Regional Haze State Implementation Plan, or SIP.

For this hearing, there are several documents for public view. First is the Draft Indiana Regional Haze State Implementation Plan, dated November 2010, and its appendices; a copy of the public notice along with the newspaper publisher's claim; a letter from Clyde Thompson of the U.S. Forest Service containing their comments on the Indiana SIP; and the comment letter from John Bunyak, representing the U.S. Department of the Interior, the National Parks Service, and the U.S. Fish and Wildlife Service.

On the table is a "Public Hearing - Attendance Record," sign-in sheet, "Request to Speak Slips," and Comment Forms." Please fill these out as appropriate.

Regional haze is caused by tiny particles that absorb and scatter sunlight, creating white and brown haze. Major contributors to these particles are electrical generating units, large industrial boilers, cement kilns, and a variety of other air pollutant sources.

The Regional Haze SIP requires -- I'm sorry. The Regional Haze Rule requires states to submit SIP's to address regional haze visibility impairment in the 156 federally protected parks and wilderness areas. These 156 scenic areas are called "mandatory Class 1 Federal areas" in the Clean Air Act, but generally referred to as "Class 1 areas."

The federal Regional Haze Rule requires Indiana to submit a SIP to the United States Environmental Protection Agency, the U.S. EPA. U.S. EPA's Regional Haze Rule was adopted July the 1st, 1999, and went into effect on August the 30th, 1999, 64 Federal Register 35714.

The Regional Haze Rule is aimed as achieving nationality visibility goals by 2064. This rulemaking addressed the combined visibility

effects of various pollution sources over a wide geographic region. This wide-reaching pollution net means that many states, even those without Class 1 areas, are required to participate in haze reduction efforts.

Indiana does not have any Class 1 areas; however, Indiana sources have been determined to impact visibility in Class 1 areas in other states. The Clean Air Act requires Indiana to develop a strategy to mitigate visibility impairment in those areas.

The strategy has been developed in consultation with the Midwest Regional Planning Organization and affected states using data and tools, including emissions inventories and modeling analyses, taking into consideration factors such as existing pollution control programs, emission reduction needs, compliance schedules, and smoke management techniques. The SIP describes Indiana's consultation process, technical analyses, and actions taken to reduce visibility impairment in other Class 1 areas.

As required by the Clean Air Act, U.S. EPA

included in the final Regional Haze Rule a requirement for best available retrofit technology, or BART, for certain large stationary sources. The Regional Haze Rule uses the term "BART-eligible source" to describe these sources.

Under the Clean Air Act, BART is required for any BART-eligible source that a state determines emits any air pollutant which may reasonably be anticipated to cause or contribute to any impairment of visibility in any Class 1 area.

Accordingly, for stationary sources meeting these criteria, states must address the BART requirement when they develop their Regional Haze SIP's. On November the 3rd, 2010, the Indiana Air Pollution Control Board adopted as final the Indiana BART Rule, 326 IAC 26-2.

The BART analysis is a key component of the Regional Haze SIP. IDEM conducted further modeling in coordination with the Midwest Regional Planning Organization and determined that there were four BART-eligible sources that were determined to be subject to BART.

Of these sources, three performed modeling that showed they were below significant impact thresholds. That left certain units at Alcoa which were subject to BART. Alcoa provided a BART analysis which was reviewed by the state, and appropriate limits were included in the final BART Rule.

This concludes my brief summary of the Regional Haze Rule. I'm now ready to accept any comments. IDEM will also accept written comments through January 13th, 2011. Mailed comments should be sent to the address listed on the public notice: The Indiana Regional Haze State Implementation Plan, Scott Deloney, Chief, the Programs Branch, Office of Air Quality, MC 61-50, Indiana Department of Environmental Management, 100 North Senate Avenue, Indianapolis, Indiana, 46206-2251.

A transcript of this hearing and all written submissions provided at the public hearing shall be open to the public for inspection at IDEM, and copies may be made available to any person upon payment of

reproduction costs. Any person heard or requested [sic] at the hearing -- or requesting notice shall be given written notice of actions resulting from the hearing.

And that's it. Thank you. The hearing's concluded.

- - -

Thereupon, the proceedings of January 11, 2011 were concluded at 6:22 o'clock p.m.

- - -

CERTIFICATE

I, Lindy L. Meyer, Jr., the undersigned Court Reporter and Notary Public residing in the City of Shelbyville, Shelby County, Indiana, do hereby certify that the foregoing is a true and correct transcript of the proceedings taken by me on Tuesday, January 11, 2011 in this matter and transcribed by me.

Lindy L. Meyer Jr.

Lindy L. Meyer, Jr.,
Notary Public in and
for the State of Indiana.

My Commission expires October 27, 2016.

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Appendix 9 - IDEM Responses to National Park Service Comments

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IDEM Responses to National Park Service Comments

Chapter 2, Regional Planning

Comment:

IDEM has identified 19 Class I areas that are impacted by Indiana emissions. Table 1 in Appendix 1 lists the specific Class I areas that Indiana impacts and cites the technical analyses that support that determination. It would be helpful to include Table 1 in the SIP Chapter 2.

IDEM Response:

IDEM has added Table 1 in Appendix 1 to Chapter 2 in the SIP and subsequent tables have been renumbered as necessary.

Chapter 4, Baseline Conditions, Pollutant Contribution, Uniform Rate of Progress

Comment:

IDEM cites work of MRPO and other states but does not provide any information to illustrate the baseline visibility conditions, the pollutant contributions, and the needed visibility improvement. We recommend that IDEM pick a Class I area from each region and include in Chapter 4 a summary of pollutant contributions in the baseline period for the average of the 20% worst days and monthly or daily time series from the IMPROVE data to illustrate the temporal variation in pollutant contributions.

As part of the contribution assessment IDEM should explicitly state which pollutants would be most effective to control to improve visibility at the impacted Class I areas. We also recommend illustrating the glide paths for the uniform rate of progress for the selected Class I areas or at least adding these data to the Appendices and citing in Chapter 4 where the data can be found.

IDEM Response:

IDEM has included a summary, in Chapter 4, of pollutant contributions in the baseline period for the average of the 20% best and worst days for the northern Class 1 areas. Although pollutant contributions from Class 1 areas in the central, eastern and northeastern regions have been included in the discussion, the summary focused primary on the northern Class 1 areas. Detailed information to illustrate the baseline visibility conditions, the pollutant contributions, the needed visibility improvement and glide paths for the uniform rate of progress have been added in Appendix 9a.

Chapter 5, Emissions Inventory:

Comment:

This chapter very briefly summarizes the methods used by the MRPO to develop the 2005 and future year inventories. Please include the MRPO Technical Support Document as an Appendix.

Table 3 summarizes the Electric Generating Unit (EGU) projections from the Integrated Planning Model (IPM) Version 3.0 for three scenarios. Please provide more detailed explanation how the three scenarios differ and explicitly why sulfur dioxide (SO_2) and nitrogen oxides (NO_x) emissions for Indiana are lower in Scenario 5a than Scenarios 5b and 5c.

IDEM needs to discuss the projected emissions changes between 2005 and 2018 as evidence that Indiana is making reasonable progress. Table 4 does not appear to be cited or discussed in the text, yet this is the most important data for demonstrating Indiana's emission reductions. Please provide emissions summaries in Table 4 as tons/year rather than tons/day to avoid questions how to account for weekly and seasonal variability to scale to tons/year values.

IDEM Response:
IDEM has included the LADCO Technical Support Document "Regional Air Quality Analyses for Ozone, PM2.5, and Regional Haze: Final Technical Support Document" in Appendix 9b. In addition, a more detailed discussion of the three scenarios and the projected emissions changes between 2005 and 2018 has been incorporated. A discussion of the Table 4 data has been incorporated, as well, and emissions summaries in Table 4 have been changed from tons/day to tons/year.

Chapter 6, Modeling Assessment

Comment:
IDEM relies on the MRPO modeling. Please include the MRPO Technical Support Document in an Appendix. A discussion of model performance is necessary to demonstrate confidence in model projections. There is not an Attainment Test for regional haze; you could delete the Section 6.2 header and cover the material under Section 6.1.

The wording in the last paragraph on page 22 is confusing as written. Please clarify your intent. If model results are less than the uniform rate of visibility improvement does that mean greater visibility improvement than the uniform rate?

The scenario terms used in Tables 6 and 7 are not the same as described in Chapter 5 Emissions Inventory. Please explain how the terms for the emissions assumptions in Tables 6 and 7 relate to the scenarios in Table 4. How does "Will Do" compare to Scenario 5a, 5b, or 5c? Do the "Will Do" adjustments pertain only to the EGU sector? Please provide additional clarification on what assumptions are included in the modeled scenarios.

IDEM Response:
IDEM has included the LADCO Technical Support Document "Regional Air Quality Analyses for Ozone, PM2.5, and Regional Haze: Final Technical Support Document" in Appendix 9 b and removed the section heading "Attainment Test for Regional Haze/Visibility." In addition, a better explanation of how the terms for the emissions assumptions in Tables 6 and 7 relate to the scenarios in Table 4 has been provided along with a clearer discussion of the visibility modeling results.

Chapter 7, Reasonable Progress Goals

Comment:
Please add reference to Appendix 1 for contribution assessments from MRPO and other RPOs and Appendix 2 for letters from states requesting consultation.

We agree that based on the contribution assessments presented in Appendix 1 and 3 and in sections 7.2-7.9, Indiana sources have comparatively small contributions to Class I areas in neighboring states.
To comply with the Regional Haze Rule Sections 308(d)(3)(ii) and (iv), IDEM still needs to demonstrate that it has included in its long term strategy all measures needed to achieve its share of emission reductions and to identify all anthropogenic sources of visibility impairment considered in developing the long term strategy. IDEM has cited modeling results of MRPO and neighboring RPOs, but IDEM still needs to evaluate its emission sources and demonstrate using a four factor analysis that Indiana is making reasonable progress in reducing anthropogenic emissions. This demonstration should evaluate the monitoring, emissions inventory, and modeling data to determine which pollutants are most important to control, what reductions are already expected by 2018, what source categories are major contributors in 2018, and evaluate the four factors for those major source categories. The MRPO provided a four factor analysis for major source categories that IDEM could cite in evaluating what control measures are feasible and reasonable for specific stationary sources.

Several states have used emissions (Q) divided by distance (d) as a screening method to prioritize which stationary sources to consider in a reasonable progress analysis. If IDEM considered a Q/d for SO_2+NO_x = 10 for sources with emissions of SO_2+NO_x greater than 200 tons/year, IDEM would likely be able to focus the reasonable progress analysis on specific stationary sources within a few major source categories. The VISTAS and CENRAP Areas of Influence are another method to identify which sources in Indiana should be evaluated for reasonable progress.

IDEM Response:
IDEM has added reference to Appendix 1 for contribution assessments from MRPO and other RPOs and Appendix 2 for letters from states requesting consultation. In addition, IDEM has included additional information related to Indiana's emissions and visibility contributions and a detailed discussion of the measures needed to achieve Indiana's share of reductions in Appendix 9c and LADCO's "Reasonable Progress for Class 1 Areas in the Northern Midwest – Factor Analysis" Document (July 18, 2007)".

Chapter 8 Best Available Retrofit Technology (BART)
Comment:
Please add greater description of the data presented in Table 10, BART-eligible Electric Generating Units (EGU) covered by the Clean Air Interstate Rule (CAIR) and discuss the implications in the text. Does Table 10 cover all EGU in Indiana including those units that are BART-eligible, those units listed by MANE-VU, and all other units? Please clarify what assumptions were used for each column. Does column "2009 + Projected" include only legally enforceable controls? What criteria were used to include a future control date? Does each succeeding column to the right include only controls that were not included in previous columns? If the LADCO column is empty does that mean that the controls assumed by IPM are legally enforceable and included in the LADCO modeling or not legally enforceable and not included in the LADCO modeling? Please make clear in the text that controls modeled by IPM Version 3.0 are estimates and may not be legally required.

IDEM Response:
IDEM has added a more detailed description of the data presented in Table 10 and an explanation of the assumptions made for each column in the table. A discussion of the implications of the various modeling scenarios and the best current information available regarding Indiana EGU controls and the legal enforceability of these controls has been added.

Section 8.4 BART Exemptions for ArcelorMittal-Burns Harbor, ESSROC-Speed, and SABIC

Comment:
Based on our conference call on December 13, 2010, we understand that the ammonia values used in the final BART exemption modeling differed from the values cited in the MRPO BART modeling protocol. We request that IDEM update this section to clarify the revised ammonia values that better reflect measured values in the region. Because the visibility impacts of the three sources did not exceed the contribution threshold using the revised ammonia values, if IDEM updates the cited analytical methods to reflect the revisions, we can support the BART exemptions.

IDEM Response:
IDEM has updated this section to clarify the revised ammonia values that better reflect measured values in the region and added the discussions and data for ArcelorMittal Burns Harbor, ESSROC - Speed and SABIC CALPUFF results using Bondville Ammonia Monitoring Results 2003-2005 in Appendix 9d.

Section 8.7 BART Determination for Alcoa

We question whether it is valid to take credit as a BART Alternative for SO_2 and NO_x reductions that were required under New Source Performance Standards (NSPS) when Alcoa increased the capacities of Boilers 1, 2, and 3. Boilers 2 and 3 are subject to BART; Boiler 1 is not. Boiler 4 is classified as an EGU and is also subject to BART. Wet flue gas desulfurization (FGD) scrubbers were installed on all boilers in 2008. For SO_2, NSPS requires 90% control. IDEM proposes to use SO_2 reductions for Boiler 1 to offset the difference between BART (92% control) and proposed controls (90% control) for Boilers 2 and 3. IDEM credits the scrubber installed on Unit 1 as achieving significantly higher reductions in SO_2, equal to approximately 21,600 tons, than would be achieved by BART. However we understand that because Boiler 1 was required by NSPS to reduce SO_2 emissions by 90%, Alcoa can take credit in the BART Alternative for only the difference between the required 90% reduction and the proposed 91% reduction at Boiler 1. We do not believe that it is valid to use reductions that are required by permit to meet NSPS at Boiler 1 to also satisfy BART for the Boilers 2 and 3.

Alcoa and IDEM have underestimated the efficiency of scrubbers (95%) and Selective Catalytic Reduction, SCR (90%). As well, Alcoa and IDEM are also proposing to increase SO_2 and PM emissions from BART sources (potlines) above current levels. We do believe that the existing analyses support the determination that the BART Alternative is better than BART.

Section 8.7 BART Determination and Modeling for Alcoa

8.7.1 Summary of Alcoa BART Analysis

Comment:

According to IDEM, the alternative achieves a visibility improvement equal to 0.46 dv and an overall improvement in visibility equal to 75% over the baseline and achieves significantly higher reductions in SO_2, equal to approximately 21,600 tons. However, it is likely that the majority of the emission reductions cited by IDEM were the result of efforts by Alcoa to increase the capacities of Boilers 1, 2, and 3 while avoiding review under the Prevention of Significant Deterioration (PSD) regulations. In order to do so, Alcoa installed wet scrubbers to reduce SO_2 emissions from these units, as well as installing Selective Catalytic Reduction on Boiler #4 to offset NO_X emission increases from Boilers 1, 2, and 3. Therefore, we question whether it is valid to take credit as a BART Alternative for reductions made for other purposes, as we shall discuss later.

IDEM Response:

IDEM's approach to BART reductions has been to follow guidance from various parts of the regional haze program. In the 1999 Regional Haze Regulations, Subpart P – Protection of Visibility, it states that reductions must be surplus to required emission reductions up to the baseline date. The established baseline date is 2002. The year 2002 has been used by various states, RPOs, and the EPA regional haze modeling guidance. It is also specified by the Lydia Wegman November 18, 2002 memo, "2002 Base Year Emission Inventory SIP Planning: 8-hr Ozone, $PM_{2.5}$ and Regional Haze Programs."

The BART Rule, 70 FR 128, 39143, states that "(2) The EPA does not believe that anything in the CAA or relevant case law prohibits a State from considering emissions reductions required to meet other CAA requirements when determining whether source by source BART controls are necessary to make reasonable progress." and "(3)…in lieu of BART programs be based on emissions reductions 'surplus to reductions resulting from measures adopted to meet requirements as of the baseline date of the SIP.' The baseline date for regional haze SIPs is 2002…" This is extracted from a discussion justifying the use of CAIR, a program used for other purposes, to substitute for BART. Therefore, it is our belief that it is valid to take credit for BART alternatives made for other purposes.

8.7.2 BART-eligible units at Alcoa

Alcoa identified 18 ingot furnaces, three boilers (Boilers 2, 3, and 4), and five aluminum refining furnaces (Potlines 2-6) as meeting the BART-eligibility criteria. Boilers 2 and 3 are classified as industrial boilers. Boiler 4 is classified as an Electric Generating Unit (EGU). Alcoa, in its December analysis addressed PM, SO_2, and NOx for all its BART-eligible units including Boiler 4. According to the Indiana BART rule, 326 IAC 26-1-5, participation of this boiler in the Clean Air Interstate Rule (CAIR) satisfies the SO_2 and NO_X requirements. The BART analysis will therefore address PM only for this boiler.

Boilers 2, 3, and 4 are dry bottom, pulverized coal-fired units. Boiler 2 came online in January 1964, Boiler 3 came online in October 1965, and the construction of Boiler 4 started on March 16, 1968. Boilers 2 and 3 each had a nominal heat input capacity of 1,357 MMBtu/hr prior to a recent upgrade to a nominal heat input capacity of 1,589 MMBtu/hr. Boiler 4 has a nominal heat input capacity of 2,958 MMBtu/hr. Each boiler is equipped with an electrostatic precipitator (ESP) for PM control. Boiler 2 was equipped with a low NO_X burner (LNB) and overfire air (OFA) in 2004, Boiler 3 was equipped with LNB and OFA in 2002, and Boiler 4 was equipped with a LNB in 1998 and a selective catalytic reduction (SCR) system in 2004. Wet flue gas desulfurization (FGD) scrubbers were installed on all boilers in 2008.

Emissions from potlines are captured and controlled with primary controls. Any uncaptured emissions escape through the roof monitors atop the potline buildings. The primary controls consist of a gas treatment system followed by a fabric filtration system. The total fluoride and particulate removal efficiencies of the control systems are estimated to exceed 99%.

Ingot furnace emissions are uncontrolled. There are several material handling operations at the facility that meet the criteria for beginning operation between 1962 and 1977. However, the BART Guidelines require that only those operations at primary aluminum ore reduction plants that meet the NSPS applicability criteria for this source category should be considered for BART controls. These operations are the potroom groups and anode bake plants. IDEM also identified three (3) ingot furnaces in the Alcoa Title V permit that meet the 1962-1977 timeline criteria but were not included in the analysis. According to Alcoa, one of these furnaces has been physically removed and the other two furnaces did not operate in the baseline years. IDEM considers the impact of the other 18- furnaces to be negligible.

8.7.3 BART Analysis

The initial screening model projected the highest visibility impact at Mammoth Cave National Park (MCNP). Other Class I areas screened included Mingo Wilderness Area, Sipsey Wilderness Area, Great Smoky Mountains National Park, Joyce Kilmer – Slick Rock Wilderness Area, Cohutta Wilderness Area, and Shining Rock Wilderness Area. The impact at MCNP exceeded 0.5 dv. Since the visibility impact was highest at MCNP, the BART analysis was solely based on the impact at MCNP.

8.7.4 Control Strategy

IDEM: Alcoa proposed an alternative to BART which requires less emissions reductions on some units for technical or economic reasons. However, it proposes to control emissions from Boiler 1 which is not a BART-eligible unit. For example, Alcoa determined SO_2 BART for Boilers 2 and 3 as 92% reduction, but it proposes to control SO_2 emissions from these boilers by 90% as an alternative. Alcoa currently limits sulfur in the anode grade coke to $\leq$ 2%. Based on a market study, it has determined that the supply of <3% sulfur coke cannot be ascertained beyond 2013. Therefore, it proposes BART as $\leq$ 3% sulfur coke and the alternative as $\leq$ 3.5% sulfur coke. In the alternative, the source proposes to control SO_2 emissions from Boiler 1 by 91% and NOx emissions at 0.38 lb/MMBtu.

Comment:
We do not believe that it is valid to use reductions that are required by permit to avoid PSD[1] and/or meet New Source Performance Standards (NSPS) at Boiler #1 to also satisfy BART for the BART sources. Construction began in 2005 and the FGDs went on-line in 2008 with the start-up of each re-rated unit. The upgraded boilers had to meet NSPS (since they were modified after Feb. 28, 2005) for large boilers (1, 2, and 3). 90% is the requirement for NSPS and Boiler 1 is used to offset the difference with 2 and 3. **Because Boiler #1 was required by NSPS to reduce SO_2 emissions by 90%, we understand that Alcoa can take credit for only the difference between the required 90% reduction at Boiler #1 and the proposed 91% reduction at Boiler #1 in its BART Alternative.**

IDEM Response:
Please see the IDEM response to 8.7.1 above.

Comment:
The majority of the emission reductions and visibility improvement cited by IDEM were the result of efforts by Alcoa to increase the capacities of Boilers 1, 2, and 3 while avoiding PSD. The only emission reductions attributable to BART are due to the 91% SO_2 control on Boiler 1 versus the 90% control required by NSPS. Otherwise, Alcoa/IDEM are proposing to increase SO_2 and PM emissions above current levels.

IDEM Response:
IDEM disagrees with the statement that "Alcoa/IDEM are proposing to increase SO_2 and PM emissions above current levels" because, as stated in the response to 8.7.1 above, it is our belief that it is valid to take credit for BART alternatives made for other purposes. Therefore, emissions will be reduced and visibility improved from the base year as a result of Alcoa's compliance with New Source Review and NSPS requirements.

8.7.5 Discussion

1. Highest Contributors to Visibility Impairment
IDEM: Boilers 2 and 3 are the highest contributors to visibility impairment. In the year of maximum impact, Boilers 2 and 3 contribute approximately 95%, followed by potlines 3%, followed by Boiler 4 equal to 2%, and the contribution from ingot furnaces is zero. Sulfates and nitrates from Boilers 2 and 3 account for 73% and 25% of the impacts, respectively.

2. Boilers 2 and 3 - SO2
Comment:
Alcoa has underestimated the effectiveness of wet scrubbing on its high sulfur coal. Although Alcoa cites "Typical removal efficiencies are 80–95%," for SO_2 scrubbers, Alcoa/IDEM determined BART as wet limestone flue gas desulfurization (FGD) for these boilers at control efficiency equal to 92%. Alcoa appears to have decided that **Best** Available Retrofit Technology is merely the **average** performance level (91.8%) of the scrubbers it found

[1] Limits on overall emissions of PM, NO_X, and H_2SO_4 to avoid PSD were part of the permit.

in the RBLC.[2] Presumptive BART for coal-fired boilers[3] is 95% SO_2 control or 0.15 lb/mmBtu, neither of which was evaluated by Alcoa. BART for these boilers should be at least 95% SO_2 control.

While the BART Guidelines allow special consideration for existing scrubbers achieving greater than 50% SO2 control, we do not believe that the Alcoa scrubbers were in existence at the time of their July 6, 2005 publication. Although we could not find a clear definition of an "existing scrubber" in the BART Guidelines, we suggest that the same reasoning provided by the BART Guidelines for determining if a source is "in existence"[4] would logically apply to a scrubber.

The only record we could find regarding permitting of the Alcoa scrubbers is an IDEM "Notice of Decision" dated December 29, 2005, five months after publication of the BART Guidelines:

On November 17, 2005, the Office of Air Quality (OAQ) received an interim significant source modification petition from Alcoa Power Generating Inc. (APGI) - Warrick Power Plant located at 4700 Darlington Road, Newburgh, Indiana for construction of wet scrubbers for sulfur dioxide reduction and for the accompanying construction of material handling facilities and modifications to the coal pulverizers and the boilers identified as Units 1, 2, 3, and 4.

We conclude that the Alcoa scrubbers were not "existing" at the time the BART Guidelines were published, and BART for Boilers 1 and 2 must be analyzed as if the scrubbers are not "existing." If BART is determined to be greater than the 92% control proposed by Alcoa/IDEM, then it is likely that Alcoa would need to either demonstrate that they will achieve the higher BART level or upgrade them to do so.

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[2] Twenty-four units were identified in the RBLC database that could be consider similar to the boiler units at Alcoa. Of these 24 units, approximately half utilized a form of dry flue gas desulfurization to control SO_2 emissions, seven used wet scrubbing to control SO_2 emissions, and the remaining units used other means such as low sulfur coal and good combustion practices. Of the 24 units in the database, 10 listed an SO_2 removal efficiency in the range of 90% to 95% with an average of 91.8%.

Based on the RBLC database analysis, which indicated an average control efficiency of 91.8% was BACT for SO_2 from industrial boilers, and Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units (40 CFR 60 Subpart Db) requires a 92% removal efficiency for this type of source, if reconstructed, it was determined that 92% efficiency would be reasonable for units 2 and 3.

[3] Even though Boilers 2 and 3 are not subject to presumptive BART, it can be presumed that the technology assumed to achieve the presumptive limits for coal-fired EGUs greater than 200 MW can achieve similar results on the smaller coal-fired Alcoa boilers. We note that IDEM has referred to the presumptive BART limits for coal-fired EGUs greater than 200 MW in its review of NO_X BART.

[4] The visibility regulations define "in existence" in 40 CFR 51.301. Under these regulations, promulgated in 1980, "in existence" means that the owner or operator has obtained all necessary preconstruction approvals or permits . . . and either has (1) begun, or caused to begin, a continuous program of physical on-site construction of the facility or (2) entered into binding agreements or contractual obligations.

IDEM Response:
Alcoa used the 92% reduction level for the BART analysis for Boilers 2 and 3. The BART proposal was to control Boiler 1 at 91% and Boiler 2 and 3 at 90%, which still results in an overall improvement in visibility degradation. The actual modifications performed to the boilers were not extensive enough to trigger the 92% removal efficiency level requirements.

3. Boilers 2 and 3 - NOx
IDEM: Alcoa proposes low NOx Burners (LNB) and OFA with an emission limit equal to 0.38 lb/MMBtu as BART and as alternative BART for these boilers. U.S.EPA's presumptive BART limit for these boiler types is equal to 0.39 lb/MMBtu. Baseline modeling without these controls shows the highest visibility impact due to these boilers equal to 0.458 dv, which is projected to decrease to 0.064 dv with the above controls. Alcoa identified Selective Non-catalytic Reduction (SNCRs) and SCRs as feasible technologies to control NOx from these boilers; however, it did not perform visibility impact analysis with these technologies. The capital and annual costs of SNCR controls on these boilers are estimated at $3 million and $2.8 million respectively. The capital and annual costs of SCRs are estimated at $70 million and $13 million. Additional controls on these boilers are likely to yield visibility improvement at a very high cost/benefit ($/dv improvement).

Comment:
Alcoa has underestimated the effectiveness of SCR. Although Alcoa notes that "SCR is capable of NOx reduction efficiencies in the range of 70–90%," it assumed 78% control in its cost analyses. It is generally assumed that a properly designed and operated SCR can achieve at least 90% control.

Comment:
Alcoa did not perform a five-step BART analysis for SNCR and SCR for Boilers 2 and 3 because it did not perform visibility impact analysis with these technologies. The NOx controls proposed as BART are already required.

IDEM Response:
The NOx controls are significantly tighter than NSPS limits (0.38 lb/MMBTu vs. 0.70 lb/MMBTu), which are the "required" controls referenced. In the Alcoa evaluation of possible NOx controls, LNBs were found to be cost effective options for the boilers at about $160/ton of NOx removed. SCNR at approximately $3,300/ton removed and SCR at approximately $5,100/ton removed were not further evaluated as feasible alternatives for NOx removal.

4. Potlines
IDEM: The maximum impact from these sources is 0.231 dv. This includes contributions due to vents and primary controls. Sulfates are the main contributors, at approximately 0.188 dv. Contributions due to other species are less than 0.01 dv. Therefore, any add-on controls for these pollutants will result in insignificant improvements in visibility. Due to insignificant impact from vents (0.013 dv), Alcoa did not perform the 5-step analysis for these sources. Further, these sources are subject to 40 CFR 63, Subpart LL, Maximum Achievable Control Technology

(MACT). In order to comply with these standards, Alcoa follows work practices which minimize emissions escaping roof vents.

Sulfur dioxide from potlines can be controlled by lowering sulfur content in the anode grade coke and/or by installing wet scrubbers. Alcoa presently limits sulfur at ≤ 2%. From a market study, Alcoa has concluded that a supply of coke below 3% sulfur cannot be ensured beyond 2013, the year when the BART controls will be needed. Therefore it proposes ≤ 3% sulfur coke as BART and ≤ 3.5% sulfur coke as alternative BART. The 3.5% sulfur limit in the coke translates into 2.919% sulfur in the baked anode composite, the practice Alcoa follows to measure the sulfur content.

The installed and annual costs of wet scrubbers on potlines are estimated at $300 million and $55 million respectively. Modeling shows that SO2 scrubbers on potlines can improve visibility by 0.138 dv. This improvement will be achieved at a cost/benefit ratio equal to $398 million/dv. Also, there are severe space and access limitations at the facility that would complicate the installation.

Comment:
Alcoa is proposing to increase SO_2 emissions by 75% from this operation.

IDEM Response:
It is true that emissions will be increased due to the unavailability of 2% sulfur content petroleum coke and that is clearly explained in the discussion of the potline alternatives. This projected unavailability of 2% sulfur coke is the primary reason Alcoa proposed the alternative to BART. Taken in the context of a whole BART alternative, these increases, while approximately 75% for pot line emissions, are part of a scenario that results greater emissions reductions than straight BART.

5. Boilers 2, 3 and 4 - PM
IDEM: The maximum baseline impact due to filterable PM emissions from these sources is 0.035 dv. Alcoa proposes ESPs with an emission limit equal to 0.03 lb/MMBtu as BART controls for Boilers 2 and 3. Alcoa determined BART for Boiler 4 as 0.015 lb/MMBtu, but it proposes alternative BART for this boiler as 0.1 lb/MMBtu. This boiler has a LNB and SCR for NOx control. Alcoa has noticed excessive conversion of SO2 to SO3 in the SCR due to the addition of an extra catalyst layer. To reduce SO3, which has the potential to adversely affect the downstream equipment and in order to comply with the sulfuric acid limit in its permit, Alcoa has applied for a permit to install a dry reagent injection system between the SCR and ESP. This system will remove SO3 from the gas stream, but it is expected to adversely affect the performance of the downstream ESP. The impact of this system on the ESP performance is not yet known. To account for this uncertainty, Alcoa proposes 0.1 lb/MMBtu as the alternative BART limit. A recent test, after the startup of the SO2 scrubber on this boiler, measured an emission rate equal to 0.05 lb/MMBtu which includes PM and sulfuric acid.

The above limits are projected to lower the contribution from Boilers 2, 3, and 4 to approximately 0.005 dv. Alcoa identified fabric filters as feasible control technology for these

boilers. However, estimating that these controls will not significantly improve visibility, it did not perform cost and visibility impact analyses with these controls. It roughly estimated the cost of fabric filters on these boilers at $97.18 million. This estimate is based on the cost of a fabric filter installed on a utility boiler. Alcoa estimates that installation of fabric filters on these boilers will improve visibility by 0.024 dv at a cost/benefit ratio equal to $445 million/dv.

Comment:
Alcoa did not perform a five-step BART analysis for PM for Boiler 4. (For example, Alcoa should have investigated low-oxidation catalysts, fabric filtration, and wet ESPs.) Instead, **Alcoa is proposing to increase PM emissions from this unit.**

IDEM Response:
At IDEM's request, Alcoa provided information regarding the cost of adding a baghouse on each unit.

Alcoa evaluated fabric filtration for Boiler 4 , the installation cost on a $ / dv basis was shown to be unreasonable. PM emissions from Boiler 4 would be higher than the BART level of control of 0.015 lb./mm Btu, which is the NSPS for a new utility boiler. However, the alternative to BART emission reductions provided by Boiler #1 offsets the PM emissions that would exceed the BART alone level from Boiler 4, and would therefore meet the regional haze rule requirements.

<u>Impact of Adding Baghouses for Units 2, 3, and 4</u>
Based on information provided by another utility where baghouse control was installed, the capital cost for a baghouse on a 2830 mm Btu/hr. boiler was $49.7 mm. Assuming baghouse capital costs are proportional to heat input, the capital cost for the baseline heat inputs for the BART eligible boilers is estimated to be:

Boiler 2: 1364.41 mm Btu/hr. Estimated baghouse capital cost would be

(1364.41/2830) X $49.7 mm = $23.96 mm

Boiler 3: 1323.51 mm Btu/hr. Estimated baghouse capital cost would be

(1323.51/2830) X $49.7 mm = $23.24 mm

Boiler 4: 2845.79 mm Btu/hr. Estimated baghouse capital cost would be

(2845.79/2830) X $49.7 mm = $49.98 mm

Airflow for boiler 2: 347,149 scfm

Airflow for boiler 3: 335,372 scfm

Airflow for boiler 4: 796,416 scfm

Assuming the lowest emission rate a baghouse vendor will guarantee is 0.005 grains /scf, filterable PM emissions would be:

Boiler 2: (0.005 grains/scf) X (347,149 scf/min) X (60 min. /hr.) X (1 lb. /7000 grains) = 14.88 lbs./hr.

Boiler 3: (0.005 grains/scf) X (335,149 scf/min) X (60 min. /hr.) X (1 lb. /7000 grains) = 14.36 lbs./hr.

Boiler 4: (0.005 grains/scf) X (796,416 scf/min) X (60 min. /hr.) X (1 lb. /7000 grains) = 34.13 lbs./hr.

On an annualized basis, the filterable PM emissions would be 128.07 tons from boilers 2 and 3 combined, and 149.49 tons/yr. from boiler 4.

Because the baghouses will be upstream of wet scrubbers, the assumed baghouse vendor guarantee emissions is conservative because it does not take into account the added filterable PM from the scrubbers.

BART for filterable PM for all 3 boilers was electrostatic precipitators and SO2 scrubbers.

BART was proposed at 0.03 lb./mm Btu for boilers 1 and 2, and 0.015 lb./mm Btu for boiler #4.

BART annual filterable PM emissions would thus be:

Boiler 2: (0.03 lb./mm Btu) X (1364.41 mm Btu/hr.) X (8760 hrs/yr.) X (1 ton/2000 lbs.) = 179.28 tons/yr.

Boiler 3: (0.03 lb./mm Btu) X (1323.51 mm Btu/hr.) X (8760 hrs/yr.) X (1 ton/2000 lbs.) = 173.91 tons/yr.

Boiler 4: (0.015 lb./mm Btu) X (2845.79 mm Btu/hr.) X (8760 hrs/yr.) X (1 ton/2000 lbs.) = 186.97 tons/yr.
Detailed engineering would have to take into consideration the available real estate for installation of baghouses, removal of the precipitators or routing the exhaust gases in series through the precipitators, baghouses then downstream pollution removal equipment, present boiler and pollution control equipment configurations, ash handling from the ash removed by the baghouses, etc. Those factors would increase the capital cost assumptions used above.

For the $/ton and $/dv improvement derived below, and the present prevailing economic conditions, Alcoa Power Generating Inc. – Warrick Power Plant does not understand the usefulness of performance of such a study.

Assuming an annualized cost of 11% of the assumed capital costs, the annualized cost on a $/ton difference between the alternative to BART proposal and baghouses would be:
Boilers 2 and 3: 11% of $47.2 mm = $5,192,000 / yr.

BART emissions: 353.19 tons/yr.

Baghouse: 128.07 tons/yr.

Baghouse additional removal: (353.19 – 128.07) tons/yr. = 225.12 tons/yr.

$ / ton impact: $5,192,000 / 225.12 tons/yr. = $23,063.26 / ton

Boiler 4: 11% of $49.98 mm = $5,497,800 / yr.

BART emissions: 186.97 tons/yr.

Baghouse: 149.49 tons/yr.

Baghouse additional removal: (186.97 – 149.49) tons/yr. = 37.48 tons/yr.

$ / ton impact: $5,497,800 / 37.48 tons/yr. = $146,686.23 / ton

Baseline visibility impact, filterable PM, boilers 2 and 3: 0.027 dv, based on 2003 (See revised table 5-2 in the BART determination report).

The assumed baghouse outlet emissions would result in a filterable PM reduction of:

Baseline: 635.02 lbs/hr.

Baghouse: 63.37 lbs./hr.

Reduction: [(635.02 – 63.37)/635.02] X 100 = 90.02%

A reduction of 90.02% in the visibility impact would represent a dv impact reduction of:

0.027 dv X (90.02/100) = 0.024 dv

The annualized cost for baghouses on a $/dv basis would thus be:

$(5,192,000 + 5,497,800) / 0.024 dv = $445 mm / dv

The above 11% of capital assumption does not consider such operating costs as increased pressure drop represented by the baghouse, possible de-rating of the boiler, and the baghouse being upstream of a wet scrubber. The above cost estimates are thus low, but still show that the extra cost represented by baghouses is unreasonable both from a $/ton and $/dv basis.

6. Ingot furnaces

IDEM: The maximum baseline impact from these sources is 0.003 dv. Due to insignificant impact from these sources, Alcoa did not perform a 5-step BART analysis for these sources.

Comment:
Conclusions & Recommendations
According to IDEM, the proposed BART Alternative achieves a visibility improvement equal to 0.46 dv and an overall improvement in visibility equal to 75% over the baseline and achieves significantly higher reductions in SO_2, equal to approximately 21,600 tons. While we recognize the emission reductions and visibility improvements that result from Alcoa's compliance with New Source Review and NSPS requirements, we believe that the proposed BART Alternative improperly relies upon SO_2 emission reductions that are already required by NSPS.

Instead, it appears that Alcoa is proposing to increase PM emissions from Boiler #4 and SO_2 emissions from the potlines, which is contrary to the fundamental premise of BART, unless it can at least be shown that the additional reductions of SO_2 from Boiler #1—reductions beyond the 90% required by NSPS—result in more visibility improvement than the 1.5 dv that would be achieved if Alcoa met its proposed BART. (If BART is determined to be more stringent than proposed by Alcoa, then additional visibility improvements would be needed.) For example, it may be necessary to model the following scenarios:

1. Baseline, BART-eligible units and Boiler #1@ 90% SO_2 control
2. BART, BART-eligible units and Boiler #1@ 90% SO_2 control
3. Alternative BART

If Scenario #3 achieves greater visibility improvement than Scenario #2, then the Alternative BART would be acceptable.

IDEM Response:
IDEM believes that the emissions reductions associated with the NSPS for Boiler 1 should be included as part of the BART engineering analysis. Therefore, the modeling that has been conducted to date is valid. Review of the modeling results shows that the percent improvement from BART Eligible baseline to the BART control and BART Eligible baseline with Unit #1 to Alternative to BART fall within 4% of each other with a greater deciview improvement from the Alternative to BART scenario, which would average nearly 2 deciview improvement.

Table 6-1 Visibility Impacts at Mammoth Cave National Park – BART Eligible Baseline Emissions

Year	Maximum Delta Bext	98th Percentile Delta Bext	Maximum Delta	98th Percentile Delta
	(%)	(%)	(DV)	(DV)
2001	46.13	22.36	3.275	1.852
2002	56.17	23.38	3.722	1.906
2003	37.03	21.40	2.787	1.788
2001-2003	56.17	22.38	3.722	1.849

Table 6-5 Visibility Impacts at Mammoth Cave National Park – BART Control Level Emissions

Year	Maximum Delta Bext	98th Percentile Delta Bext	Maximum Delta	98th Percentile Delta
	(%)	(%)	(DV)	(DV)
2001	9.18	4.60	0.850	0.444
2002	10.46	3.07	0.958	0.299
2003	10.75	4.16	0.992	0.402
2001-2003	10.46	3.94	0.933	0.382

Visibility Impacts at Mammoth Cave National Park – Difference between BART Eligible Baseline Emissions and BART Control Level Emissions				
Year	Maximum Delta Bext	98th Percentile Delta Bext	Maximum Delta	98th Percentile Delta
	(%)	(%)	(DV)	(DV)
2001	36.95	17.76	2.425	1.408
2002	45.71	20.31	2.764	1.607
2003	26.28	17.24	1.795	1.386
2001-2003	45.71	18.44	2.789	1.467

Percentage Difference between BART Eligible Baseline and BART Control Emissions				
2001	80.10%	79.43%	74.05%	76.03%
2002	81.38%	86.87%	74.26%	84.31%
2003	70.97%	80.56%	64.41%	77.52%
2001-2003	81.38%	82.39%	74.93%	79.34%

Table 6-2 Visibility Impacts at Mammoth Cave National Park – BART Eligible Baseline + Unit 1 Emissions				
Year	Maximum Delta Bext	98th Percentile Delta Bext	Maximum Delta	98th Percentile Delta
	(%)	(%)	(DV)	(DV)
2001	60.69	28.81	4.042	2.311
2002	85.38	35.39	4.570	2.774
2003	55.30	31.61	3.329	2.549
2001-2003	85.38	31.94	4.570	2.545

Table 6-3 Visibility Impacts at Mammoth Cave National Park – Alternative to BART Emissions				
Year	Maximum Delta Bext	98th Percentile Delta Bext	Maximum Delta	98th Percentile Delta
	(%)	(%)	(DV)	(DV)
2001	13.98	7.24	1.265	0.686
2002	16.33	4.81	1.446	0.463
2003	14.85	5.75	1.323	0.549
2001-2003	16.33	5.93	1.345	0.566

Visibility Impacts at Mammoth Cave National Park – Difference between BART Eligible Baseline + Unit 1 Emissions and Alternative to BART Emissions				
Year	Maximum Delta Bext	98th Percentile Delta Bext	Maximum Delta	98th Percentile Delta
	(%)	(%)	(DV)	(DV)
2001	46.71	21.57	2.777	1.625
2002	69.05	30.58	3.124	2.311
2003	40.45	25.86	2.006	2.000
2001-2003	69.05	26.01	3.225	1.979

Percentage Difference between BART Eligible Baseline + Unit 1 and Alternative to BART Emissions				
2001	76.96%	74.87%	68.70%	70.32%
2002	80.87%	86.41%	68.36%	83.31%
2003	73.15%	81.81%	60.26%	78.46%
2001-2003	80.87%	81.43%	70.57%	77.76%

Difference between BART eligible baseline and baseline + Unit 1				
Year	Maximum Delta Bext	98th Percentile Delta Bext	Maximum Delta	98th Percentile Delta
	(%)	(%)	(DV)	(DV)
2001	14.56	6.45	0.767	0.459
2002	29.21	12.01	0.848	0.868
2003	18.27	10.21	0.542	0.761
2001-2003	29.21	9.56	0.848	0.696

Difference between Alternative to BART and BART Control				
Year	Maximum Delta Bext	98th Percentile Delta Bext	Maximum Delta	98th Percentile Delta
	(%)	(%)	(DV)	(DV)
2001	4.8	2.64	0.415	0.242
2002	5.87	1.74	0.488	0.164
2003	4.1	1.59	0.331	0.147
2001-2003	5.87	1.99	0.412	0.184

Year	Maximum Delta Bext	98th Percentile Delta Bext	Maximum Delta	98th Percentile Delta
	(%)	(%)	(DV)	(DV)
2001	9.76	3.81	0.352	0.217
2002	23.34	10.27	0.36	0.704
2003	14.17	8.62	0.211	0.614
2001-2003	23.34	7.57	0.436	0.512

Table 6-7 Source and Specie Contributions to 8th Highest Extinction changes for BART Eligible Baseline at Mammoth Cave

Source Group	Bext Change	Contribution to Total Bext	Modeled Extinction	SO4 Contribution	NO2 Contribution	Organics Contribution	Elemental Carbon Contribution	PM Coarse Contribution	PM Fine Contribution
	(%)	(%)	Mn^{-1}	Mn^{-1}	Mn^{-1}	Mn^{-1}	Mn^{-1}	Mn^{-1}	Mn^{-1}
All Sources	22.380	100.000	4.818	4.087	0.574	0.066	0.000	0.001	0.089
Lines	0.080	0.367	0.017	1.336	0.000	0.007	0.000	0.001	0.005
GTC	0.493	2.213	0.106	0.098	0.001	0.004	0.000	0.000	0.003
A-398s	0.680	3.073	0.146	0.135	0.001	0.004	0.000	0.000	0.004
Melter/Holders	0.020	0.033	0.002	0.033	0.004	0.000	0.000	0.000	0.001
WPP01	4.870	21.740	1.049	0.890	0.145	0.006	0.000	0.000	0.008
WPP02	15.923	71.130	3.429	2.960	0.425	0.018	0.000	0.000	0.022
WPP03	0.313	1.443	0.067	0.000	0.000	0.023	0.000	0.000	0.045

Chapter 9 Long Term Strategy

Comment:

Indiana needs to provide a more complete discussion of the long term strategy. The Strategy should list all the existing control programs that Indiana is implementing. Does the State have rules to limit emissions from construction sources? Indiana appears to rely on existing controls under CAIR or the proposed Transport Rule and existing federal requirements to reduce mobile sources. The State has not discussed any controls or consideration of controls beyond those required for other regulatory purposes.

The Federal Land Managers request that Indiana acknowledge the connection between new emission permitting under New Source Review and the Regional Haze Rule visibility improvement goals to return to natural background visibility conditions by 2064. We recommend that the State commit to considering the visibility impacts as part of the New Source Review.

IDEM Response:
Indiana has state rules with specific requirements that apply to emissions from construction sources and visibility. First, "rules to limit emissions from construction sources", IDEM thinks that all Class 1 areas are far enough away from any construction sources in Indiana that there would be no impact on visibility. However, Indiana's Article 6 Particulate Rules, Rule 6-4, Fugitive Dust Emissions, limits fugitive emissions from construction activities. Second, "adverse impact on visibility" is defined and the responsibilities of sources impacting federal Class I areas outlined in Indiana's Article 2 Permit Review Rules, Rule 2-2, Prevention of Significant Deterioration (PSD) Requirements. The following sections are taken from Indiana Administrative Code that covers the Air Pollution Control Board.

326 IAC 2-2-1 Definitions
(c) "Adverse impact on visibility" means visibility impairment that interferes with the management, protection, preservation, or enjoyment of the visitor's visual experience of the federal Class I area as defined in section 13 of this rule. This determination must be made on a case-by-case basis taking into account the geographic extent, intensity, duration, frequency, and time of visibility impairment, and how these factors correlate with:
(1) times of visitor use of the federal Class I area; and
(2) the frequency and timing of natural conditions that reduce visibility.

326 IAC 2-2-14 Sources impacting federal Class I areas: additional requirements
Sec. 14. (a) The department shall provide written notice of any permit application for a proposed major stationary source or major modification, the emissions from which may affect a Class I area, to the federal land manager and the federal official charged with direct responsibility for management of any lands within any such area. Such notification shall be given within thirty (30) days of receipt of a permit application and at least sixty (60) days prior to any public hearing on the application for a permit to construct and shall include the following:
(1) A copy of all information relevant to the permit application.
(2) An analysis of the proposed source's anticipated impacts on visibility in the federal Class I area. The department shall also provide the federal land manager and such federal officials with a copy of the preliminary determination required under this section, and shall make available to them any materials used in making that determination, promptly after the department makes the determination. The department shall also notify all affected federal land managers within thirty (30) days of receipt of any advance notification of any such permit application.

(b) The federal land manager and the federal official charged with direct responsibility for management of the Class I area have an affirmative responsibility to protect the air quality related values, including visibility, of the Class I area and to consider, in consultation with U.S. EPA, whether a proposed source or modification will have an adverse impact on such values.

(c) The department shall consider any analysis performed by the federal land manager, provided to the department within thirty (30) days of the notification required by subsection (a), that shows that a proposed new major stationary source or major modification may have an adverse impact on visibility in any federal Class I area. Where the department finds that the analysis does not demonstrate to the satisfaction of the department that an adverse impact on visibility will result in the federal Class I area, the department must, in the notice of public hearing on the permit application, either explain the decision or give notice as to where the explanation may be obtained.

(d) The federal land manager of any Class I area may demonstrate to the department that the emissions from a proposed major stationary source or major modification would have an adverse impact on the air quality-related values, including visibility, of a Class I area, notwithstanding that the change in air quality resulting from emissions from the major stationary source or major modification would not cause or contribute to concentrations that would exceed the maximum allowable increases for a Class I area. If the department concurs with the demonstration, then the department shall not issue the permit.

(e) The owner or operator of a proposed major stationary source or major modification may demonstrate to the federal land manager that the emissions from the source or modification would have no adverse impact on the air quality related values of any Class I areas, including visibility, notwithstanding that the change in air quality resulting from emissions from the major stationary source or major modification would cause or contribute to concentrations that would exceed the maximum allowable increases for a Class I area. If the federal land manager concurs with the demonstration and the federal land manager so certifies, the department may issue the permit provided that the applicable requirements of this section are otherwise met, to issue the permit with emission limitations as may be necessary to assure that emissions of sulfur dioxide, particulate matter, and nitrogen oxides shall not exceed the following maximum allowable increases over minor source baseline concentration for such pollutants:

Pollutant	Maximum Allowable Increase (Micrograms Per Cubic Meter)
Particulate matter:	
PM10, annual arithmetic mean	17
PM10, 24 hour maximum	30
Sulfur dioxide:	
Annual arithmetic mean	20
24 hour maximum	91
3 hour maximum	325
Nitrogen dioxide:	
Annual arithmetic mean	25

(f) The owner or operator of a proposed major stationary source or major modification that cannot be approved under subsection (e) may demonstrate to the department that the source cannot be constructed by reason of any maximum allowable increase for sulfur dioxide for a period of twenty-four (24) hours or less applicable to any Class I area and, in the case of federal mandatory Class I areas, that an exemption under this subsection would not adversely affect the air quality related values of the area, including visibility. The department, after consideration of the federal land manager's recommendation, if any, and subject to the federal land manager's

concurrence, may, after notice and public hearing, grant an exemption from such maximum allowable increase. If such exemption is granted, the department shall issue a permit to such major stationary source or major modification pursuant to the requirements under subsection (h) provided that the applicable requirements of this section are otherwise met.

(g) In any case where the department recommends an exemption in which the federal land manager does not concur, the recommendations of the department and the federal land manager shall be transmitted to the president. The president may approve the department's recommendation if the president finds that the exemption is in the national interest. If the exemption is approved, the department shall issue a permit pursuant to the requirements under subsection (h) provided that the applicable requirements of this section are otherwise met.

(h) In the case of a permit issued pursuant to subsection (f) or (g), the major stationary source or major modification shall
comply with such emission limitations as may be necessary to assure that emissions of sulfur dioxide from the major stationary source or major modification would not, during any day on which the otherwise applicable maximum allowable increases are exceeded, cause or contribute to concentrations that would exceed the following maximum allowable increases over the baseline concentration and to assure that such emissions would not cause or contribute to concentrations that exceed the otherwise applicable maximum allowable increases for periods of exposure of twenty-four (24) hours or less for more than eighteen (18) days, not necessarily consecutive, during any annual period:

Maximum Allowable Increase
(Micrograms Per Cubic Meter) of Sulfur Dioxide

	Terrain Areas	
Period of Exposure	Low	High
24 hour maximum	36	62
3 hour maximum	130	221

(i) The department shall transmit to the U.S. EPA a copy of each permit application relating to a major stationary source or major modification and provide notice to the U.S. EPA of the following actions related to consideration of such permit under this
section:

(1) Receipt of an advanced notification of a permit application affected by this section.

(2) Any written notice provided to the federal land manager under this section.

(3) Public notice of a preliminary determination.

(4) Notices of public hearings.

(5) Decisions to grant or deny exemptions in accordance with this section.

(6) Any decision in accordance with subsection (c) that an analysis submitted by the federal land manager does not demonstrate
to the satisfaction of the department that an adverse impact on visibility will result in the Class I area.

(7) Denial of a permit.

(8) Issuance of a permit.

United States Department of the Interior
NATIONAL PARK SERVICE
Air Resources Division
P.O. Box 25287
Denver, CO 80225

IN REPLY REFER TO:

January 3, 2011

N3615 (2350)

Ken Ritter
Air Programs Branch
IDEM Office of Air Quality
100 North Senate Avenue
Indianapolis, Indiana 46204-2251

Dear Mr. Ritter:

On November 5, 2010, we received Indiana's draft State Implementation Plan to address regional haze. We appreciate the opportunity to work closely with the State through the initial evaluation, development, and review of this plan. Cooperative efforts such as these ensure that, together, we will continue to make progress toward the Clean Air Act's goal of natural visibility conditions at all of our most pristine National Parks and wilderness areas for future generations.

This letter acknowledges that the U.S. Department of the Interior, National Park Service (NPS), in consultation with the U.S. Fish and Wildlife Service (FWS), has received and conducted a substantive review of your revised proposed Regional Haze Rule implementation plan in fulfillment of your requirements under the federal regulations 40 CFR 51.308(i)(2). Please note, however, that only the U.S. Environmental Protection Agency (EPA) can make a final determination regarding the document's completeness and, therefore, ability to receive federal approval from EPA.

As outlined in a letter to each State dated August 1, 2006, our review focused on eight basic content areas. The content areas reflect priorities for the Federal Land Manager agencies, and we have enclosed comments associated with these priorities.

We look forward to your response, as per section 40 CFR 51.308(i)(3). For further information regarding our comments, please contact Pat Brewer at (303) 969-2153.

Again, we appreciate the opportunity to work closely with the State of Indiana to improve visibility in our Class I areas.

Sincerely,

John Bunyak
Acting Chief, Air Resources Division

Enclosures

cc:
John Summerhays
U.S. EPA Region 5
77 W. Jackson Blvd.
Chicago, Illinois 60604

National Park Service Comments
Indiana Draft Regional Haze State Implementation Plan (SIP)
January 3, 2011

The National Park Service received Indiana's draft regional haze state implementation plan (SIP) on November 5, 2010. The National Park Service, in consultation with the Fish and Wildlife Service, has reviewed the draft plan consistent with the priorities that we detailed to Indiana in a letter dated August 2006. Our comments below address those priorities. We are available to assist Indiana in addressing our recommendations.

There are no Class I areas within the State of Indiana. Indiana Department of Environmental Management (IDEM) cites the monitoring analyses and regional inventory and modeling by the Midwest Regional Planning Organization (MRPO) and the neighboring Regional Planning Organizations (RPOs) as evidence that Indiana is meeting the requirements of the regional haze rule. However, additional documentation in the Indiana SIP is necessary to describe the pollutant contributions to visibility impairment at Class I areas impacted by Indiana and how emissions controls that are underway or planned in Indiana are sufficient to demonstrate reasonable progress by Indiana in reducing visibility impairment. Specific examples of additional documentation are described below.

Chapter 2 Regional Planning
IDEM has identified 19 Class I areas that are impacted by Indiana emissions. Table 1 in Appendix 1 lists the specific Class I areas that Indiana impacts and cites the technical analyses that support that determination. It would be helpful to include Table 1 in the SIP Chapter 2.

Chapter 4 Baseline Conditions, Pollutant Contribution, Uniform Rate of Progress
IDEM cites work of MRPO and other states but does not provide any information to illustrate the baseline visibility conditions, the pollutant contributions, and the needed visibility improvement. We recommend that IDEM pick a Class I area from each region and include in Chapter 4 a summary of pollutant contributions in the baseline period for the average of the 20% worst days and monthly or daily time series from the IMPROVE data to illustrate the temporal variation in pollutant contributions.

As part of the contribution assessment IDEM should explicitly state which pollutants would be most effective to control to improve visibility at the impacted Class I areas. We also recommend illustrating the glidepaths for the uniform rate of progress for the selected Class I areas or at least adding these data to the Appendices and citing in Chapter 4 where the data can be found.

Chapter 5 Emissions Inventory
This chapter very briefly summarizes the methods used by the MRPO to develop the 2005 and future year inventories. Please include the MRPO Technical Support Document as an Appendix.

Table 3 summarizes the Electric Generating Unit (EGU) projections from the Integrated Planning Model (IPM) Version 3.0 for three scenarios. Please provide more detailed explanation

how the three scenarios differ and explicitly why sulfur dioxide (SO_2) and nitrogen oxides (NO_x) emissions for Indiana are lower in Scenario 5a than Scenarios 5b and 5c.

IDEM needs to discuss the projected emissions changes between 2005 and 2018 as evidence that Indiana is making reasonable progress. Table 4 does not appear to be cited or discussed in the text, yet this is the most important data for demonstrating Indiana's emission reductions. Please provide emissions summaries in Table 4 as tons/year rather than tons/day to avoid questions how to account for weekly and seasonal variability to scale to tons/year values.

Chapter 6 Modeling Assessment

IDEM relies on the MRPO modeling. Please include the MRPO Technical Support Document in an Appendix. A discussion of model performance is necessary to demonstrate confidence in model projections. There is not an Attainment Test for regional haze; you could delete the Section 6.2 header and cover the material under Section 6.1.

The wording in the last paragraph on page 22 is confusing as written. Please clarify your intent. If model results are less than the uniform rate of visibility improvement does that mean greater visibility improvement than the uniform rate?

The scenario terms used in Tables 6 and 7 are not the same as described in Chapter 5 Emissions Inventory. Please explain how the terms for the emissions assumptions in Tables 6 and 7 relate to the scenarios in Table 4. How does "Will Do" compare to Scenario 5a, 5b, or 5c? Do the "Will Do" adjustments pertain only to the EGU sector? Please provide additional clarification on what assumptions are included in the modeled scenarios.

Chapter 7 Reasonable Progress Goals

Please add reference to Appendix 1 for contribution assessments from MRPO and other RPOs and Appendix 2 for letters from states requesting consultation.

We agree that based on the contribution assessments presented in Appendix 1 and 3 and in sections 7.2-7.9, Indiana sources have comparatively small contributions to Class I areas in neighboring states.

To comply with the Regional Haze Rule Sections 308(d)(3)(ii) and (iv), IDEM still needs to demonstrate that it has included in its long term strategy all measures needed to achieve its share of emission reductions and to identify all anthropogenic sources of visibility impairment considered in developing the long term strategy. IDEM has cited modeling results of MRPO and neighboring RPOs, but IDEM still needs to evaluate its emission sources and demonstrate using a four factor analysis that Indiana is making reasonable progress in reducing anthropogenic emissions. This demonstration should evaluate the monitoring, emissions inventory, and modeling data to determine which pollutants are most important to control, what reductions are already expected by 2018, what source categories are major contributors in 2018, and evaluate the four factors for those major source categories. The MRPO provided a four factor analysis for major source categories that IDEM could cite in evaluating what control measures are feasible and reasonable for specific stationary sources.

Several states have used emissions (Q) divided by distance (d) as a screening method to prioritize which stationary sources to consider in a reasonable progress analysis. If IDEM considered a Q/d for SO_2 +NO_x = 10 for sources with emissions of SO_2+NO_x greater than 200 tons/year, IDEM would likely be able to focus the reasonable progress analysis on specific stationary sources within a few major source categories. The VISTAS and CENRAP Areas of Influence are another method to identify which sources in Indiana should be evaluated for reasonable progress.

Chapter 8 Best Available Retrofit Technology (BART)

Please add greater description of the data presented in Table 10, BART-eligible Electric Generating Units (EGU) covered by the Clean Air Interstate Rule (CAIR) and discuss the implications in the text. Does Table 10 cover all EGU in Indiana including those units that are BART-eligible, those units listed by MANE-VU, and all other units? Please clarify what assumptions were used for each column. Does column "2009 + Projected" include only legally enforceable controls? What criteria were used to include a future control date? Does each succeeding column to the right include only controls that were not included in previous columns? If the LADCO column is empty does that mean that the controls assumed by IPM are legally enforceable and included in the LADCO modeling or not legally enforceable and not included in the LADCO modeling? Please make clear in the text that controls modeled by IPM Version 3.0 are estimates and may not be legally required.

Section 8.4 BART Exemptions for ArcelorMittal-Burns Harbor, ESSROC-Speed, and SABIC

Based on our conference call on December 13, 2010, we understand that the ammonia values used in the final BART exemption modeling differed from the values cited in the MRPO BART modeling protocol. We request that IDEM update this section to clarify the revised ammonia values that better reflect measured values in the region. Because the visibility impacts of the three sources did not exceed the contribution threshold using the revised ammonia values, if IDEM updates the cited analytical methods to reflect the revisions, we can support the BART exemptions.

Section 8.7 BART determination for Alcoa

We question whether it is valid to take credit as a BART Alternative for SO_2 and NO_x reductions that were required under New Source Performance Standards (NSPS) when Alcoa increased the capacities of Boilers 1, 2, and 3. Boilers 2 and 3 are subject to BART; Boiler 1 is not. Boiler 4 is classified as an EGU and is also subject to BART. Wet flue gas desulfurization (FGD) scrubbers were installed on all boilers in 2008. For SO_2, NSPS requires 90% control. IDEM proposes to use SO_2 reductions for Boiler 1 to offset the difference between BART (92% control) and proposed controls (90% control) for Boilers 2 and 3. IDEM credits the scrubber installed on Unit 1 as achieving significantly higher reductions in SO_2, equal to approximately 21,600 tons, than would be achieved by BART. However we understand that because Boiler 1 was required by NSPS to reduce SO_2 emissions by 90%, Alcoa can take credit in the BART Alternative for only the difference between the required 90% reduction and the proposed 91% reduction at Boiler 1. We do not believe that it is valid to use reductions that are required by permit to meet NSPS at Boiler 1 to also satisfy BART for the Boilers 2 and 3.

Alcoa and IDEM have underestimated the efficiency of scrubbers (95%) and Selective Catalytic Reduction, SCR (90%). As well, Alcoa and IDEM are also proposing to increase SO_2 and PM emissions from BART sources (potlines) above current levels. We do believe that the existing analyses support the determination that the BART Alternative is better than BART.

Our detailed comments on the BART determination are attached.

Chapter 9 Long Term Strategy

Indiana needs to provide a more complete discussion of the long term strategy. The Strategy should list all the existing control programs that Indiana is implementing. Does the State have rules to limit emissions from construction sources? Indiana appears to rely on existing controls under CAIR or the proposed Transport Rule and existing federal requirements to reduce mobile sources. The State has not discussed any controls or consideration of controls beyond those required for other regulatory purposes.

The Federal Land Managers request that Indiana acknowledge the connection between new emission permitting under New Source Review and the Regional Haze Rule visibility improvement goals to return to natural background visibility conditions by 2064. We recommend that the State commit to considering the visibility impacts as part of the New Source Review.

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Appendix 9a - Baseline Visibility Conditions, Pollutant Contributions, Needed Visibility Improvement and Glide Paths for the Uniform Rate of Progress

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For the 20% worst visibility days in the northern Class 1 areas, the pollutants that contribute to visibility impairment are sulfates, which represent 35-55% impairment, nitrates are 25-30% of the pollutant contribution and organic carbon contributes 12-22% to visibility impairment . These results are shown below in Figure 1.

Figure 1. 20% Best Days 20% Worst Days

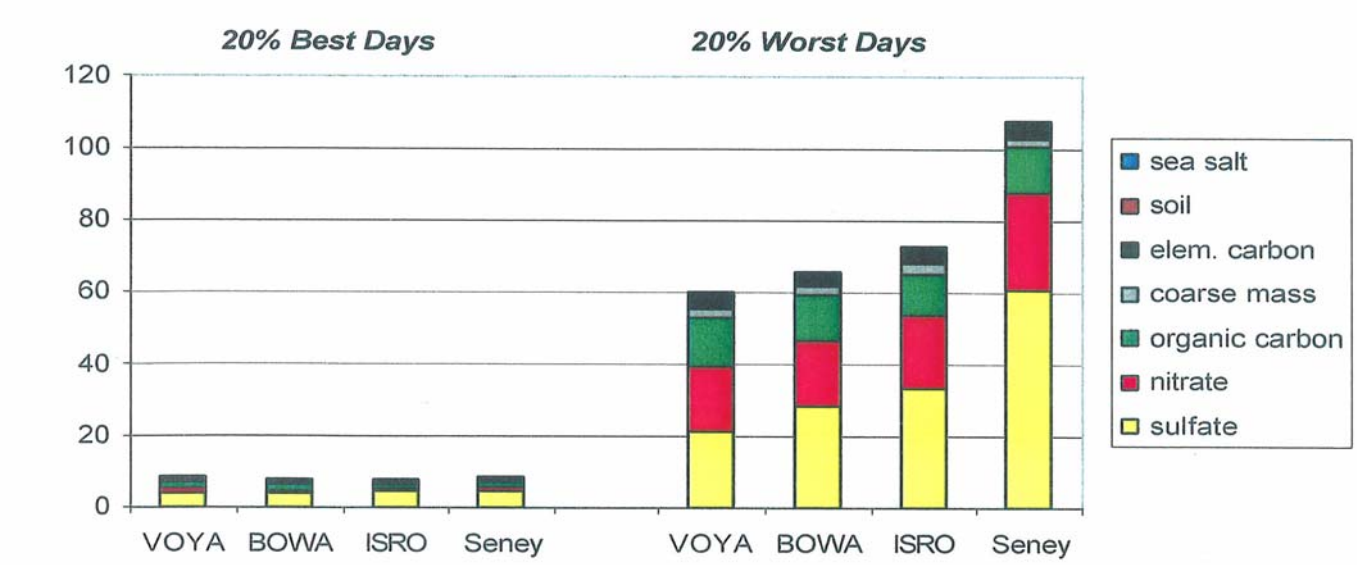
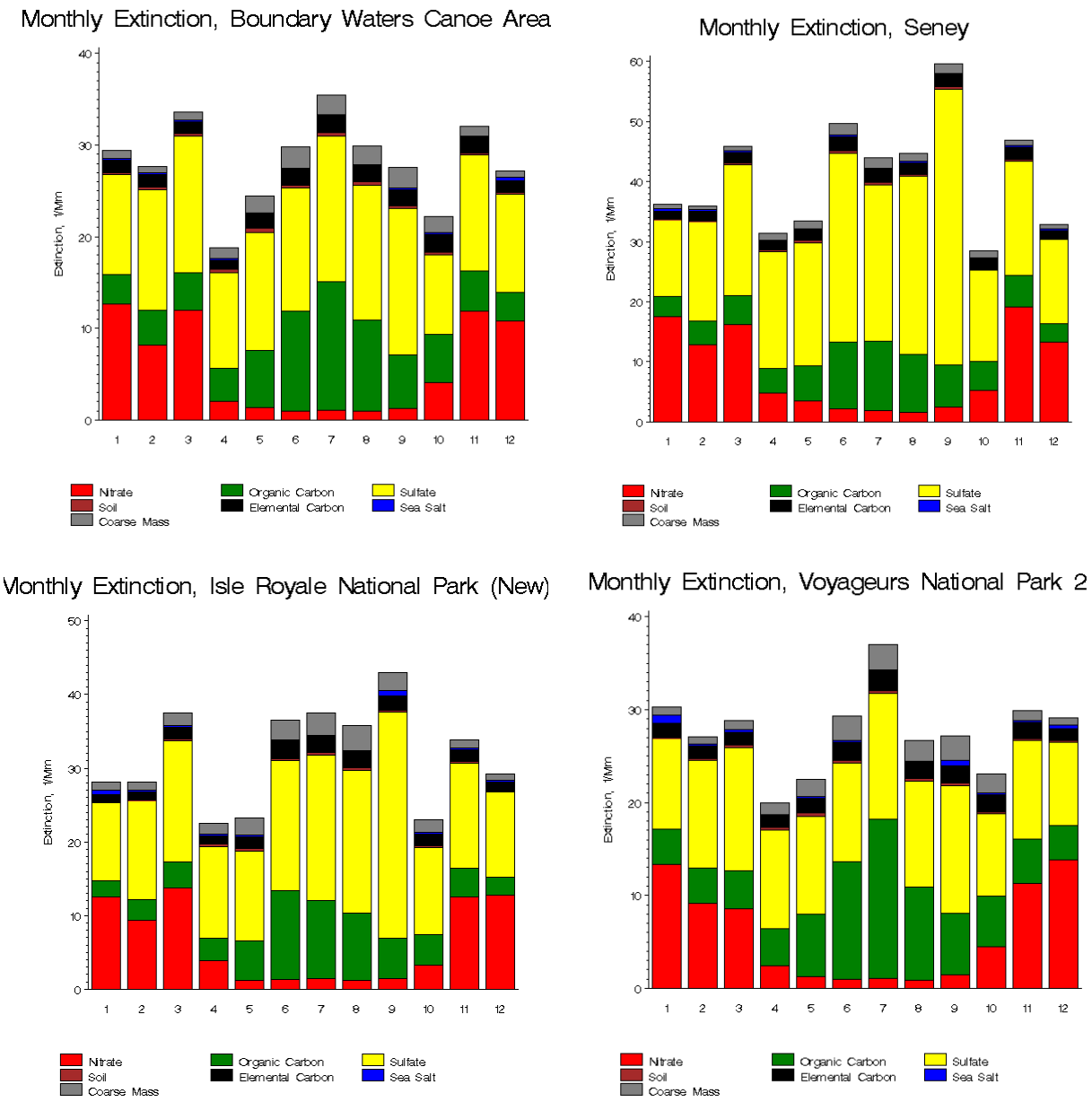


Figure 1. Chemical composition of light extinction for 20% best visibility days (left) and 20% worst visibility days (right) in terms of Mm^{-1}

Monthly average light extinction values for the northern Class 1 areas are shown below in Figure 2. Sulfates represent the highest contributing pollutant to light extinction with nitrates and organic carbon providing seasonal contributions. Nitrates have higher contributions during the late fall, winter and early spring while organic carbon has higher contributions to light extinction during the summer. Elemental carbon, and coarse mass are fairly consistent throughout the year at all northern Class 1 areas.

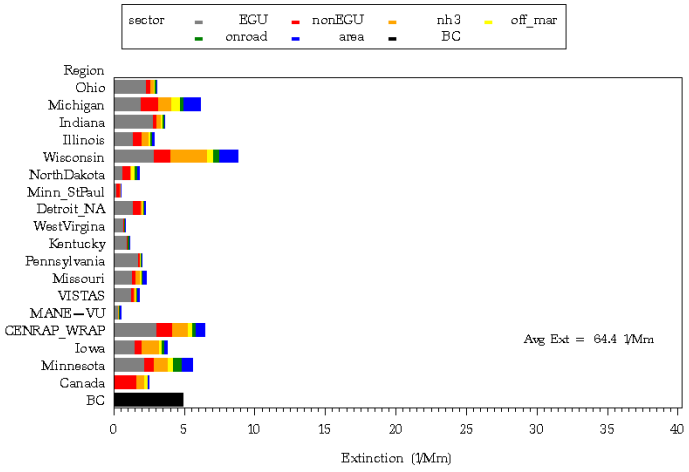
Figure 2. Monthly Average Light Extinction Values for Northern Class 1 Areas



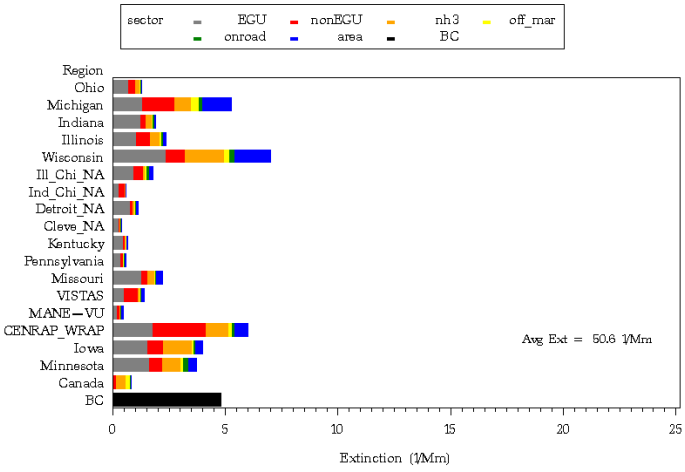
LADCO conducted photochemical modeling for baseline and future year light extinction. This source apportionment modeling analyzed regional, source and pollutant impacts on visibility at Isle Royale in Michigan (as shown below in Figure 3); Mammoth Cave National Park in Kentucky (Figure 4); Shenandoah National Park in Virginia (Figure 5); and Lye Brook Wilderness in Vermont (Figure 6). Indiana's contributions to visibility impairment in the northern Class 1 areas of Isle Royale, Seney and Boundary Waters, comprises mainly of sulfates from EGU emissions.

Figure 3. Isle Royale, Michigan

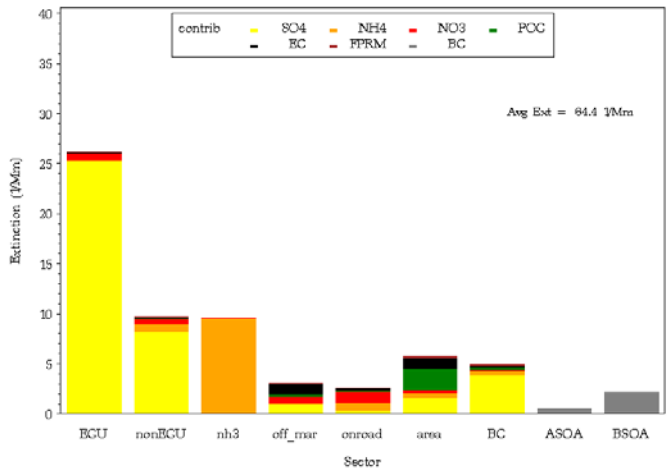
2005 (LADCO Round 5)



2018 (LADCO Round 5)



2005 (LADCO Round 5)



2018 (LADCO Round 5)

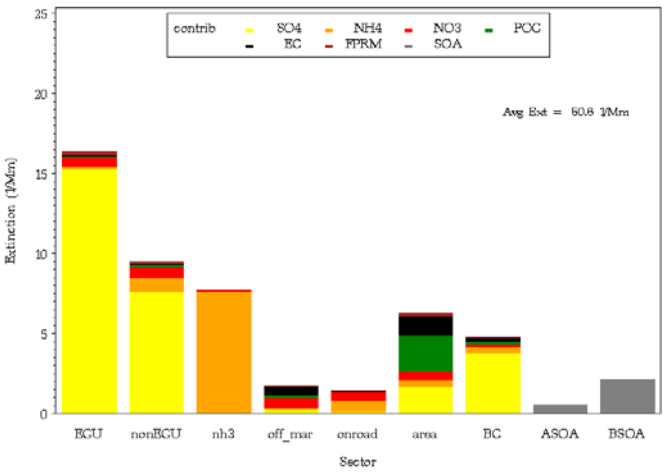
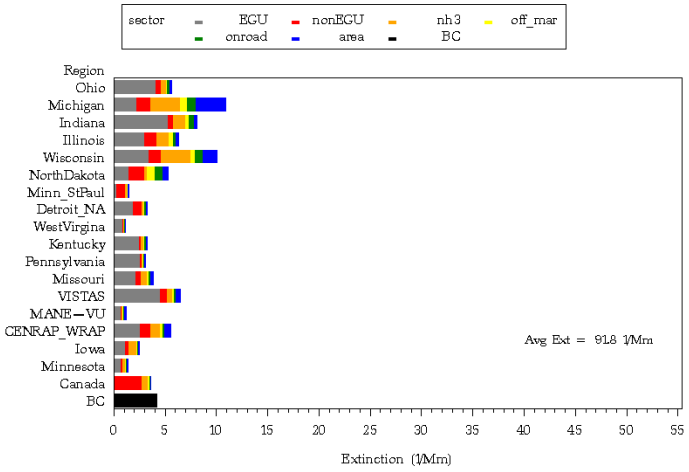
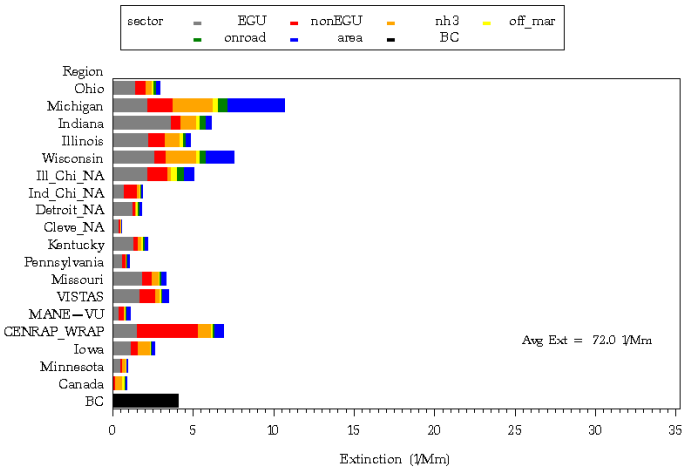


Figure 4. Seney, Michigan

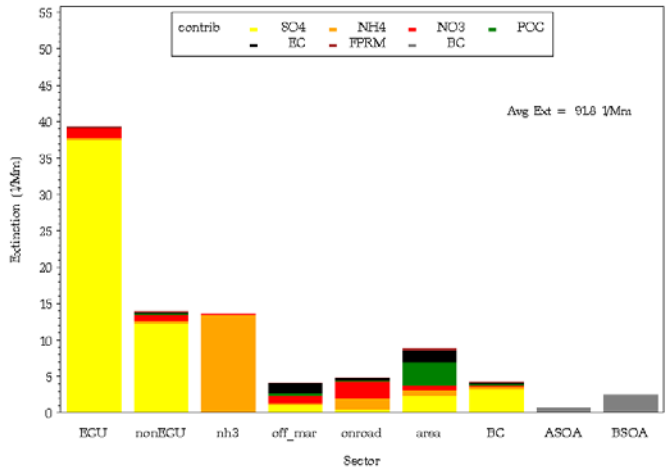
2005 (LADCO Round 5)



2018 (LADCO Round 5)



2005 (LADCO Round 5)



2018 (LADCO Round 5)

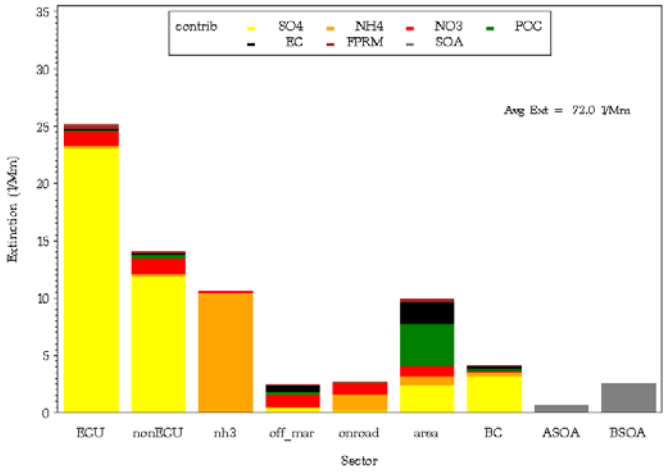
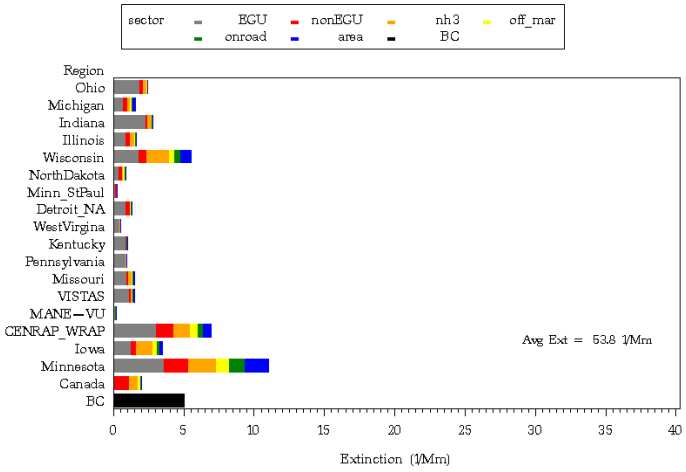
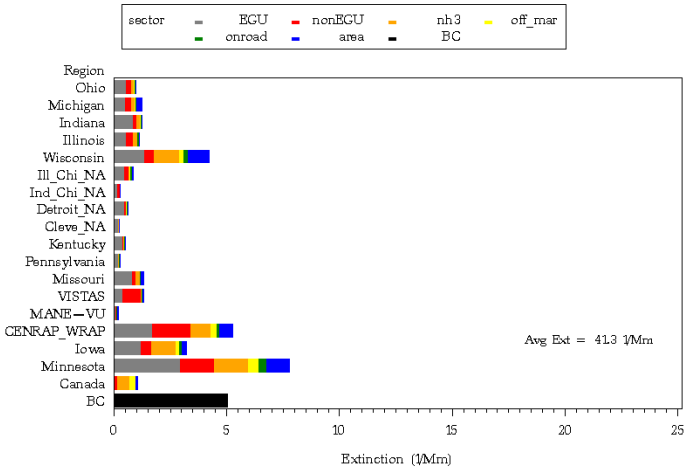


Figure 5. Boundary Waters, Minnesota

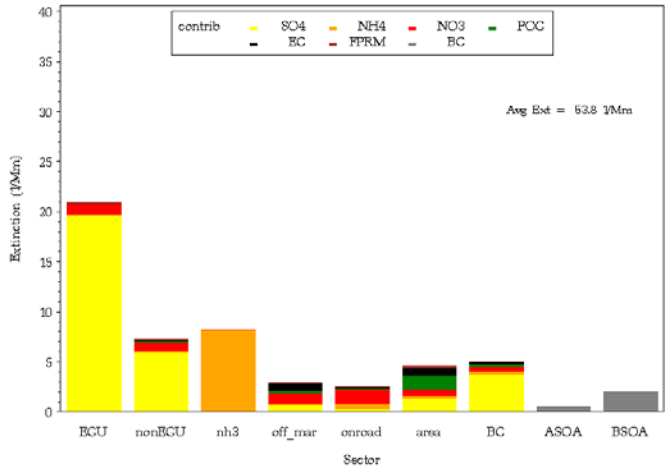
2005 (LADCO Round 5)



2018 (LADCO Round 5)



2005 (LADCO Round 5)



2018 (LADCO Round 5)

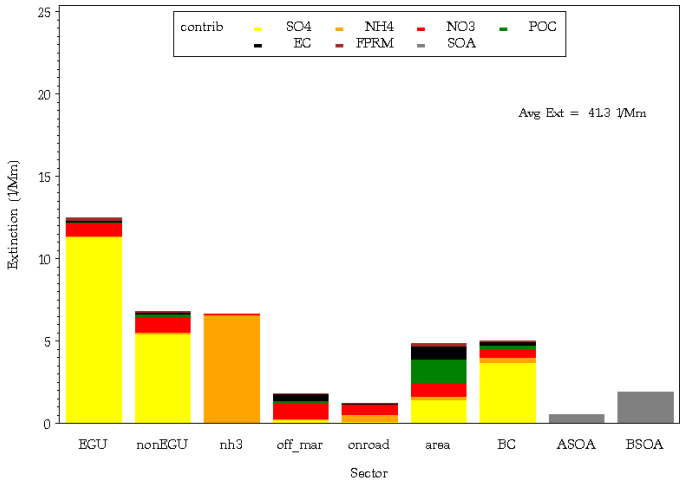
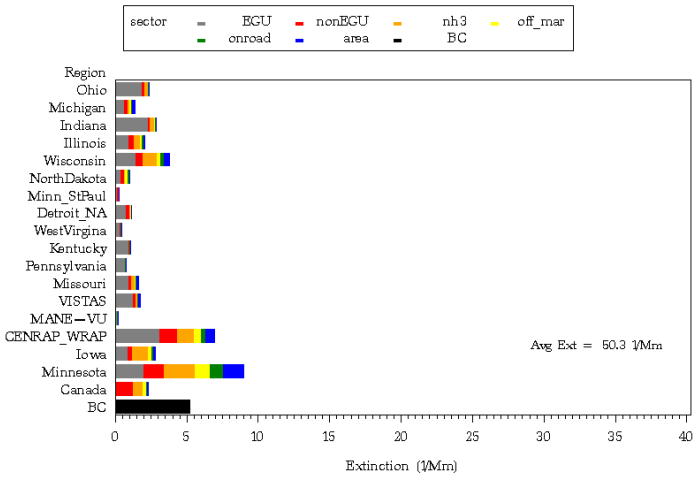
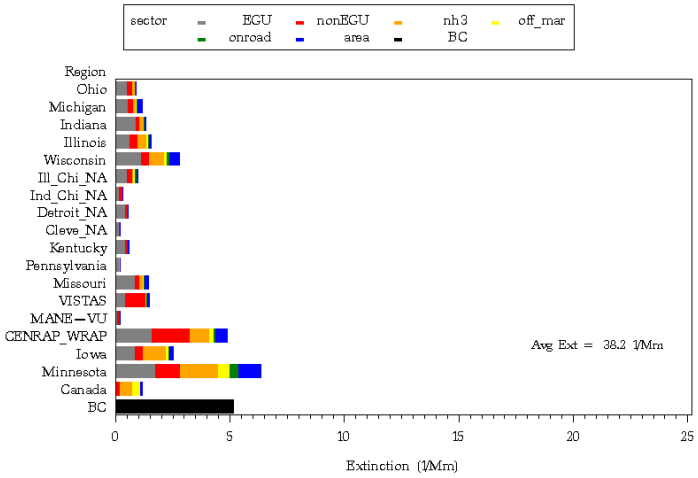


Figure 6. Voyageurs, Minnesota

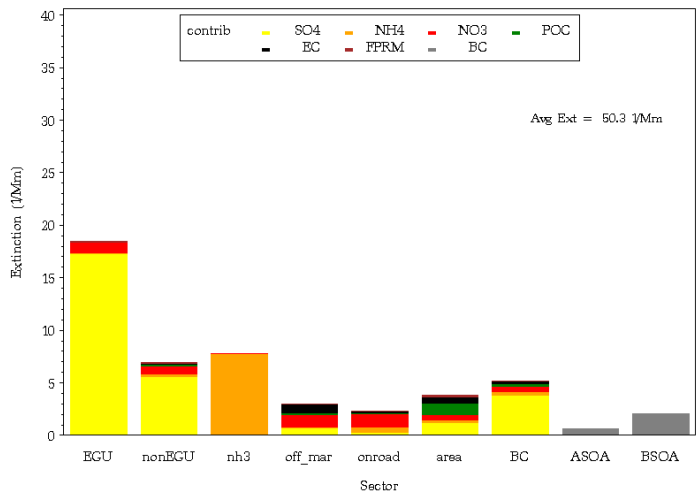
2005 (LADCO Round 5)



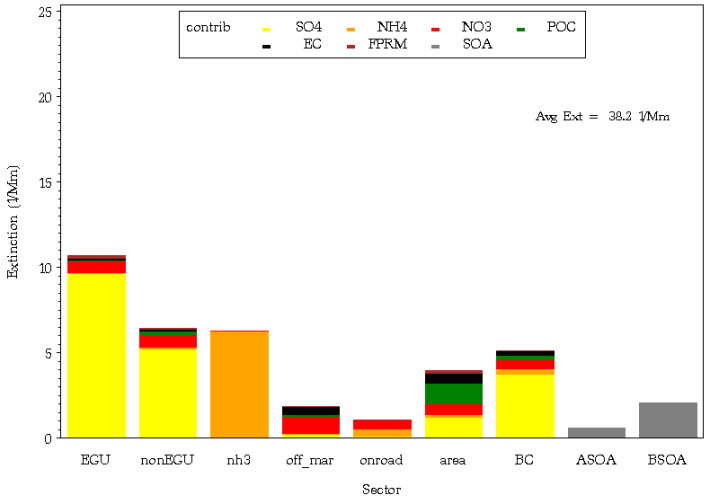
2018 (LADCO Round 5)



2005 (LADCO Round 5)



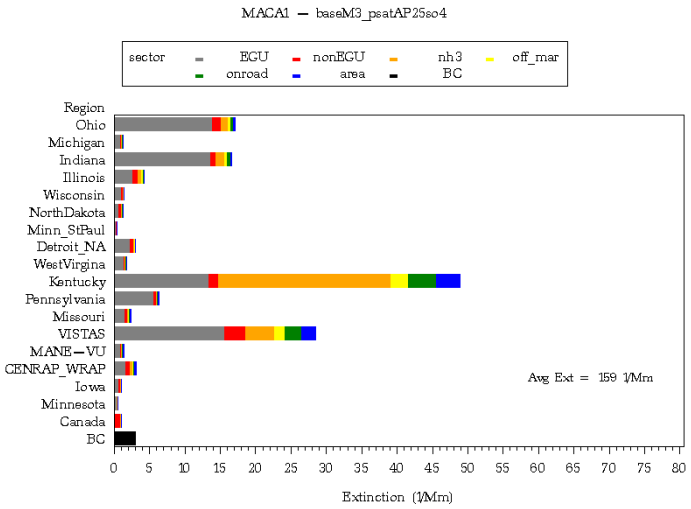
2018 (LADCO Round 5)



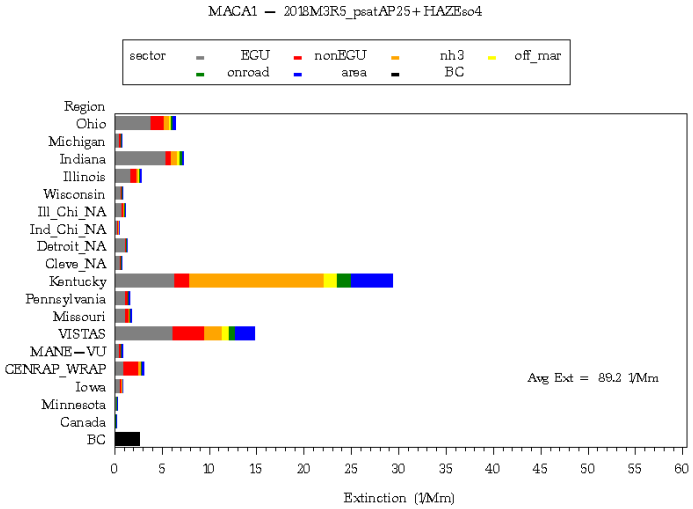
Indiana contributions to visibility impairment at Mammoth Cave, Kentucky comprise mostly of sulfates emissions from EGUs, as shown in Figure 7. Indiana's contributions to light extinction are expected to decrease through 2018 and overall light extinction at Mammoth Cave is expected to be approximately half of the light extinction modeled for 2005.

Figure 7. Mammoth Cave, Kentucky

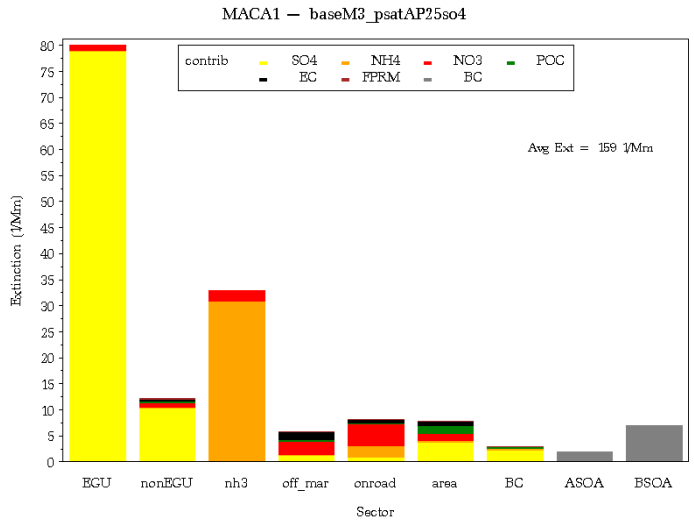
2005 (LADCO Round 5)



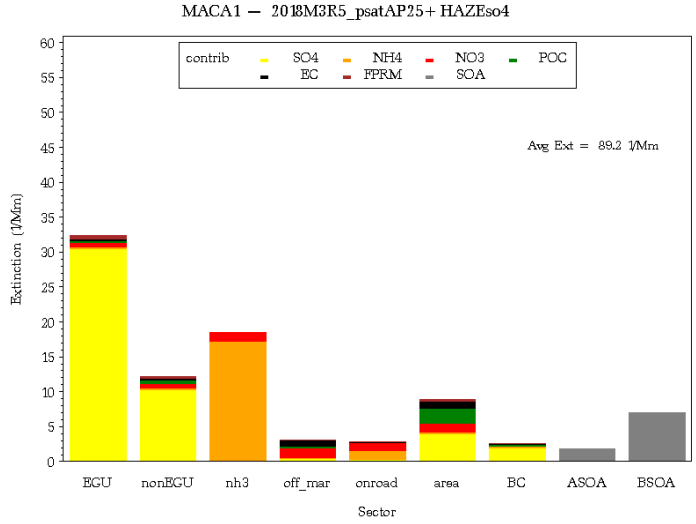
2018 (LADCO Round 5)



2005 (LADCO Round 5)



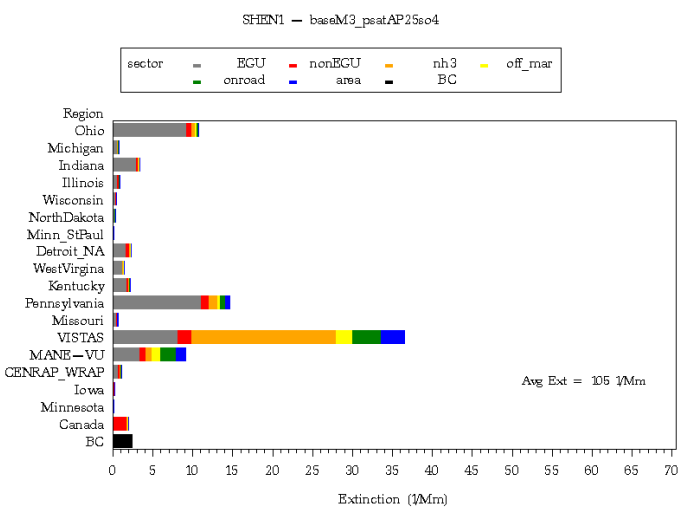
2018 (LADCO Round 5)



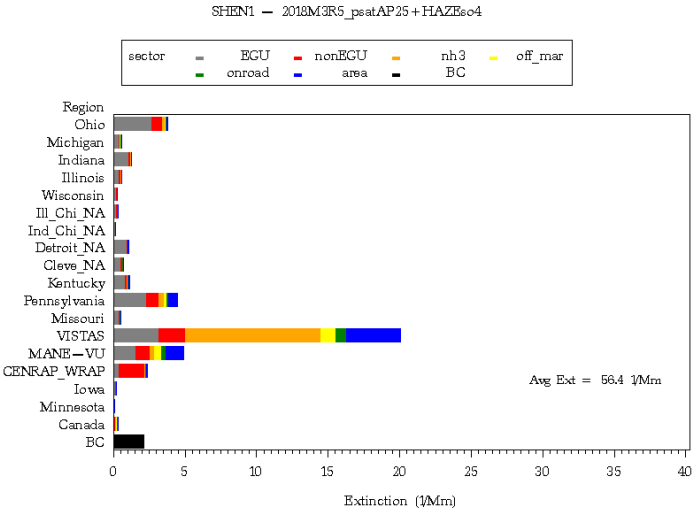
Indiana contributions to visibility impairment at Shenandoah National Park, Virginia comprise mostly of sulfate emissions from EGUs, as shown in Figure 8. Indiana's contributions to light extinction are predicted to decrease through 2018 and overall light extinction at Shenandoah is expected to be approximately half of the light extinction modeled for 2005.

Figure 8. Shenandoah, Virginia

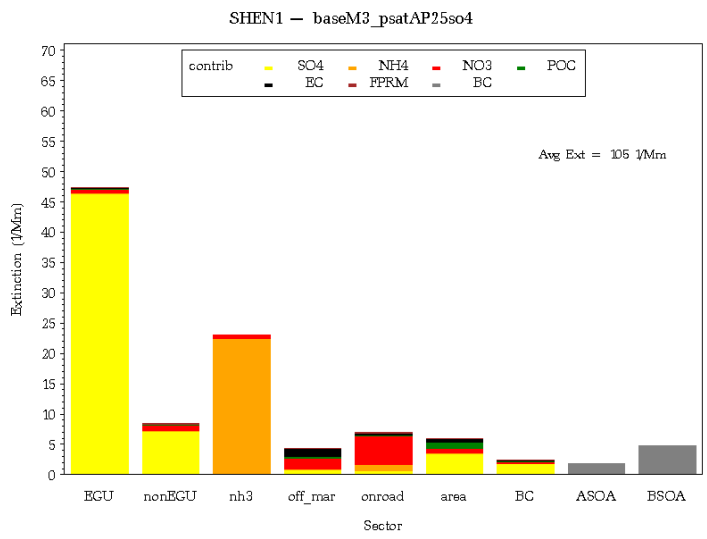
2005 (LADCO Round 5)



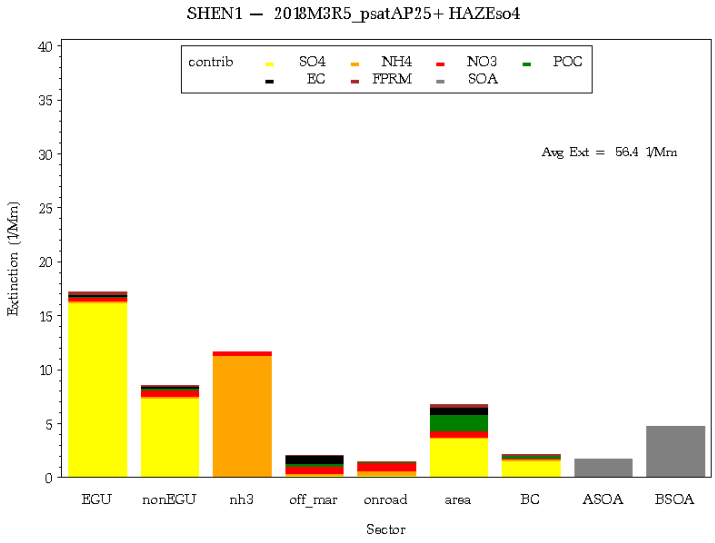
2018 (LADCO Round 5)



2005 (LADCO Round 5)



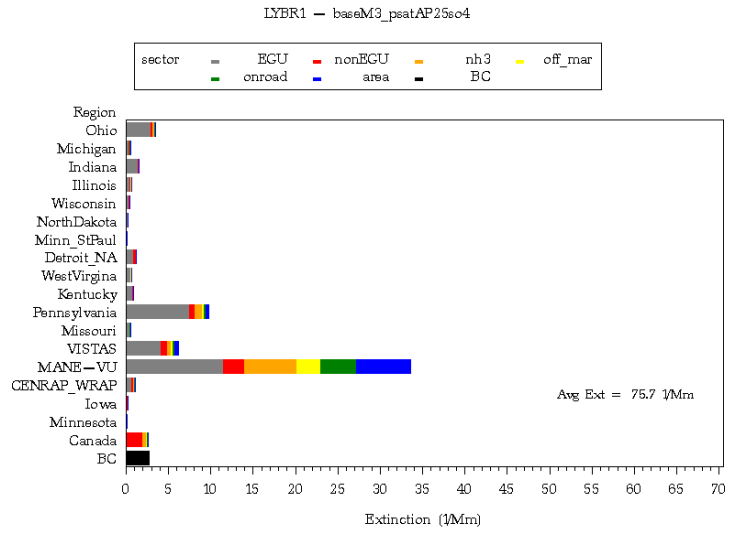
2018 (LADCO Round 5)



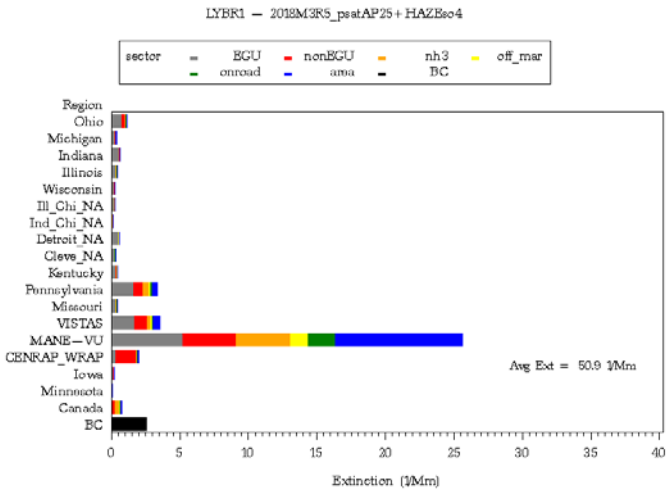
Indiana contributions to visibility impairment at Lye Brook Wilderness, Vermont comprise mostly of sulfate emissions from EGUs, as shown in Figure 9. Indiana's contributions to light extinction will decrease through 2018 and overall light extinction at Lye Brook is expected to be approximately 1/3 of the light extinction modeled for 2005.

Figure 9. Lye Brook Wilderness, Vermont

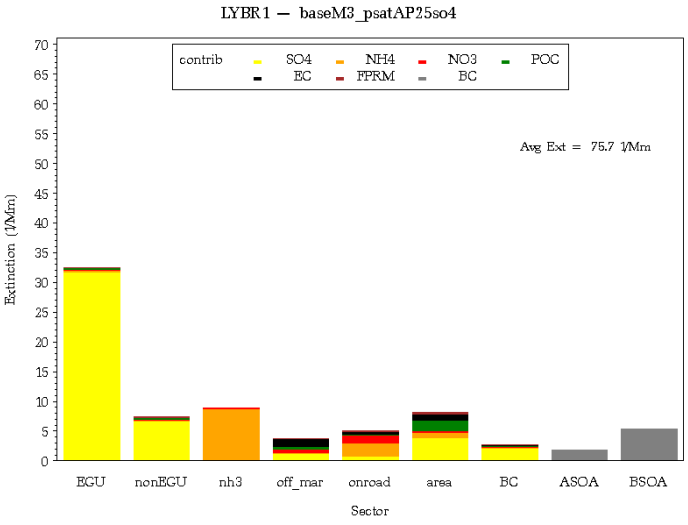
2005 (LADCO Round 5)



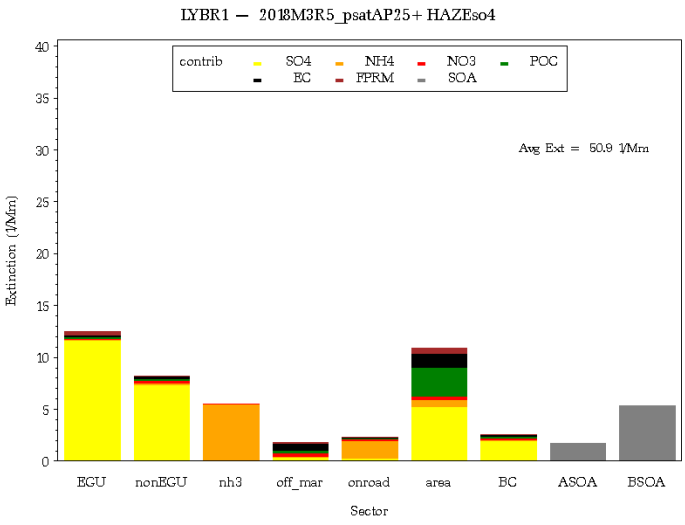
2018 (LADCO Round 5)



2005 (LADCO Round 5)



2018 (LADCO Round 5)



Indiana contributions to visibility impairment at all the Class 1 areas analyzed were less than 5 Mm^{-1} with the exception of Indiana's contribution to visibility at Mammoth Cave National Park in Kentucky. The future year modeling shows that Indiana is projected to have reduced its contribution on Mammoth Caves' visibility impairment by approximately 50% by 2018.

LADCO conducted back trajectory analyses to determine which states were culpable during bad visibility days at each of the northern Class 1 area analyzed. Table 1 shows the percentage of light extinction culpability from states in the eastern United States at the northern Class 1 areas. Indiana is shown to contribute less than 3 % light extinction at Boundary Waters Canoe Area, MN and Seney Wilderness, MI and no appreciable contribution to light extinction at Voyageurs National Park, MN.

Table 1. LADCO's Back Trajectory Analysis -1997-2001 (percent of light extinction)

Region		Boundary Waters Light Extinction			Voyageurs Light Extinction			Seney Light Extinction		
		Best	All Days	Worst	Best	All Days	Worst	Best	All Days	Worst
US	Alabama		0.03						0.2	0.39
	Arkansas		0.3	0.4		0.1	0.19		1.54	2.93
	Florida								0.09	0.17
	Georgia								0.21	0.39
	Illinois		1.68	2.74		0.5	1.22		4.99	7.43
	Indiana		**0.57**	**1.18**					**1.67**	**2.17**
	Iowa		5.14	7.44		6.12	10.24		5.27	5.66
	Kentucky								1.14	2.18
	Louisiana		0.12	0.23		0.03	0.06		0.78	1.23
	Michigan	0.78	1.17	0.66	0.27	1.22	1.57	14.51	13.68	14.68
	Minnesota	22.04	34.75	37.63	20.96	34.6	36.88	1.46	5.41	3.79
	Mississippi		0.06						0.62	1.04
	Missouri		2.17	3.26		1.02	0.3		2.42	3.17
	New Hampshire								0.02	
	New York								0.07	0.1
	North Carolina		0.09						0.19	0.36
	North Dakota	1.21	5.13	5.91	1.59	6.51	7.11		1.26	0.64
	Ohio		0.19	0.23				0.07	1.61	2.8
	Pennsylvania							0.49	0.15	0.26
	South Carolina								0.21	0.39
	South Dakota	0.45	3.06	4.38		4.08	6.93		1.13	1.12
	Tennessee			0.01					0.47	0.85
	Vermont								0.02	
	Virginia		0.03						0.17	0.33
	West Virginia		0.05						0.54	1.02
	Wisconsin	1.31	7.86	10.06		5.5	9.66	0.26	10.63	8.44
	Western States	1.1	4.31	5.74		7.05	9.53		5.8	5.9
Canada	Manitoba	9.95	7.45	3.71	17.65	10.35	6.04	3.77	2.37	0.77
	Ontario	47.52	15.96	8.92	49.56	13.59	4.98	50.97	12.86	7.66
	Quebec	1.77	0.15		0.21	0.01		0.97	0.93	0.41
	Other Provinces	2.27	3.73	2.46	6.05	6.29	2.35	0.86	1.72	2.28
Other	(over water, etc)	11.61	6.02	5.05	3.72	3.05	2.94	26.65	21.86	21.44
Total		100	100	100	100	100	100	100	100	100

LADCO summarized its back trajectory, Round 4 and Round 5 PSAT analyses along with the CENRAP and MPCA PSAT modeling results to show the state culpabilities on the northern Class 1 areas. As can be seen, Indiana's impacts on the Boundary Waters, Voyageurs and Isle Royale Class 1 areas are less than 6% of the total visibility impairment. Indiana is modeled to have a slightly higher impact at Seney, with modeled results less than 12% of total visibility impairment. Emission reductions that are projected through future year 2018 PSAT modeling show Indiana's impact will be reduced approximately 20% or more, decreasing Indiana's impact on future year visibility at Seney.

Table 2. State Culpabilities Based on PSAT Modeling and Trajectory Analysis

	Boundary Waters					Seney		
State/Region	LADCO Rnd 4 PSAT	LADCO Rnd 5 PSAT	MPCA-PSAT	CENRAP PSAT	LADCO-Traj Analysis	LADCO Rnd 4 PSAT	LADCO Rnd 5 PSAT	LADCO Traj Analysis
Michigan	3.40%	4.80%	3.00%	1.90%	0.70%	13.80%	18.10%	14.70%
Minnesota	30.50%	23.50%	28.00%	30.60%	37.60%	4.80%	1.60%	3.80%
Wisconsin	10.40%	10.90%	10.00%	6.40%	10.60%	12.60%	10.90%	8.40%
Illinois	5.20%	5.10%	6.00%	3.50%	2.70%	13.00%	14.30%	7.40%
Indiana	**2.90%**	**3.90%**	**3.00%**	**1.80%**	**1.20%**	**9.60%**	**11.60%**	**2.20%**
Iowa	7.60%	8.30%	8.00%	2.50%	7.40%	6.20%	3.80%	5.70%
Missouri	5.20%	3.40%	6.00%	2.10%	3.30%	6.50%	4.80%	3.20%
N. Dakota	5.70%	1.10%	6.00%	4.60%	5.90%	1.50%	0.10%	0.60%
Canada	1.90%	2.70%	3.00%	12.50%	15.10%	2.10%	1.20%	11.10%
CENRAP-WRAP	10.90%	13.50%		4.20%	10.10%	13.10%	10.00%	7.00%
TOTAL	83.60%	77.20%	73.00%	70.20%	94.60%	83.30%	76.40%	64.10%

	Voyageurs					Isle Royale	
State/Region	LADCO Rnd 4 PSAT	LADCO Rnd 5 PSAT	MPCA-PSAT	CENRAP PSAT	LADCO-Traj Analysis	LADCO Rnd 4 PSAT	LADCO Rnd 5 PSAT
Michigan	2.00%	4.90%	2.00%	1.00%	1.60%	12.70%	13.40%
Minnesota	35.00%	20.20%	31.00%	31.50%	36.90%	14.10%	9.50%
Wisconsin	6.30%	7.90%	6.00%	3.70%	9.70%	16.30%	14.70%
Illinois	3.00%	7.10%	3.00%	1.80%	1.20%	7.00%	8.70%
Indiana	**1.60%**	**4.60%**	**2.00%**	**0.80%**		**5.60%**	**5.20%**
Iowa	7.40%	7.10%	7.00%	2.40%	10.20%	6.90%	8.30%
Missouri	4.30%	4.00%	4.00%	1.60%	0.30%	3.90%	4.60%
N. Dakota	10.30%	1.70%	13.00%	6.10%	7.10%	3.60%	0.30%
Canada	2.70%	3.30%	5.00%	17.20%	13.30%	2.20%	1.70%
CENRAP-WRAP	10.20%	13.70%	6.10%	16.50%	12.50%	12.60%	
TOTAL	82.70%	74.50%	73.00%	72.20%	96.80%	84.90%	79.00%

Table II-2, "Regional Haze in the Upper Midwest: Summary of Technical Information" Feb 22, 2008

Baseline visibility conditions for the northern Class 1 areas, taken from 2000 through 2004, established the baseline values at the northern Class 1 areas between 18.5 and 23.5 deciviews for the 20% worst days using the old IMPROVE equation and baseline values at the northern Class 1 areas between 19.5 and 24.5 deciviews using the new IMPROVE equation. This information is used to establish the uniform rate of improvement (URI) for 2018. Table 3 shows the visibility values for the northern Class 1 area using the old and new IMPROVE equations.

Table 3. Visibility Values for the Northern Class 1 Area using the Old and New IMPROVE Equations

Old IMPROVE Equation (Cite: VIEWS, November 2005)								
	20% Worst Days					Baseline	2018	Natural
	2000	2001	2002	2003	2004	Value	URI Value	Conditions
Voyageurs	18.5	18	19	19.2	17.6	18.46	16.74	11.09
BWCA	19.85	19.99	19.68	19.73	17.65	19.38	17.47	11.21
Isle Royale	20	22	20.8	19.5	19.1	20.28	18.17	11.22
Seney	22.6	24.9	24	23.8	22.6	23.58	20.73	11.37
	20% Best Days					Baseline	Natural	
	2000	2001	2002	2003	2004	Value	Conditions	
Voyageurs	6.3	6.2	6.7	7	5.4	6.32	3.41	
BWCA	5.9	6.52	6.93	6.67	5.61	6.33	3.53	
Isle Royale	5.7	6.4	6.4	6.3	5.3	6.02	3.54	
Seney	5.8	6.1	7.3	7.5	5.8	6.5	3.69	
New IMPROVE Equation (Cite: VIEWS, March 2006)								
	20% Worst Days					Baseline	2018	Natural
	2000	2001	2002	2003	2004	Value	URI Value	Conditions
Voyageurs	19.55	18.57	20.14	20.25	18.87	19.48	17.74	12.05
BWCA	20.2	20.04	20.76	20.13	18.18	19.86	17.94	11.61
Isle Royale	20.53	23.07	21.97	22.35	20.02	21.59	19.43	12.36
Seney	22.94	25.91	25.38	24.48	23.15	24.37	21.64	12.65
	20% Best Days					Baseline	Natural	
	2000	2001	2002	2003	2004	Value	Conditions	
Voyageurs	7.01	7.12	7.53	7.68	6.37	7.14	4.26	
BWCA	6	6.92	7	6.45	5.77	6.43	3.42	
Isle Royale	6.49	7.16	7.07	6.99	6.12	6.77	3.72	
Seney	6.5	6.78	7.82	8.01	6.58	7.14	3.73	

The glide paths, as determined by LADCO's Base M modeling, show the different emission scenarios meeting the glide paths for most Class 1 areas by 2018. The different emission scenarios include:

- **R5S1a scenario** - EGU emissions as assumed by the EPA's IPM3.0 model
- **R5S1b scenario** – EPA's IPM3.0 model emissions for EGUs along with several "will do" adjustments identified by states (legally binding agreements such as consent degrees, operating permits, signed contracts, etc).

Modeling results show the deciview values resulting from the different emission rates fall in line with the glide path for each Class 1 area for the 20% worst days. Further explanation of the glide path results can be found in the "Regional Air Quality Analyses for Ozone, $PM_{2.5}$ and Regional Haze: Final Technical Support Document, April 25, 2008" page 96-100.

References:

"Regional Haze in the Upper Midwest: Summary of Technical Information Version 2.2", February 22, 2008
http://www.ladco.org/reports/rpo/consultation/products/regional_haze_in_the_upper_midwest_summary_of_technical_information_v2.2_feb_22_2008.pdf

"Regional Air Quality Analyses for Ozone, PM2.5 and Regional Haze, Final Technical Support Document" April, 25, 2008
http://www.ladco.org/reports/technical_support_document/tsd/tsd_version_iv_april_25_2008_final.pdf

"Reasonable Progress for Class I Areas in the Northern Midwest – Factor Analysis" July 18, 2007
http://www.ladco.org/reports/rpo/consultation/products/reasonable_progress_for_class_i_areas_in_the_northern_midwest-factor_analysis_draft_final_technical_memo_july_18_2007.pdf