

Appendix D: Documentation/Background for Program Matrix

Note to readers: This appendix and others refer to reports and documents indicated as clickable internet links, which were live when the report was drafted. It is likely that some of these links are no longer live and current, as the MPCA cannot maintain those belonging to other organizations. If you are interested in a particular reference and cannot access it, please contact Michael Trojan at 651/297-5219.

This document summarizes information used to develop the Programs Matrix. During construction of the Program Matrix, we attempted to identify as much information as possible, primarily from the Internet. There was, however, limited input from experts within the various programs. Consequently, the information should not be construed as being complete.

The information focuses on sources rather than stressors. Sources align better than stressors with MPCA programs and activities. The reader should be careful to make sure they identify the stressors associated with particular sources. For example, Trains is a source listed in the Program Matrix. Trains are associated with two stressors: Explosive Flammable Materials – High Level Accidental Exposure, and Toxic Chemicals – High Level Accidental Exposure. Trains may affect other stressors, such as Particles in Air, but in the EIR, the contribution of trains to particles was not considered separately but was instead grouped with another source – Off-Road Vehicles. Within the following discussion, stressors are identified for each source.

There is no attempt to evaluate the effectiveness of any program or activity. We instead identify activity levels, which are a measure of how much activity exists within a particular source area. Three levels of activity are identified in the Program Matrix and these are described below.

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- Programs or activities do not exist
- Limited programs or activities exist
- Well-established programs or activities exist

Four types of programs or activity are discussed:

Cleanup – A program dedicated to cleaning up or reducing exposure to pollutants that have been released to the environment.

Control - A program dedicated to controlling the release of pollutants through management practices or equipment rather than use of preventive strategies. Control programs include compliance or regulatory outreach and training, which should not be confused with education. Education is treated as a separate category in this document. Control programs also encompass most permitting activities, although certain aspects of permitting may relate to cleanup, education, or prevention.

Education – Programs or activities concerned with the interrelationships among components of the natural and human-made world, producing growth in the individual and leading to responsible stewardship of the earth (<http://www.sru.edu/Depts/pcee/ProfDevInit/Resources/DEFINITION.html>). Activities such as training, outreach, and technical assistance generally are not included under education but more typically are considered under control.

Prevention - Strictly speaking, “pollution prevention” means to reduce the quantity or toxicity of wastes or inputs at the source (source reduction) *Minn. Stat. § 115D and Executive Order 99-4*. Reusing wastes or products and recycling are other preventative approaches. These preventative practices contrast with treatment and disposal of wastes (commonly referred to as control, management or abatement methods). In addition to source reduction, the US EPA considers eliminating pollution through increased efficiency in the use of raw materials, energy and water, and the protection of natural resources by conservation to be pollution prevention. For more information, go to <http://www.pca.state.mn.us/programs/p2-s/index.html#overview>.¹

We also distinguish between MPCA and external programs or activities. External entities include any non-MPCA organization or agency. These include federal, regional, state, or local government and non-government agencies or organizations.

A List of Abbreviations is included at the end of this document. The following outline indicates discussions for individual sources can be found.

¹ Prevention includes but is not limited to the following activities.

- Increase the efficiency in the use of raw materials, water, air or energy.
- Increase the useable life span of a product.
- Change procurement, consumption, or waste-generation habits for greater source reduction.
- Reduce volume of solid waste going to a landfill through recycling.
- Recycling process waters.
- Avoid cross media transfer.
- Use benign rather than toxic chemicals or energy-intensive remedies for site cleanup.
- Use natural systems (e.g., reclaimed/constructed wetlands) as part of cleanup remedies.
- Reuse salvageable materials recovered during deconstruction.
- Restore, replace or enhance habitat (e.g., Natural Resource Damages at Superfund sites).
- Prevent stormwater pollutants from entering lakes, streams or groundwater (e.g., low-impact development, integrated management practices).
- Support preventative approaches in environmental management systems or ISO 14001.
- Incorporate “Design for the Environment” or product stewardship.
- Promote high-performance building design, low impact transit, roadways, lighting and vegetation.

Note: This list is not comprehensive.

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Discussion of Individual Sources

Agricultural Runoff

Stressors Impacted: Nitrogen, oxygen-demanding pollutants, phosphorus, toxic organic chemicals, transported sediments

Impact Categories: Aquatic Organisms, Quality of Life-Aesthetics

Agricultural runoff is excess water from rainfall and other precipitation that runs off the land. When uncontrolled, agricultural runoff removes topsoil, nutrients, pesticides, and organic materials and carries them to water bodies where they become pollutants (<http://www.ianr.unl.edu/pubs/water/g586.htm#ar>). Agricultural runoff includes sediments and chemicals associated with sediments and in solution. Most agricultural runoff is classified as nonpoint in origin. Impacts are to aquatic ecosystems. Additional information can be found in this document in sections on construction, feedlots, fertilizer use, land-applied manure, land-applied municipal and industrial byproducts, mining, and urban runoff.

Cleanup – There is no cleanup program associated with agricultural runoff, unless the source of runoff is regulated through a NPDES permit.

Control – Historically, nonpoint pollution has not been directly regulated, though implementation of Total Maximum Daily Loads (TMDLs) would alter this (<http://www.epa.gov/owow/tmdl/>). For each pollutant that causes a water body to fail state water quality standards, the federal Clean Water Act requires the MPCA to conduct a TMDL study. A TMDL study identifies both point and nonpoint sources of each pollutant that fails to meet water quality standards. Rivers and streams may have several TMDLs, each one determining the limit for a different pollutant. The Clean Water Act requires states to publish, every two years, an updated list of streams and lakes that are not meeting their designated uses because of excess pollutants. The list, known as the 303(d) list, is based on violations of water quality standards and is organized by river basin

(<http://www.pca.state.mn.us/water/tmdl.html#rulemaking>). Minnesota has prepared a list of impaired waters (<http://www.pca.state.mn.us/water/pubs/tmdl-list98.pdf>).

MPCA's innovation program seeks to promote greater use of Environmental Management Systems (EMSs) in agriculture. This is a two-pronged effort. On one track, the agency will be promoting and piloting EMS-based programs with producers and processors, and their associations and cooperatives. On the other track, MPCA seeks to strengthen market, lending, and insurance incentives for producers and processors to implement EMS, prevention, and sustainability approaches. With the Multi-State Working Group (MSWG) on Environmental Management Systems (<http://www.iwrc.org/mswg/>), the MPCA co-hosted a discussion of the potential for the expanded use of EMS and related tools in agriculture in March 2001. MPCA staff and MSWG members developed a survey of EMS-related activities in agriculture and agribusiness

(<http://www.iwrc.org/mswg/emsfac.doc>). One of the activities outlined in the linked document above is the United Egg Producers initiative under EPA's Project XL. MPCA is working with some Minnesota facilities as part of the egg producers pilot (<http://www.epa.gov/projectxl/uep/index.htm>). Activities that would be included in EMS promotion include feedlots, fertilizer use, land application of

manure, pesticide use, and streambank erosion. Some runoff is regulated indirectly through other programs, such as land application of manure. Some agricultural facilities, such as manufacturers of pesticides and fertilizers, are regulated through National Pollution Discharge Elimination System (NPDES) permits.

Prevention – MPCA's innovation program seeks to promote greater use of EMSs in agriculture (See discussion above under Control). The second phase of Clean Water Partnership (CWP) projects involve putting in place best management practices (BMPs), including sedimentation ponds, manure management, conservation tillage, terraces, new ordinances, wetland restoration, fertilizer management, education or other methods designed to reduce nonpoint-source pollution. Many of these BMPs are more correctly classified as control activities. FANMAP, a program administered through the Minnesota Department of Agriculture (MDA), is designed to educate farmers in sensitive hydrologic environments about assessing nutrient and pesticide needs (<http://mrbdc.mankato.msus.edu/inventory/state/sbmp.html>; <http://www.mda.state.mn.us/appd/1999acpp.pdf>). Preventive activities are described in sections on feedlots, fertilizer use, land-applied manure, pesticide use, and streambank erosion.

Education – MPCA's innovation program seeks to promote greater use of EMSs in agriculture (See discussion above under Control). Education activities are further described in sections on Fertilizer use and Land-applied manure.

Agriculture

Stressors Included: Habitat modification, Particles in air, Odorous chemicals from biological processes, Temperature increase/climate change

Impact Categories: Terrestrial Organisms, Human Health-cancer, Human Health-noncancer chronic, Human Health-noncancer acute, Aquatic Organisms, Quality of Life-Aesthetics

Agriculture includes a range of activities, including manure management, fertilizer and pesticide application, cultivation, crop management, etc. Many of these activities are discussed in other sections of this document (Agricultural runoff; Drainage and channelization; Feedlots; Fertilizer use; Land-applied manure; Pesticide use). These activities were combined because we felt it would be cumbersome to list each agricultural activity. Comments in EIR matrices may identify specific sources that are important for a particular stressor. The primary habitat impact from agriculture will be from crop growth. Because grasslands typically occur on well-developed soils and gentle terrain, they are prime spots for crop production. Sites that are not converted for crop production are highly desired as grazing land for livestock production. Crop production destroys grassland habitats while overgrazing degrades these habitats, allowing the invasion of exotic and early succession stage species. The net result is habitat that no longer supports the diversity of vertebrates that they once did

(<http://www.orst.edu/instruct/fw251/notebook/habitat.html>). Agriculture affects wildlife by reducing and isolating natural habitat. Often all that remains of natural habitat in heavily farmed areas are scattered remnant patches, wet depressions, and linear strips lost in a sea of cropland (<http://res2.agr.ca/london/gpres/report/rep19sum.html>; <http://www.sierraclub.org/habitat/report/habitatloss.asp>). Another affect of crop production involves global climate change, which is primarily associated with release of

nitrous oxide from fertilizer. The primary human health effects are related to air quality. A variety of agricultural activities impact air quality, including release of ammonia from manure and commercial fertilizers, release of fugitive dust (air particles), and release of pesticides associated with particles.

Cleanup – Minnesota Statute 116.07 subd. 7(p) requires that 75% cost-share funding be available before the Minnesota Pollution Control Agency (MPCA) may take enforcement action against any feedlot operation (<http://www.mda.state.mn.us/feedlots/assessment.pdf>). Other cleanup programs for agricultural activities occur within the Minnesota Department of Agriculture (MDA), although many of these programs are more accurately defined as affecting unpermitted waste disposal. These programs do not directly impact air emissions, although contaminated soils may act as sources for air releases (<http://www.mda.state.mn.us/incidentresponse/default.htm>).

Control – Chapter 7020.0200 governs the storage, transportation, disposal, and utilization of animal manure and process wastewaters and the application for and issuance of permits for construction and operation of animal manure management and disposal or utilization systems for the protection of the environment. This Chapter does not preempt the adoption or enforcement of zoning ordinances or plans by counties, townships, or cities (<http://www.revisor.leg.state.mn.us/arule/7020/0200.html>). Chapter 7020.2002 states that the owner of an animal feedlot is exempt from the state ambient air quality standards during the removal of manure from barns or manure storage facilities pursuant to the limitations in Minnesota Statutes, section 116.0713, paragraphs (b) and (c). Nothing in this part limits the emergency powers authority of the MPCA in Minnesota Statutes, section 116.11. The operator of a livestock production facility that claims exemption from the state ambient air quality standards shall notify the commissioner or county feedlot pollution control officer (<http://www.revisor.leg.state.mn.us/arule/7020/2002.html>). Chapter 7020.2010 discusses transportation of manure but does not specifically mention air quality (<http://www.revisor.leg.state.mn.us/arule/7020/2010.html>). Similar language exists for construction of manure storage structures, manure stockpiling, and land-applied manure (<http://www.revisor.leg.state.mn.us/arule/7020/>). Minnesota Statutes, Section 18C.121, regulate the design, construction, repair, alteration, location, installation, and operation of agricultural anhydrous ammonia systems with product used or intended for use as a fertilizer (<http://www.revisor.leg.state.mn.us/arule/1513/0010.html>). In December 1979, the MPCA adopted rules which allow counties to process MPCA feedlot permit applications for feedlots under 1,000 Animal Units (AU)(2,500 adult hogs). The county must forward applications to MPCA to process for feedlots over 1,000 AU (<http://www.ctic.purdue.edu/Core4/Nutrient/ManureMgmt/Paper20.html>). Many BMPs can be implemented to control odors, including use of odor over-riding chemicals and adsorption of odors (<http://www.bae.umn.edu/extens/aeu/aeu8.html>). Local ordinances may control release of odors or other agricultural air emissions. Minnesota Statutes 2000, Chapter 103C, describes powers of soil and water conservation districts. The Conservation Districts have broad authority regarding agricultural activities that may impact habitat modification (<http://www.revisor.leg.state.mn.us/stats/103C/331.html>).

Prevention – Wildlife diversity is diminished by agriculture, but a number of activities may decrease this effect. These include land application of manure or other organic matter, reducing field size and incorporating areas of noncultivated land, limiting grazing activities in noncultivated fields, reducing tillage, planting crops that are more desirable for birds, increasing edge habitat, promoting forest instead of herbaceous plants at field edges, decreased mowing and burning, conservation tillage, use of border fences and posts, a buffer zone for spraying adjacent to field edges, and use of timothy/clover instead of alfalfa (http://res2.agr.ca/london/gpres/download/rep1_9.pdf). Historically, conservation efforts in agriculture have focused on improving crop production. While some of these efforts improve wildlife diversity, increasing diversity is rarely an objective of agricultural management. USDA supports research to understand how community composition and structure relate to function and sustainability. Specific research needs are to understand the interaction of the biological community, including its environment, and to identify sustainable management practices for forest, range, crop, and aquatic ecosystems (<http://www.usda.gov/oce/sdsf2/sdhome.htm>; <http://www.nnic.noaa.gov/CENR/agnew.html>). Several references to prevention or reduction of odors from feedlots can be found at <http://www.4cleanair.org/members/committee/agriculture/BMPs.PDF>. Many odor-control BMPs qualify as controls, but some activities may be considered preventive. Examples of BMPs include proper maintenance of animal-holding structures, care of animals including dead animals, proper care of feed, use of manure pits beneath barns, dust suppression, and complete combustion for incineration activities. These activities reduce or prevent odors, but not the waste that generated the odor. The University of Minnesota (U of M) is the lead organization dealing with prevention of odors from manure operations (<http://www.bae.umn.edu/extens/manure/odor/index.html>; <http://www.bae.umn.edu/extens/aeu/aeu8.html>). The MPCA has established reduction goals for air particulates (<http://www.pca.state.mn.us/hot/legislature/reports/2001/aq-report.pdf>). Additional information about prevention efforts in agriculture can be found in this document in sections on drainage and channelization, agricultural runoff, fertilizer use, land-applied manure, and pesticide use. Activity that results in use of less chemical or reduction of erosion could be classified as prevention.

Education – There are many educational web sites that provide information on habitat destruction. Many of these do not directly relate to agriculture, but the activities and information provide students with tools for understanding environmental consequences of habitat modification (<http://www.nwf.org/education/>; <http://www.usda.gov/news/usdakids/index.html>; <http://www.nwf.org/kids/>; <http://exchanges.state.gov/forum/journal/env1internet.htm>; <http://www.epa.state.il.us/kids/teachers/books.html>; <http://www.enc.org/resources/records/0,1240,013466,00.shtm>). Other information about education efforts in agriculture can be found in sections on drainage and channelization, agricultural runoff, fertilizer use, land-applied manure, and pesticide use. We did not identify educational activities related to control of emissions from manure.

Aircraft

Stressors Included: Noise

Impact Categories: Human Health-noncancer chronic, Human Health-noncancer acute, Quality of Life-Aesthetics

Aircraft contribute to off-road air emissions. They were considered a significant source of noise and added as a separate source for Noise.

Cleanup – none

Control – The Federal Aviation Administration (FAA) has source regulations for commercial jet engines. All commercial jet engines must meet noise emission criteria prior to being certified for flight. 14 CFR Part 150 provides a means for airports to accomplish comprehensive noise reduction goals. Part 150 is a federal program appropriating aviation-generating funds for the purpose of aircraft noise mitigation measures in communities surrounding an airport (including sound insulation). Currently Minneapolis-St. Paul (MSP) appropriates millions of dollars annually for the Residential Sound Insulation Program. However, the ability for an airport authority to use Part 150 funds or any aviation generated funds for the purpose of noise mitigation hinges upon completion and federal acceptance of approved noise mitigation measures proposed in a Part 150 study. The Part 150 Process provides airport operators with the procedures, standards and methodology governing the development, submission and review of airport Noise Exposure Maps (typically referred to as noise contours) and airport Noise Compatibility Programs. The PCA adopts standards describing the maximum levels of noise in terms of sound pressure level that may occur in the outdoor atmosphere. Standards give due consideration to such factors as the intensity of noises, the types of noises, the frequency with which noises recur, the time period for which noises continue, the times of day during which noises occur, and such other factors as could affect the extent to which noises may be injurious to human health or welfare, animal or plant life, or property, or could interfere unreasonably with the enjoyment of life or property (<http://www.revisor.leg.state.mn.us/stats/116/07.html>; <http://www.pca.state.mn.us/programs/pubs/noise.pdf>).

Prevention – The following measures comprise MSP's current approved Noise Compatibility Program (http://macavsat.org/noise_info/index.htm).

- Voluntary Noise Budget Program - The MAC has adopted a phased-in noise budget ordinance for MSP in April 1987.
- Voluntary Nighttime Limits on Flights
- Nighttime Powerbacks
- Engine Run-up Field Rule
- Training Restriction - The major carriers at MSP have agreed not to conduct training operations at MSP. No other carriers conduct training flights at MSP at this time.
- Operating Procedures agreed to by the major carriers at MSP.

Education - none

Area Source Combustion

Stressors Impacted: Particles in air, Ground-level ozone, Toxic organic chemicals, Nitrogen

Impact Categories: Human Health-noncancer chronic, Human Health-noncancer acute, Aquatic Organisms, Terrestrial Organisms, Quality of Life-Aesthetics

We define area sources as a collection of similar emission units within a geographic area. Commonly, area sources have been defined at the county level, and most area source methods are designed to estimate area source emissions at the county level. Area sources collectively represent individual sources that are small and numerous and that have not been inventoried as specific point, mobile, or biogenic sources. Individual sources are typically grouped with other like sources into area source categories. These source categories are grouped in such a way that they can be estimated collectively using one methodology

(http://www.epa.gov/ttn/chief/eiip/techreport/volume03/iii01_apr2001.pdf). Area source combustion includes prescribed burns, wildfires, residential open burning, wood combustion, solvent use, product storage and transport distribution (e.g. gasoline), light industrial sources, agriculture (feedlots and crop burning), waste management (landfills), and other small sources (<http://www.tnrcc.state.tx.us/air/aqp/pollsource.html#Area>). The contribution of each source is not well understood. Additional information on area sources can be found at <http://www.epa.gov/ttn/chief/eiip/techreport/volume03/>.

Cleanup – none identified, although limited cleanup may be conducted through programs that work within the sources contributing to area source combustion.

Control – There is no agency having a specific program that deals with just area sources. Some of the area sources are addressed through agency programs. The following discussion addresses individual area sources. The source of information for much of this is <http://www.epa.gov/ttn/chief/eiip/techreport/volume03/>. For most of the National Emission Standards for Hazardous Air Pollutants (NESHAPs) affecting larger groups of facilities, such as Chrome, Halogenated Solvents, Printing (Litho and Flexo), Degreasing, Dry Cleaning, Styrene and Boatbuilding, there is an effort made by NESHAPs, Small Business Assistance Program (SBAP), Small Business Environmental Improvement Loan, and Pollution Prevention (P2) staff (coordinating with MnTAP) to conduct outreach and assistance before the implementation dates of the new standards. This effort seeks to get enough implementation to get sources out of the standard altogether, or if unavoidable, to enhance on-time compliance.

Wood burning: The Clean Air Act Amendments of 1990 required that all areas in the country achieve the National Ambient Air Quality Standards (NAAQS) for PM10 by December 31, 1994. The EPA published technical guidance for reasonably available control measures and Best Available Control Measures (BACM) for control of particulate matter (PM) from woodstoves to achieve this goal of reducing PM10 emissions. Those areas that do not achieve PM10 attainment by December 31, 1994, must apply BACM and develop a plan to meet the NAAQS by December 31, 2001. The only exceptions are those areas that were reclassified as serious after 1990; these areas must attain the NAAQS for PM10 no later than the end of the tenth calendar year after the area's designation as nonattainment. The best available control measure requirements include combinations of the following control measures: the use of new technology woodstoves, improvements in wood burning performance (e.g., control of wood moisture content, weatherization of homes), the use of "no burn" days, public awareness and education programs, replacement or

installation of gas-burning equipment in fireplaces, and total banning of burning. The use of these BACM will reduce volatile organic compound (VOC), hazardous air pollutants (HAPs), carbon monoxide, and PM for measures that result in efficient wood combustion. Use of BACM will reduce nitrous oxide for measures that reduce the occurrence of combustion. The MPCA recently provided economic incentives to upgrade wood-burning stoves and fireplaces to newer, more efficient systems.

Dry Cleaning: Under the NESHAP program, the EPA has passed regulations that require the control of emissions for dry cleaning units using perchloroethylene. The NESHAP includes the required use of refrigerated condensers, leak detection, seal inspection programs, and monitoring and reporting requirements. Coin-operated dry cleaning units are exempt from all but the initial reporting NESHAP requirements. Dry cleaning with petroleum solvents was regulated under NESHAP beginning in 2000. NESHAP requirements are administered through the MPCA (<http://www.pca.state.mn.us/air/index.html>).

Architectural Surface Coating: The EPA is using regulatory negotiation to prepare a national rulemaking for controlling VOC emissions from architectural and industrial coatings. Currently, no federal EPA regulations are in place to limit VOC content or VOC emissions from architectural surface coatings.

Consumer and Commercial Solvent Use: In a March 23, 1995, Federal Register (FR) notice, the EPA identified 24 consumer product subcategories scheduled for development of federal regulations (60 FR 15264). As individual products and categories are further assessed, the EPA reserves the right to remove categories from or add categories to the list.

Solvent Cleaning: In 1994, a NESHAP was promulgated to regulate HAP emissions from halogenated solvent cleaning machines. The halogenated solvent cleaning NESHAP, promulgated in December 1994 (59 FR 61801, December 2, 1994), established standards for both area and major sources of solvent cleaners using HAP solvent.

Pesticide applications (agricultural and non-agricultural): Currently there are no federal or state regulations limiting air emissions from pesticide applications.

Gasoline Marketing: Stage I controls have been implemented in some areas, both attainment and nonattainment. Stage II controls are currently not widely implemented, but are required in some ozone nonattainment areas as defined by the 1990 Clean Air Act.

Municipal Landfills: Air quality standards and regulations that affect municipal solid waste landfill facility operations are New Source Performance Standards and Emissions Guidelines. The Standards of Performance for New Municipal Solid Waste Landfills, 40 Code of Federal Regulations (CFR) part 60, Subpart WWW are federal regulations affecting air emissions for new landfills or landfills that began construction, modification, or reconstruction on or after May 30, 1991. The Emission Guidelines required States to develop State plans to regulate existing landfills that began construction before May 30, 1991 and that have accepted waste since November 8, 1987, or have capacity to accept additional waste. The Emission Guidelines are contained in 40 CFR part 60 Subpart Cc. As of December 1999, existing landfills throughout the United

States were covered by either approved State plans that implement and enforce the Emission Guidelines, or by the Federal plan in 40 CFR part 62, Subpart GGG (see 40 CFR part 62 for a list of approved State plans). In late 2000, EPA expects to propose national emission standards for hazardous air pollutants from landfills. The proposed rule contains the same requirements as the Emission Guidelines and New Source Performance Standards.

Open burning: A variety of sources are included under open burning. Open burning is banned in many locations. Control in other areas are largely regulated to technologies designed to increase burning efficiency.

Residential and commercial coal combustion: This source category covers air emissions from coal combustion in the residential and commercial sectors for space heating or water heating. This category includes small boilers, furnaces, heaters, and other heating units that are not inventoried as point sources. Residential and commercial coal combustion sectors comprise housing units; wholesale and retail businesses; health institutions; social and educational institutions; and federal, state, and local government institutions (e.g., military installations, prisons, office buildings). No regulatory controls were identified.

Hexavalent Chromium: On January 25, 1995, the US EPA finalized regulations known as the NESHAP for Chromium Emissions from Hard and Decorative Chromium Electroplating and Chromium Anodizing Tanks (<http://www.epa.gov/ttn/atw/chrome/chromepg.html>). Major sources should already have submitted Part 70 air emissions permit applications. Area sources are currently deferred from Part 70 air emissions permit requirements. Permanent exemptions from Part 70 permits are granted for area sources with decorative chrome electroplating and chrome anodizing tanks that use fume suppressants, and decorative chrome electroplating tanks that use a trivalent chromium bath with a wetting agent incorporated into the bath (<http://www.pca.state.mn.us/air/pubs/5-07.pdf>).

Prevention – Prevention consists of decreasing the quantity or toxicity of materials used or generated in processes associated with these sources, or substituting less toxic inputs. MPCA's permitting process does not include incentives for prevention. Many businesses use prevention principles because they realize reduced regulatory burden with decreased volume or toxicity of regulated substances used or generated. MPCA SBAP provides regulatory and technical assistance to promote preventive approaches. MnTap works with private businesses to incorporate pollution prevention practices. Trivalent chrome can sometimes be used in place of hexavalent chromium. Water reuse can be maximized. Other additives can be reused or substituted to decrease toxicity or corrosivity of discharge to publicly owned wastewater treatment plants (<http://www.mntap.umn.edu/>). The MPCA has established reduction goals for air particulates and chemicals that lead to formation of ground-level ozone (<http://www.pca.state.mn.us/hot/legislature/reports/2001/aq-report.pdf>). Additional information on prevention can be found in this document in sections on agricultural sources, fertilizer use, land-applied manure, on-road vehicles, pesticide use, unpermitted waste disposal, and waste incineration.

Education – Education activities are associated with some area combustion sources. See sections on feedlots, fertilizer use, land-applied manure, on-road vehicles, pesticide use, unpermitted waste disposal, and waste incineration.

Coal-fired power plants

Stressors Included: Particles in air, habitat modification, ground-level ozone, nitrogen, toxic metals, temperature increase/climate change, other criteria pollutants in air, toxic chemicals in food, acid deposition.

Impact Categories: Human Health-cancer, Human Health-noncancer chronic, Human Health-noncancer acute, Aquatic Organisms, Terrestrial Organisms, Quality of Life-Aesthetics

Coal-fired power plants directly impact human health through the emission of toxic chemicals, particulate matter, and other chemicals such as sulfur dioxide. Coal-fired power plants also impact aquatic and terrestrial ecosystems by contributing to acid rain, air deposition of toxic chemicals, and climate change. Climate change, in turn, can result in habitat modification. Environmental impacts from coal-fired power plants were deemed significant enough to separate them from other industrial sources. This section discusses air quality aspects of coal combustion. Other aspects of coal combustion, such as generation of byproducts, including ash, and thermal discharge, are covered in other sections of this document.

Cleanup – none identified.

Control – Coal-fired power plants are not regulated as an individual entity, but are regulated through MPCA Air Quality programs. Air permits are required for coal-fired power plants, as specified in FCR, Title 40, Part 70 (<http://www.revisor.leg.state.mn.us/arule/7007/0200.html>). A permit includes a description of the source's processes and products (by Standard Industrial Classification Code or SIC Code), information about fugitive emissions, identification and description of each emission point in sufficient detail to verify the applicability of all applicable requirements, specification of the potential emissions from the source, emission limits that will be imposed on the source by applicable requirements, information on actual emissions for the preceding calendar year, actual emission rates of criteria pollutants, and actual emission rates of each hazardous air pollutant. The MPCA has authority to craft permit conditions to prevent pollution and to protect human health and the environment, although the requirements do not specifically exist in rule [Minn. Stat. § 116.07, subd. 4a and Minn. R. 7007.0800, subp. 2.]. The general permitting rule also authorizes the MPCA to craft permit conditions that protect human health and the environment [Minn. R. 7001.0150, subp. 2.] (<http://www.pca.state.mn.us/hot/legislature/reports/2001/at-appendix-k.pdf>). The primary MPCA activity that serves to reduce toxic emissions from a stationary source (e.g. coal-fired power plants) is the implementation of the federal NESHAP program. The MPCA has adopted 22 of the NESHAPs into state rule. For air particulates, Section 109 of the Clean Air Act defines primary NAAQS as allowing an adequate margin of safety to protect the public health. This is generally believed to mean that the standards would be set at a concentration below the threshold. However, the preamble of the final rule for the 1997 particulate matter standard (62

FR 38651) states that the Administrator isn't required to first identify a threshold and then set the standard somewhat lower than the threshold. In 1997, EPA selected 15 µg/m³ as the average annual PM_{2.5} NAAQS, in part, because solid evidence of a threshold lower than this did not exist. For criteria air pollutants, the EPA set NAAQS. Minnesota has, in some cases, established standards that are more stringent than EPA standards. The Clean Air Act also requires EPA to periodically review the state of the science for criteria pollutants and revise the standards if warranted. The ozone and PM_{2.5} standards were revised most recently (<http://www.pca.state.mn.us/hot/legislature/reports/2001/at-appendix-c.pdf>).

Prevention – Possible MPCA activity in prevention could include promotion of demand side energy use reduction techniques and programs, and on the supply side, use of "clean" coal and coal cleaning techniques. The MPCA has established reduction goals for air particulates and chemicals that lead to formation of ground-level ozone (<http://www.pca.state.mn.us/hot/legislature/reports/2001/aq-report.pdf>). The Coordinated Toxics Reduction Strategy refers to a collaborative effort by staff in the Office of Environmental Assistance and Minnesota Pollution Control Agency to gain meaningful cross-media reduction in toxic substances emphasizing preventative approaches (<http://intranet.pca.state.mn.us/programs/ctrs/index.html#network>). Although meetings of the Network have been discontinued for the time being, meetings will be resumed when current efforts in single- and multimedia monitoring, evaluation and modeling of PBTs have evolved to the point where the group is ready to consider developing and implementing multimedia pollution prevention strategies or other collaborative action items.

Education - The primary education tool for toxic chemicals is adoption of the NESHAPs into state rule. Coal-fired power plants, however, have not yet been included.

Construction

Stressors Impacted: Transported sediment.

Impact Categories: Aquatic Organisms, Quality of Life-Aesthetics

Construction activities result in erosion. Eroded sediment impacts aquatic ecosystems and aesthetic quality of surface waters.

Cleanup – Under the permitting process, permitted parties are required to take certain corrective actions when sediment is transported off a construction site

(<http://www.pca.state.mn.us/water/pubs/sw-cpermit.pdf>).

Control – Minnesota Statutes Chapters 115 and 116, as amended, and Minnesota Rules Chapter 7001, provide a permitting process (Phase I) that establishes conditions for discharging storm water to waters of the state from construction activities which disturb five or more acres of total land area

(<http://www.pca.state.mn.us/water/pubs/sw-cpermit.pdf>). Anyone conducting a construction activity, including clearing, grading and excavating, which results in the disturbance of five or more acres of land, is required to apply for coverage under the General Storm-Water Permit for Construction Activity. Such activities may include (but are not limited to) road building and construction of residential houses, office buildings, industrial or commercial buildings, landfills, airports, and

feedlots. There are two main permit requirements that are important to successful erosion and sediment control on a project

1. The Temporary Erosion and Sediment Control Plan. The goal of this plan is to prevent erosion from occurring and keep sediment on site during active construction.
2. The Permanent Erosion and Sediment Control Plan. The goal of this plan is to minimize long-term erosion and manage storm-water runoff discharging from the project's ultimate impervious surface after construction is complete (<http://www.pca.state.mn.us/water/stormwater-c.html>). Local ordinances may exist.

The Phase II program expands the Phase I program by requiring operators of small construction sites, through the use of NPDES permits, to implement programs and practices to control polluted storm water runoff (<http://www.pca.state.mn.us/publications/wq-sw1-02.pdf>). Construction activity disturbing less than one acre, and any other storm water discharges, can be designated for coverage if the NPDES permitting authority or EPA determines that storm water controls are necessary. Site activities disturbing less than one acre are also regulated as small construction activity if they are part of a larger common plan of development or sale with a planned disturbance of equal to or greater than one acre and less than five acres (<http://www.pca.state.mn.us/publications/wq-sw1-05.pdf>).

Prevention – Although Phase I construction general permits and Phase II small construction permits require the development and implementation of a Storm Water Pollution Prevention Plan, the Best Management Practices (BMPs) employed are properly categorized as control measures, since they are intended to control loss of sediment. The objective is to minimize the discharge of pollutants from the site (<http://www.pca.state.mn.us/publications/wq-sw1-05.pdf>). Many municipalities implement a Good Housekeeping program. The goal is to prevent or reduce pollutant runoff from municipal operations, and typically involves municipal staff training on pollution prevention measures and techniques (e.g., regular street sweeping, reduction in the use of pesticides or street salt, or frequent catch-basin cleaning). Regulatory review, inspections and enforcement of these plans is limited. Further pollution prevention measures are found at <http://www.pca.state.mn.us/water/pubs/swm-ch7.pdf>. Other preventive activities include use of certain types of construction materials (to minimize erosion loss) and long-term maintenance after construction is completed (<http://www.ieca.org/http://128.241.229.74/public/articles/index.cfm?cat=24>; <http://es.epa.gov/ncer/final/grants/96/wwshed/reice.html>).

Education – Education is considered a component of an NPDES Phase II permit, but few educational activities are currently practiced (<http://www.pca.state.mn.us/water/pubs/sw-mpdes2-01.pdf>). Most activities described as educational are more accurately defined as preventive or control measures. Training is an example (<http://128.241.229.74/public/articles/index.cfm?cat=24>).

Drainage and channelization

Stressors Included: Habitat modification.

Impact Categories: Aquatic Organisms

Drainage includes any activity that results in removal of surface water. This definition makes no distinction between surface waters and therefore includes activities designed to remove temporary water. Considering impacts to the environment, drainage is most important for water bodies classified as public waters, as defined by the Minnesota Department of Natural Resources (DNR). Channelization includes a variety of activities that change the physical features of a surface water body.

Cleanup – Cleanup entails restoration of a water body. Chapter 354 of Minnesota Statutes provides for mitigation of drained or filled wetlands, allows local units of government administrative authority, and authorizes the Minnesota Board of Soil and Water Resources (BWSR) to adopt rules and acquire permanent easements for Type 1, 2, and 3 wetlands. The basis for civil restoration order is contained in Minnesota Statute 105.461 and 105.462. The basis for injunctive relief is contained in Minnesota Statute 105.55.

Control

General: Control of water bodies affected by drainage, channelization, or other modification are regulated by a variety of agencies, principally the Minnesota DNR, Army Corps of Engineers, and Board of Water and Soil Resources (BWSR). Environmental Impact Statements (EIS) and Environmental Assessment Worksheets (EAW) are required for a variety of projects and activities that potentially impact water bodies. These include activities related to drainage, channelization, or other modifications (<http://www.revisor.leg.state.mn.us/arule/4410/>). The Environmental Quality Board ultimately oversees implementation of this rule, although local government units have a large role in implementation. There are, however, numerous exemptions to these requirements. For example, any stream diversion or channelization within the right-of-way of an existing public roadway associated with bridge or culvert replacement is exempt (<http://www.revisor.leg.state.mn.us/arule/4410/4600.html>). The DNR's Water Permits Unit oversees the administration of the Public Waters Work Permit Program that regulates water development activities below the Ordinary High Water Level (OHWL) in public waters and public waters wetlands. Examples of development activities addressed by this program include filling, excavation, shore protection, bridges and culverts, structures, docks, marinas, water level controls, dredging, and dams (http://www.dnr.state.mn.us/waters/programs/water_mgt_section/pwpermits/progdsc.html).

Public waters (including wetlands): Under Minnesota Statute 103G.245, Subdivision 1 (except as provided in Subdivisions 2, 11, and 12), the state, a political subdivision of the state, a public or private corporation, or a person must have a public waters work permit (application available under DNR Waters Forms) to do the following: 1) construct, reconstruct, remove, abandon, transfer ownership of, or make any change in a reservoir, dam, or waterway obstruction on public waters; or 2) change or diminish the course, current, or cross section

of public waters, entirely or partially within the state, by any means, including filling, excavating, or placing of materials in or on the beds of public waters. No permit is required for beach sand blankets, rock riprap (for shore protection), streams with a watershed less than 5 square miles (3,200 acres), debris removal, repair of public drainage systems, seasonal docks and floating structures, permanent docks (on lakes only), privately owned boat ramps, publicly owned boat ramps, water level control structures (on streams only), low water ford crossings (on streams only), temporary bridges (on streams only), maintenance of storm sewers, agricultural drain tile, and ditch outlets, and installation of agricultural drain tile outlets. The basis for criminal prosecution is contained in Minnesota Statute 105.463 and 105.541

(http://www.dnr.state.mn.us/waters/programs/water_mgt_section/pwpermits/permit_requirements.html).

Wetlands: Public waters wetlands are protected under state laws governing all public waters. Under Minnesota Statutes Section 103G.005, Subd. 18, they are defined as "all types 3, 4, and 5 wetlands, as defined in United States Fish and Wildlife Service Circular No. 39 (1971 edition) . . . that are ten or more acres in size in unincorporated areas or 2-1/2 or more acres in incorporated areas. Public waters wetlands were inventoried during the 1980s by the DNR. The boundaries of such wetlands (and other water basins and watercourses like lakes and rivers) are set at the OHWL, as defined in Minnesota Statutes Section 103G.005. Wetlands protected under the Wetland Conservation Act are delineated according to the United States Army Corps of Engineers Wetland Delineation Manual (January 1987), pursuant to Minnesota Statutes Section 103G.2242, Subd. 2, except those which are public waters wetlands regulated under Minnesota Statutes Section 103G.005 Subd. 18

(<http://www.dnr.state.mn.us/waters/wetlands/index.html>). Exemptions apply for some types of land use and for wetlands smaller than the minimum regulatory requirements. Each Chippewa Band and Sioux Community makes its own land management decisions and policies on reservation lands, since their jurisdictions are separate from the State of Minnesota. In 1993, the legislature passed Chapter 175, which allowed counties or watersheds that had 80 percent or more of the presettlement wetlands remaining to mitigate for draining or filling on a 1-to-1 acre basis. The law created a de minimis exemption of up to 400 square feet of wetland area. In addition, BWSR adopted rules under the 1991 Wetland Conservation Act. In 1994, the legislature passed Chapter 627, which allowed local governments some flexibility in adopting a comprehensive wetland management plan that could substitute for parts of the BWSR rule on wetlands. It also allowed existing roadways to be upgraded to current construction and safety standards if wetland impacts were minimized and less than 2 acres of wetland was affected. In 1996, the legislature passed Chapter 462, which amended the Wetland Conservation Act to provide a more streamlined notification process. Exemptions were reformatted for easier interpretation with expansion of exemptions covering agricultural land, individual sewage treatment systems, wildlife habitat improvement projects, drainage, and de minimis. The 1996 amendments provided that local

governmental units may develop Local Comprehensive Wetland Protection and Management Plans as an alternative to the state rules with flexibility in the application of sequencing standards, replacement standards, and certain exemptions. Changes in 1996 also amended the requirements for public road project replacement, including the provision that the BWSR will replace wetlands drained or filled from the repair, reconstruction, or rehabilitation of existing local government public roads. In 2000, the legislature passed Chapter 382 (Senate File 83) which amended parts of Minnesota Statutes 1998, section 103G in order to consolidate state wetland laws. The law was changed to maintain wetland protection to current standards, to better coordinate with federal wetland programs, and to simplify and make wetland regulation consistent for landowners. Specific details of the bill included the refinement of the Public Waters Inventory, established a consistent statewide definition of wetland, gave state conservation officers enforcement flexibility in pursuing Wetland Conservation Act and DNR violations, standardized wetland replacement/mitigation standards among state wetland agencies, and added an appeals process for landowners to challenge a wetland boundary or type determination.

Prevention – The 1976 public waters inventory included the establishment of a state Water Bank Program to compensate rural landowners who intended to drain wetlands for agricultural purposes. Under Minnesota Statutes, Section 105.492, a wetland qualified for compensation if drainage was lawful, feasible, and practical and, if drained, the wetland would provide high-quality cropland. In addition, the 1979 Minnesota Legislature enacted a system of wetland tax exemptions and credits to encourage wetland owners to maintain their natural wetlands (Laws of Minnesota, 1979, Chapter 303). The Minnesota Wetlands Conservation Plan was developed by several interested parties, in conjunction with several state agencies, to guide stewardship of wetlands. An important goal of this effort is to ensure wetland preservation

(http://www.dnr.state.mn.us/fish_and_wildlife/wetlands/wetland.pdf).

Education - The Minnesota Wetlands Conservation Plan, developed by several interested parties in conjunction with several state agencies, developed a list of education goals and strategies for informing various audiences about wetlands

(http://www.dnr.state.mn.us/fish_and_wildlife/wetlands/wetland.pdf). The Environmental Quality Incentives Program (EQIP), operated by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) in Minnesota and the University of Minnesota Extension Service (UMES), provides agricultural producers and agricultural professionals with education on conservation practices

(<http://www.extension.umn.edu/mnimpacts/impact.asp?projectID=1029>). There are a wide variety of environmental education organizations that focus on wetlands, but not specifically on drainage and channelization

(<http://facweb.stvincent.edu/academics/environment/wetlandtours.html>;

<http://www.lwv.org/where/protecting/webwalk/>;

<http://www.montana.edu/wwwwet/>;

<http://www.montana.edu/wwwwater/publications/module.html>:
<http://www.ducks.ca/edu/resource.html>).

Dredging

Stressors Included: Habitat modification.

Impact Categories: Aquatic Organisms

The section of this document dealing with drainage and channelization provides a summary of activities related to modification of water bodies, including dredging. In general, EIS are required for most dredging operations. Regulatory authority is distributed among the Minnesota DNR, Army Corps of Engineers, and Minnesota BWSR.

Ethanol production

Stressors Included: Odorous chemicals from biological processes

Impact Categories: Human Health-noncancer chronic, Human Health-noncancer acute, Quality of Life-Aesthetics

Ethanol is a gasoline additive that reduces air pollution. There are 14 ethanol plants in Minnesota. Residents near these plants occasionally comment on a distinctive yeasty odor, some reporting it as unpleasant. In 2001, Senators Tom Daschle (D-SD) and Richard Lugar (R-IN) introduced bipartisan legislation that would triple the nation's use of ethanol over the next decade, reducing the nation's dependence on foreign oil. Daschle's and Senate Agriculture Committee Chairman Lugar's bill increases demand for ethanol, a clean-burning renewable fuel, through the creation of a nationwide Renewable Fuels Standard (RFS), and it allows states to address serious groundwater contamination problems by phasing out MTBE – or methyl tertiary butyl ether – over the next four years. The bill will also reduce emissions of greenhouse gases, diversify our domestic liquid fuels production base, and promote investment and job creation in rural communities

(<http://www.senate.gov/~daschle/pressroom/releases/01/04/2001402515.html>).

Cleanup – none

Control – An air quality permit is required before an ethanol plant begins production. The permit sets state and federal limits on the amounts of certain air pollutants that may be emitted from a facility (<http://www.pca.state.mn.us/hot/gopherstate/>). Minnesota had an "odor rule" until November 1996. The odor rule was repealed because it relied on an outdated test method and there was no better test method available. Although Minnesota Statutes mention odor (116.061), the statute's context is that of the responsibility of a business to notify the MPCA of "excessive" or "unpermitted" emissions that are "obnoxious" "public nuisance" and eliminate those emissions. There are no quantitative values to determine obnoxiousness or nuisance level. Since the odor rule was repealed, the MPCA's policy has been to refer cases of odor to cities to be handled as local nuisances under their regulatory authority, unless the MPCA can directly tie the odor to a violation of a standard or exceedance of a health risk level of a known chemical. MPCA can amend existing permits. Amendments fall into two categories: minor, which involve impact on the environment; and major, which involve more impact on the environment or make significant changes to an existing permit. Technological controls may alleviate

odor problems associated with ethanol production, including eliminating drying wet corn and thermally oxidizing the odorous gases created during the drying process. Prevention – Ethanol is intended to decrease the United State’s dependency on foreign oil and will reduce consumption of fossil fuels and discharge of greenhouse gases. Use of ethanol is therefore a prevention mechanism in itself. Activities designed to control odors resulting from ethanol production are more appropriately labeled as control activities.

Education – None identified.

Feedlots

Stressors Included: Odorous chemicals from biological processes, toxic chemicals in water, ammonia, phosphorus, oxygen-demanding pollutants, nitrogen, pathogens in water, acid deposition.

Impact Categories: Human Health-noncancer chronic, Human Health-noncancer acute, Aquatic Organisms, Terrestrial Organisms, Quality of Life-Aesthetics

Animal feedlot means “a lot or building or combination of lots and buildings intended for the confined feeding, breeding, raising, or holding of animals and specifically designed as a confinement area in which manure may accumulate, or where the concentration of animals is such that a vegetative cover cannot be maintained within the enclosure. For purposes of these parts, open lots used for the feeding and rearing of poultry (poultry ranges) shall be considered animal feedlots. Pastures shall not be considered animal feedlots under these parts”

(<http://www.revisor.leg.state.mn.us/arule/7020/0300.html>). Feedlots have a variety of impacts on the environment, including emission of gases that may impact health or create odors, nutrient and sediment loading of surface water, and ground water contamination. In this section, we include facilities that are regulated by the MPCA, MDA, or a local agency, plus animal manure storage facilities that are unregulated. Unregulated facilities may include a variety of feedlots having unpermitted manure storage systems, and open feedlots.

Cleanup – The MPCA does not administer cleanup at feedlots, but has a number of requirements for feedlot owners. In cases of a spill, feedlot owners are required to report, contain, and clean up the spill (<http://www.exnet.iastate.edu/Publications/PM1859.pdf>). In cases of feedlot abandonment, MPCA has closure requirements, including removal of contaminated soil and establishment of vegetation at the feedlot (<http://www.pca.state.mn.us/publications/wq-f6-50.pdf>). In cases where a feedlot has high pollution potential, corrective actions may be required. Some feedlots with unpermitted manure areas are required to reconstruct the manure storage area or close and properly abandon the manure area (<http://www.pca.state.mn.us/hot/feedlot-rulesataglance.pdf>). County feedlot programs are responsible for the implementation of feedlot rules and regulations for feedlots with under 1000 animal units in 53 Minnesota counties, including most of the major feedlot counties (<http://www.pca.state.mn.us/publications/wq-f6-51.pdf>). A county feedlot program is established by the transfer of regulatory authority from the MPCA to the county. This transfer of authority is granted by statute and it allows the MPCA to "delegate" administration of certain parts of the feedlot program to counties. County feedlot

programs have responsibility for implementing state feedlot regulations including registration, permitting, inspections, education and assistance, and complaint follow-up.

Control – Recently revised rules address control measures designed to reduce the risk of environmental contamination from feedlots. These include change of ownership, construction or expansion of feedlots (<http://www.pca.state.mn.us/hot/pubs/fl-notice.pdf>; <http://www.pca.state.mn.us/publications/wq-f6-02.pdf>; <http://www.pca.state.mn.us/publications/wq-f6-22.pdf>; <http://www.pca.state.mn.us/publications/wq-f6-32.pdf>), new requirements for open lots (<http://www.pca.state.mn.us/hot/pubs/fl-cert2005-2010.pdf>), operation and maintenance of feedlots (<http://www.pca.state.mn.us/publications/wq-f6-21.pdf>; <http://www.pca.state.mn.us/publications/wq-f6-31.pdf>), and requirements for NPDES permits (<http://www.pca.state.mn.us/publications/wq-f3-05.pdf>). There are also technical requirements established for land-applied manure (<http://www.pca.state.mn.us/publications/wq-f8-04.pdf>; <http://www.pca.state.mn.us/publications/wq-f8-03.pdf>), stockpiling of manure (<http://www.pca.state.mn.us/publications/wq-f8-06.pdf>), use of geosynthetic liners, feedlot management in karst areas, and general management of liquid manure (<http://www.pca.state.mn.us/publications/wq-f8-04a.pdf>). County feedlot programs are responsible for the implementation of feedlot rules and regulations in 53 Minnesota counties including most of the major feedlot counties (<http://www.pca.state.mn.us/publications/wq-f6-51.pdf>). A county feedlot program is established by the transfer of regulatory authority from the MPCA to the county. This transfer of authority is granted by statute and it allows the MPCA to "delegate" administration of certain parts of the feedlot program to counties. County feedlot programs have responsibility for implementing state feedlot regulations including registration, permitting, inspections, education and assistance, and complaint follow-up. The MDA licenses commercial animal waste application technicians (<http://www.mda.state.mn.us/appd/cawt/default.htm>). The MDA certifies manure testing laboratories (<http://www.mda.state.mn.us/appd/manurelabs.htm>).

Prevention – The role of preventive measures in agricultural operations are being explored, but most technologies and management strategies control contamination of air and water resources. The MPCA and external agencies have been involved in a limited amount of "prevention" activity, including promoting the use of anaerobic digesters which convert manure into electricity and reduce pathogens, composting (which kills pathogens and reduces manure volumes), reduction in concentrations of feed minerals which are not taken up by the animals' physiology ("pass-through"), and use of phytase in livestock diets to reduce phosphorus in excrements. MPCA recently approved a corrective action to reclaim a former prairie pothole that had been converted to a manure lagoon. These technologies are not a focal point of MPCA or county management strategies, which largely focus on controlling the likelihood of contamination. Individual farmers often land apply manure for agronomic benefit. Total confinement feedlots reduce the likelihood of pollution by controlling contact with soil and water, but they do not reduce the amount of waste generated. Dairy inspectors from the Dairy and Food Division of the MDA assist farmers in understanding the feedlot rules and provide them with information on

resources for technical and financial assistance. The dairy inspectors and other MDA staff also work with MPCA and delegated county feedlot staff, soil and water conservation districts and other local partners to provide educational materials such as *The Minnesota Livestock Producer 's Guide to Feedlot Rules*, available at <http://www.mda.state.mn.us/feedlots/feedlotrulesguide.pdf>.

Education – Education is identified as a component of MPCA and county feedlot management. Most efforts labeled as education are training. The U of M, through its extension services, offers both training and education to feedlot owners and staff who work with management of feedlots (<http://www.bae.umn.edu/extens/manure/>). Similar efforts are conducted by dairy inspectors from the Dairy and Food Division of the MDA (<http://www.mda.state.mn.us/feedlots/feedlotrulesguide.pdf>).

Fertilizer Use

Stressors Included: Toxic chemicals in water, Nitrogen

Impact Categories: Human Health-noncancer acute, Terrestrial Organisms

Fertilizer use includes both agricultural and urban use. In this section, the primary concerns with fertilizer use are impacts to surface water and ground water.

Cleanup - The MDA is the lead agency for response to, and cleanup of, agricultural chemical contamination (pesticides and fertilizers) in Minnesota. These activities, however, are generally associated with unpermitted disposal or spills. There is no cleanup associated with routine use of fertilizers.

Control - Commercial applicators or authorized agents of applicators must maintain a record of fertilizer applications used on each site and for five (5) years after the date of application (Minnesota Statutes, Chapter 18B.37 and 18C.215) (<http://www.mda.state.mn.us/./mdaforms/ag01353categorye.pdf>). The Minnesota Fertilizer, Soil Amendment and Plant Amendment Law (Minnesota Statutes, Section 18C.001-18C.575) applies to fertilizer labeling, licensing, storage, facilities, mixing with other products, specialty fertilizers, genetically engineered fertilizers, chemigation, prohibited fertilizer activities, soil and manure testing laboratory certification, reporting, sampling, manure application and certification, and fertilizer distributors (<http://www.revisor.leg.state.mn.us/stats/18C/>). Minnesota Rules, Parts 1513.0010-1513.1100 apply to storage and handling of anhydrous ammonia (<http://www.revisor.leg.state.mn.us/arule/1513/>).

Prevention – Many programs exist that provide assistance (technical and financial) for minimizing environmental impacts from fertilizer use, including the Conservation Reserve Program (CRP) (<http://www.mda.state.mn.us/crp/>), Agricultural BMP loan programs (<http://www.mda.state.mn.us/./agbmp/moreinfo.html>), sustainable agriculture and integrated pest management programs (<http://www.mda.state.mn.us/esap/>), the Farm Nutrient Management Assessment Program (FANMAP) (<http://www.mda.state.mn.us/appd/1999acpp.pdf>), and various other programs funded through USDA, LCMR (Legislative Commission on Minnesota Resources), and wellhead protection (see Summary of Unit Activities section at <http://www.mda.state.mn.us/appd/1999acpp.pdf>). MPCA water quality permitting staff are collaborating with MnTAP to promote preventative approaches in Phosphorus Management Plans.

Education – Minnesota Statute 18C.432 states the commissioner shall develop, in conjunction with the UMES, innovative educational and training programs addressing manure applicator concerns, including water quality protection and the development of manure management plans. The commissioner shall appoint educational planning committees that must include representatives of industry (<http://www.revisor.leg.state.mn.us/stats/18C/432.html>). Educational efforts are often part of the programs identified above in the section on prevention. These education efforts are conducted in cooperation with the UMES and local cooperators. An example of a program that promotes education is the Environmental Quality Incentives Program (EQIP) (<http://www.extension.umn.edu/mnimpacts/impact.asp?projectID=1029>).

Fire extinguishers

Stressors Impacted: Excess UV radiation from stratospheric ozone depletion

Impact Categories: Human Health-cancer, human Health-noncancer chronic, Aquatic Organisms, Terrestrial Organisms

Fire extinguishers are a source of Halon 1211, which has about three times the ozone depletion potential of CFC-11 and CFC-12. Fire extinguishers are also a source of brominated organic chemicals that are listed as Persistent Bioaccumulative Toxics (PBTs).

Cleanup – MPCA has a mandate to provide for management of Household Hazardous Waste (HHW). It is accomplished through technical, financial, and regulatory support to counties. MPCA passes money through for the 13 regional county programs and they collect and dispose of all types of HHW including fire extinguishers. No business waste is accepted except for Very Small Quantity Generators (VSQGs).

Control – There are no requirements for disposal of halon-containing fire extinguishers, but MPCA’s Stratospheric Ozone Protection Program works to reduce emissions from fire extinguishers (http://www.pca.state.mn.us/programs/cfc_p.html).

Prevention – halon fire extinguishers are banned.

Education – none identified

Fugitive Dust

Stressors Impacted: Particles in air

Impact Categories: Human Health-cancer, Human Health-noncancer chronic, Human Health-noncancer acute, Quality of Life-Aesthetics

Fugitive dust is the largest single source of primary PM-2.5 emissions in the U.S. (<http://www2.mriresearch.org/ae/abstract.html>). There are several important sources of fugitive dust, including vehicle traffic, mining, landfills, construction (including highway construction), industry, and erosion from agricultural activities. Dust from roads, erosion, and agriculture account for about 80 percent of all emissions (<http://www.pca.state.mn.us/hot/legislature/reports/2001/at-appendix-b.pdf>). Other sources are discussed at <http://www.tfsrc.gov/hnr20/recycle/waste/evenvir.htm>.

Cleanup – Several cleanup programs indirectly impact fugitive dust releases by requiring removal of sources, such as stockpiles. Some of these programs are discussed in

under Unpermitted waste disposal. Many of these programs are administered at the county or other local level.

Control – Minnesota Rule Chapter 7035 states municipal solid waste combustor ash must be stored in a manner that minimizes the emission of fugitive dust (<http://www.revisor.leg.state.mn.us/arule/7035/0700.html>). Under Chapter 7855, which applies to fuel conversion facilities, coal slurry or coal liquids pipelines, nuclear fuel processing facilities, and nuclear waste storage or disposal facilities, applicants shall provide data on wastes and emissions associated with construction or operation of the facility, including: ... locations that may be sources of fugitive dust and the nature of each source (<http://www.pca.state.mn.us/water/pubs/fdust.pdf>). Permit applications for demolition debris land disposal facilities must include ... procedures to control fugitive dust (<http://www.iet.msu.edu/environmental/laws/regstate/mnwaste.htm>) (Chapter 7041, Minnesota Rules). Minnesota Rules Ch. 7011 establishes air quality standards for stationary sources of air emissions and includes control of fugitive dust (http://www.dnr.state.mn.us/waters/czm/feis/part5_ch3_c.html#1). The Indirect Source Permit rules, found in Minn. R. 7023.9000 through 7023.9050, provide information on conditions relating to fugitive dust emissions from large development or highway projects (<http://www.pca.state.mn.us/publications/aq2-08.pdf>). EAWs include a section that addresses dust and fugitive emissions (<http://www.soils.agri.umn.edu/academics/classes/soil4021/doc/eawsht.htm>). Many industries that emit PM 10 and PM 2.5 particles require an air permit. There is a national ambient air quality standard for PM 2.5 particles, but this standard does not specifically control release of particulate matter from sources (<http://www.pca.state.mn.us/hot/legislature/reports/2001/at-appendix-b.pdf>).

Prevention – Prevention activities focus on reducing erosion loss. The MPCA has established reduction goals for air particulates, although these largely apply to industrial, transportation, and energy-related emissions (<http://www.pca.state.mn.us/hot/legislature/reports/2001/aq-report.pdf>). Some of the discussion under Agricultural runoff, Fertilizer use, and Pesticide use apply to reducing erosion losses from agricultural activities.

Education – Some educational activities are discussed in sections on Fertilizer use, Land-applied manure, Land-applied municipal and industrial byproducts, Permitted waste disposal, Pesticide use, and Unpermitted waste disposal.

Industry

Stressors Included: Toxic volatile chemicals in air, Toxic chemicals in soil, Toxic metals, excess UV radiation from stratospheric ozone depletion, Toxic chemicals in food, Toxic organic chemicals, Noise, Particles in air, Other criteria pollutants in air, Toxic chemicals-high level accidental release, Explosive/flammable material-high level accidental release, Ground-level ozone, Habitat modification, Temperature increase/climate change.

Impact Categories: Human Health-cancer, Human Health-noncancer chronic, Human Health-noncancer acute, Aquatic Organisms, Terrestrial Organisms, Quality of Life-Aesthetics

Environmental impacts from industry include effects from air emissions and noise. Industry is a broad category that includes a variety of sources. For air emissions, these may include major industries that act as point sources, such as wastewater treatment facilities, smaller industries that act as area sources (for example, gasoline stations), or a group of activities that may be treated as an industry (for example, the feedlot industry). These sources impact all media, although many of the pollutants of concern are initially released to air. Consequently, there are many programs to consider. The term Industry is used in the environmental matrices when there are many industries that contribute somewhat equally to a stressor, or when a specific source cannot be identified. The following discussion divides these programs by media.

Cleanup

Air – There are few cleanup programs within the air medium.

Water – There are few cleanup programs directly associated with water (see section on spills). Many programs affect water resources, primarily ground water, because they result in cleanup of sources to water (see sections on agriculture, construction, feedlots, mining, permitted waste disposal, tanks, and unpermitted waste disposal).

Land – Many traditional Agency cleanup programs primarily affect land. These include Superfund, the VIC Program, and storage tank programs (see section on unpermitted waste disposal). For information on other cleanup programs, see sections on agricultural sources, construction, feedlots, mining, permitted waste disposal, and tanks.

Control

Air - facilities that have the potential to emit (also known as PTE) any regulated pollutant, in greater than specific threshold amounts, must obtain a total facility permit. In addition, some federal regulatory programs require facilities to apply for permits regardless of how much air pollution they could potentially cause. Besides total facility operating permits, another general class of permits that the MPCA issues are construction permits. Construction permits are issued for the construction of a new facility whose PTE is over the federal or state thresholds, or the modification of an existing facility

(<http://www.pca.state.mn.us/air/aboutpermits.html#who>). Consequently, a large number of industries are regulated through the air permitting process. For more information on control programs for industries that impact air, see sections on coal-fired power plants, mining, refrigerants, and waste incineration.

Water – MPCA has a variety of programs designed to control industrial releases to water. These include the programs identified for cleanup (see above). In addition, there are programs designed to minimize impact from wastewater treatment plants and other, more general, industries (e.g. feedlots, land application). In addition to the programs described under cleanup for water and land (see above), control programs are further discussed in sections on land-applied municipal and industrial byproducts, municipal and industrial wastewater, and pesticide use.

Land – Land programs that control release of chemicals include those discussed under cleanup (see above).

Noise - The PCA adopts standards describing the maximum levels of noise in terms of sound pressure level that may occur in the outdoor atmosphere

(<http://www.revisor.leg.state.mn.us/stats/116/07.html>;
<http://www.pca.state.mn.us/programs/pubs/noise.pdf>).

Prevention – A large number of prevention activities are used to combat these sources. These are discussed in various sections of this document, including sections on area source combustion, mining, municipal and industrial wastewater, and unpermitted waste disposal. The MPCA has established reduction goals for air particulates and chemicals that lead to formation of ground-level ozone (<http://www.pca.state.mn.us/hot/legislature/reports/2001/aq-report.pdf>). The Coordinated Toxics Reduction Strategy refers to a collaborative effort by staff in the OEA and MPCA to gain meaningful cross-media reduction in toxic substances emphasizing preventative approaches (<http://intranet.pca.state.mn.us/programs/ctrs/index.html#network>). Although meetings of the Network have been discontinued for the time being, meetings will be resumed when current efforts in single- and multimedia monitoring, evaluation and modeling of PBTs have evolved to the point where the group is ready to consider developing and implementing multimedia pollution prevention strategies or other collaborative action items. Businesses that realize regulatory, economic or marketing benefits conduct voluntary prevention efforts that focus primarily on source reduction or elimination of air emissions, which has been somewhat effective for industries using toxic chemicals.

Education – As with cleanup and control programs, there are a large number of education activities. These are discussed in various sections of this document, including Unpermitted waste disposal. In general, the majority of and best-organized education programs are for land. The UMES has been very active in educational efforts. Education activities are described in sections on fertilizer use, land-applied manure, and pesticide use of this document. MPCA has limited education efforts.

Land-applied manure

Stressors Included: Nitrogen, toxic chemicals in water, pathogens in water

Impact Categories: Human Health-noncancer acute, Terrestrial Organisms

Manure is typically applied by farmers as a means of managing wastes and as a nutrient supplement to agricultural fields. Land-applied manure may impact surface water through runoff of organic matter, pathogens, and nutrients; and ground water through leaching of nitrogen and pathogens.

Cleanup – since manure should be applied at agronomic rates, cleanup is unnecessary.

Control - All Minnesota feedlot permits require a manure management plan that accounts for all manure produced by the operation, including land application. There are state requirements for some aspects of land application, such as setback distances from surface waters. Many counties have local ordinances that apply to land-applied manure

(<http://www.mda.state.mn.us/DOCS/AGDEV/AgLandUse/animalordinancesummary.pdf>).

Commercial applicators of manure must be licensed (<http://www.mda.state.mn.us/appd/cawt/>). Training is available for commercial applicators. Manure and process wastewater must not be applied to land in a manner that will result in a discharge to waters of the state during the application process. In addition, manure and process wastewater must not be applied to land in

a manner that causes water pollution due to manure-contaminated runoff (Minn. R. chap. 7020.2225 subp. 1, item A). Manure and process wastewater application rates must be limited so that the estimated plant-available nitrogen from all nitrogen sources does not exceed expected crop nitrogen needs for non-legume crops and expected nitrogen removal for legumes (Minn. R. 7020.2225 subp. 3, item A). Manure in storage areas produced from more than 100 animal units must be tested for nitrogen and phosphorus content a minimum of once every four years (Minn. R. Ch. 7020.2225 Subp. 2). Additional protective measures are required for application in special protection areas (7020.2225 Subpart 6). Records must be kept of manure application activities and soils must be tested at larger facilities (<http://www.pca.state.mn.us/publications/wq-f8-04.pdf>).

Prevention – Prevention activities focus on applying manure to agronomic fields at appropriate agronomic rates. This reduces the amount of commercial fertilizer required and provides a means of utilizing waste, although utilization of waste may not be considered preventive. Manure in storage areas produced by more than 100 animal units must be tested by the feedlot facility owner for nitrogen and phosphorus content (see Minn. R. Ch. 7020.2225 Subp. 2). Many programs exist that provide assistance (technical and financial) for minimizing environmental impacts from manure (fertilizer) use, including the CRP (<http://www.mda.state.mn.us/crp/>), Agricultural BMP loan programs (<http://www.mda.state.mn.us/./agbmp/moreinfo.html>), sustainable agriculture and integrated pest management programs (<http://www.mda.state.mn.us/esap/>), the FANMAP (<http://www.mda.state.mn.us/appd/1999acpp.pdf>), and various other programs funded through USDA, LCMR (Legislative Commission on Minnesota Resources), and wellhead protection (see Summary of Unit Activities section at <http://www.mda.state.mn.us/appd/1999acpp.pdf>).

Education - Minnesota Statute 18C.432 states the commissioner shall develop, in conjunction with the UMES, innovative educational and training programs addressing manure applicator concerns, including water quality protection and the development of manure management plans. The commissioner shall appoint educational planning committees that must include representatives of industry (<http://www.revisor.leg.state.mn.us/stats/18C/432.html>). Educational efforts are often part of the programs identified above in the Prevention section. These education efforts are conducted in cooperation with the UMES and local cooperators.

Land-applied municipal and industrial byproducts

Stressors included: Toxic organic chemicals, toxic chemicals in soil, pathogens in water, toxic chemicals in water

Impact Categories: Human Health-cancer, Human Health-noncancer chronic, Human Health-noncancer acute, Terrestrial Organisms

Industrial and municipal wastes often have agronomic value as a fertilizer or soil amendment. They are frequently applied to agronomic fields. They can potentially impact drinking water supplies by leaching to ground water or through transport to surface water. Industrial and municipal byproducts are administered under two separate programs at the MPCA, although we combine them in this document. Industrial

byproducts are increasingly being used in other applications, including roadbase, concrete, landfill cover, and flowable fill. These applications are not considered in this document (<http://www.pca.state.mn.us/water/landapp.html>). For more information, see Chapter 14 in <http://www.pca.state.mn.us/water/nonpoint/nsmpp-toc.pdf>).

Cleanup – No cleanup program exists for land application, since byproducts are applied at agronomic rates and cleanup is not required.

Control - Land application of biosolids (sewage sludge) is regulated through Minnesota Rule Ch. 7041, while land application of industrial by-products are regulated through a permitting process (<http://www.pca.state.mn.us/water/landapp.html>). The permitting program established for land application of industrial byproducts requires further development. Questions have arisen which cannot be answered using the existing permitting criteria. Mandatory certification of operators managing land application of biosolids and industrial byproducts is an important program element. Courses are offered yearly for continuing education credits for operators managing land application. This training program is essential for relaying information on management and rule requirements to the people land applying these materials and for maintaining good communication with operators and inspectors (<http://www.pca.state.mn.us/news/training/>). Staff estimate about 10 percent of their time is spent on training and education (personal communication). Some local agencies may regulate land application activities (http://www.co.ramsey.mn.us/PH/eh/reg_sw_ord_1_9.htm).

Prevention – No program identified. Land application programs deal with material that has been produced rather than with reducing quantities of pollutants, although staff from the Minnesota Office of Environmental Assistance (MOEA) maintain contact with MPCA staff working with land application. The Coordinated Toxics Reduction Strategy refers to a collaborative effort by staff in the Office of Environmental Assistance and Minnesota Pollution Control Agency to gain meaningful cross-media reduction in toxic substances emphasizing preventative approaches (<http://intranet.pca.state.mn.us/programs/ctrs/index.html#network>). Although meetings of the Network have been discontinued for the time being, meetings will be resumed when current efforts in single- and multimedia monitoring, evaluation and modeling of PBTs have evolved to the point where the group is ready to consider developing and implementing multimedia pollution prevention strategies or other collaborative action items.

Education – No program identified. Activities labeled as education are actually training activities that focus on applicators and on proper application of byproducts. The U of M occasionally offers courses related to land application, but it is unclear if these are training or true educational activities.

Lead paint

Stressors Included: Toxic chemicals in soil.

Impact Categories: Human Health-noncancer acute, Human Health-noncancer chronic

Lead is toxic to humans. Children under the age of six years are especially sensitive to lead poisoning. The lead hazard occurs primarily from exposure to dust containing lead-based paint. When lead-based paint deteriorates, paint dust containing

lead is released. This paint dust can be inhaled and eaten by the people living and working in buildings painted with lead-based paints.

Cleanup – none

Control – The MPCA has developed regulations with procedures that owners of steel structures or contractors must follow in removing lead paint from exterior surfaces of the structures. The regulations affect almost everyone who removes lead paint from steel structures such as bridges, water tanks, fuel tanks, grain storage bins, railcars and pipelines (<http://www.pca.state.mn.us/air/leadpaint.html>; <http://www.revisor.leg.state.mn.us/arule/7025/>). In 1991, the Minnesota Legislature passed laws requiring reduction of lead in specified products (Minn. Stat. Sec.115A.9651). The law applies to an estimated 1,000 products made or sold in Minnesota, including inks, dyes, paints, pigments and one fungicide (<http://www.pca.state.mn.us/waste/listedmetals.html>; <http://www.revisor.leg.state.mn.us/stats/115A/9651.html>). “... no manufacturer or distributor may sell or offer for sale or for promotional purposes in this state packaging or a product that is contained in packaging if the packaging itself, or any inks, dyes, pigments, adhesives, stabilizers, or any other additives to the packaging contain any lead, ... that has been intentionally introduced as an element during manufacture or distribution of the packaging” (<http://www.revisor.leg.state.mn.us/stats/115A/965.html>).

Prevention – Since use of lead paints has been largely controlled, prevention now centers on reducing exposure to lead paints that occur in the environment. MPCA provides tips for reducing the risk of lead exposure in the home on it’s website (<http://www.pca.state.mn.us/air/lead.html#tips>). New regulations that affect the sale or lease of almost all residential buildings constructed prior to 1978 were adopted by the Federal Department of Housing and Urban Development and the EPA. The regulations took effect on September 6, 1996 for the owners of more than four residential dwellings, and will take effect on December 6, 1996 for the owners of all residential dwellings. The new regulations require certain disclosures about lead-based paint and establish stiff penalties for failure to comply (<http://www.perkinscoie.com/resource/real/paint.htm>). On August 29, 1996, the Agency published a final rule for the certification and training of lead-based paint professionals (61FR 45778)(<http://www.epa.gov/lead/leadcert.htm>). The EPA clarified that contractors can manage residential lead-based paint waste as household waste, thus ensuring that lead paints can be removed in an affordable manner (<http://www.epa.gov/lead/fslbp.htm>). Section 406 of TSCA directed EPA to develop requirements for renovators to distribute a lead hazard information pamphlet to housing owners and occupants before conducting renovations in pre-1978 housing. EPA published a final rule on June 1, 1998. The rule became effective on June 1, 1999 (<http://www.epa.gov/lead/leadrenf.htm>). Several additional regulations are under development (<http://www.epa.gov/opptintr/lead/regulation.htm>). EPA has published several materials regarding lead paint (<http://www.epa.gov/opptintr/lead/leadpbed.htm>). In Minnesota, it is illegal to dispose paint containing lead in the trash (<http://www.moea.state.mn.us/res/consumertips.cfm#paint>). The Coordinated Toxics Reduction Strategy refers to a collaborative effort by staff in the Office of

Environmental Assistance and Minnesota Pollution Control Agency to gain meaningful cross-media reduction in toxic substances emphasizing preventative approaches (<http://intranet.pca.state.mn.us/programs/ctrs/index.html#network>). Although meetings of the Network have been discontinued for the time being, meetings will be resumed when current efforts in single- and multimedia monitoring, evaluation and modeling of PBTs have evolved to the point where the group is ready to consider developing and implementing multimedia pollution prevention strategies or other collaborative action items.

Education – none identified

Mining

Stressors Included: Habitat modification, toxic metals, toxic chemicals in food

Impact Categories: Human Health-cancer, Human Health-noncancer chronic, Aquatic Organisms, Terrestrial Organisms, Quality of Life-Aesthetics

Some of the environmental effects of mining include deposition of hydraulic-mining debris in stream channels and on fields, accelerated introduction of heavy metals into streams and reservoirs, and production of acidic water. Many of the metals released to the environment are classified as PBTs. Mining is generally not regulated as a separate industry. Mining activities potentially impact soil, air, and water. A variety of wastes are produced from mining. Consequently, a number of MPCA programs are involved in regulation of the mining industry.

Cleanup – The Minnesota DNR, through the Division of Lands and Minerals, administers the Mineland Reclamation Act (Minn. Stat. §§ 93.44-93.51, rules adopted 1980), which requires reclamation implementation of a variety of measures to stabilize all areas disturbed by mining, minimize the impact on water resources, and ensure that the land fulfills a future land use such as forestry, wildlife, or recreation activities. Included in the rules are requirements for lift heights and benches, sloping and revegetation. Because of the program, over 6,600 acres of tailings basins, stockpiles and pit walls have been reclaimed since the program began in 1980 (<http://www.pca.state.mn.us/water/nonpoint/nsmpp-ch13.pdf>). Minnesota Rules, Chapter 298.223, created a fund called the taconite environmental protection fund. The fund was created for the purpose of reclaiming, restoring and enhancing those areas of northeast Minnesota located within a tax relief area defined in section 273.134 that are adversely affected by the environmentally damaging operations involved in mining taconite and iron ore and producing iron ore concentrate and for the purpose of promoting the economic development of northeast Minnesota.

Control – The Minnesota DNR, through the Division of Lands and Minerals, administers the Mineland Reclamation Act (Minn. Stat. §§ 93.44-93.51, rules adopted 1980) which requires that all facilities operating after 1980 obtain a permit to mine. This permit requires reclamation of the entire facility and requires the implementation of a variety of measures to stabilize all areas disturbed by mining, minimize the impact on water resources, and ensure that the land fulfills a future land use such as forestry, wildlife, or recreation activities. Included in the rules are requirements for lift heights and benches, sloping and revegetation (<http://www.pca.state.mn.us/water/nonpoint/nsmpp-ch13.pdf>). A Permit to Mine Peat is required of all peat mining operations exceeding 40 acres in size and for

those operations less than 40 acres where there is potential for significant environmental effects. The Minnesota DNR administers this permit under the authority of the Mineland Reclamation Act (Minn. Stat. §§ 93.44-93.51) and the rules adopted under that Act relating to the reclamation of mined peatlands (Minn. R. Ch. 6131). The DNR Division of Waters also regulates the mining industry through permits for appropriating surface and ground water and for working in the beds of public waters. Appropriation permits are issued to regulate the taking of water, usually for processing or for dewatering pits. Each application triggers an evaluation to identify and mitigate impacts associated with taking or discharging the water. All appropriation permits are normally issued in concert with MPCA's discharge permit. Protected Waters permits are issued to regulate mining activities that alter the course, current or cross-section of a protected water basin or wetland. Provisions are included which require specific engineering design, construction, or reclamation to mitigate identified impacts. The Wetland Conservation Act, passed in 1991, required that all wetlands impacted by mining operations be replaced. MPCA is the lead agency for regulating ground water quality and surface water. MPCA responsibilities include establishing and enforcing effluent limitations, water quality standards, and compliance monitoring. The MPCA administers the NPDES and State Disposal System (SDS) permit program for mining facilities in Minnesota. Under this program, individual water quality permits are issued to all of the state's large iron and peat mines, as well as all clay mines. Individual NPDES/SDS permits are also required for any mine pit dewatering or process water surface discharges, such as occur at many crushed stone and construction sand and gravel mines and quarries. Mine and quarry operations that do not have an individual NPDES/SDS permit are required to be covered by a general industrial NPDES/SDS storm water permit. Local units of government, such as counties, townships and cities, have the lead responsibility for mineland reclamation oversight at crushed stone, dimension stone, industrial sand, clay and construction sand and gravel mines and quarries throughout Minnesota. Specific reclamation requirements vary considerably, depending on location. The DNR and the MPCA at times have provided technical assistance to local units of government. Abandoned iron mine lands, which include all areas disturbed prior to the adoption of the Mineland Reclamation Rules 1980, are handled by the Iron Range Resources and Rehabilitation Board (IRRRB). Founded in 1978 and supported by a tax on taconite production, the IRRRB has completed about 250 projects. Some of these have been recreation-oriented, such as the development of campgrounds and sliding hills, but others have focused on stabilizing old areas of mine waste. Over three million trees have been planted and about 1,000 acres of abandoned mine lands have been reclaimed. Operations requiring a NPDES permit are regulated under the Clean Water Act, as amended, (33 U.S.C. 1251 et. seq.), 40 CFR 122,123, and 124, as amended, et. seq.; Minn. Stat. Chs. 115 and 116, as amended, and Minn. Rules Ch. 7001. Mining waste disposal must conform with existing regulations for disposal of solid waste in permitted landfills (see Section 18, of this document – Permitted Waste Disposal). Mining wastes do not qualify as a mixed municipal solid waste and are therefore landfilled as a separate waste stream. The MPCA has developed a new general water quality permit to cover most gravel and hot mix

operations. This permit is an optional replacement for MPCA water quality multiple permit coverage. The permit covers storm water runoff from gravel mines and stone quarries and pit dewatering from gravel mines (<http://www.pca.state.mn.us/water/pubs/asphalt.pdf>). The DNR has compiled several fact sheets describing BMPs for mining operations (<http://www.dnr.state.mn.us/minerals/minpubs3.html>). The 1990 amendments to the Clean Air Act involved many significant changes to the federal air quality programs that, in turn, caused a major overhaul of Minnesota's existing air permitting program. Two of the larger changes included the way hazardous air pollutants are addressed, and the addition of the Title V (or Part 70) operating permitting program. Title V refers to the section of the Clean Air Act, and Part 70 the part of Title 40 of the Code of Federal Regulations, which include the requirements for this program. Minnesota's air rules were revised in October 1993, in response to these changes. Companies who were required to apply for Title V operating permits had to submit their Title V permit applications to the MPCA between 1995 and 1996 (depending on the industry category). In general, facilities who have the potential to emit (also known as PTE) any regulated pollutant, in greater than specific threshold amounts, must obtain a total facility permit (<http://www.pca.state.mn.us/air/aboutpermits.html>). This includes mining facilities. All facilities that are required to obtain an air emission permit are required to submit an annual emission inventory (<http://www.pca.state.mn.us/air/emissionfaq.html>).

Prevention – Storm water permits require mining operations, which include the majority of Minnesota's construction sand and gravel mines, to develop pollution prevention plans and implement best management practices (BMPs) to control their storm water and to protect ground water quality. These BMPs are more appropriately classified as control activities, however, since they are designed to control pollution at mining facilities. The Coordinated Toxics Reduction Strategy refers to a collaborative effort by staff in the Office of Environmental Assistance and Minnesota Pollution Control Agency to gain meaningful cross-media reduction in toxic substances emphasizing preventative approaches (<http://intranet.pca.state.mn.us/programs/ctrs/index.html#network>). Although meetings of the Network have been discontinued for the time being, meetings will be resumed when current efforts in single- and multimedia monitoring, evaluation and modeling of PBTs have evolved to the point where the group is ready to consider developing and implementing multimedia pollution prevention strategies or other collaborative action items.

Education – The Minnesota Minerals Education Workshop consists of a daylong series of classroom sessions followed by a day and a half-day of geology field trips and tours of mining operations. Topics covered include general geology, rock and mineral identification and mineland reclamation. Classes are taught by geologists, educators, and minerals and mining industry professionals (<http://www.dnr.state.mn.us/minerals/mmewrpt.html>).

Municipal and Industrial Wastewater

Stressors Included: Nitrogen, dissolved solids, particles in air, toxic chemicals in water, transported sediment, toxic metals, pathogens in water, phosphorus, toxic organic chemicals, toxic chemicals in food, oxygen-demanding pollutants, ammonia

Impact Categories: Human Health-cancer, Human Health-noncancer chronic, Human Health-noncancer acute, Aquatic Organisms, Terrestrial Organisms, Quality of Life-Aesthetics

This section describes programs and activities related to environmental impacts associated with wastewater. Consequently, surface water is the primary media affected. Cleanup – MPCA responds to spills and leaks that involve municipal and industrial waste and wastewater (http://www.pca.state.mn.us/cleanup/pubs/6_1.html). Other cleanup activities are limited. An example is removal of mercury from sewers prior to pretreatment.

Control – MN Rules 7077.0100 provides MPCA administration of financial assistance programs for the construction of municipal wastewater treatment systems. Facilities that process wastewater from domestic sanitary sewer sources (sewage) are considered municipal facilities. These include city wastewater districts treatment, sanitary districts, wayside rest areas, national or state parks, mobile home parks, and resorts. NPDES permits regulate wastewater discharges to lakes, streams, wetlands and other surface waters. SDS permits regulate the construction and operation of wastewater disposal systems, including land disposal (http://www.pca.state.mn.us/programs/inpdes_p.html). For Minnesota industrial facilities, the MPCA strives to issue these permits as consolidated water quality management permits. An individual NPDES/SDS permit for an industrial facility may cover a number of different waste types and activities, including industrial process wastewater, contact and non-contact cooling water, storm water, contaminated ground water pumpouts, water supply treatment backwash, and wastewater treatment sludges. The Industrial Pretreatment Program seeks to control the discharge of industrial (and other) wastes into the sanitary sewer. This is done through many kinds of controls. The POTW (publicly owned (wastewater) treatment works)(i.e. the municipal sewage treatment plant and the authority who operates it) is inherently the primary control authority. Therefore, most of the actual regulatory work of pretreatment is carried out by POTWs. Several general NPDES/SDS permits also are available. NPDES/SDS permit requirements may include monitoring, limits, and management practices designed to protect surface and ground water quality. Municipal wastewater is subject to similar regulations regarding discharge. Major facilities are regulated through the US EPA NPDES program (<http://cfpub1.epa.gov/npdes/>). Minnesota's point source revolving loan program provides loans to municipalities for planning, design and construction of wastewater and stormwater treatment projects (<http://www.pca.state.mn.us/water/wpcrf-psource.html>). MPCA has incorporated its Phosphorus Strategy into the NPDES process (<http://www.pca.state.mn.us/water/pubs/phos-npdes.pdf>).

Prevention – For the Minnesota River Basin, permit writers and engineers promote P2 initiatives to protect smaller municipal treatment systems from toxics and phosphorus loading through P2 implemented at upstream contributors. The

Pretreatment Program has promoted P2 outreach as a standard part of service from the state's larger municipal treatment systems that operate their own pretreatment programs. This initiative is a collaboration between MPCA and MnTAP. The Nonpoint Source side of water quality protection has several efforts under way that promote pollution prevention. MPCA's Minnesota River staff are teaming with MnTAP to work on priority point sources (particularly phosphorus loading), whether they contribute to municipal systems or direct discharges (<http://www.mntap.umn.edu/>). The MPCA has established reduction goals for air particulates (<http://www.pca.state.mn.us/hot/legislature/reports/2001/aq-report.pdf>). The Coordinated Toxics Reduction Strategy refers to a collaborative effort by staff in the Office of Environmental Assistance and Minnesota Pollution Control Agency to gain meaningful cross-media reduction in toxic substances emphasizing preventative approaches (<http://intranet.pca.state.mn.us/programs/ctrs/index.html#network>). Although meetings of the Network have been discontinued for the time being, meetings will be resumed when current efforts in single- and multimedia monitoring, evaluation and modeling of PBTs have evolved to the point where the group is ready to consider developing and implementing multimedia pollution prevention strategies or other collaborative action items. In the broadest definition of wastewater, any activity designed to reduce municipal and industrial waste qualifies as a prevention program. There are a multitude of these programs, although they typically address specific wastes or waste generators (<http://www.pca.state.mn.us/programs/p2-success.html>; <http://www.moea.state.mn.us/reduce/index.cfm>).

Education – MPCA's Phosphorus Strategy includes educational components (<http://www.pca.state.mn.us/hot/legislature/factsheets/phosphorus-00.pdf>). In the broadest definition of wastewater, any educational activity designed to inform about waste and waste reduction qualifies as an education program. There are many educational programs and much educational information related to wastewater (<http://www.extension.umn.edu/water/>; http://www.metrocouncil.org/environment/PollutionPrevention/P2_Home.htm; http://metrocouncil.org/environment/Kids/Slide_1.htm; <http://www.epa.gov/owow/monitoring/nationswaters/>). It is unclear if these resources are widely used.

Off-road equipment

Stressors Included: Particles in air, other criteria pollutants in air, acid deposition, noise, nitrogen, toxic volatile chemicals in air, toxic chemicals in food, ground-level ozone

Impact Categories: Human Health-cancer, Human Health-noncancer chronic, Human Health-noncancer acute, Aquatic Organisms, Terrestrial Organisms, Quality of Life-Aesthetics

Off-road equipment affects noise levels, air quality, aquatic ecosystems, and terrestrial ecosystems. In the case of air quality, emissions are the primary concern. For terrestrial and aquatic ecosystems, nitrogen and acid deposition are the primary concerns. Off-road equipment includes a variety of equipment and vehicles, including lawn mowers, all-terrain vehicles, farm equipment, diesel locomotives, etc.

Cleanup – none identified

Control

Emissions: The MPCA has limited regulatory authority for controlling emissions from off-road equipment.

Noise: The PCA adopts standards describing the maximum levels of noise in terms of sound pressure level that may occur in the outdoor atmosphere (<http://www.revisor.leg.state.mn.us/stats/116/07.html>; <http://www.pca.state.mn.us/programs/pubs/noise.pdf>). The Minnesota DNR has source standards for snowmobiles, motorboats, personal watercraft and off-highway vehicles (<http://www.pca.state.mn.us/programs/pubs/noise.pdf>; http://www.dnr.state.mn.us/information_and_education/water_safety/bg-equ07.html).

Prevention – See On-road vehicles.

Education – See On-road vehicles.

On-road vehicles

Stressors Included: Particles in air, other criteria pollutants in air, acid deposition, heat/severe weather, temperature increase, noise, nitrogen, toxic volatile chemicals in air, toxic chemicals in food, ground-level ozone

Impact Categories: Human Health-cancer, Human Health-noncancer chronic, Human Health-noncancer acute, Aquatic Organisms, Terrestrial Organisms, Quality of Life-Aesthetics

On-road equipment affects noise levels, air quality, aquatic ecosystems, and terrestrial ecosystems. In the case of air quality, emissions are the primary concern. For terrestrial and aquatic ecosystems, nitrogen and acid deposition are the primary concerns. On-road vehicles include automobiles, vans, SUVs, trucks, and other machines that are permitted to be driven on roads and highways.

Cleanup – none identified

Control

Emissions: The MPCA has limited regulatory authority for controlling emissions from on-road vehicles.

Noise: The PCA adopts standards describing the maximum levels of noise in terms of sound pressure level that may occur in the outdoor atmosphere. Most highways subject to Federal funding and new highways are exempt “provided that all reasonably available noise mitigation measures are employed to abate noise” Public roads in St. Paul and Minneapolis are also exempt. Most noise abatement efforts conducted by MNDOT, such as use of sound barriers, would be considered control measures (<http://www.revisor.leg.state.mn.us/stats/116/07.html>; http://www.dot.state.mn.us/metro/tps/htms/noise/mndot_noise_policy.html; <http://www.pca.state.mn.us/programs/pubs/noise.pdf>).

Prevention – Numerous organizations conduct prevention for air emissions by promoting activities that reduce fuel consumption (and therefore emissions) from on-road vehicles. The MPCA has established reduction goals for air particulates and chemicals that lead to formation of ground-level ozone (<http://www.pca.state.mn.us/hot/legislature/reports/2001/aq-report.pdf>). Some links

to websites dealing with prevention are found at <http://www.dot.state.mn.us/sti/telework.html> and at <http://www.pca.state.mn.us/air/mvpollution.html#faq>. The MPCA conducts limited efforts at prevention (<http://www.pca.state.mn.us/programs/p2-components.html#smartgrowth>; <http://www.pca.state.mn.us/air/pubs/2-10.pdf>; <http://www.pca.state.mn.us/programs/p2-components.html#cleanair>). The Coordinated Toxics Reduction Strategy refers to a collaborative effort by staff in the Office of Environmental Assistance and Minnesota Pollution Control Agency to gain meaningful cross-media reduction in toxic substances emphasizing preventative approaches (<http://intranet.pca.state.mn.us/programs/ctrs/index.html#network>). Although meetings of the Network have been discontinued for the time being, meetings will be resumed when current efforts in single- and multimedia monitoring, evaluation and modeling of PBTs have evolved to the point where the group is ready to consider developing and implementing multimedia pollution prevention strategies or other collaborative action items. There are limited prevention efforts for noise and habitat destruction or modification.

Education – There is limited educational activity at the MPCA related to environmental impacts from on-road vehicles. Numerous environmental education efforts focus on lifestyle adaptations to minimize environmental impact. Vehicle use is a component of some of these efforts. Examples of environmental education resources and lessons can be found at <http://www.nceet.snre.umich.edu/>.

Permitted waste disposal

Stressors Included: Toxic chemicals in food, temperature increase/climate change

Impact Categories: Human Health-cancer, Human Health-noncancer chronic, Human Health-noncancer acute, Aquatic Organisms, Terrestrial Organisms

The MPCA is actively involved in regulating Minnesota's landfills. MPCA has two programs for cleaning up and closing Minnesota landfills, including unpermitted landfills (see Unpermitted waste disposal). The primary concern with landfills is release of chemicals that may enter the food chain (PBTs).

Cleanup – The purpose of the Minnesota Landfill Cleanup Program (Minn. Stat. Ch. 115B.441 - 115B.445) is to ensure the proper closure and postclosure care at 106 closed, permitted municipal sanitary landfills in the state. Any MPCA-permitted mixed-municipal solid waste landfill that stopped accepting mixed municipal solid waste by 4/9/94 , and demolition debris before 5/1/95, can qualify for application to this program. After the owners/operators enter an agreement with the MPCA and complete the requirements set forth in that agreement, the owner/operators are issued a Notice of Compliance. The MPCA assumes responsibility for any remaining cleanup work, closure construction, and long-term care of the landfill. In some cases, past cleanup costs can be reimbursed to owner/operators (http://www.pca.state.mn.us/programs/landfill_p.html). The primary customers are the owners and operators of the municipal sanitary landfills in Minnesota. The MDA has responsibility for cleanup of pesticides. Information of MDA pesticide cleanup programs can be found under Cleanup in the section on pesticide use.

Control – Minn. Stat. Ch. 115B.441 - 115B.445 give MPCA regulatory authority to manage wastes at permitted municipal sanitary landfills in the state (<http://www.revisor.leg.state.mn.us/stats/115B/39.html>). Mixed municipal solid waste (<http://www.revisor.leg.state.mn.us/arule/7035/2815.html>), demolition debris (<http://www.revisor.leg.state.mn.us/arule/7035/2825.html>), municipal solid waste combuster ash (<http://www.revisor.leg.state.mn.us/arule/7035/2885.html>), and compost (<http://www.revisor.leg.state.mn.us/arule/7035/2836.html>) facilities are specifically covered under Minnesota Rule 7035. The Agency has authority to ensure the proper closure and postclosure care at 106 closed, permitted municipal sanitary landfills in the state. An indirect control measure that relates to landfills is reuse of municipal and industrial byproducts, which decreases the amount of material entering landfills. These are control activities if they do not decrease the quantity of pollutants generated but decrease the potential for environmental degradation associated with landfills. Section 17 of this document describes land application of reuse products. The MPCA does not promote reuse through a specific program, but reviews reuse cases on an individual basis. Other agencies, such as MOEA, promote reuse (<http://www.pca.state.mn.us/cleanup/pubs/c8-01.pdf>). The Resource and Conservation Recovery Act (1976) and the Pollution Prevention Act (1990) are the primary federal laws that regulate disposal of hazardous wastes (http://www.enviroliteracy.org/hazardous_waste.html).

Prevention – Preventive activities, as they relate to landfills, primarily focus on waste reduction. The Pollution Prevention Act of 1990 and Minnesota Toxic Pollution Prevention Act (TPPA) of 1990 (Minn. Stat. § 115D) and Executive Order 99-4, "Providing for the Implementation of Pollution Prevention and Resource Conservation By State Government", mandate the use of preventive actions to reduce waste (<http://www.revisor.leg.state.mn.us/stats/115D/>; <http://www.epa.gov/opptintr/p2home/p2policy/act1990.htm>). The Coordinated Toxics Reduction Strategy refers to a collaborative effort by staff in the Office of Environmental Assistance and Minnesota Pollution Control Agency to gain meaningful cross-media reduction in toxic substances emphasizing preventative approaches (<http://intranet.pca.state.mn.us/programs/ctrs/index.html#network>). Although meetings of the Network have been discontinued for the time being, meetings will be resumed when current efforts in single- and multimedia monitoring, evaluation and modeling of PBTs have evolved to the point where the group is ready to consider developing and implementing multimedia pollution prevention strategies or other collaborative action items. For more information, see the section on unpermitted waste disposal). Some landfill activities, such as recovery of wastes for beneficial purposes, can be labeled as prevention activities. An example would be recovery of methane for energy use.

Education – See Unpermitted waste disposal.

Pesticide use

Stressors Included: Toxic chemicals in water, toxic chemicals in soil, toxic chemicals in food, toxic organic chemicals.

Impact Categories: Human Health-cancer, Human Health-noncancer chronic, Human Health-noncancer acute, Terrestrial Organisms.

Pesticides impact drinking water through leaching to ground water and discharge to surface water. Surface water discharge includes overland transport of storm water runoff and contributions from tile drains. Although aquatic ecosystems are not identified above as an impact category, they are included under agricultural runoff, which is a broad source category that does impact aquatic ecosystems.

Cleanup – The MDA is the lead agency for response to, and cleanup of, agricultural chemical contamination (pesticides and fertilizers) in Minnesota. These activities, however, are generally associated with unpermitted disposal or spills. There is no cleanup associated with routine use of fertilizers.

Control – Licenses are required for commercial application of pesticides. The UMES provides pesticide applicator training (<http://www.extension.umn.edu/pesticides/pat/mnpat.html>) and some other pesticide training (<http://www.extension.umn.edu/pesticides/index.html>).

Prevention : MDA operates a voluntary BMP program (<http://www.mda.state.mn.us/appd/BMPs/BMPs.htm>; <http://www.pca.state.mn.us/water/nonpoint/nsmpp-ch10.pdf>). Some BMPs are preventive, including reducing pesticide application, utilizing alternatives to pesticides, changing formulations, and using less toxic chemicals (<http://www.mcstoppp.org/pesticides.htm>; [http://wbln0018.worldbank.org/essd/essd.nsf/GlobalView/PPAH/\\$File/71_pestf.pdf](http://wbln0018.worldbank.org/essd/essd.nsf/GlobalView/PPAH/$File/71_pestf.pdf)). The Coordinated Toxics Reduction Strategy refers to a collaborative effort by staff in the Office of Environmental Assistance and Minnesota Pollution Control Agency to gain meaningful cross-media reduction in toxic substances emphasizing preventative approaches (<http://intranet.pca.state.mn.us/programs/ctrs/index.html#network>). Although meetings of the Network have been discontinued for the time being, meetings will be resumed when current efforts in single- and multimedia monitoring, evaluation and modeling of PBTs have evolved to the point where the group is ready to consider developing and implementing multimedia pollution prevention strategies or other collaborative action items.

Education – FANMAP, a program administered through MDA, is designed to educate farmers in sensitive hydrologic environments about assessing nutrient and pesticide needs (<http://mrbdc.mankato.msus.edu/inventory/state/sbmp.html>; <http://www.mda.state.mn.us/appd/1999acpp.pdf>). Another example of a program that utilizes education is EQIP (<http://www.extension.umn.edu/mnimpacts/impact.asp?projectID=1029>). Additional information is available on the internet (<http://www.cehn.org/cehn/resourceguide/ncamp.html>; <http://www.epa.gov/opptintr/kids/hometour/index.htm>).

Petroleum storage and transfer

Stressors Included: Ground-level ozone

Impact Categories: Human Health-noncancer chronic, Human Health-noncancer acute, Terrestrial Organisms, Quality of Life-Aesthetics

Much of the discussion under Solvent utilization applies to petroleum storage and transfer. Many of the activities for petroleum storage and transfer that lead to release of

ozone-depleting chemicals are unregulated or have been given relatively low priority for prevention. These include vapor loss associated with fueling vehicles or transferring volatile chemicals.

Cleanup – none identified.

Control – MPCA requires air permits for some facilities involved in storage and transfer, but many activities are not considered.

Prevention – Most of the prevention activities discussed for Solvent utilization are not applicable. Prevention activities may include more efficient methods for transfer of volatile chemicals. The MPCA has established reduction goals for chemicals that lead to formation of ground-level ozone

(<http://www.pca.state.mn.us/hot/legislature/reports/2001/aq-report.pdf>).

Education – none identified.

Pipelines

Stressors Included: Explosive/flammable materials-high level accidental release, toxic chemicals-high level accidental release.

Impact Categories: Human Health-noncancer acute

Cleanup – The Minnesota Pollution Control Agency regulates pipelines associated with petroleum storage tanks, and has similar regulatory authority for contamination from pipelines associated with other cleanup programs, such as Superfund. The MPCA has no formal regulatory authority for other types of pipelines. The US EPA has broad regulatory authority under Title 40 CFR.

Control – The Minnesota Pollution Control Agency regulates pipelines associated with petroleum storage tanks, and has similar regulatory authority for contamination from pipelines associated with other cleanup programs, such as Superfund (<http://www.pca.state.mn.us/cleanup/ast.html>; http://www.pca.state.mn.us/programs/lust_p.html; <http://www.pca.state.mn.us/cleanup/ust.html>). The MPCA has no formal regulatory authority for other types of pipelines. The Minnesota Office of Pipeline Safety provides training on issues related to pipeline safety (<http://www.dps.state.mn.us/pipeline/>), and has authority to inspect underground pipelines and conduct other activities related to ensuring the safety of underground pipelines (<http://www.revisor.leg.state.mn.us/arule/7530/>). The US EPA has broad regulatory authority under Title 40 CFR. Minnesota Rules Chapter 6135 provides DNR with authority to regulate licensing of utility crossings, including pipelines, across public lands and waters.

Prevention – The US EPA has broad regulatory authority for Oil Pollution Prevention under Title 40 CFR Part 112 (<http://www.epa.gov/earth1r6/6sf/sfsites/oil/prgothier.htm>). Activities, however, relate to drilling, production, gathering, storage, processing, refining, transferring, distribution, or consumption of oil and oil products. These cannot be clearly defined as pollution prevention activities

Education – none identified

26. Power plants

Stressors Included: Temperature increase/climate change

Impact Categories: Aquatic Organisms

This section provides information on thermal discharge (cooling water) to surface water. Potential impacts are to aquatic ecosystems.

Cleanup – none identified

Control – Congress included section 316 in the Clean Water Act for the express purpose of regulating thermal discharges and addressing the environmental impact of cooling water intake structures. Sections 316(a) and (c) provide for relief in certain circumstances from the thermal effluent standards applicable to point source discharges of pollutants. Section 316(b) does not focus on controlling the discharge of pollutants. Rather, it addresses the environmental impact of cooling water intake structures. Section 316(b) is the only provision in the Clean Water Act that focuses exclusively on water intake. These regulations are administered at the state level by the MPCA through the NPDES program

(<http://www.pca.state.mn.us/water/permits/index.html#cooling>;

<http://www.pca.state.mn.us/water/permits/nccoolng.pdf>). There may also be local rules that apply to specific water bodies. One example is surface water within the Lake Superior Basin (<http://www.revisor.leg.state.mn.us/arule/7052/0300.html>).

Prevention – none identified

Education – none identified

Recreational use (shooting ranges, fishing tackle)

Stressors Included: Toxic metals.

Impact Categories: Terrestrial Organisms

The primary environmental concern with recreational activity is use of lead shot or tackle. Lead poisoning has been documented, particularly in raptors and waterfowl, such as swans and loons (<http://www.raptor.cvm.umn.edu/content.asp?page=7006>; http://species.fws.gov/bio_swan.html; <http://www.michiganloons.org/lead.htm>; <http://www.uswaternews.com/archives/arcquality/1leause4.html>).

Cleanup – Cleanup of sediments in lakes and wetlands is generally discouraged because the cleanup activities result in extensive environmental damage. The MPCA may work with local entities to clean contaminated soils.

Control – The United States banned the use of lead shot for hunting migratory waterfowl in 1991 (<http://www.michiganloons.org/lead.htm>). Upland game hunters hunting on federal Waterfowl Production Areas (WPAs) are required to use non-toxic shot (<http://www.great-lakes.net/lists/glin-announce/1998-08/msg00013.html>). No person may use lead shot to take—or have lead shot in possession while taking—geese, ducks (including captive-reared mallards), mergansers, coots, or moorhens. This restriction includes muzzleloading shotguns. Only these types of shot may be used: steel; copper-, nickel-, or zinc-plated steel; bismuth-alloy; tungsten-iron; tungsten-nickel-iron; tungsten-polymer; tungsten-matrix; or other nontoxic shot approved by the director of the U.S. Fish and Wildlife Service (http://www.dnr.state.mn.us/fish_and_wildlife/regulations/hunting/waterfowl_regs.pdf). The U.S. Fish and Wildlife Service has asked all national wildlife refuges to document waters frequently used by recreational anglers as well as habitat used by common loons. Those areas where the two overlap will be designated "lead-free fishing areas." Lead-free fishing areas would be phased in during a 2-year period.

During the first year, the refuge would alert anglers to the impending lead-free fishing area and educate anglers about the benefits of non-toxic sinkers and jigs for wildlife. During the second year, refuges with lead-free fishing areas would also offer anglers the opportunity to trade in their lead sinkers and jigs for non-toxic substitutes. After the second full year, the use of lead sinkers and jigs in lead-free fishing areas would be prohibited (<http://www.fws.gov/r9extaff/pr9908.html>).

Prevention – The DNR, University of Minnesota Raptor Center, the Minnesota Office of Environmental Assistance (OEA), retailers such as Target Stores and Wal-Mart, and tackle manufacturers such as Water Gremlin and Bullet Weights are partnering to educate anglers about this issue. These organizations, and others, promote use of environmentally friendly, non-lead sinkers (<http://www.moea.state.mn.us/media/03-26-99-1.cfm>; <http://www.lpleader.com/Opinion/DNR.html>).

Education – Several organizations provide information about the environmental effects of lead from shot or fishing tackle

(<http://www.learner.org/jnorth/tm/loon/SteelSinkers.html>;

<http://www.moea.state.mn.us/media/03-26-99-1.cfm>;

<http://www.leadfreesinkers.com/lead2.html>). Many of these efforts are passive, providing information only. There are some attempts, however, to bring this information into the classroom or directly to the recreationists.

Refrigerants

Stressors Included: Excess UV radiation from stratospheric ozone depletion.

Impact Categories: Human Health-cancer, Human Health-noncancer chronic, Aquatic Organisms, Terrestrial Organisms

Air conditioners include any machinery containing refrigerants and designed for cooling. This would include home and vehicle air conditioners, refrigerators, and freezers.

Cleanup – No cleanup program exists.

Control – The MPCA requires technician certification for persons servicing and disposing of appliances containing refrigerant and the servicing, and in some cases, disposal of motor vehicle air conditioners (<http://www.pca.state.mn.us/industry/ts-links.html#airconditioning>). Proper disposal of Chlorofluorocarbon (CFC)-containing refrigerants is required (<http://www.pca.state.mn.us/air/cfc.html>). Anyone who sells or distributes ozone-depleting refrigerant must retain invoices that indicate the name of the purchaser, the date of sale, and quantity of refrigerant purchased.

Prevention – CFC's have been banned from use in refrigerants.

Education – No educational programs exist.

Residences

Stressors Included: Explosive/flammable materials-high level accidental release, toxic chemicals-high level accidental release.

Impact Categories: Human Health-noncancer acute

This section considers accidental releases of toxic chemicals or explosive/flammable materials. While MPCA programs do not directly address households, MPCA activities apply, in many cases, to residential homes.

Cleanup – The MPCA ERT members are responsible for organizing the MPCA's efforts for oil and hazardous material emergencies (<http://www.pca.state.mn.us/cleanup/ert.html>).

Control – Minnesota Statutes 2000, 115.061, requires notification for petroleum spills greater than five gallons (<http://www.revisor.leg.state.mn.us/stats/115/061.html>). Minnesota Statutes 2000, 115E.02, states “A person who owns or operates a vessel or facility transporting, storing, or otherwise handling hazardous substances or oil or who is otherwise in control of hazardous substances or oil shall take reasonable steps to prevent the discharge of those materials in a place or manner that might cause pollution of the land, waters, or air of the state or that might threaten the public's safety or health” (<http://www.revisor.leg.state.mn.us/stats/115E/02.html>). Local agencies may have similar requirements.

Prevention – Internal and external spill prevention and preparedness is an important part of the MPCA ERT's strategic plan and is carried-out through pro-active community planning, fire department training, exercises and drills, and enforcement (<http://www.pca.state.mn.us/cleanup/ert.html>).

Education – none identified.

Residential fuel combustion

Stressors Included: Temperature increase/climate change, other criteria pollutants in air, toxic chemicals in food, toxic volatile chemicals in air, habitat modification.

Impact Categories: Human Health-cancer, Human Health-noncancer chronic, Human Health-noncancer acute, Aquatic Organisms, Terrestrial Organisms

Residential fuel combustion is included in some subcategories of Area source combustion. These include wood burning and residential coal combustion.

Cleanup – none identified

Control – The Clean Air Act Amendments of 1990 (CAAA) required that all areas in the country achieve the (NAAQS) for PM10 by December 31, 1994. The EPA published technical guidance for reasonably available control measures and BACM for control of PM from woodstoves to achieve this goal of reducing PM10 emissions. Those areas that do not achieve PM10 attainment by December 31, 1994, must apply BACM and develop a plan to meet the NAAQS by December 31, 2001. The only exceptions are those areas that were reclassified as serious after 1990; these areas must attain the NAAQS for PM10 no later than the end of the tenth calendar year after the area's designation as nonattainment. The BACM requirements include combinations of the following control measures: the use of new technology woodstoves, improvements in wood burning performance (e.g., control of wood moisture content, weatherization of homes), the use of "no burn" days, public awareness and education programs, replacement or installation of gas-burning equipment in fireplaces, and total banning of burning. The use of these BACM will reduce VOC, HAPs, and carbon monoxide along with PM, for measures that produce more complete combustion of wood; for measures that reduce the occurrence of combustion, nitrous oxides will also be reduced. The MPCA recently provided economic incentives to upgrade wood-burning stoves and fireplaces to newer, more efficient systems. Residential and commercial coal combustion covers air emissions from coal combustion in the residential and

commercial sectors for space heating or water heating. This category includes small boilers, furnaces, heaters, and other heating units that are not inventoried as point sources. Residential and commercial coal combustion sectors comprise housing units; wholesale and retail businesses; health institutions; social and educational institutions; and federal, state, and local government institutions (e.g., military installations, prisons, office buildings). No regulatory controls were identified for coal combustion (See Area Source Combustion in this document for web sites).

Prevention – No specific program was identified. The MPCA has established reduction goals for chemicals that lead to formation of ground-level ozone (<http://www.pca.state.mn.us/hot/legislature/reports/2001/aq-report.pdf>). The Coordinated Toxics Reduction Strategy refers to a collaborative effort by staff in the Office of Environmental Assistance and Minnesota Pollution Control Agency to gain meaningful cross-media reduction in toxic substances emphasizing preventative approaches (<http://intranet.pca.state.mn.us/programs/ctrs/index.html#network>). Although meetings of the Network have been discontinued for the time being, meetings will be resumed when current efforts in single- and multimedia monitoring, evaluation and modeling of PBTs have evolved to the point where the group is ready to consider developing and implementing multimedia pollution prevention strategies or other collaborative action items. There are unorganized efforts by various agencies and groups to decrease home use of fuels.

Education – No specific program was identified. There are unorganized efforts by various agencies and groups to increase awareness about environmental impacts from home use of fuels.

Road salt

Stressors Included: Toxic chemicals in soil.

Impact Categories: Human Health-noncancer acute

In Minnesota, a tremendous amount of salt is used each year to melt ice from roads, parking lots and sidewalks. From 1984 to 1994 average salt usage was approximately 157,000 tons per year. Over 1989 to 1994 usage increased to an average of 181,000 tons per year. Because it is extremely soluble, almost all salt applied ends up in surface or ground water (Pitt, 1995). If the concentration of chloride becomes too high, it can be toxic to many freshwater organisms. There have been many cases of surface and ground water contamination caused by runoff from inadequately protected stockpiles of salt and sand-salt mixtures (Blaha and Cherryholmes, unpublished MPCA data)(<http://www.pca.state.mn.us/water/nonpoint/nsmpp-ch11.txt>). Aquatic effects from road salt are included in urban and agricultural runoff. We consider soil effects in this section. Cyanide is the primary chemical of concern in road salt.

Cleanup – none

Control – Some industrial facilities may require an NPDES permit (<http://www.pca.state.mn.us/water/stormwater-i.html>).

Prevention – Facilities that need a permit must develop and implement a Storm Water Pollution Prevention Plan under this program. This plan must be tailored to specific site conditions and designed with the goal of controlling and minimizing the

amount of pollution in storm water that leaves the site. This is accomplished with BMPs selected for site-specific conditions

(<http://www.pca.state.mn.us/water/stormwater-i.html>). A variety of prevention activities exist to reduce impacts from road salts

(<http://www.cwp.org/Cold%20Climates/CHAPT8%20-%20POLLUTION%20PREVENTION.pdf>). In general, prevention activities are largely voluntary and not extensively implemented.

Education – There are limited efforts to educate the public about environmental effects of deicing salt (<http://www.captus.com/information/tac.htm>; <http://www.pca.state.mn.us/publications/mnenvironment/fall2000/salt.html>)

Septic systems

Stressors Included: Toxic chemicals in water, pathogens in water, ammonia, phosphorus, nitrogen, oxygen-demanding pollutants

Impact Categories: Human Health-noncancer chronic, Human Health-noncancer acute, Aquatic Organisms, Quality of Life-Aesthetics

Septic systems include individual sewage treatment systems (ISTS), cesspools, community systems, and other systems designed to treat human waste, excluding municipal treatment systems.

Cleanup – There is no organized effort at cleaning up environmental impacts from septic systems or for bringing noncompliant systems into compliance, with the exception of failing systems, which must be brought into compliance. Numerous local communities have begun conducting septic inventories in the past ten years to determine the number of noncompliant systems

(<http://www.bwsr.state.mn.us/news/2001March.pdf>). Some restoration projects have resulted in repair of septic systems

(<http://www.epa.gov/owow/NPS/Section319II/MN.html>).

Control - The goal of the agency's ISTS program is to protect the public health and the environment by adequate treatment and disposal of sewage from dwellings or other establishments not serviced by a publicly-owned treatment facility. The agency is charged to do this by Minnesota statutes 115.55 and 115.56 and through Minnesota Rules Chapter 7080. Statutes §§ 115.55 and 115.56. MN Stat. § 115.55 describe the administrative requirements of the program including rule requirements; local ordinance requirements; and permitting, inspection and upgrade requirements. MN Stat. § 115.56 describes the statewide licensing program for septic system professionals (<http://www.pca.state.mn.us/programs/ists/index.html#information>). Minnesota Rules, Chapter 7080, provides requirements for managing septage solids (<http://www.revisor.leg.state.mn.us/arule/7080/0175.html>). Septage pumpout waste may be land-applied or sent to a wastewater treatment facility. State law requires homeowners, when selling a home with a septic system, to disclose everything they know about the system to the buyer. The state also requires that if a county, township or city is going to have their own ordinance governing septic systems, it cannot be less restrictive than the state rules. Local units of government are required to adopt Chapter 7080 to set standards for septic systems. Because of unique local conditions, local ordinances may be slightly more or less restrictive than the state rules

(<http://www.extension.umn.edu/extensionnews/1999/JP1054.html>). ISTS requirements are adopted and enforced locally and requests for assistance or complaints are first be directed to the local authority (county, city, and township). The Minnesota Department of Health has building codes, plumbing codes and well codes. The DNR has the Shoreland Act and the BWSR has wetland rules. All of these codes impact septic systems

(<http://www.pca.state.mn.us/programs/ists/rules.html>). Inspections are required for all new septic system construction and replacement. Existing systems must be inspected when there is a bedroom addition permit request (if the local government unit has a permitting program for bedroom additions). Existing systems must also be inspected when any building permit or variance is requested for systems located in a shoreland area. Local ordinances or lending institutions may require inspections at other times, such as at property transfer

(<http://www.pca.state.mn.us/programs/ists/technical.html#inspections>). Additional state rules and statutes exist, such as for state financing of septic systems. In addition to maintaining septic systems, managing lot size, installing sewers, properly locating septic systems with respect to drinking water receptors, and utilizing new technologies are control methods for reducing exposure risk from septic systems. These may be implemented at the local level, but generally not in response to reducing potential impacts to drinking water receptors.

Prevention – Preventive activities for reducing impacts from septic systems include managing the quantity and types of waste discharged through septic systems, maintaining septic systems, and utilizing new technologies

(http://www.stormwatercenter.net/Pollution_Prevention_Factsheets/SepticSystemControls.htm; <http://www.cepp.cc/>;

http://www.dep.state.pa.us/dep/deputate/enved/enviroed/Can_Do/p2home.htm).

The latter two activities do not reduce waste at the source (the septic tank), but may lead to destruction of pollutants near the source. The MPCA does little to promote these activities. There appears to be greater prevention activity at the local level, although there is likely to be a wide range in activity level between different localities (<http://www.co.dakota.mn.us/environ/links.htm>;

<http://www.extension.umn.edu/county/dakota/Environment/nonpt.html>).

Implementation of prevention activities is likely to be a function of economics, personal preference, and convenience, rather than an effort to control pollution from septic systems. It is unclear if there is an environmental advantage to community septic systems for situations where houses are completed on small lots

(<http://www.extension.umn.edu/extensionnews/1999/JP1057.html>). A community system probably does not affect the extent of environmental impacts, but it may be easier to define impacted areas.

Education – Most education is conducted through agencies other than the MPCA. There are numerous fact sheets and manuals intended to educate owners of septic systems (<http://www.hometimes.com/HowTo/septic.html>; <http://www.bae.umn.edu/~septic/>; <http://www.pca.state.mn.us/water/pubs/istsfact.pdf>). Included are efforts to educate about water use and types of wastes that may be disposed, such as anti-bacterial soaps, household cleaners, dairy product/food residue, oil, paint, and solvents (<http://www.extension.umn.edu/distribution/naturalresources/DD7439.html>;

<http://www.hometimes.com/HowTo/septic.html>;
http://www.stormwatercenter.net/Pollution_Prevention_Factsheets/SepticSystemControls.htm; <http://www.dakotaswcd.org/newsnotes/1999win/nnw9901a.htm>;
http://thurston.wsu.edu/Resource%20Library/water_quality_library.htm#groundwater). There appear to be many outreach efforts, primarily at the local level and often in response to specific needs. For example, there have been outreach efforts directed at shoreline property owners. Consequently, these efforts do not provide well-rounded education, since they are narrowly focused. It is unclear how extensive these efforts are and what the environmental effects of these efforts have been.

Silviculture

Stressors Included: Habitat modification.

Impact Categories: Terrestrial Organisms, Quality of Life-Aesthetics

Silviculture is a branch of forestry dealing with the development and care of timber. Severe habitat destruction can result from forestry activities. Effects of silviculture are therefore primarily on terrestrial ecosystem health. Forestry has been identified as one of Minnesota's four major sources of nonpoint source pollution. Pollutants from forestry operations include sediment, nutrients, organic debris, pesticides, petroleum products; water temperature increases are also of concern (<http://www.epa.gov/OWOW/NPS/Success319/MN.html>). These affects on aquatic ecosystems are included under urban or agricultural runoff. State and federal forest lands are managed through government programs, but most regulations do not extend to private forest land.

Cleanup – none

Control – The commissioner of the DNR manages the forest resources of state forest lands according to the principles of multiple use and sustained yield (<http://www.revisor.leg.state.mn.us/stats/89/002.html>). This includes forest extraction (i.e. silviculture). The DNR is directed to enact rules to reach this objective, including provision for sale of all timber species by both the informal and the auction sale method; and maintaining reasonable proportions of volume in each method of sale (<http://www.revisor.leg.state.mn.us/stats/90/02.html>). The United States Forest Service manages federal forested lands.

Prevention – Since forests are a renewable resource, the primary objective of prevention activities is to conduct silviculture activities that have the least effect on habitat destruction. Each year the DNR commissioner strives to assure that (1) reforestation occurs annually on an acreage at least equal to the acreage harvested that year on all forest lands under the authority of the commissioner; (2) additional reforestation is accomplished on areas previously harvested but not adequately reforested so that the backlog of reforestation work can be eliminated; and (3) poorly stocked forest land, or forest land damaged by natural causes, shall be returned to a state of productivity (<http://www.revisor.leg.state.mn.us/stats/89/002.html>). Under Section 319 of the Clean Water Act, the MINNESOTA DNR has authority to identify nonpoint pollution sources and develop BMPs for controlling environmental effects from these activities (<http://www.dnr.state.mn.us/waters/czm/feis/part6.html>). The

MPCA has a minor role to play in 319 and Clean Water Partnership projects that focus on implementation of BMPs in forested lands. The Minnesota DNR has established a statewide goal of encouraging 50% of private landowners with holdings over 20 acres in size to participate in the development of a private Forest Stewardship Plan with the assistance of a qualified forester, by the year 2005 (<http://www.dnr.state.mn.us/forestry/aitkin/98press13.html>). If the landowner wishes to sell timber as part of a private Forest Stewardship Plan, consulting foresters can set up a timber sale contract to ensure that all parties are satisfied and protected. This contract will contain a specific set of guidelines to ensure that proper management is accomplished and that all applicable laws are followed (<http://www.dnr.state.mn.us/forestry/aitkin/98press13.html>). The Sustainable Forestry Initiative (SFI) program is a dynamic and comprehensive system of objectives and performance measures that guide the responsible management of our forests. Several counties in Northeast Minnesota are active licensees of this program (<http://www.minntrees.org/asp/default.asp?PageID=89>).

Education - Minnesota uses Section 319 funds to determine the effectiveness of BMPs and to what extent they are being used in forestry operations throughout the state. The MPCA has a minor role in these activities. Minnesota has developed a field audit process to evaluate how extensively silvaculture BMPs are used in forest management operations on state, federal, county, private industrial, and nonindustrial private (small properties) forest lands. The audit process has been tested in Aitkin County. The field audits provide valuable information to the MPCA, the Minnesota DNR, and the forest community on the degree to which BMPs are being employed. Audit results provide a focus for educational efforts and technical assistance and identify practice deficiencies so that the state can clearly target corrective measures to improve compliance. Field audits began in the fall of 1991. The field audit forms used to evaluate forest management sites were based on the BMPs identified in Water Quality in Forest Management: Best Management Practices in Minnesota, the state-approved forestry BMP guidebook.

Solvent utilization

Stressors Included: Ground-level ozone.

Impact Categories: Human Health-noncancer chronic, Human Health-noncancer acute, Terrestrial Organisms, Quality of Life-Aesthetics

Nonmethane VOCs are a principal component in the chemical and physical atmospheric reactions that form ozone and other photochemical oxidants. Nearly half (47.9 percent) of the 20.7 million metric tons of NMVOC emissions during 1995 came from industrial processes, of which solvent use was the largest source (<http://www.eia.doe.gov/oiaf/1605/gg97rpt/chap6.html>). The primary effect of solvent utilization is on production of ground-level ozone (<http://www.bea.doc.gov/bea/an/0300are/table5.htm>)

Cleanup – none identified.

Control – The MPCA requires air permits from individuals or industries that emit or have the potential to emit pollutants, including VOCs. The threshold for VOCs is 100 tons per year (<http://www.pca.state.mn.us/air/aboutpermits.html#who>).

Prevention – The Pollution Prevention Act (42 U.S.C. 13101 and 13102, s/s et seq.; 1990) focused industry, government, and public attention on reducing the amount of pollution through cost-effective changes in production, operation, and raw materials use (<http://www.epa.gov/region5/defs/html/ppa.htm>). The Act states “... Congress hereby declares it to be the national policy of the United States that pollution should be prevented or reduced at the source whenever feasible (<http://www4.law.cornell.edu/uscode/unframed/42/13101.html>; <http://www4.law.cornell.edu/uscode/unframed/42/13103.html>). The Minnesota Toxic Pollution Prevention Act of 1990 states “... [to] protect the public health, welfare, and the environment, the legislature declares that it is the policy of the state to encourage toxic pollution prevention. The preferred means of preventing toxic pollution are techniques and processes that are implemented at the source and that minimize the transfer of toxic pollutants from one environmental medium to another (<http://www.revisor.leg.state.mn.us/stats/115D/12.html>). Pollution prevention fees are collected from individuals producing hazardous waste. Emissions from solvent utilization declined in the 1990’s because of the substitution of products and improvement of technologies (<http://www.eia.doe.gov/oiaf/1605/gg97rpt/chap6.html>; <http://www.cleanairprogress.org/studies/summary.htm>). There is information that describes alternatives for use of solvents for parts cleaning and degreasing (<http://clean.rti.org/>; <http://www.ehsfreeware.com/p2comp.htm>). The MPCA has established reduction goals for chemicals that lead to formation of ground-level ozone (<http://www.pca.state.mn.us/hot/legislature/reports/2001/aq-report.pdf>). Some organizations focus on proper disposal of solvents, particularly in the household (<http://www.moea.state.mn.us/p2week/schools-paints.cfm>; <http://www.pca.state.mn.us/waste/hhw.html>).

Education – none identified.

Spills

Stressors Included: Toxic chemicals in soil, toxic chemicals in water, oxygen-demanding pollutants, toxic organic chemicals.

Impact Categories: Human Health-cancer, Human Health-noncancer chronic, Human Health-noncancer acute, Aquatic Organisms, Terrestrial Organisms, Quality of Life-Aesthetics

The MPCA's Emergency Response Team (ERT) members are responsible for organizing the MPCA's efforts for oil and hazardous material emergencies. Chemical fires, train derailments, pipeline breaks, tanker truck accidents and petroleum vapors in a sewer are examples of environmental and public health emergencies that the MPCA's ERT members respond to. The MDA is the lead agency for responses to agricultural chemical emergencies.

Cleanup – One of the goals of MPCA’s ERT is to respond to environmental releases and support public safety protection and achieve cleanup (<http://www.pca.state.mn.us/cleanup/ert.html>; <http://www.revisor.leg.state.mn.us/stats/115/061.html>). The MDA Emergency Response Spills Team is responsible for directing and assisting with the response

and cleanup of emergency agricultural chemical incidents
(<http://www.mda.state.mn.us/incidentresponse/99gd02.htm>).

Control – Two goals of the ERT are preventing unpermitted releases of pollutants and ensuring emergency preparedness and planning
(<http://www.pca.state.mn.us/cleanup/ert.html>;
<http://www.pca.state.mn.us/cleanup/pubs/ertpubs.html>). Emergency Response Plans have been developed for some areas of Minnesota. Counties and services may have spill response plans through environmental services, waste management programs, etc.

Prevention – no program or activity identified.

Education – no program or activity identified.

Streambank erosion

Stressors Included: Transported sediment.

Impact Categories: Aquatic Organisms, Quality of Life-Aesthetics

Streambank erosion is a natural process in surface water, but human activities often accelerate the rate of erosion. Streambank erosion affects aquatic ecosystems.

Cleanup – none identified

Control – MN Statute, Chapter 103G.245 requires a permit prior to any alteration of Protected Waters and Wetlands, as identified by the Minnesota DNR. Other agencies may also have regulations for streambank or shoreline modification, including local government units, Soil and Water Conservation Districts, and the Army Corps of Engineers

(<http://www.shorelandmanagement.org/quick/faqpdf/spfaq.pdf>;

<http://www.dnr.state.mn.us/waters/publications/lakeshim.pdf>). The UMES provides information useful for controlling streambank erosion. This is most appropriately categorized as a control component since most of the recommended techniques involve technological ways of decreasing the potential for erosion

(<http://www.extension.umn.edu/distribution/naturalresources/components/DD6946g.html>). Other organizations, such as the Minnesota Lakes Association, provide similar information

(<http://www.mnlakesassn.org/Main/Resources/ShorelandManagement/index.cfm>).

Prevention – Leaving the natural shoreland undisturbed is often the best and least expensive protection against erosion. This preventive activity maintains shoreline in a natural condition without relying on technological solutions to maintain erosion protection. Methods for managing natural shoreland are promoted by the UMES and other local or private groups

(<http://www.extension.umn.edu/distribution/naturalresources/components/DD6946g.html>).

Education – Education efforts are often linked with prevention efforts and are therefore conducted by the UMES, local agencies, and private groups

(<http://www.extension.umn.edu/distribution/naturalresources/components/DD6946g.html>;

<http://www.mnlakesassn.org/Main/Resources/ShorelandManagement/index.cfm>).

Tanks

Stressors Included: Toxic chemicals in water, Explosive/flammable materials-high level accidental release, toxic chemicals-high level accidental release

Impact Categories: Human Health-cancer, Human Health-noncancer chronic, Human Health-noncancer acute

The primary effect of leaking tanks is on drinking water supplies, but leaking tanks have the potential to impact soil and aquatic ecosystems. This discussion focuses on impacts to drinking water supplies and human health risk associated with release of toxic or flammable chemicals. Tanks include both above- and below-ground tanks and all associated appurtenances, such as piping.

Cleanup

- LUST (Leaking Underground Storage Tank Program): The LUST program mission is to investigate petroleum releases from petroleum tanks, and to evaluate and remove risks to human health and the environment resulting from those releases. The risks targeted are those posed by petroleum contamination that has impacted ground water and may affect human health, led or may lead to dangerous conditions due to petroleum vapors, or affected or may affect surface water quality. Free product recovery to the extent practicable is required. Where pathways linking contaminant sources to receptors exist, risk removal efforts might include: replacement of the water supply wells or providing municipal water; long-term point-of-use treatment of contaminated ground water; or active remediation of petroleum contaminated soil and ground water (http://www.pca.state.mn.us/programs/lust_p.html#search).
- VPIC (Voluntary Petroleum Investigation and Cleanup) Program: The VPIC Program provides technical assistance and liability assurance needed to expedite and facilitate the investigation and cleanup of property that is contaminated with petroleum. MPCA approves corrective actions required under the Petroleum Tank Release Cleanup Act (Minn. Stat. 115C) (http://www.pca.state.mn.us/programs/vpic_p.html;).
- Aboveground Storage Tank (AST) Program: Cleanup procedures within the AST generally follow guidelines specified through the LUST Program, with a few exceptions that are described at <http://www.pca.state.mn.us/cleanup/pubs/c1-17.pdf>. The AST Program typically refers to large facilities. Smaller facilities are dealt with through the LUST Program. Smaller facilities are required to develop a spill response plan that describes procedures for cleanup of leaking tanks and spills (http://www.pca.state.mn.us/cleanup/pubs/2_12.pdf).

Control

- UST (Underground Storage Tank) Program: All regulated UST systems must have spill protection, overfill protection, corrosion protection, and leak detection to comply with state and federal requirements. However, regulated USTs that receive less than 25 gallons of product at a time are only required to have corrosion protection and leak detection (<http://www.pca.state.mn.us/cleanup/ust.html#regulations>). The Storage Tank Compliance and Assistance Program provides storage tank owners and operators with the information they need to prevent spills and leaks at their facilities. Program staff offer underground storage tank owners technical

assistance about tank requirements and spill prevention. Technical assistance is available through tank inspectors, workshops, the tanks help line, the agency's tank newsletters, fact sheets, and a web page. The program also evaluates compliance of tank facilities with state statutes and rules through inspections and investigations and determines appropriate enforcement actions when violations are discovered. Regulated underground storage tanks must be installed, upgraded or removed by a certified supervisor (that is a certified contractor or a person employed by a certified contractor). This program operates a certification program for underground storage tank contractors and supervisors (http://www.pca.state.mn.us/programs/tanks_p.html).

- AST: Facilities that have more than one million gallons capacity must obtain an individual permit from the MPCA (Minnesota Rules Chapter 7001.4205-4250). These facilities must create a standard for safe operation of aboveground storage tank facilities. In addition, these facilities are required to use industry standards for tank construction and maintenance activities. Facilities storing less than one million gallons of liquid substances shall follow Minnesota Rules Chapter 7151. Tanks that are greater than 500 gallons in capacity and less than or equal to 1,100 gallons in capacity and located within 500 feet of a Class 2 Surface Water must meet the labeling and secondary containment requirements only. Owners of ASTs larger than 110 gallons must notify the MPCA of the existence of these tanks. In addition, tank owners are required to notify the MPCA within 30 days of a change of product or change of status of ASTs. All ASTs must have a secondary containment area surrounding the tank that can hold 100 percent of the contents of the largest tank located within the containment area. Tanks at existing sites must have a continuous dike surrounding the tanks. Secondary containment for ASTs must be impermeable to the materials being stored. All tanks must be routinely monitored to ensure they are not leaking. ASTs must have corrosion protection for the floor of the tank. Areas where substances are transferred must be equipped with spill containment. All regulated tanks must be equipped with overfill prevention equipment. Regulated AST owners of tanks larger than 1,100 gallons are required to keep records about the system design, containment area evaluation, tank monitoring, and tank inspections (<http://www.pca.state.mn.us/cleanup/ast.html>). The Aboveground Petroleum Storage Act of 1990 requires owners and operators of AST's to file a storage statement with the State Water Resources Control Board and implement spill prevention measures by developing and utilizing a Spill Prevention Control and Countermeasure (SPCC) Plan that is specific for the site (http://www.sbcfire.org/ofm/field_services/ast.shtml; <http://www.epa.gov/oilspill/spcc/>).
- Agriculture: The MDA guidance on rules for facilities that store, handle or use anhydrous ammonia are available at <http://www.mda.state.mn.us/appd/nh3/nh3rules.pdf>. The storage of pesticides is regulated by the MDA under Minnesota Ch. 18B, Pesticide Control Law (<http://www.revisor.leg.state.mn.us/stats/18B/>). The storage of fertilizers is regulated by the MDA under Minnesota Ch. 18C (<http://www.revisor.leg.state.mn.us/stats/18C/>).

Prevention – A Toolkit for Enhanced Opportunities for P2 and Sustainable Activities at Remediation Sites helps MPCA staff and program users identify and implement enhanced opportunities for P2 and sustainable activities at remediation sites. Some of the Toolkit guidelines may be applicable to tank sites, but it has not been widely used within the tank programs (<http://www.pca.state.mn.us/programs/p2-s/remediation/toolkit.html>).

Education – no program or activity identified

Trains

Stressors Included: Explosive/flammable materials-high level accidental release, toxic chemicals-high level accidental release.

Categories Impacted: Human Health-noncancer acute

See discussions under Residences and Spills.

Treatment/settling ponds

Stressors Included: Odorous chemicals from biological processes

Impact Categories: Human Health-noncancer chronic, Human Health-noncancer acute, Quality of Life-Aesthetics

Treatment and settling ponds includes a variety of activities that result in odor and associated health problems. Manure management is probably the most important of these activities, but most activities that utilize treatment and settling ponds for organic chemicals generate odors. These include activities associated with management of petroleum, vegetable and fruit processing, or waste management.

Cleanup – none identified

Control – The MPCA regulates feedlots and wastewater treatment facilities, although wastewater treatment is addressed under Municipal and industrial wastewater (<http://www.pca.state.mn.us/hot/feedlots.html>; <http://www.pca.state.mn.us/water/wastewater.html>; <http://www.pca.state.mn.us/water/wastewater-engineering.html>). Local agencies may administer regulations or programs related to management of these wastes. A variety of BMPs may be implemented to reduce odor problems (<http://www.bae.umn.edu/extens/manure/odor/>; http://www.cahe.nmsu.edu/pubs/_m/m-106.html; http://www.united-tech.com/aq_ProdLn.html; <http://www.epa.state.il.us/p2/fact-sheets/hog-facts.html>; http://www.betzdearborn.com/customer_successes/customersuccesses.asp?CS_ID=264).

Prevention – Some of the activities included in the above references for control may also be classified as prevention, particularly if the waste is utilized and odor and health effects are controlled.

Education – none identified

Unpermitted waste disposal

Stressors Included: Toxic chemicals in soil, toxic chemicals in water, excess UV radiation from stratospheric ozone depletion, toxic chemicals in food.

Impact Categories: Human Health-cancer, Human Health-noncancer chronic, Human Health-noncancer acute, Aquatic Organisms, Terrestrial Organisms

Unpermitted waste disposal includes wastes that are not incinerated, reused, land applied, or landfilled at permitted facilities. Municipal and industrial wastewater treatment is a permitted activity, but many of the wastes treated through this activity may be improperly disposed (for example, household hazardous waste dumped down the sink). These wastes, although they pass through municipal and industrial wastewater treatment plants, are addressed in this section of the document.

Cleanup

- MERLA : Superfund (http://www.pca.state.mn.us/programs/superf_p.html; <http://www.revisor.leg.state.mn.us/stats/115B/>) and the VIC Program (<http://www.pca.state.mn.us/cleanup/vic.html#intro>; <http://www.pca.state.mn.us/cleanup/vic.html>) contain or eliminate human exposure to toxic chemicals. These programs conduct a variety of land and ground water cleanups. Metro District Site Remediation continues to investigate potential contaminant sources for inclusion in the Superfund program.
- RCRA Corrective Action : RCRA covers a wide variety of programs dealing with waste management including a program involved in cleanup of improperly managed hazardous wastes referred to as RCRA Corrective Action (<http://www.epa.gov/epaoswer/hazwaste/ca/index.htm>). RCRA was amended by the 1984 Hazardous and Solid Waste Amendments (HSWA), which include RCRA Corrective Action. A variety of land and ground water cleanups are conducted under RCRA Corrective Action. Two types of sites are subject to RCRA Corrective Action: 1-Hazardous Waste Treatment, Storage, or Disposal Facilities, commonly referred to as TSDs. These facilities have RCRA permits allowing the treatment, storage and or disposal of hazardous wastes; and 2- Interim Status Hazardous Waste Treatment, Storage, or Disposal Facilities, commonly referred to as Interim Status Facilities. These facilities at one time applied for a RCRA treatment, storage and or disposal permit, but did not complete the permitting process. Although the permitting process was never completed, by applying for the permit, such facilities were allowed to conduct business as a Hazardous Waste Treatment, Storage, or Disposal Facility operating under interim status. Hazardous Waste Generators, usually referred to as Generators, are not subject to RCRA Corrective Action as defined in the 1984 HSWA. However, releases or potential releases from these sites are required to be properly investigated and if necessary remediated in accordance with other hazardous waste management rules found in Minn. Rules Chapter 7045 that are administered by the MPCA RCRA and remediation programs. Generators include all entities that generate a hazardous waste and include all very small, small, and large quantity generators. While conducted under different rules and authorities, investigation and remediation at Generator sites often follow the phased Corrective Action process. The Hazardous Waste Treatment, Storage, or Disposal Facilities enter the RCRA corrective action program through the permitting process. Interim Status Facilities enter the RCRA Correction Action Program through a negotiated process initiated by the MPCA. Hazardous Waste Generators usually enter the RCRA remediation program through evidence of suspected releases to soil and or ground water

from improper management of hazardous wastes or hazardous constituents uncovered during hazardous waste inspections conducted by state, county or city inspectors (<http://www.pca.state.mn.us/cleanup/rcra.html>).

- Landfill Program (see also Permitted waste disposal): Because of potential contamination from old, abandoned, unpermitted dumps, the Minnesota Legislature in 1999 appropriated one million dollars for a two-year environmental assessment program, looking at old dumps in the state. In 2001, the MPCA will report to the Legislature on which dumps may pose a threat to public health or the environment (<http://www.pca.state.mn.us/cleanup/pubs/c8-01.pdf>).
- MPCA's Pretreatment Program does limited cleanup, such as removal of mercury from sewers.
- Fertilizers: The MDA is the lead agency for response to, and cleanup of, agricultural chemical contamination (pesticides and fertilizers) in Minnesota. These activities are generally associated with unpermitted disposal or spills. This lead role was an outcome of the 1989 Minnesota Groundwater Protection Act which provided the MDA authority for agricultural chemical contamination under the Minnesota Environmental Response and Liability Act (MERLA – the Minnesota “Superfund”) and created a reimbursement fund for the partial reimbursement of agricultural chemical cleanup costs (Agricultural Chemical Response and Reimbursement Account - ACRRA). The program operates under the primary authorities of Minnesota Chapters: 115B (MERLA); 18B (Pesticide Control Law); 18C (Fertilizer Law); 18D (Agricultural Chemical Liability, Incident, and Enforcement Law); and, 18E (ACRRA). The MDA agricultural chemical incident response program has four major program areas: 24 hour emergency response; comprehensive facility investigations; the Voluntary Cleanup and Technical Assistance Program (AgVIC); and, the Agricultural Chemical Response and Reimbursement Account (ACRRA) (<http://www.mda.state.mn.us/incidentresponse/default.htm#Overview>).
- Pesticides: The MDA is the lead agency for response to and cleanup of agricultural chemical contamination (pesticides and fertilizers) in Minnesota. This role was an outcome of the 1989 Minnesota Groundwater Protection Act which provided the MDA authority for agricultural chemical contamination under the Minnesota Environmental Response and Liability Act (MERLA – the Minnesota “Superfund”) and created a reimbursement fund for the partial reimbursement of agricultural chemical cleanup costs (Agricultural Chemical Response and Reimbursement Account – ACRRA). The program operates under the primary authorities of Minnesota Chapters: 115B (MERLA); 18B (Pesticide Control Law); 18C (Fertilizer Law); 18D (Agricultural Chemical Liability, Incident, and Enforcement Law); and, 18E (ACRRA). The MDA agricultural chemical incident response program has four major program areas: 24 hour emergency response; comprehensive facility investigations; the Voluntary Cleanup and Technical Assistance Program (AgVIC); and, the ACRRA. The incident unit also is a contact point for agricultural chemical incident and facility database searches (<http://www.mda.state.mn.us/incidentresponse/default.htm>).

Control

- RCRA : The RCRA was enacted in 1976 to address the issue of how to safely manage and dispose of the huge volumes of municipal and industrial waste generated nationwide. The RCRA program is administered by EPA's Office of Solid Waste. Subtitles C and D of RCRA set forth the framework for EPA's comprehensive waste management program. RCRA Subtitle C establishes the regulatory structure for managing hazardous waste from the time it is generated until its ultimate disposal. RCRA Subtitle D establishes a system for managing solid (primarily nonhazardous) waste, such as household waste (<http://www.epa.gov/epaoswer/hotline/rcra.htm>; <http://www.pca.state.mn.us/cleanup/rcra.html>). A variety of other wastes are covered through various rules (http://www.pca.state.mn.us/waste/sw_mnrules.html). The above rules are generally successful in controlling the majority of solid waste discharged to the environment. Unknown quantities of waste are released from very small quantity generators (VSQG), households, and from people or industries that do not comply with the rules. Under the federal program, VSQGs are called conditionally exempt generators and are exempted from most of the provisions of RCRA (Federal hazardous waste rules) provided the waste is not spilled and is disposed at an acceptable facility. Under the federal program, an acceptable facility may be either a hazardous waste facility or a permitted solid waste facility (landfill or incinerator). In Minnesota, these generators have been regulated under the hazardous waste rules since the start of the hazardous waste program in the 1970's. Although they are excluded from certain minor parts of the Minnesota hazardous waste rules, most VSQGs are still required to meet hazardous waste storage and disposal standards, obtain a license, manifest their waste shipments and pay hazardous waste generator fees. In the metropolitan area, county level hazardous waste programs conduct many of the VSQG licensing, manifest, and inspection activities. The county programs do not have civil enforcement authority, therefore, they refer civil cases and clean ups to the MPCA for resolution. In Greater Minnesota, the average amount of VSQG waste is 1.5 % of the total waste volume generated, but in more sparsely populated areas, this proportion will increase. For example, in the Lake Superior Basin, VSQGs generate 23 percent of all the hazardous waste produced in the region.
- Landfill Program (see also Permitted waste disposal): The MPCA Landfill program is responsible for permitting active landfills (<http://www.pca.state.mn.us/waste/pubs/sw-execsum.html#perpetual>).
- Non-MPCA : MN Statute (473.811, subd. 5b) requires that the metropolitan counties have a hazardous waste program and an ordinance that "may not be inconsistent... and must be at least as stringent as the agency (MPCA) hazardous waste rules." Each Metro county administers a hazardous waste program (http://www.pca.state.mn.us/programs/bau_p.html). Eighty-seven counties in Minnesota operate household hazardous waste programs (<http://www.pca.state.mn.us/waste/hhw.html>). Several counties operate various environmental service programs, including waste management

(<http://www.pca.state.mn.us/waste/hhw.html#program>). Some cities operate collection systems for specific types of wastes
(<http://www.ci.fridley.mn.us/serv/monthlydrop.html>)

- The Industrial Pretreatment Program seeks to control the discharge of industrial (and other) wastes into the sanitary sewer. This is done through many kinds of controls. The POTW (publicly owned (wastewater) treatment works)(i.e. the municipal sewage treatment plant and the authority who operates it) is inherently the primary control authority. Therefore, most of the actual regulatory work of pretreatment is carried out by POTWs.
- Agriculture: Pesticide Response Plans include emergency response in cases of spills or leaks. MDA's Waste Pesticide Collection Program helps farmers, small businesses, households, and other pesticide users to properly dispose of unwanted and unusable pesticides
(<http://www.mda.state.mn.us/appd/wastepest/default.htm>). The amount of pesticide collected through the Waste Collection Program has increased from 34100 pounds in 1991 to 236500 pounds in 1995 and 410718 pounds in 1999
(<http://www.mda.state.mn.us/appd/wastepest/pounds.htm>).

Prevention – MN Rules, Chap. 155D states “To protect the public health, welfare, and the environment, the legislature declares that it is the policy of the state to encourage toxic pollution prevention. The preferred means of preventing toxic pollution are techniques and processes that are implemented at the source and that minimize the transfer of toxic pollutants from one environmental medium to another ... The legislature intends that the programs developed under sections 115D.01 to 115D.12 shall encourage and lead to a greater awareness of the need for and benefits of toxic pollution prevention, and to a greater degree of cooperation and coordination among all elements of government, industry, and the public in encouraging and carrying out pollution prevention activities. A review of MPCA prevention activities shows a wide diversity of programs. These programs are generally not coordinated. Many activities labeled as prevention activities would more accurately be defined as control programs, since they do not have the primary goal of reducing waste at the source (<http://www.pca.state.mn.us/water/stormwater-i.html>). The Coordinated Toxics Reduction Strategy refers to a collaborative effort by staff in the Office of Environmental Assistance and Minnesota Pollution Control Agency to gain meaningful cross-media reduction in toxic substances emphasizing preventative approaches
(<http://intranet.pca.state.mn.us/programs/ctrs/index.html#network>). Although meetings of the Network have been discontinued for the time being, meetings will be resumed when current efforts in single- and multimedia monitoring, evaluation and modeling of PBTs have evolved to the point where the group is ready to consider developing and implementing multimedia pollution prevention strategies or other collaborative action items. Examples of prevention efforts are discussed below.

- Although P2/S is not commonly included as part of the cleanup process, successful examples exist (<http://www.pca.state.mn.us/programs/p2-success.html>). Once cleanup is underway, an existing business or redevelopment plan can incorporate P2 measures. A Toolkit for Enhanced

Opportunities for P2 and Sustainable Activities at Remediation Sites helps MPCA staff and program users identify and implement enhanced opportunities for P2 and sustainable activities during cleanup, ongoing business and redevelopment at remediation sites on a voluntary basis in the Superfund, VIC, and RCRA corrective action programs.

(<http://www.pca.state.mn.us/programs/p2-s/remediation/toolkit.html>;
http://www.pca.state.mn.us/programs/inpdes_p.html).

- Project XL is a voluntary state and federal pilot program. Project XL supports regulated parties that demonstrate excellence and leadership (XL) in protecting the environment who are willing to undertake new initiatives that go beyond the existing requirements of state and federal law. In exchange for their superior environmental performance, these parties will receive increased operational flexibility and reduced environmental-management costs (<http://www.pca.state.mn.us/programs/projectxl/index.html#background>). Minnesota pilot projects are summarized at <http://www.pca.state.mn.us/programs/projectxl/xlprojects.html>.
- MnTAP, operated through the U of M, helps businesses prevent pollution and better manage waste. MnTAP provides assistance to a wide range of industry sectors. A variety of outreach efforts are coordinated through MnTAP (<http://www.mntap.umn.edu/>).
- The MOEA provides information, assistance, grants and loans in the areas of waste and pollution prevention, recycling, reuse, environmental education, sustainable communities, and resource conservation to protect Minnesota's environment and assure a sustainable economy (<http://www.moea.state.mn.us/>).
- There are a large number of organizations at the national, state, and local level, including a variety of public and private organizations and nonprofit organizations, dedicated to incorporating prevention into waste reduction (<http://www.mntap.umn.edu/> see Links).

Education – The MPCA and external agencies operate various programs designed to train people who manage wastes, but few of these programs are geared toward education. Numerous fact sheets have been prepared and are available on the web, but there appears to be little outreach associated with getting this information to potential users. Minnesota has many organizations involved in environmental education. They are not well coordinated and the focus is not necessarily on waste reduction (<http://www.moea.state.mn.us/reduce/index.cfm>). The MPCA does not have coordinated education programs.

Urban runoff

Stressors Included: Toxic metals, transported sediment, toxic organic chemicals, temperature increase/climate change, oxygen-demanding pollutants, dissolved solids, phosphorus, nitrogen.

Impact Categories: Aquatic Organisms, Terrestrial Organisms, Quality of Life-Aesthetics

Urban runoff includes overland discharge to receiving water bodies, infiltration or injection of stormwater collected in retention basins, and leakage from sewers. The primary contaminants include phosphorus, nitrogen, ammonia, metals, and organic materials. The effects of urban runoff are on aquatic and terrestrial ecosystems. The

most recent National Water Quality Inventory reports that runoff from urban areas is the leading source of impairments to surveyed estuaries and the third largest source of water quality impairments to surveyed lakes

(<http://www.epa.gov/OWOW/NPS/facts/point7.htm>). Improperly functioning sewer systems can result in ground water contamination, which in turn may affect aquatic ecosystems. Additional information for this section can be found in this document under Construction. Short summaries are provided below.

Cleanup – Most large municipalities in Minnesota have Public Works departments that are charged, in statute, with repairing and maintaining sewer systems

(<http://www.ci.stpaul.mn.us/code/lc081.html>;

http://www.ci.eagan.mn.us/water_resources/3_07.htm). Corrective actions may be required for activities that result in off-site transport of sediment or chemicals.

Control

Sewers: MN Rules 7077.0100 provides for the MPCA's administration of financial assistance programs for ... the combined sewer overflow program for grants awarded on or after July 1, 1990, under Minnesota Statutes, section 116.162 (<http://www.ci.stpaul.mn.us/code/lc081.html>). EPA has issued a national policy statement entitled "Combined Sewer Overflow (CSO) Control Policy." This policy establishes a consistent national approach for controlling discharges from CSOs to the Nation's waters through the National Pollutant Discharge Elimination System (NPDES) permit program

(<http://www.epa.gov/owm/csopol.htm>). This policy provides guidance to permittees with CSOs, NPDES authorities and State water quality standards authorities on coordinating the planning, selection, and implementation of CSO controls that meet the requirements of the Clean Water Act and allow for public involvement during the decision-making process. Implementation of storm sewer separation has occurred in much of the Twin Cities Metropolitan Area (<http://www.kyeqc.net/minutes/2000/nkuminutes.htm>). Many municipalities implement storm sewer maintenance and repair, though not by statute (<http://www.newulm.com/city/publicworks.html>;

<http://www.ci.hammond.in.us/sewer/paper.html>).

Storm water: The 1987 Amendments to the Clean Water Act required the US EPA to develop regulations for stormwater discharges associated with construction and industrial activity. NPDES permitting authority was given to the MPCA to administer this federal program

(<http://www.pca.state.mn.us/water/stormwater.html>). Phase I of the US EPA's storm water program relies on NPDES permit coverage to address storm water runoff from "medium" and "large" municipal separate storm sewer systems (MS4s), construction activities disturbing five or more acres of land, and ten categories of industrial activity. The Storm Water Phase II expands the Phase I program by requiring additional operators of MS4s in urbanized areas and operators of small construction sites (1 to 5 acres), through the use of NPDES permits, to implement programs and practices to control polluted storm water runoff. Nonpoint contributions of pesticides from agricultural and, to a lesser extent, urban land use are addressed through a variety of non-regulatory programs. Nonpoint programs focus on education, training, and consequently,

voluntary controls for stormwater. MDA operates a voluntary BMP program for pesticides (<http://www.mda.state.mn.us/appd/BMPs/BMPs.htm>; <http://www.pca.state.mn.us/water/nonpoint/nsmpp-ch10.pdf>).

Prevention – As of January, 1999, 45 cities in Minnesota collected fees based on stormwater runoff volume and pollution. In the Twin Cities Metro Area, over 23 million dollars in stormwater utility fees were collected in 1997. Most of this money, however, goes toward maintenance and repair of existing infrastructure. <http://www.me3.org/sprawl/envlfin.pdf> states “... the *Smart Growth Scenario* specifies that households sited according to that plan will create 53 percent fewer transportation-related site imperviousness acres ... compared to the site plan for the *Sprawling Scenario*.” There are a variety of other prevention activities. New developments can maintain the volume of runoff at predevelopment levels by using structural controls and pollution prevention strategies. Plans for the management of runoff, sediment, toxics, and nutrients can establish guidelines to help achieve both goals. Management plans are designed to protect sensitive ecological areas, minimize land disturbances, and retain natural drainage and vegetation. Existing urban areas can target their urban runoff control projects to make them more economical. Runoff management plans for existing areas can first identify priority pollutant reduction opportunities, then protect natural areas that help control runoff, and finally begin ecological restoration and retrofit activities to clean up degraded water bodies. Citizens can help prioritize the clean-up strategies, volunteer to become involved with restoration efforts, and help protect ecologically valuable areas. The control of nutrient and pathogen loading to surface waters can begin with the proper design, installation, and operation of onsite disposal systems (OSDSs). These septic systems should be situated away from open waters and sensitive resources such as wetlands and floodplains. They should also be inspected, pumped out, and repaired at regular time intervals. Household maintenance of septic systems can play a large role in preventing excessive system discharges (<http://www.epa.gov/OWOW/NPS/facts/point7.htm>; <http://www.epa.gov/OWOW/NPS/roads.html>; <http://www.epa.gov/OWOW/NPS/runoff.html>). The second phase of Clean Water Partnership (CWP) projects involve putting in place best management practices (BMPs), including sedimentation ponds, manure management, conservation tillage, terraces, new ordinances, wetland restoration, fertilizer management, education or other methods designed to reduce nonpoint-source pollution. FANMAP, a program administered through MDA, is designed to educate farmers in sensitive hydrologic environments about assessing nutrient and pesticide needs (<http://mrbdc.mankato.msus.edu/inventory/state/sbmp.html>; <http://www.mda.state.mn.us/appd/1999acpp.pdf>). MPCA water quality permitting staff are collaborating with MnTAP to promote preventative approaches in Phosphorus Management Plans.

Education - The United States Congress enacted Section 319 of the federal Clean Water Act in 1987, establishing a national program to control nonpoint sources of water pollution. There are educational activities associated with Section 319 funds (<http://www.bae.umn.edu/annrpt/1996/outreach/exten15.html>; <http://www.pca.state.mn.us/water/nonpoint/mplan.html>). Fact sheets and manuals

have been written with Section 319 or other funds, but it appears little outreach is associated with many of these publications (<http://www.pca.state.mn.us/water/pubs/sw-bmpmanual.html>). The CWP program was created in 1987 to address pollution associated with runoff from agricultural and urban areas. The program provides local governments with resources to protect and improve lakes, streams and ground water. Educational components are built into both phases of a CWP effort. Both Section 319 and CWP program focus on improving a water resource that has been polluted by land-use-related activities. FANMAP, a program administered through MDA, is designed to educate farmers in sensitive hydrologic environments about assessing nutrient and pesticide needs. The Nonpoint Education for Municipal Officials (NEMO) program is an educational program for local land use officials that addresses the relationship of land use to natural resource protection. There are multiple NEMO projects in Minnesota, most focusing on the Great Lakes (<http://nemo.uconn.edu/>; <http://nemo.uconn.edu/edprog.htm>; <http://www.seagrant.umn.edu/water/nemo.html>; <http://nemo.uconn.edu/newnatl/stateprograms/mi-wi.html>).

Urban development

Stressors Included: Habitat modification

Impact Categories: Aquatic Organisms, Terrestrial Organisms, Quality of Life-Aesthetics

Urban development has a wide variety of environmental effects, including consumption of fossil fuels associated with sprawl; runoff; and management of wastes, such as with septic systems. Some of these are discussed in other sections. We discuss urban development in terms of environmental effects on habitat modification. These occur through wetland drainage, deforestation and loss of natural areas, and fragmentation. Urban development, however, can occur in a manner that minimizes these environmental effects, or, in the case of abandoned or blighted properties, enhances development of habitat. A variety of urban development strategies can be utilized to redevelop properties and make them more “habitat-friendly”. These include watershed protection (targeting growth to areas outside of sensitive aquifer recharge areas or watersheds), urban growth boundaries (a regulatory strategy for limiting urban development by creating a geographical boundary for new development), in-fill development (a strategy to direct development within previously developed areas), brownfield redevelopment (turning idle and possibly contaminated urban properties into productive use, versus “greenfield” development on previously undeveloped land), and open space protection (strategy to protect undeveloped or agricultural land)(<http://www.marinenv.com/pg2.pdf>). MPCA’s authority is limited in the arena of urban development. The primary tool available to MPCA is through its cleanup programs, which can decrease urban sprawl and, when conducted properly, encourage habitat development in otherwise abandoned or blighted areas. Beyond these activities, partnership with other governmental and non-governmental organizations is necessary to affect urban development activities that impact environmental quality (<http://intranet.pca.state.mn.us/programs/smartgrowth/actionfinal.pdf>). The MPCA identified four leverage areas where smart growth can be incorporated into Agency activities. These include providing data and information, education and outreach,

planning assistance, financial assistance and incentives, and regulation. Many local agencies are concerned with environmental affects of urban development. Like MPCA, these agencies are limited in their ability to manage urban development.

Cleanup – Brownfields are abandoned, idled, or underused industrial and commercial properties where expansion or redevelopment is complicated by actual or suspected environmental contamination. By investigating and cleaning up brownfield sites, many of which are abandoned or blighted properties in inner-city areas, redevelopment can take place without fear of environmental legal liabilities. This benefits Minnesota communities by bringing new businesses, jobs and an improved tax base to areas where brownfield sites have been unused and unproductive. Brownfield sites in Minnesota are addressed by programs at both the state and local level. The MPCA has several programs that work on investigating and cleaning up brownfield sites. The individual MPCA program that works with a particular site is based on the types of contaminants present or the circumstances under which the contamination occurred (<http://www.pca.state.mn.us/cleanup/brownfields.html>). The VIC Program can encourage development in areas that are already developed (in-fill development). While the focus of this program is to improve environmental quality through cleanup actions, activities can be conducted in a manner that is favorable for habitat development. Information on regulatory authority for the various programs can be found under Tanks and Unpermitted waste disposal.

Control – Under Minnesota State Statute 115.07, subdivision 3, permits are required for extensions of sanitary sewers. The MPCA can use traditional regulatory authorities (rules, standards, enforcement, etc.), as appropriate, to discourage practices and behaviors for which education, planning assistance, and financial assistance and incentives are insufficient motivators for achieving “smarter” growth and development. The MPCA can work with the MDH and local agencies and organizations to protect areas with vulnerable resources. Examples include development in areas where wild and scenic rivers exist, wellhead protection areas, or sole-source aquifer areas (http://www.health.state.mn.us/divs/eh/dwp/swp/whp_mn2.html). The Metropolitan Council can develop policies that affect urban development, such as development of municipal water and sewer lines (http://www.metrocouncil.org/sgtc/news_events.htm; <http://www.metrocouncil.org/>).

Prevention – Brownfield development can be conducted or encouraged in a manner that is “habitat-friendly”. Examples include establishing guidelines for planting, care, maintenance and removal of trees, shrubs and any other plantings in public areas; making provisions for lots that are contiguous with or directly adjoin an intermittent or perennial stream or river; and encouraging development of greenways (<http://www.sustainable.doe.gov/codes/napaord.shtml>; <http://www.sustainable.doe.gov/codes/santaros.shtml>; <http://www.sustainable.doe.gov/codes/sttrees.shtml#12.28.010>). Although little of this activity currently exists in Minnesota, the MPCA can align financial assistance and incentive programs to promote development decisions and projects that are more environmentally protective in the long-term (<http://www.pca.state.mn.us/programs/smartgrowth/>). The business operations and

redevelopment options promoted in MPCA's Toolkit for P2 and Sustainable Activities at Remediation Sites also apply to non-contaminated sites. This toolkit has not been fully integrated into MPCA service delivery programs.

Education – The MPCA can provide education and outreach to local officials, state and regional agencies, and members of the public on the environmental impacts of growth and development. Areas in which education can be implemented include wastewater, storm water, brownfields redevelopment, air quality/transportation, and basin management efforts. Other potential educational areas include researching areas of knowledge gaps, compiling and organizing existing information into more useable forms by decision-makers and the public, gathering program staff who are currently working on issues in focus areas into intra-agency working groups that meet cooperatively with local communities to carry out these Action Directions, and participating in the Governor's Local Solutions Alliance pilot program to develop similar collaborative approaches at an interagency level, as well. There are many educational activities conducted by a variety of organizations. Lesson plans and numerous links to educational materials are available on the web. Colleges and universities offer degrees and programs in sustainable development and land use planning (<http://www.planning.org/kidsandcommunity/>; <http://www.sustainable.doe.gov/efficiency/educ/educatn3.shtml>; <http://www.sustainable.doe.gov/landuse/luedtoc.shtml>).

Waste incineration

Stressors Included: Toxic chemicals in food, toxic metals.

Impact Categories: Human Health-cancer, Human Health-noncancer chronic, Aquatic Organisms, Terrestrial Organisms

Waste incineration is a source of PBTs, which may enter the food chain. Waste incineration also releases chemicals that may affect human health through inhalation, but these activities are discussed under Industry.

Cleanup – MPCA and MDA operate cleanup programs that deal with hazardous wastes, although it is difficult to ascertain what their role would be in the case of air deposition from waste incineration.

Control – The Clean Air Act (42 USC 7412) provides the regulatory authority and framework for regulating air releases from waste incineration. The US EPA has jurisdiction over incineration involving PCBs and hazardous waste from Superfund sites (<http://books.nap.edu/books/030906371X/html/184.html#pagetop>). All hazardous waste incinerators are currently required to control particulate emissions to 0.08 grains per dry standard cubic foot of air emissions (40 CFR 264.343) (<http://www.crw.org/textfiles/partem.htm>). The Omnibus Mercury Emissions Reduction Act of 1998 amends the Clean Air Act to require new standards for mercury emissions from solid waste and medical waste incineration units (<http://www.cnie.org/nle/waste-16.html>). Regulation of waste incineration is largely administered at the state level. Waste incinerators must follow the same air pollution control requirements as other emission sources (<http://www.revisor.leg.state.mn.us/arule/7007/0200.html>; <http://www.pca.state.mn.us/air/permits/index.html>).

Prevention – Incineration is considered by environmental groups to represent a destruction of materials that could potentially be reused and recycled. There are recommendations regarding how to minimize impacts from waste incineration facilities (<http://www.sierraclub.org/policy/conservation/solidwaste.asp>). True prevention consists of efforts to reduce waste production. There are many prevention efforts designed to reduce waste generation. Some of these are discussed under Unpermitted waste disposal and other sections that deal with generation of waste. The Coordinated Toxics Reduction Strategy refers to a collaborative effort by staff in the Office of Environmental Assistance and Minnesota Pollution Control Agency to gain meaningful cross-media reduction in toxic substances emphasizing preventative approaches (<http://intranet.pca.state.mn.us/programs/ctrs/index.html#network>). Although meetings of the Network have been discontinued for the time being, meetings will be resumed when current efforts in single- and multimedia monitoring, evaluation and modeling of PBTs have evolved to the point where the group is ready to consider developing and implementing multimedia pollution prevention strategies or other collaborative action items. The MOEA's website is a good starting point for more information on waste reduction efforts (<http://www.moea.state.mn.us/reduce/index.cfm>).

Education – Minnesota has many organizations involved in environmental education. They are not well coordinated and the focus is not necessarily on waste reduction (<http://www.moea.state.mn.us/reduce/index.cfm>). The MPCA does not have coordinated education programs.

List of Abbreviations

AST – Aboveground Storage Tank
AU – Animal Units
BACM – Best Available Control Measures
BMPs – Best Management Practices
BWSR – Board of Water and Soil Resources
CFC – Chlorofluorocarbon
CFR – Code of Federal Regulations
Ch. – Chapter
CRP – Conservation Reserve Program
CSO – Combined Sewer Overflow
CWP – Clean Water Partnership
DNR – Department of Natural Resources
EAW – Environmental Assessment Worksheet
EIS – Environmental Impact Statement
EPA – Environmental Protection Agency
EQIP – Environmental Quality Incentives Program
ERT – Emergency Response Team
FAA – Federal Aviation Administration
FANMAP - Farm Nutrient Management Assessment Program
FR – Federal Register
HAPs – Hazardous Air Pollutants
HHW – Household Hazardous Waste
HSWA - Hazardous and Solid Waste Amendments
IRRRB – Iron Range Resources and Rehabilitation Board
ISTS – Individual Sewage Treatment System
LUST – Leaking Underground Storage Tank
MDA – Minnesota Department of Agriculture
MSP – Minneapolis-St. Paul
MOEA – Minnesota Office of Environmental Assistance
MPCA – Minnesota Pollution Control Agency
NAAQS – National Ambient Air Quality Standards
NEMO – Nonpoint Education for Municipal Officials
NESHAP – National Emission Standards for Hazardous Air Pollutants
NPDES – National Pollutant Discharge Elimination System
NRCS – National Resource and Conservation Service
OHV – Off Highway Vehicle
OHWL – Ordinary High Water Level
PM – Particulate Matter
PBT – Persistent Bioaccumulative Toxic
POTW – Publicly Owned Treatment Works
R. - Rule
RCRA – Resource Conservation and Recovery Act
St. – Statute
SDS – State Disposal System
Subd. - Subdivision

TMDL – Total Maximum Daily Load
U of M – University of Minnesota
UMES – University of Minnesota Extension Service
US – United States
USDA – United States Department of Agriculture
UST – Underground Storage Tank
VIC – Voluntary Investigation and Cleanup
VPIC – Voluntary Petroleum Investigation and Cleanup
VOC – Volatile organic compound
VSQG – Very Small Quantity Generators