Sierra Club Great Lakes Program
Toxic Air Pollution Education Series

A Narrative on Michigan's Air Pollution Rules on Toxic Air Pollution

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Forward

This document is one in a series produced for the Sierra Club Great Lakes Program in order to facilitate and increase public understanding of toxic substance issues and the connection between toxic air pollution, Great Lakes water pollution and effects on human health and the environment.

In this document, we brief the reader on current provisions of the Michigan Department of Environmental Quality rules dealing with toxic air pollution. The Sierra Club Great Lakes Program hopes that these educational materials will assist citizens in their use of these regulations and stimulate discussion about potential changes in Michigan administrative agency policy to more fully protect public health and the environment.

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Note to Readers:

This document assumes understanding of some terms and some of the basic science of air quality regulation and toxicology that is explained in the Sierra Club Great Lakes Program Toxic Air Pollution Education Series document entitled "An Introduction to Airborne Toxicant Evaluation and Regulation."

Persons who are not already familiar with basic concepts of air quality regulation and toxicology should first read that introductory briefing paper before reading this document.

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1. Introduction

The purpose of this document is to brief the reader on the provisions of Michigan's air pollution statute and regulations relating to toxic air pollution. The primary focus in this Sierra Club descriptive series is on state-initiated policy formation to control airborne toxic pollutants that exceeds the reach and scope of minimum Federal hazardous air pollutant regulations.

2 Brief History of Michigan Toxic Air Pollution Regulation

Beginning in the mid 1970's, the Air Quality Division of the Michigan Department of Natural Resources (AQD-MDNR) began to confront the problem of issuing permits to new and modified sources of toxic air pollutants. Then-existing federal regulations and the Federal Clean Air Act provided many gaps in coverage for both control regulations and prudent measures to determine the health and environmental impacts of pollutants.

At the same time, the public was raising questions concerning the public health and environmental protection afforded by the Departments permitting and regulatory decisions.

In 1977, the Air Quality Division began examining toxic pollutants that were not regulated by the Federal Clean Air Act in permit reviews for new sources. In 1978, the Division began insisting that permit applicants make a demonstration of environmental acceptability of proposed emissions. By May of 1979, the Michigan Air Pollution Control Commission created the Special Air Advisory Committee. At this time, chemist George Su, toxicologist Kathy Wurzel and engineer Gerald Avery on the AQD-MDNR staff provided the primary leadership to develop internal policies on the regulation of toxic air pollution. By the early 1980's, toxicologist Catherine Simon led efforts to formalize MDEQ-AQD toxics policy along with Gerald Avery from the mid-1980's to the present. In addition, selected Great Lakes air toxics and mercury reduction program activities were led by MDEQ staffers Joanne Foy and Joy Taylor.

In November 1981, the Special Air Advisory Committee issued its report to the Commission. The Air Advisory Committee formalized some key recommendations for demonstrating environmental acceptability of toxic emissions involving the use of occupational health guidelines with Threshold Limit Values (TLVs), and the use of animal toxicology data to demonstrate acceptable ambient concentrations of toxic air pollutants.

Also, in 1981, quantitative cancer risk assessment was used by AQD-MDNR for the very first time to demonstrate environmental acceptability of a residual risk after the application of best available control technology on a chemical company emission source of dichloro-benzidene.

By 1986, the Great Lakes Governors signed the Great Lakes Toxic Substances Control Agreement and the environmental administrators signed an agreement, "Toxic

Substances Management in the Great Lakes Basin Through the Permitting Process." These agreements formalized state efforts to consider the effects of air discharges on contamination of the Great Lakes and to incorporate preventative measures for such Great Lakes pollutants.

In 1986, a massive public controversy erupted over toxic emissions and failure to incorporate state-of-the-art emission controls at the Greater Detroit Resource Recovery Authority municipal waste incinerator. Also, during the mid-1980's, pressure was building on AQD-MDNR to formalize its internal toxic air pollution policies into legally enforceable MDNR administrative rules.

In May of 1987, the Michigan Air Pollution Control Commission established the Michigan Air Toxics Policy Committee to develop recommendations on toxic air pollution policy and to proposed a set of toxic air pollution control rules by a regulatory negotiation process among interested stakeholders. After over two years of meetings, the Committee made its final report in September, 1989. Subsequently, the recommended rules were adopted with minor modification with an effective date in April, 1992.

In 1998, the rules were subject to two amendments. One amendment added silica to a list of materials which would not be regulated under the rule under certain conditions; another amendment was complex and provided for certain additional screening procedures associated with rule compliance and provided certain relaxations in the rule requested by Dow Chemical Company and other industry entities. This latter change resulted from the Report of the Air Toxics Subcommittee of the MDEQ Air Advisory Group that was published in February 1997.

3 Provisions Affecting Toxic Air Pollution in the Air Section of Michigan's Natural Resources and Environmental Protection Act

3.1 Siting of Municipal Solid Waste Incinerators

Michigan's Natural Resources and Environmental Protection Act (NREPA) prohibits the Department of Environmental Quality from issuing a permit to install or an operating permit for a municipal waste incinerator unless it is located at least 1,000 feet from all residential dwellings, public or private elementary or secondary schools, preschool facilities for infants or children, hospitals and nursing homes. However this requirement does not apply to municipal waste incinerator sites that existed prior to June 15, 1993; such pre-existing waste incinerators may add new units, expand, retrofit or otherwise be modified without triggering the above permit ban.[1]

[1] MCL 324.5502(1)

3.2 Regulation of Medical Waste Incinerators

Michigan NREPA has special provisions[2] concerning MDEQ regulation of medical waste incineration facilities. Under the law, a medical waste incinerator shall not be operated without an operating permit after June 6, 1991 or the effective date of rules required under the Act, whichever is later. Permits have a renewable term of 5 years.

Under the statute, MDEQ must promulgate administrative rules covering both medical and pathological waste incinerators. The rules must cover design and operation, ash handling and quality, stack design, requirements for receiving off-site waste, air pollution control requirements, performance monitoring and testing, and inspection and maintenance requirements.[3] However, despite an effective date of March 30, 1995 on the statutory section establishing this provision, it appears that MDEQ has not yet finally issued the required regulations. A public hearing was held in August 1999 on rules which respond to part of the state statutory mandate, but the primary purpose of the rules was to adopt recently challenged federal standards for medical waste incinerators

Also, under the statute, within 2 years after the effective date of the rules which haven't yet been finally issued, MDEQ must then review all current permits and determine which facilities do not comply with the rules. Such non-complying facilities would only receive a 1 or 2 year permit and would have certain restrictions on accepting off-site medical waste. To the best of the knowledge of this reviewer, none of these events have yet occurred because of the extensive Michigan Department of Environmental Quality delay in issuance of medical waste incinerator regulations.

3.3 Regulation of Both Process Equipment and Processes

Under NREPA and MDEQ's rules, both process equipment and processes are regulated. In other words, an emission source that doesn't change their process equipment but does change the processes running in that equipment cannot do so without obtaining a permit to install.[4]

For certain industries, such as the pharmaceutical and specialty chemical industries, common practice is to run many different processes through the same process equipment. Each such process will, in general, use different chemical feedstocks and intermediates, and also have different emissions. As a result, permits for changes in

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[2] MCL 324.5504

[3] MCL 324.5504(5)

[4] MCL 324.5505(1-3)

processes where there is no change in the process equipment can be important for public health and environmental protection.

3.4 Exemptions from Enhanced Criminal Penalties for Certain Toxic Releases

NREPA criminal enforcement provision contains a basic criminal penalty for criminal violations of the act, including misdemeanor violations punishable by up to one year of imprisonment and not more than $10,000 per day in penalties.[5]

NREPA also contains enhanced felony violations of the Act[6] with more stringent fines and imprisonment for releases which pose more serious threats to public health and safety, or are more clearly knowing violations with intent and knowledge of potential consequences. However, at the time these enhanced penalties were enacted, the automotive, steel and other industrial interests successfully lobbied for an exemption for certain releases. Under these provisions, air emissions of the following substances cannot be penalized with the enhanced felony criminal penalties:

> Compounds of antimony, arsenic, arsine, beryllium, cadmium, chromium, cobalt, cyanide, lead, manganese, mercury, nickel and selenium; coke oven emissions, glycol ethers, finer mineral fibers, polycyclic organic matter and radionuclides.[7]

4 Michigan Department of Environmental Quality Administrative Rules Affecting Toxic Air Pollution

4.1 Michigan's General Duty Rule on Air Pollution and the Environmental Acceptability Rule

Michigan has a general duty rule designed to control air pollution of all types, including toxic air contaminants, and to otherwise abate what amount to common law nuisances from air pollution:

> "Rule 901. Notwithstanding the provisions of any other commission rule, a person shall not cause or permit the emission of an air contaminant or water vapor in quantities that cause, alone or in reaction with other air contaminants, either of the following:
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> > (a) Injurious effects to human health or safety, animal life, plant life of significant economic value, or property.

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[5] MCL 324.5531(1-2)

[6] MCL 324.5531(3-7)

[7] MCL 324.5531(12)(b)

> (b) Unreasonable interference with the comfortable enjoyment of life and property."[8]

Rule 901 provides broad authority to prevent air pollution that damages public health and environment. However, carrying out such regulation may be difficult if a polluter can make a case against the agency of selective prosecution or abuse of discretion.

Another important rule provides that applications for permits to install must contain:

> "Data demonstrating the effect of the air contaminant emissions on human health and the environment."[9]

This provision has been in the permit to install rules since the 1970s and was used by MDNR for several years to develop further efforts to control toxic air pollution through individual permit decisions.

4.2 A Quick Overview of Michigan's Specific Rules for Airborne Toxicants

In general, Michigan's toxic air pollution rules require certain emission control technologies for new or modified sources that meet the rule's requirements for Toxics Best Available Control Technology (T-BACT).

In addition, these new/modified sources must show they will meet ambient screening concentration limits for toxic air contaminants in community ambient air during the permit process review process. Ambient screening limits vary based on whether a particular pollutant is regarded as a carcinogen or non-carcinogen. The rules also provide exemptions from certain requirements and detailed procedures for developing ambient screening concentration limits.

Ambient screening concentration limits are not like air quality standards. There is no ambient, community air quality monitoring or post construction enforcement for ambient screening limits. The applicant must use an air quality modeling demonstration or other method to show compliance with ambient screening limits during the permit application, review and approval process. After this demonstration is made, stack emission limitations are imposed on the proposed new/modified source in their permit to ensure that the ambient impact of the source during operation will be less than the

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[8] Michigan Administrative Code (MAC) 336.1901, prohibited emissions in general duty rule.

[9] MAC 336.1203(1)(h), environmental acceptability data in permit applications.

screening limits applied during the permit review process. The emission limitations for toxic air pollutants in permits to install are the permit provisions that are subject to later enforcement after operation commences.

Michigan's toxic air pollution rules apply only to permits for new and modified toxic air pollutant sources. Except for a few industrial source categories with specifically set rules, Michigan does not have rules to control toxic air pollution from existing sources other than rules designed to meet minimum federal requirements for certain federally regulated hazardous air pollutants. Although the Michigan rules only affect permits for new/modified sources, many industrial sources eventually come under the toxic air pollution rules as a result of emission increases and/or changes from increased production or industrial process modification.

New and modified sources are expected to meet emission limits by implementing the emission control technologies required by the rule. However, if modeling shows that a source with T-BACT controls would still exceed an ambient screening concentration limit, then the source must either install a more effective emission control system or cleaner process (providing greater emission control performance than T-BACT) or a source may increase its stack height to lower predicted maximum ground-level concentrations of toxic pollutants downwind of the source. However a source choosing the latter solution can only gain credit for a limited stack height increase under the MDEQ rules.

Michigan does not have a list of toxic air pollutants for which the rule is applicable. All "non-criteria" pollutants[10] are regulated under the rule unless they are subject to a "small emission exemption" or they are on a specific "de-list list" that specifically exempts certain pollutants.

The requirements of Michigan's rules default to certain federal requirements if the Environmental Protection Agency has promulgated certain standards under Section 112 of the Federal Clean Air Act for an industrial process that emits one of the 189 federally regulated hazardous air pollutants (HAPs).

4.3 The Definition of a "Toxic Air Contaminant" (TAC)

Michigan's rules define "toxic air contaminants" as follows:

[10] Non-criteria pollutants are the vast majority of air contaminants for which the U.S. EPA has not published National Ambient Air Quality Standards (NAAQS). The NAAQS pollutants are particulate matter, sulfur dioxide, nitrogen oxides, ozone, lead and carbon monoxide.

> "(f) "Toxic air contaminant" or "TAC" means any air contaminant for which there is no national ambient air quality standard and which is or may become harmful to public health or the environment when present in the outdoor atmosphere in sufficient quantities and duration."[11]

Michigan's rules thus do not attempt to declare a list of toxic air contaminants that are subject to regulation. However, additional provisions in the definition of "toxic air contaminant" specifically exclude certain materials.[12]

MDEQ Air Quality Division staff have consistently opposed establishing a list of regulated toxic air contaminants for new and modified sources. MDEQ-AQD first articulated this position in the 1970's by staff requesting under the rules that permit applicants submit information on the "environmental acceptability" of all emitted air contaminants. Despite heavy industrial pressure during adoption of the original toxic air pollution rules in the early 1990's, MDEQ-AQD has consistently opposed a list of toxic air contaminants. More recently, this issue again surfaced at industrial initiatives during advisory committee deliberations in 1997-98 and again MDEQ-AQD has prevailed to ensure that all toxic air contaminants from new and modified sources remain regulated under the rule.

4.4 Michigan's Emission Control Technology Requirements for Airborne Toxicants

4.4.1 Definition of Best Available Control Technology for Toxics (T-BACT)

Michigan provides both a regulatory definition of Best Available Control Technology for Toxics (T-BACT) and more informal guidance on how T-BACT decisions should be made. Under the rules, T-BACT is defined as follows:

> "(a) "Best available control technology for toxics" or "T-BACT" means the maximum degree of emission reduction which the Department determines is

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[11] Michigan Administrative Code (MAC) 336.1120(f)

[12] MAC 336.1120(f)(I-xxxx) specifically excludes the following substances from being considered as "toxic air contaminants:" Acetylene, Aluminum metal dust, Aluminum oxide (nonfibrous forms), Ammonium sulfate, Argon, Calcium carbonate, Calcium hydroxide, Calcium oxide, Calcium silicate, Calcium sulfate, Carbon dioxide, Carbon monoxide, Cellulose, Coal dust, Emery, Ethane, Graphite (synthetic), Grain dust, Helium, Hydrogen, Iron oxide, Lead, Liquefied petroleum gas (l.p.g.), Methane, Neon, Nitrogen, Nitrogen oxides, Nuisance particulates, Oxygen, Ozone, Perlite, Portland cement, Propane, Silicon, Starch, Sucrose, Sulfur dioxide, Vegetable oil mist, Water vapor, Zinc metal dust.

reasonably achievable for each process that emits toxic air contaminants, taking into account energy, environmental, and economic impacts and other costs."[13]

From an environmental perspective, the T-BACT definition emphasizes a "maximum degree" of control and specifically calls for attention to the environmental impact of a particular toxic pollutant emission. T-BACT is not as stringent as EPA's "top down BACT" procedure for new and modified criteria pollutant sources subject to Prevention of Significant Deterioration (PSD) permitting requirements in clean air areas or the Clean Air Act requirements for Lowest Achievable Emission Rate (LAER) required for new emission sources in dirty air locations. However, Michigan's T-BACT is more stringent than what might be called "reasonably available control technology (RACT)," since the "maximum degree" of control and environmental considerations are both explicitly emphasized.

The Department has published guidance on conducting a T-BACT analysis.[14] The guidance emphasizes analysis from a process standpoint, requires examination of the entire demonstrated range of control technology options and includes the requirement to examine controls that could be achieved by technology transfer and innovative controls. The guidance emphasizes that technology decisions are ultimately expressed as emission limitations and that such limitations must be enforceable with requirements for monitoring and record keeping.

The guidance's specific procedure for making T-BACT decisions is set forth in the table below:

Step	Procedures for Making a Best Available Control Technology Decision for Toxics
1	Determine which "toxic air contaminants" are to be evaluated in the T-BACT Analysis
2	Determine all potential process emissions, including fugitive emissions (i.e. each stack or vent, relief valves, pumps, storage piles or tanks, conveyers, valves, etc.)
3	Identify and consider any potentially sensitive concerns involving energy, economic and environmental issues.
4 A	Determine the "base case" level of emission control that would have been applied in the absence of the T-BACT analysis, such a minimal federal requirement or the level of control generally used in industry practice.

[13] MAC 336.1102(a)

[14] Final Report of the Michigan Air Toxics Policy Committee, a Proposed Strategy for Processing Air Quality Permit Applications for New Emission Sources of Toxic Air Pollutants, Michigan Department of Natural Resources, September 14, 1989; Appendix A, Page 45-47

4 B	Identify alternative control strategies which are available at the time of the submission of a complete permit application that afford greater control, including: (a) processes that inherently produce less pollution (b) various configurations of the same technology which achieve different control efficiencies (c) examination of alternative control technologies through literature search of technical literature, industrial publications, EPA clearinghouses on emission control technology and toxicants and surveys of EPA/State/Local air pollution control agencies.
5	Determine if the alternative with the greatest emission reduction is not reasonable because of energy, economic or environmental impacts or other costs. If necessary, continue evaluating the less efficient alternatives. T-BACT is the most efficient alternative which is not demonstrated to be unreasonable. Examples of conditions making alternatives unreasonable include unavailability of natural gas for an afterburner, project would no longer be economically feasible because of increased cost, increased cost is out of proportion to the environmental benefit or disposal of process sludge byproduct would be difficult or environmentally damaging.
6	Establish emission limits with reasonable margin of safety (i.e. 95% confidence level of available test data); establish averaging time if necessary; and establish appropriate stack testing, continuous emission monitoring, record-keeping and reporting requirements.

4.4.2 Applicability of the Best Available Control Technology for Toxics Requirement

Under Michigan's rules, if a new or modified source is required to have a permit to install under Michigan's Air Use Approval rules[15] and the source discharges toxic air contaminants, its emissions of toxic air contaminants cannot exceed the maximum allowable emission rate based on the application of T-BACT.[16]

The act of modifying an existing source is defined as follows:

"(j) "Modify" means making a physical change in, or change in the method of operation of, existing process or process equipment *which increases the amount of*

[15] MAC 336.1279 through 336.1290 provide a description of all industrial processes which are explicitly exempt from the requirement to obtain a permit to install for new and modified sources.

[16] MAC 336.1224(1), T-BACT requirements

> *any air contaminant emitted into the outer air* which is not already allowed to be emitted under the conditions of a permit or order or *which results in the emission of any toxic air contaminant into the outer air not previously emitted.* An increase in the hours of operation or an increase in the production rate up to the maximum capacity of the process or process equipment shall not be considered to be a change in the method of operation unless the process or process equipment is subject to enforceable permit conditions or enforceable orders which limit the production rate or the hours of operation, or both, to a level below the proposed increase."[17] (Emphasis added)

Because many sources are modified for increases in production, changes in industrial processes and/or changes in feedstocks or products produced, the effect of the "modify" definition is to eventually bring a large cohort of existing sources under the new/modified source rule and subsequent technology and health-based screening procedures.

The rules exempt certain sources from the requirement for T-BACT if they already comply with certain fairly stringent federal emission control requirements or if they are small sources of toxic air contaminants with screening levels reflecting a lessor toxicity.[18] These exemptions for the T-BACT requirement are summarized in the following table:

[17] MAC 336.1113(j), definition of the act of modifying a source.

[18] MAC 336.1224(2)

Emission Sources with Exemptions from Michigan's T-BACT Requirements
Emission units for which Federal Maximum Achievable Control Technology (MACT) standards have been published by the U.S. Environmental Protection Agency; Emission units for which a "case by case" MACT determination has been carried out under Section 112(g) or 112(j) of the Clean Air Act (a determination which might be made in another state or by an EPA region)
Emission units emitting particulate matter (PM) or volatile organic compounds (VOC) which are in compliance with PM and VOC controls required in a federal Prevention of Significant Deterioration (PSD) permit controlled with PSD-Best Available Control Technology or sources which achieve requirements for permits in dirty air regions to install Lowest Achievable Emission Rate (LAER) emission control technology
Proposed new or modified emission units that emit 0.1 pounds/hour or less of a carcinogen (cancer causing) toxicant or 1.0 pounds/hour or less of a non-carcinogenic toxic compound; provided that the initial risk screening level (IRSL) for the carcinogen is greater than 0.1 micrograms per cubic meter (ug/M3) and the initial threshold screening level (ITSL) of the non-carcinogen toxicant is less than 200 ug/M3.[19]

4.5 Michigan's System for Evaluating and Limiting Residual Risks from Human Exposure to Toxic Air Contaminants Emitted from New and Modified Sources

4.5.1 Sources Must Comply with Health-Base Ambient Screening Levels

Michigan's rules set ambient screening limits for both carcinogens and non-carcinogens that are designed to protect human health from residual risks caused by toxic air contaminant emissions remaining after the application of T-BACT emission controls. During the permit application, evaluation and approval process for new and modified sources, compliance with such ambient screening limits is evaluated through worst case modeling and such permits will incorporate emission limitations to ensure community ambient impacts will be limited during source operation.

[19] The initial risk screening level is an ambient concentration on an annual average that is equivalent to a 70 year lifetime exposure equivalent to a cancer risk incidence of one in a million.

The idea with the way this small source exemption is written is that the most highly toxic compounds will not be eligible for the exemption....i.e. their screening level ambient concentrations will be below those stated.

These ambient screening limits are derived to protect human health from the inhalation of toxic air pollutants. Under the rules, a permit for a new/modified source must contain emission limitations sufficient to ensure that the ambient screening concentrations will be met at the location in the community outside of company fence lines where air quality modeling predicts the maximum ground level concentration of a toxic pollutant will occur.

The rules establish a process for determining two health-based limits, an initial risk screening level (IRSL) and a secondary risk screening level (SRSL), for emissions of a cancer causing substance. The rules establish a single limit, an initial threshold screening level (ITSL), for all other toxic air contaminants. How these screening levels are set is discussed in a subsequent section of this memo. All new or modified sources subject to the permit to install requirement must ensure their predicted community ambient impacts will meet these limits.[20] The rule does not address (other than in the case-by-case provisions discussed below) contributions to ambient air levels and human health risks from background concentrations and other sources of a particular toxic air contaminant.

Ambient air levels of a particular pollutant are predicted by air quality models.[21] If a source's predicted levels exceed the rule's ambient limits, it may either use emissions controls or other changes to reduce its emissions, or it may increase its stack height to better disperse pollutants. However, the source may not use a stack height that exceeds

[20] MAC 336.1225(1), health-based screening level requirements for new and modified sources

[21] MAC 336.1240-336.1241, requirements and procedures governing air quality modeling

"good engineering practice"[22] or another impermissible technique for increasing dispersion of pollutants.[23]

Alternatively, if a source is unable to demonstrate compliance with the initial risk screening level for the new and modified source of emissions of a carcinogen, a permit may still issue if the source can show that total predicted ambient concentration from both the new/modified source and from all other existing emission units at a major stationary source will not exceed the secondary risk screening level.[24]

In 1998, the rule was amended at the request of Dow Chemical Company, the Michigan Manufacturers Association and others to relax the requirement to comply with the Initial Risk Screening Level (IRSL) and the Secondary Risk Screening Level (SRSL) by a factor of 10 for exposures occurring on industrial property and public roadways.

If a new/modified source's emissions of a carcinogen fall on adjacent industrial property or on a public roadway, the predicted maximum ambient concentration of that

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[22] The definition of "good engineering practice" (MAC 336.1107(c))

> (c) "Good engineering practice design" means, with respect to stack heights, the height necessary to insure that emissions from the stack result in acceptable concentrations of air contaminants in the immediate vicinity of the stationary source as a result of atmospheric downwash, eddies, and wakes which may be created by the stationary source itself, nearby structures, or nearby terrain obstacles and shall not exceed the greatest of the following limits:
>
> (i) Two hundred and thirteen feet (65 meters).
>
> (ii) Two and one-half times the height of the structure or nearby structure for those stacks for which construction or modification commended on or before January 12, 1979, if the owner or operator produces evidence that this relationship was actually relied upon in designing the stack to insure protection against downwash.
>
> (iii) The sum of the height of the structure or nearby structure plus 1.5 times the lesser of the height or width of the structure or nearby structure for those stacks for which construction or modification commenced after January 12, 1979.
>
> (iv) Such height as an owner or operator of a stationary source demonstrates, to the satisfaction of the commission, is necessary through the use of field studies or fluid models after notice and opportunity for public hearing.

[23] MAC 336.1241(1)(f), permissible credit for stack heights

[24] MAC 336.1225(2), provisions for compliance with a secondary risk screening level

chemical can be 10 times the initial risk screening level (IRSL). Any impacts on land that is not a public roadway and is not industrial property must still comply with the initial risk screening level.[25, 26]

Similarly, a source can show compliance with a predicted maximum impact of ten times the secondary risk screening level from the combined impact of both a new/modified source plus all previously installed existing sources at an industrial complex if the maximum impact is on a public roadway or industrial property, while ensuring all other impact sites to which the public is exposed meet the secondary risk screening level.[27]

Industrial property is defined as:

> "(5) For the purposes of this rule, industrial property includes only property where the activities are industrial in nature, for example, manufacturing, utilities, industrial research and development, or petroleum bulk storage. The term industrial property does not include farms or commercial establishments."[28]

The rule also requires that if a land use changes after a permit determination based on industrial zoning is made, the source must submit a plan for complying with the requirement for non-industrial land within one year.[29]

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[25] MAC 336.1225(3)(a), impacts on public roadways and industrial property

[26] There is a toxicological basis for the factor of 10 times the initial risk screening level for industrial zoning. The IRSL assumes 24 hour, 7 day a week, 70 year lifetime exposure in a cancer risk assessment of the carcinogenic pollutant concentration equivalent to one in a million risk. An industrial exposure scenario goes to assumptions of 8 hours per day, 5 days per week and a 30 year exposure. It turns out that the risk from industrial exposure to 10 times the IRSL produces the same level of risk – one in a million – as the general public exposure scenario to IRSL compliant air.

Notwithstanding this fact, environmental and public health organizations still opposed this relaxation because it will allow increased emissions from new/modified sources of carcinogens over what would have been permitted under the old rule. This will lead to increased exposures on non-industrial property, although still below the IRSL or SRSL, because a source would have had to reduce emissions at all times to meet the IRSL on industrial property if that was where the maximum ambient predicted concentration was located, thus also lowering exposure on non-industrial property.

[27] MAC 336.1225(3)(b), secondary risk level on public roadways and industrial property

[28] MAC 336.1225(6)

[29] MAC 336.1225(4)

In dealing with emissions of the highly toxic poly-chlorinated dibenzo-dioxins/furans (PCDD/PCDF), the Michigan rules consider all such toxic air contaminants to be one compound expressed as toxic equivalent concentrations of the most toxic chlorinated dioxin form, 2,3,7,8-tetrachlorodibenzo(p)dioxin, based on the relative potency of the different chlorinated dioxin forms emitted.[30] With a system of toxic equivalents, each of the several chlorinated dibenzo-dioxin/furan chemical forms are weighted according to their toxicity in comparison to the most toxic form (2,3,7,8-tetrachlorodibenzo(p)dioxin. Then the distribution of emissions and ambient concentrations of this family of highly toxic substances can be normalized to the emissions equivalent of the most toxic form in this family of related toxic materials.

The Michigan rules also provide that:

> "If 2 or more toxic air contaminants are present and known to result in toxicological interaction, then the interactive effects shall be considered in establishing initial threshold screening levels, initial risk screening levels, and secondary risk screening levels."[31]

4.5.2 Exemptions from Health-Based Screening Level Requirements

Some new/modified sources subject to permit to install requirements are exempt from health-based screening level analysis and limitations. The rule provides four different scenarios when the health-based screening level does not apply.

4.5.2.1 Small Source Exemption

The first exemption is for small sources. A new/modified source with an emission rate of less then 10 pounds per month and less than 0.14 pounds per hour is exempt from meeting the Initial Threshold Screening Level as long as the toxic air contaminant emission is not a carcinogen or a "high concern" toxic air contaminant listed in Table 20 of the rule.[32]

Table 20 is a list of 38 compounds with serious acute or chronic effects at low doses. The list includes pulmonary irritants and sensitizers, reproductive toxicants,

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[30] MAC 336.1225(6)(a), all PCDD/PCDF's considered as TCDD toxic equivalents

[31] MAC 336.1225(6)(b), toxic air contaminants acting by the same mechanism of toxicity.

[32] MAC 336.1226(a)(i-ii)

neurotoxicants, certain highly toxic metals and other compounds with very serious potential acute and chronic effects upon human exposure.

4.5.2.2 Exemption Based on Federal Residual Risk Standards

The second exemption from the health-based screening levels is applied if the U.S. Environmental Protection Agency publishes residual risk standards for the applicable industrial source category. Although EPA has made the required report to Congress under the Clean Air Act, no such standards have been promulgated to date and none are expected for a long time.[33]

4.5.2.3 Exemption Based on the Existence of a Federal National Emission Standard for Hazardous Air Pollutants

A number of air contaminants and industrial processes are specifically exempt if EPA published a National Emission Standard for Hazardous Air Pollutants (NESHAPs) on or before November 14, 1990 and the air contaminant is a federally regulated hazardous air pollutant under Section 112(b) of the Clean Air Act. The exempted source categories are listed in the table below.[34]

NESHAP Source Categories Exempted from Health-Based Screening Levels
Subpart B - NESHAP for radon-222 emissions from underground uranium mines.
Subpart C - NESHAP for beryllium
Subpart D - NESHAP for beryllium rocket motor firing.
Subpart E - NESHAP for mercury.
Subpart F - NESHAP for vinyl chloride.
Subpart H - NESHAP for radionuclide emissions from Department of Energy facilities
Subpart I - NESHAP for radionuclide emissions from facilities licensed by the nuclear regulatory commission and federal facilities not covered by subpart H.

[33] MAC 336.1226(b), exemption for section 112(f) sources. See also 42 USC §7412(f), Federal Clean Air Act

[34] MAC 336.1226(c), exemption from health-based limits for certain NESHAP industrial sources.

Subpart J - NESHAP for equipment leaks (fugitive emission sources) of benzene.
Subpart K - NESHAP for radionuclide emissions from elemental phosphorus plants
Subpart L - NESHAP for benzene emissions from coke-by-product recovery plants.
Subpart M - NESHAP for asbestos.
Subpart N - NESHAP for inorganic arsenic emissions from glass manufacturing plants.
Subpart O - NESHAP for inorganic arsenic emissions from primary copper smelters.
Subpart P - NESHAP for inorganic arsenic emissions from arsenic trioxide and metallic arsenic production facilities.
Subpart V - NESHAP for equipment leaks (fugitive emission sources).
Subpart W - NESHAP for radon-222 emissions from licensed uranium mill tailings.
Subpart Y - NESHAP for benzene emissions from benzene storage vessels.
Subpart BB - NESHAP for benzene emissions from benzene transfer operations.
Subpart FF - NESHAP for benzene waste operations.

4.5.2.4 Exemption for Special Demonstration and Case-by-Case Review

Under the rules, a source may submit a demonstration to the satisfaction of the MDEQ AQD that a new/modified source emission "will not cause or contribute to a violation of the provisions of R 336.1901" (See Section 4.1 for the text of rule 901). In this type of demonstration the usual methodology for determining ambient risk and threshold screening limits is not used. Instead, the source can provide the following information about its predicted emissions and make an alternate demonstration of public health protection and environmental acceptability:

"(i) All available information on the health effects of the toxic air contaminant.

(ii) The levels at which adverse health or environmental effects have occurred.

(iii) Net air quality benefits that would occur as a result of replacing an existing facility.

(iv) Actual exposure levels and duration of exposure.

(v) The uncertainty in data or analysis.

(vi) Other supporting information requested by the department."[35]

4.5.3 Allowable Methods to Demonstrate Compliance with Screening Levels

While sources must typically use modeling to show compliance with community ambient screening concentrations, recent amendments to Michigan's toxic air pollution rules created two other short hand methods for assuring compliance with health-based screening levels under the rules.[36] These provisions are recent amendment to the rule from 1998 that are intended to reduce regulatory burdens on industry by allowing non-modeling approaches that have been pre-tested for conservatism for showing compliance with screening levels. A detailed discussion of these methods is outside the scope of this paper.

This same rule also provides a procedure for dealing with screening level compliance when emissions are intermittent and are not continuous.[37]

4.5.4 More Stringent Toxic Air Contaminant Emission Limitations Done on a Case-by-Case Basis for Special Cases, Environmental Effects and Other Matters

Michigan does not have any specific rules requiring multi-pathway risk assessment (i.e. assessments which look at all pathways of exposure and not just inhalation) for persistent bioaccumulative toxicants. However, the rules do provide for a case by case procedure to consider and evaluate such effects and to set a more stringent emission limitation than would simply be provided by T-BACT and by the health-based screening procedure.

> "The department may determine, on a case-by-case basis, that the maximum allowable emission rate determined in R 36.1224(1), R 336.1225(1), R 336.1225(2), or R 336.1225(3) may not provide adequate protection of human health or the environment. In this case, the department shall establish a maximum allowable emission rate considering all relevant scientific information, such as exposure from routes of exposure other than direct inhalation, synergistic or

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[35] MAC 336.1226(d), case by case demonstration of health-based and environmental acceptability

[36] See MAC 336.1227(a) and 336.1227(b)

[37] MAC 336.1227(2), intermittent emission rule.

additive effects from other toxic air contaminants, and effects on the environment."[38]

Under this provision, MDEQ has the discretion to conduct a case by case review of non-inhalation risks, ecological risks and special case compounds that may be dangerous as a result of their neurotoxicity, reproductive toxicity or potential for endocrine disruption. MDEQ may then impose more stringent emission limitations than are required by regular technology and health-based reviews under the rules.

For example, MDEQ recently conducted non-inhalation risk assessment associated with permitting a mini-steel mill in Flint, MI, and considered the problems of mercury fish contamination in their review of a proposed municipal waste incinerator near Pontiac several years ago.

4.5.5 MDEQ's Informational List on Health-Based Screening Levels and T-BACT Determinations

Michigan's rules provide that MDEQ Air Quality Division maintains an up-to-date list of determinations of health-based screening levels and T-BACT determinations. This informational list is available through the MDEQ-AQD Toxics Unit.[39] MDEQ is required to publish the chemical abstract numbers and the basis of the determination for ITSLs, IRSLs and SRSLs and determinations made under the case by case procedures of the rules, as well as T-BACT determinations.[40]

4.6 Proposed Medical Waste Incinerator Rules

On August 4, 1999, MDEQ held a public hearing on new medical waste incinerator rules. The proposed rules adopt the existing federal Maximum Achievable Control Technology standards, except for mercury. MDEQ-AQD propose somewhat more stringent mercury emission limitations from such incinerators. In addition, MDEQ's proposed rules require a more detailed mercury waste pollution prevention plan than is required in the federal rules. At this writing, the medical waste incinerator rules are not yet finalized.

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[38] MAC 336.1228, requirements for a most stringent emission limitation than is required for T-BACT and for health-based screening levels.

[39] Download this information at http://www.deq.state.mi.us/aqd/toxics/itslpage.html

[40] MAC 336.1230, information list for health-based screening levels and T-BACT determinations.

4.7 Emission Averaging and Trading and Clean Corporate Citizen Rules

Two recent regulatory relaxation and flexibility efforts in the adoption of emission averaging/trading rules and the so-called Clean Corporate Citizen rules have the potential to affect certain toxic air contaminant issues. Detailed examination of the effects of these programs on toxic air contaminants is outside the scope of this memo.

However, emission averaging and trading may have the potential to create certain "hotspots" if not properly managed. The Clean Corporate Citizen rules will reduce public notice and participation before commencement of construction of certain new/modified toxic air contaminant sources; it may also lead to less stringent regulation and less review of industry proposals by MDEQ-AQD permitting staff.

Appendix 1 — Determination of Ambient Screening Levels under Michigan's Rules to Control Toxic Air Contaminants

5 Derivation of the Initial Risk and Secondary Risk Screening Levels for Carcinogenic Toxic Air Contaminants

For carcinogenic toxic air contaminants, Michigan's rules provide for an initial risk screening level (IRSL) and a secondary risk screening level (SRSL). The IRSL is the concentration in ambient air with an annual averaging time for a possible, probable or known human carcinogen that is calculated using the methods of the rule to produce a lifetime cancer risk of one in a million. The SRSL is similar but is calculated to produce a lifetime cancer risk of one in one hundred thousand.

IRSLs and SRSL can be determined by different methods under the rule. Each depends on understanding the concept of *unit risk.* The unit risk is equal to the additional lifetime cancer risk occurring in a population in which all individuals are exposed continuously for life to a concentration of 1.0 microgram per cubic meter of the carcinogenic chemical in the air they breath

If the U.S. Environmental Protection Agency has developed a unit risk value according to EPA's 1986 guidelines for carcinogen risk assessment, this value shall be used.

If EPA has not published a unit risk value, then the rule allows MDEQ AQD toxicologists to develop a unit risk value from a statistical model, known as the linearized multistage computer model. The model is based on the upper 95% confidence limit on the risk prediction from available animal carcinogenic bio-assays. The linearized model is used to predict the potency of the chemical to induce cancer at low doses based on higher dose animal carcinogenicity tests.

The model provides a procedure for examining the quality and the fit of specific animal test results. The model also provides an adjustment factor to account for the different human dose compared to animal doses to arrive at comparable doses on the basis of milligrams of a toxicant per body surface area per day, all based on a 70 kilogram person and their associated respiratory rate of 20 cubic meters of air per day. Additional adjustment factors are assumed for absorption efficiency by the inhalation route of exposure as compared to oral routes of exposure is this was the type of animal test that was done.

It is also possible to use a different method of deriving the unit risk by use of:

> "Any alternative cancer risk assessment methodology which can be demonstrated to the Department to be more appropriate based on biological grounds and which is supported by scientific data."[41]

This later provision opens the way to use EPA's proposed updated methods for carcinogenic risk assessment published in April, 1996.[42] The later provision also opens the way for the use of pharmocokinetic and pharmacodynamic approaches (usually used by industry seeking less stringent regulation) in which it is argued that carcinogenisis occurs in test animals by biochemical means that may not occur in humans, or that a particular carcinogenic result in humans depends not on the chemical agent itself but on a metabolite (breakdown product) of the chemical substance in the human body.

Once a unit risk is determined, the IRSL and the SRSL are determined by the following equations:

$IRSL = 1 * 10^{-6} / \text{unit risk}$ $SRSL = 1 * 10^{-5} / \text{unit risk}$

In plain English, continuous exposure to the IRSL ambient concentration is equivalent one in a million lifetime cancer incidence. Continuous exposure to the SRSL ambient concentration is equivalent to one in one hundred thousand lifetime cancer incidence.

6 Derivation of the Initial Threshold Screening Level for Toxic Air Contaminants that are not Carcinogens

The initial threshold screening level (ITSL) is an ambient concentration of a toxic air contaminant in the air which is not expected to result in adverse health effects with human exposure. In general, the derivation of ITSLs are based, either directly or indirectly, either on no observable effects level (NOEL) or lowest observable effects levels (LOEL) testing in animals or evidence and experience from human exposures in occupational settings (also supported by animal data), or use of acute lethal toxicity testing with adjustment by a number of conservative safety factors. The following table illustrates the derivation and selection of ITSLs pursuant to the Michigan rule:[43]

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[41] MAC 336.1229(c), alternate means of carcinogenic potency of a toxic air contaminant

[42] A description of the main features by which the proposed 1996 guidelines differ from the 1986 guidelines, as well as a location where the 1996 proposed guidelines may be downloaded can be found on the Internet at http://www.epa.gov/ORD/WebPubs/carcinogen/

[43] This hierarchical procedure for determination of an initial threshold screening level is set forth in MAC 336.1232.

	Derivation of Michigan Initial Threshold Screening Levels for Toxic Air Contaminants that are not Carcinogens
Condition	**The ITSL Value**
If an EPA inhalation reference concentration (RfC)[44] exists or can be developed from available data	The ITSL is equal to the inhalation reference concentration (RfC) with a 24 hour averaging time
If an EPA RfC isn't available or can't be developed; and an EPA oral reference does (RfD) is available	The ITSL value equals Oral RfD * (70 kg/20m^3) as long as data is not available to indicate that the oral route to inhalation route extrapolation is inappropriate. Averaging time is 24 hours. The extrapolation assumes a 70 kg adult breathing 20 cubic meters of air per day.

[44] MAC 336.1109(c) provides:

(c) "Inhalation reference concentration" or "RfC" means a conservative estimate of the daily exposure to the human population, including sensitive subgroups, that is likely to be without appreciable risk of deleterious effect during a lifetime. The inhalation reference concentration is for continuous inhalation exposures and is expressed in units of milligrams per cubic meter (mg/m^3).

EPA's RfC definition:

"An estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious noncancer effects during a lifetime." (From EPA's IRIS system)

If an EPA RfC and Rfd are not available and cannot be derived; and an occupation exposure guideline is available	ITSL = Occupational Exposure Limit / 100 Where the occupational exposure limit is the lowest value recommended by either the National Institute for Occupational Safety and Health (NIOSH) in 1994[45] or a Threshold Limit Value (either time-weighted average or ceiling value)[46] published in 1996. ITSL averaging time is 8 hours if based on a time-weighted average TLV; if based on a ceiling value TLV or a NIOSH recommended exposure level, the ITSL averaging time is 1 hour.
If RfC, RfD or occupational exposure levels are not available; and if a 7 day (or comparable) ***inhalation*** No Observable Adverse Effects Level (NOAEL) or Lowest Observable Adverse Effects Level (LOAEL) animal toxicology testing data is available, then...	ITSL = (NOAEL / 35 * 100) * (hours exposed per day/24 hours) ITSL = (LOAEL / 35 * 100 * UF) * (hours exposed per day/24 hours) Where UF is a case by case uncertainty factor considering type and severity of effect Both ITSLs are for an annual average 35 is a safety factor to extrapolate from a 7 day test to lifetime exposure and 100 is to account for species difference between laboratory test animal an a human

[45] Published values must come from the "NIOSH Pocket Guide to Chemical Hazards," published by the National Institute for Occupational Safety and Health, June 1994.

[46] Published values must come from the "1996 TLVs and BEIs," published by the American Conference of Governmental Industrial Hygienists.

If RfD, RfD, occupational exposure levels and inhalation NOAEL/LOAEL are not available; if a 7 day (or comparable) ***oral*** No Observable Adverse Effects Level (NOAEL) or Lowest Observable Adverse Effects Level (LOAEL) animal toxicology testing data is available, then	ITSL = (NOAEL / 35 * 100) * (W_A / I_A) * (b / a) ITSL = (LOAEL / 35 * 100 * UF) * (W_A / I_A) * (b / a) Where UF is a case by case uncertainty factor considering type and severity of effect W_A = Body weight of experimental animal I_A = Daily inhalation rate of experimental animal b = Absorption efficiency by oral route of exposure a = Absorption efficiency by inhalation route of exposure Safety factors are the same as for inhalation NOAEL/LOAEL Both ITSLs are for an annual average
If RfD, RfD, occupational exposure levels and inhalation/oral NOAEL/LOAEL are not available; but a Lethal Concentration -50 (at which 50% of test animals die) is available	For a 4 hour LC-50 test (preferred) ITSL = LC-50 / (500 * 100) ---- annual averaging time For a 1 hour LC-50 test ITSL = LC-50 / (500 * 100 * 40) ---- annual averaging time Where 500 is a factor to extrapolate from an LC-50 to a lifetime NOAEL; 100 is a species and individual differences safety factor; and 40 is a safety factor accounting for a 1 hour test as opposed to a 4 hour LC-50 test.
If RfD, RfD, occupational exposure levels, inhalation/oral NOAEL/LOAEL and an inhalation LC-50 are not available; but an oral LD-50 is available (oral dose at which 50 % of test animals die)	ITSL = (LD-50 / (500 * 100 * 40)) * (0.167 * W_A / I_A) ---- annual averaging time (See above for variable definitions) Where 500 is a factor to extrapolate from an LC-50 to a lifetime NOAEL; 100 is a species and individual differences safety factor; and 40 is a safety factor accounting for a 1 hour test as opposed to a 4 hour LC-50 test. Other factors convert an oral LD-50 dose into an equivalent 4 hr LC-50 dose.

If there is no EPA guidance, no toxicological data or other guidance at all	ITSL = 0.1 micrograms per cubic meter, annual averaging time This default presumption is based on studies which relate short term values for toxicity to long tern no observable adverse effects levels; the objective was to find a value for which there would be a 95% confidence that, for an unknown, compound such pollutant concentration would be protective of human health.