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Comprehensive Regulatory Control and Oversight of Industrial Sand (Frac Sand) Mining

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Fifth in a series

#137 (May 2015): Environmental Impacts of Industrial Silica Sand (Frac Sand) Mining

#138 (June 2015): Economic Impacts of Industrial Silica Sand (Frac Sand) Mining

#139 (September 2015) Roadway Impacts of Industrial Sand (Frac Sand) Mining

#140 (February 2016) Social Impacts of Industrial Sand (Frac Sand) Mining - Land Use and Value

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Introduction

Industrial silica sand mining is governed by statutes and laws, rules and regulations, and local ordinances established by a multitude of government and regulatory agencies at the federal, state, and local levels. This comprehensive regulatory apparatus was established to protect human and environmental health from the potential impacts of all industrial activities, including industrial sand mining.

Industrial silica sand mining is governed by statutes and laws, rules and regulations, and local ordinances established by a multitude of government and regulatory agencies at the federal, state, and local levels.

The first four *Policy Studies* in this series provide factual information to policymakers and decision makers to be used for local mine permitting, as well as the general public and other stakeholders who wish to better understand the effects industrial sand mining may have on their communities. Those studies detail the protections in place to preserve the safety and well-being of the environment, communities, and public health from the potential impacts of this industry.

Although industrial silica sand mining is heavily regulated, mining opponents often claim it is an "unregulated industry," and members of the general public may be unaware of the extensive protective measures that guide the mining, processing, and shipping of industrial sand. These regulations are not unlike protections designed to prevent widespread negative effects from every other industrial, agricultural, and commercial enterprise.

The rapid growth of the industrial sand industry in the upper Midwest has generated controversy, often dominated at the local level by a small yet vocal group of critics who promote a narrative generally based upon misconceptions that call into question the adequacy of industrial sand regulations.

Industry critics often attempt to sway public opinion by portraying industrial sand mining as an unregulated industry running roughshod over local communities, harming the environment, public health, and public infrastructure. This characterization could not be more untrue.

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Most environmental, health, safety, transportation, and other regulations are applicable to nearly all industries. Regulations tend not to be industry-specific because creating industry-specific regulations would create an unmanageable patchwork of rules and regulations that would be less effective and more difficult to enforce. A standardized approach ensures all industries are equally protective of the environment, human health, safety, transportation, and other issues.

It is the lack of industry-specific regulation that appears to fuel claims that industrial sand mining is unregulated. Critics of industrial sand mining are either unaware of the manner in which environmental regulations are applied or simply choose to portray the industry as unregulated to put an end to existing, and prevent future, industrial sand mining.

Part 1 of this *Heartland Policy Study* provides an overview of the federal, state, and local regulations that apply to industrial sand operations. In Part 2, we provide examples of the complex overlapping regulatory oversight that applies to air, water, wetlands, railroads, and explosives, all of which affect industrial sand operations.

At the state level, when concerns over lack of regulation are raised in an organized and persistent manner, it can prompt a review of existing rules, impact assessments, and the rule-making process. This situation occurred not long ago in Minnesota and Wisconsin. These rule review and rule-making processes are summarized in Part 3.

Concerns raised at the local level frequently promote fear and distrust of the industry. In many communities such concerns have resulted in moratoria, bans, and questionable legal actions involving ordinances, assumption of police powers, and other actions as described in Part 4. Part 5 offers a summary and concluding remarks.

The industrial sand industry supports regulations and strict operating standards that are protective of the environment and protective of health and safety for employees and the public, provided these regulations are based on sound science and applied equally across all industries.[1]

Years of research and application of existing rules and regulations in non-metallic mining operations yield the following three key points:

1. Non-metallic mining, which includes industrial sand mining, is one of the most highly regulated industrial businesses in the United States.

2. Every potential affect on the environment and public health, safety, and welfare is addressed by existing laws, regulations, and the non-metallic mine permitting process through zoning laws.

3. The appropriate and applicable technical resources are available to demonstrate point number 1 and validate point number 2.

Part 1

Overview of Federal, State, and Local Regulations Governing Industrial Sand Operations

The United States Geological Survey (USGS) reported industrial sand and gravel was produced by 230 companies at 335 operations in 35 states in 2015.[2] In many states, industrial sand has been mined for more than a century. Silica sand is an essential mineral with a wide variety of industrial and domestic uses, including glassmaking, foundry metal casting cores, paper, construction aggregate, fiberglass insulation, livestock bedding, water filtration, domestic items such as toothpaste, food, paint texture, and sand paper, and hydraulic fracturing, a technique used in oil and natural gas development.

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[1] See for example Wisconsin Industrial Sand Association at http://www.wisconsinsand.org/assets/WISA-Q_A-on-Enforcement-of-Environmental-Regulations-February-2014-14577806-v1.pdf.

[2] U.S. Geological Survey, 2016, "Mineral commodity summaries 2016," January 30, 2016, page 202, http://dx.doi.org/10.3133/70140094.

operations, require an understanding of and adherence to numerous federal, state, and local statutes, ordinances, rules, and regulations; documentation and recordkeeping requirements; the development and implementation of written plans and programs; and reporting of this information to the proper authorities.

There are two general levels of regulations that apply to all industries. The first level involves permits, licenses, or other written approvals required to operate a facility. These regulations are comprehensive and generally require substantial lead time to go through a permit application, review, and approval process. Examples of such regulations include the Clean Air Act (CAA), Clean Water Act (CWA), and federal explosives licenses.

The second level involves activities subject to self-implementing regulations not otherwise governed by official permit. Self-implementing regulations are established by regulatory agencies and must be carried out by the industry without direct approvals and oversight. Regulatory agencies have the right to audit facilities and records to ensure companies are in compliance with the regulations. With self-implementing regulations, the federal or state government has the implementation burden without requiring a permit, and the regulated industry bears the compliance burden. Examples of self-implementing regulations include Mine Safety and Health Administration mine safety rules; oil storage under the Spill, Control and Countermeasures Rule; the Safe Drinking Water Act (SDWA); the Toxic Substances Control Act (TSCA); the Resource Conservation and Recovery Act (RCRA); federal and state waste handling and disposal; and many others. In essence, these rules are similar to automobile safety and road speed limits: Compliance is up to the individual, but the government inspects and audits.

Mining companies employ teams of environmental, safety, health, and other professionals and retain consultants to monitor available sources of information to ensure that each operation is in compliance with existing standards and aware of potential and proposed changes.

The extensive regulatory scheme that applies to all aspects of an industrial sand mining operation developed as a result of lengthy evaluation and rulemaking processes including detailed, rigorous scientific study, public and stakeholder input, and legislative decision-making.

In addition to constant awareness of regulatory changes, mining operations must constantly seek out and recognize background studies, best management practices (BMPs), and guidance established by regulatory agencies, governmental and nongovernmental scientific bodies, scientific societies and associations, industry associations, non-governmental organizations, and others. Doing so provides the regulated community with an understanding of why the regulation is in place, not just the mechanics of the regulation.

Mining companies employ teams of environmental, safety, health, and other professionals and retain consultants to monitor available sources of information to ensure that each operation is in compliance with existing standards and aware of potential and proposed changes. An exhaustive list of information sources, outside the scope of this *Policy Study*, must be monitored.

In response to rural townships drafting non-metallic mining ordinances – effectively duplicating existing federal and state laws and regulations – an effort was undertaken by GZA GeoEnvironmental, Inc.[3] and the Wisconsin Industrial Sand Association to educate policymakers and other stakeholders on the magnitude of regulations already in place.

One outcome of that effort was the Regulatory Authority and Control – Nonmetallic Mining in Wisconsin chart (Figure 1), which provides a representative visual depiction of the magnitude of regulations to which non-metallic mines are subject in Wisconsin. Similar charts could be prepared for other states. Similarly, with only a few changes to the chart – blasting, mine safety, and consideration of certain individual media-specific regulations represented by small circles, for example – the chart could just as easily represent any one of the hundreds of industries in Wisconsin.

The chart depicts more than 50 federal and state programs and almost 300 individual state regulations. These laws and regulations are manifested in what we estimate to be more than 20,000 pages of laws, rules, regulations, their preambles and appendices, and federal and state guidance documents. The complicated and comprehensive nature of these regulations demonstrates that claims asserting industrial sand mining is not regulated, are not factual.

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Laws written by Congress provide the authority for the federal regulatory agencies – such as the United States Environmental Protection Agency, Mine Safety Health Administration, and others, to write regulations. Regulations explain the technical, operational, and legal details necessary to implement laws. Although there are subtle difference between regulations and rules, the terms are commonly used interchangeably.

A. Federal Regulatory Agencies

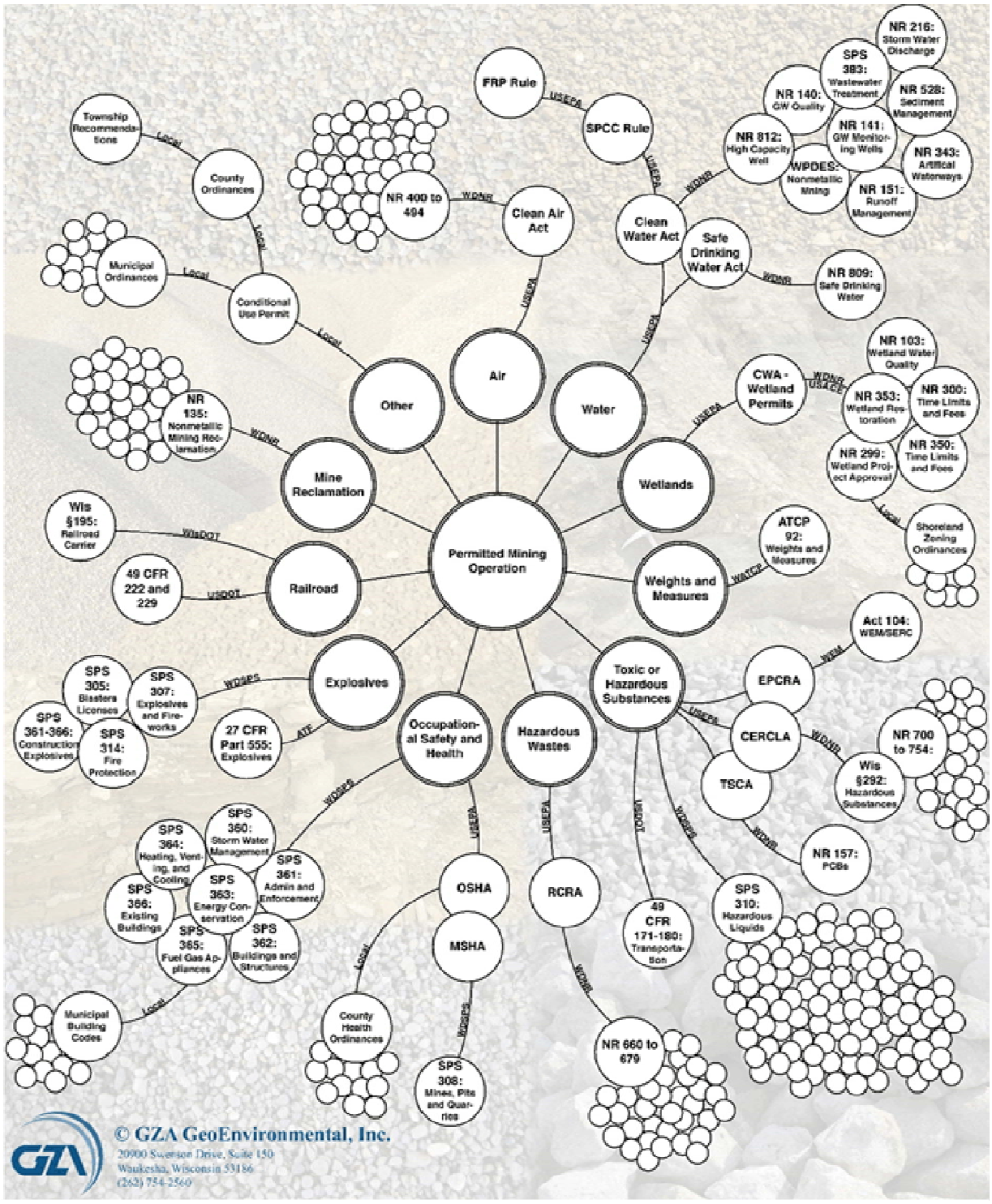
The following federal agencies have regulatory authority to administer and enforce environmental and health and safety laws applicable to industrial sand mining operations.

United States Environmental Protection Agency (USEPA)

USEPA is an agency of the United States government created for the purpose of protecting human health and the environment by writing and enforcing regulations based on laws passed by

[3] Mark Krumenacher, co-author of this series of *Heartland Policy Studies*, is a senior principal and senior vice president of GZA GeoEnvironmental, Inc.

Figure 1
Regulatory Authority and Control
Nonmetallic Mining in Wisconsin



Source: GZA GeoEnvironmental, Inc.

Congress.[4] USEPA is responsible for maintaining and enforcing national standards under a variety of environmental laws in consultation with state, tribal, and local governments. It delegates some permitting, monitoring, and enforcement responsibility to the states. The agency's enforcement powers include fines, sanctions, and other legal measures, including injunctive relief.

Specifically, USEPA is charged with implementation and enforcement of the Clean Air Act (CAA), Clean Water Act (CWA), Resource Conservation and Recovery Act (RCRA), Toxic Substances Control Act (TSCA), Comprehensive Environmental Response Compensation and Control Act (CERCLA), Emergency Planning, Community Right-to-Know Act (EPCRA), and 26 other laws and presidential executive orders. All industrial sand operations must determine the applicability of the laws enforced by USEPA and the states and comply as appropriate.

United States Fish and Wildlife Service (USFWS)

USFWS is a federal agency within the United States Department of the Interior dedicated to the management of fish, wildlife, and natural habitats. The mission of the agency is "working with others to conserve, protect and enhance fish, wildlife, plants and their habitats for the continuing benefit of the American people."[5] USFWS administers the provisions of the Endangered Species Act (ESA), whose purpose is to protect and recover threatened and endangered species and the ecosystems upon which they depend. All industrial sand mining operations must consider how ESA may affect their operations. In Wisconsin, for example, industrial sand operations must take steps to protect the Karner Blue Butterfly.

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Mine Safety Health Administration (MSHA)

MSHA is an agency of the United States Department of Labor that administers the provisions of the Federal Mine Safety Health Act ("Mine Act") to enforce compliance with safety and health standards to eliminate fatal accidents, reduce the frequency and severity of nonfatal accidents, minimize health hazards, and promote improved safety and health conditions in the nation's mines. MSHA carries out the mandates of the Mine Act at all mining and mineral processing operations in the United States, regardless of size, number of employees, commodity mined, or method of extraction.

[4] USEPA website at http://www3.epa.gov/.

[5] U.S. Fish and Wildlife Service, "Who We Are," accessed September 19, 2016, https://www.fws.gov/who/.

The safety- and health-related requirements for the operation of surface and underground mines are contained in the Code of Federal Regulations (CFR) issued by MSHA. All non-metallic mines are inspected by MSHA at least semi-annually, and underground mines are inspected quarterly.

United States Occupational Health and Safety Administration (OSHA)

OSHA is an agency of the United States Department of Labor. Its mission is to "assure safe and healthful working conditions for working men and women by setting and enforcing standards and by providing training, outreach, education and assistance."[6] The agency is also charged with enforcing a variety of workplace safety statutes and regulations.

Safety- and health-related requirements for the workplace are established by the Occupational Health and Safety Act and are contained in the CFR issued by OSHA. All operations associated with the industrial sand industry that are not mine-related, such as certain offices, rail operations, and coating plants, must comply with OSHA regulations.

United States Department of Transportation (USDOT)

USDOT regulates the transportation of hazardous materials. Industrial sand transportation must comply with USDOT regulations.

USDOT is a federal cabinet department of the United States government that is responsible for the regulation of transportation. It is governed by the Unites States Secretary of Transportation. Its mission is to "serve the United States by ensuring a fast, safe, efficient, accessible, and convenient transportation system that meets our vital national interests and enhances the quality of life of the American people, today and into the future."[7] USDOT also regulates the transportation of hazardous materials. Industrial sand transportation must comply with USDOT regulations.

Federal Railroad Administration (FRA)

FRA is an agency of USDOT. The purpose of FRA is to promulgate and enforce rail safety regulations, administer railroad assistance programs, conduct research and development in support of improved railroad safety and national rail transportation policy, and consolidate government support of rail transportation activities. Railroad design, construction, and operations at industrial sand facilities and rail car movement are regulated by FRA.

[6] Occupational Safety and Health Administration, "About OSHA," U.S. Department of Labor, accessed September 19, 2016, https://www.osha.gov/about.html.

[7] U.S. Department of Transportation, "About Us," September 28, 2015, https://www.transportation.gov/mission/about-us.

Bureau of Alcohol, Tobacco, Firearms and Explosives (BATF)

BATF is a law enforcement agency in the United States Department of Justice. The federal explosives law and regulations affect all persons who import, manufacture, deal in, purchase, use, store, or possess explosive materials. They also affect those who ship, transport, cause to be transported, or receive explosive materials. BATF plays a vital role in regulating and educating the explosives industry, and in protecting the public from inadequate or improper storage and security.

B. State Regulatory Agencies

The U.S. Constitution grants states the power to self-govern in the Tenth Amendment. The amendment empowers the states to protect and promote public health and environment following policies, laws, and regulations developed to meet the standards set by the federal government.

Each state has developed agencies with regulatory authority to administer and enforce environmental, health, and safety laws applicable to industrial sand mining operations. The names of the agencies vary among the states although their roles are generally similar, with authorities that mirror federal regulations. For example, some of the key regulatory agencies in Wisconsin are represented in Figure 1 above.

Each state has developed agencies with regulatory authority to administer and enforce environmental, health, and safety laws applicable to industrial sand mining operations.

Environmental Protection

Each state has developed one or more agencies to preserve, protect, manage, and maintain the natural resources of the state. Agencies responsible for environmental protection in industrial sand-producing states include the Arkansas Department of Environment Quality, Illinois Environmental Protection Agency, Illinois Department of Natural Resources, Michigan Department of Environment Quality, Minnesota Pollution Control Agency, Minnesota Department of Natural Resources, Missouri Department of Natural Resources, Texas Commission on Environmental Quality, and Wisconsin Department of Natural Resources.

The regulations developed by these environmental protection agencies apply equally to all enterprises in the state, including industrial sand mining operations, and ensure all industries are compliant with the provisions of CAA, CWA, SDWA, RCRA, CERCLA, and ESA.

Transportation

Each state has established an agency responsible for planning, building, and maintaining a safe network of state highways and the federal Interstate highway system. All users of the

transportation system are required to adhere to the rules established by the departments. In addition to the common rules that address road safety, industrial sand mining operations must understand and comply with rules developed to maintain road integrity.

The Wisconsin Department of Transportation (WisDOT) has the authority for licensing truck drivers transporting sand, as well as truck safety, load limits, and size restrictions. WisDOT also reviews designs and provides permits for developing access onto state highways. The equivalent agencies in other industrial sand-producing states have similar names and responsibilities.

The transport of all commodities, including agricultural products and industrial sand, is subject to rules regulating weights and measures. These can apply to weight restrictions on local and state roads, as well as to railroads. Regulations pertaining to weights and measures are administered by a state agency that has developed requirements for equipment used to weigh cargo and commodities.

Health Services

Minnesota's Environmental Quality Board has developed a process of environmental review that is unique in states that mine industrial sand.

The state departments of health provide public health services to residents across a wide range of issues including radiation safety, drinking water quality, and access to health care. The agencies in industrial sand-producing states have similar names.

The Wisconsin Department of Health Services has not taken an active role in specifically regulating industrial sand operations. By contrast, as described later in this report, the Minnesota Department of Health (MDH) was directed to adopt an air quality standard to protect human health from exposure to respirable crystalline silica.

Minnesota Environmental Quality Board

The Environmental Quality Board (EQB) of the State and Community Services Division of the Department of Administration in Minnesota is a somewhat-unique state agency. EQB is comprised of the governor's office, five citizens, and the heads of nine state agencies. EQB develops policy, creates long-range plans, and reviews proposed projects that may significantly affect Minnesota's environment. EQB has developed a process of environmental review that is unique in states that mine industrial sand.[8]

EQB's environmental review process investigates the environmental impacts of major development projects before approvals or permits are issued by the state or local governments. For industrial sand operations, there are typically two types of analyses and documents prepared

[8] Minnesota Environmental Quality Board, "About the Environmental Quality Board," accessed February 18, 2016, https://www.eqb.state.mn.us/content/about-environmental-quality-board.

through the environmental review process: Environmental Assessment Worksheets (EAWs) and Environmental Impact Statements (EISs). A third process is an Alternative Urban Areawide Review (AUAR), but that process has not yet occurred for any proposed industrial sand operation, although one was contemplated in 2015.

The initial process for most proposed sand operations is EAW, an analysis and overview of the potential environmental impacts for a proposed project used to determine whether an EIS is necessary. Although intended to be brief, EAW is a substantial study. EIS is a comprehensive continuation of EAW studies and requires a minimum of one to two years of preparation.

Criteria established in the environmental review rules make EAWs and EISs mandatory for many types of projects. These criteria are called "mandatory thresholds" and are listed in MN Rule 4410.4300 and 4410.4400. If a project's size is above the mandatory threshold for its category, then environmental review is mandatory. Recent rule changes described below in Part 3 have lowered these minimum standards for proposed industrial sand mines, so more proposed facilities will be subject to environmental review.

C. Local Regulatory Units

The scope of regulatory authority at the local level is a function of state law. Local authority varies among the states, and states generally have complete authority over most local units of government except where explicitly granted power to manage their own affairs. Such powers may be granted, for example, under a municipal home rule system providing local governments authority to establish a system of self-government.

In many states, county governments and municipalities with zoning authority often adopt local ordinances regulating the activities allowed or prohibited at mines.

Thirty-one states follow a tenet of municipal law called Dillon's Rule or a combination of Dillon's Rule and Home Rule.[9] Dillon's Rule affirms that a local unit of government may engage in activities explicitly delegated to it by state law.

In many states, county governments and municipalities with zoning authority often adopt local ordinances regulating the activities allowed or prohibited at mines. In unincorporated areas, a county or township may administer non-metallic mining ordinances, if developed, through committees of a board of supervisors that are granted authority under the ordinance to accept and review permit applications, requests for permit modifications and notices of completion of reclamation plans. The county or township generally also retains the authority to conduct follow-up inspections.

[9] Honorable Jon D. Russell and Aaron Bostrom,"Federalism, Dillon Rule and Home Rule," American City County Exchange (ACCE), January 2016, https://www.alec.org/app/uploads/2016/01/2016-ACCE-White-Paper-Dillon-House-Rule-Final.pdf.

Some counties or unincorporated areas do not have ordinances that specifically regulate mining. In these jurisdictions, a successful approach for permitting mining is to enter into a Consent Judgment Entry that provides controls not otherwise available to the township and continued jurisdiction and enforcement by courts.

Part 2

Examples of Complex Overlapping Regulatory Oversight

Here we provide examples of the complex overlapping regulations applicable to industrial sand mines.

A. Air Quality

> Air quality is protected by regulations designed to manage and minimize the potential impacts on air quality from all industrial and commercial activity.

Air quality is protected by several federal and state regulations designed to manage and minimize the potential impacts on air quality from all industrial and commercial activity, including sand mining.

The Clean Air Act (CAA), the federal law regulating air emissions from stationary and mobile sources, is one of the most comprehensive air quality laws in the world. Passed in 1970 and amended in 1990, CAA authorizes USEPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health and public welfare and regulate emissions of hazardous air pollutants.[10]

CAA is applied to industrial sand mining operations by regulating six principal pollutants, called "criteria pollutants," under NAAQS. States are required to adopt enforceable plans to achieve and maintain air quality meeting standards applicable to these pollutants. States also are required to control emissions from drifting across state lines and affecting downwind states.[11]

The primary criteria pollutant regulated and controlled at industrial sand operations is dust, also referred to as particulate matter (PM) measuring ten micrometers in diameter or smaller.[12] In the upper Midwest, particulate emissions have been measured comprehensively at industrial sand

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[10] U.S. Environmental Protection Agency, "Summary of the Clean Air Act," updated November 17, 2015, http://www.epa.gov/laws-regulations/summary-clean-air-act.

[11] U.S. Environmental Protection Agency, "Clean Air Act Requirements and History," updated January 6, 2016, http://www.epa.gov/clean-air-act-overview/clean-air-act-requirements-and-history.

[12] U.S. Environmental Protection Agency, "National Ambient Air Quality Standards," January 7, 2016, http://www3.epa.gov/ttn/naaqs/criteria.html.

operations. Studies using USEPA-certified equipment and sampling methodologies have consistently reported concentrations of PM at industrial sand mines below levels considered hazardous to human health.

In addition to federal CAA regulations, each state established a series of regulations to comply with the requirements of CAA. Figure 1 above provides a partial representation of the depth of regulation in Wisconsin.

In addition to federal CAA regulations, each state established a series of regulations to comply with the requirements of CAA. Figure 1 above provides a partial representation of the depth of regulation in Wisconsin.

Under the Wisconsin Administrative Code (WAC) Chapter NR 400 *et seq*. – Air Pollution Prevention and Control, we identified 48 regulations applicable to industrial sand mining operations.[13] Similar detailed regulations have been developed in other states with industrial sand mining. Among the most relevant regulations pertaining to industrial sand mining are those that address fugitive dust, ambient air monitoring, particulate matter, and hazardous air pollutants, as summarized briefly below.

Fugitive dust is regulated under WAC Chapter NR 415.075(2), Wis. Adm. Code, which has specific requirements for fugitive dust control plans applicable to industrial sand mines. These plans are developed to help industrial sand facilities reduce or eliminate fugitive dust emissions. WAC Chapter NR 415 requires plans to include when specific dust suppression activities will be implemented and requires companies to keep records of those dust suppression activities. Plans must be in writing, and WDNR recommends they be kept on-site to be available for review by a compliance inspector.[14]

Ambient air monitoring is required for mining operations with production averaging more than 2,000 tons per month. Facilities can apply for a variance from this requirement if they can demonstrate the general public will not be exposed to significant levels of particulate matter. Requests for variances must be submitted to WDNR in writing.

Industrial sand operations that are required to monitor for **particulate matter** must provide ambient monitoring data to WDNR. Data are submitted to WDNR on a monthly basis and are reviewed by air monitoring staff. Quality-assured data are compiled into plots and the updated information is posted to a WDNR-maintained interactive map and included in spreadsheets approximately 60 to 90 days after the end of each calendar quarter.[15] The WDNR Air

[13] Wisconsin Department of Natural Resources, "Air pollution control rules," November 23, 2015, http://dnr.wi.gov/topic/airquality/rules.html.

[14] Wisconsin Department of Natural Resources, "Template Best Management Practices of Fugitive Dust Control Plans for the Ledge Rock Quarry and Industrial Sand Mining Industries," January 18, 2012, http://dnr.wi.gov/cias/guidance/guidanceexternal/guidanceitem.aspx?item_seq_no=2091.

[15] Wisconsin Department of Natural Resources, "Industrial sand mining," July 6, 2015, http://dnr.wi.gov/topic/mines/sand.html.

Management Program works with industrial sand facilities to provide technical assistance and review of monitoring sites near the facilities, as required by their permits.

Hazardous air pollutants (HAPs) are regulated by WAC Chapter NR 445. Commonly referred to as Wisconsin's air toxics rule, WAC Chapter NR 445 sets emission standards for about 550 HAPs and is applicable to all facilities with air emissions in Wisconsin. Facilities must identify air toxics, quantify emissions, and reduce or control emissions where necessary. At industrial sand operations, WAC Chapter NR 445 is primarily applicable to certain sand-drying operations that use a fuel source other than natural gas. Driers fueled by natural gas are unlikely to be affected by WAC Chapter NR 445 because they do not emit harmful levels of particulates.[16]

B. Water Quality

Protection of water quality and quantity is important to most people and is often raised in discussions of industrial sand mining and processing. Concerns include the potential for contamination of surface water or groundwater from hazardous substances such as chemicals and oils that may be used at the operations and the use or diversion of what may seem like large quantities of groundwater.

> The general public may not be aware of the regulations, procedures, and protections that are in place to minimize degradation of surface water and ensure safe drinking water and adequate groundwater supplies.

As is true of most comprehensive environmental regulations, the general public may not be aware of the depth of regulatory control over storage and handling of hazardous substances, the planning and response to spills that must be considered, and the procedures and protections that are in place to minimize degradation of surface water and ensure safe drinking water and adequate groundwater supplies to all potential users and sensitive ecosystems.

Note that almost 50 percent of the federal and state regulations depicted on Figure 1 were developed to protect surface water and groundwater resources. Those include the primary bubbles identified as Water, Wetlands, Toxic or Hazardous Substances, Hazardous Wastes, and Mine Reclamation. Collectively these regulations control the transportation, handling, storage, use, and disposal of hazardous substances and the management of surface water and groundwater resources. They encompass the majority of the estimated 20,000 pages of laws, rules, regulations, their preambles and appendices, and federal and state guidance documents.

1. Surface Water, Drinking Water, and Groundwater Quality

Federal regulations developed to ensure surface water quality are administered by USEPA

[16] Wisconsin Department of Natural Resources, "Wisconsin Air Toxics Rule (NR445)," Air Program Fact Sheet, September 2012, http://dnr.wi.gov/files/PDF/pubs/am/AM405.pdf.

through the Clean Water Act (CWA); Safe Drinking Water Act (SDWA); Spill Prevention, Control, and Countermeasure (SPCC) Rule; and Facility Response Plan (FRP) Rule. The regulations are enforced by WDNR and other similarly authorized state environmental agencies.

CWA, adopted in 33 United States Code (U.S.C.) Section 1253 *et seq*., is the primary federal law in the United States governing water pollution, regulating discharges of pollutants into the waters of the United States, and regulating quality standards for surface waters.[17] Passed in 1972, CWA established the goals of eliminating releases of toxic substances into water and ensuring surface waters would meet standards necessary for human recreation. The principal body of law is based on the Federal Water Pollution Control Act of 1972.

CWA is administered by USEPA. In Wisconsin, WDNR has accepted a delegation of authority from USEPA to implement portions of CWA. Similar delegation of authority is accepted by the Illinois EPA, Michigan Department of Environmental Quality, Minnesota Pollution Control Agency, and other state environmental agencies. Mining operations are regulated under CWA by USEPA, the U.S Army Corps of Engineers (USACE), and state agencies, as discussed below.

The Safe Drinking Water Act (SDWA), passed in 1974, adopted at 42 U.S.C. Section 300, and implemented and enforced by USEPA, sets health and safety standards for public drinking water in the United States. It was the nation's first comprehensive national drinking water law. Under the law, USEPA sets national standards for drinking water. The states must meet or exceed those standards. If a state fails to meet its responsibilities, the federal government can step in and enforce the standards.

The Safe Drinking Water Act, passed in 1974 and amended in 1996, was the nation's first comprehensive national drinking water law.

Congress amended SDWA in 1996. The changes were intended to help EPA, states, and water systems prepare for future drinking water safety challenges and assure the availability of safe drinking water. They also strengthened public health protection and allowed for increased public participation in rule-making and permitting processes.

SDWA applies to non-transient non-community water systems (NTNC) – water systems that serve at least 25 of the same people over six months of the year. Examples of these systems include schools, daycare facilities, industries, and businesses. In Wisconsin, WDNR administers the provisions of SDWA, as do environmental agencies in other states.

SDWA regulates all water that is intended to be, or may become, drinking water, whether from above-ground or underground sources. The act authorizes USEPA to establish minimum standards to protect tap water and requires all owners or operators of public water systems to

[17] U.S. Environmental Protection Agency, "Summary of the Clean Water Act," Laws & Regulations, October 8, 2015, http://www.epa.gov/laws-regulations/summary-clean-water-act.

comply with these primary (health-related) standards.[18]

Drinking water in Wisconsin is regulated at the state level by NR 809, which establishes minimum standards and water monitoring procedures for the protection of the public health, safety, and welfare in the obtaining of safe drinking water.[19]

Procedures must be followed for the proper filling of drill holes and the design, installation, construction, abandonment, and documentation of groundwater monitoring wells.

Groundwater quality is regulated in Wisconsin by WAC Chapter NR 140, which establishes groundwater quality standards to protect public health and welfare and identifies potential sources of pollution. Specifically, WAC Chapter NR 140 establishes standards for substances detected in or having a reasonable probability of entering the groundwater resources of the state; specifies scientifically valid procedures for determining if a numerical standard has been attained or exceeded; specifies where groundwater standards are applied; and evaluates groundwater monitoring data.[20]

Regulations are also in place in Wisconsin to protect groundwater by preventing the introduction of contaminants to the subsurface from soil and bedrock drill holes. WAC Chapter NR 141 establishes procedures for the proper filling of drill holes and the design, installation, construction, abandonment, and documentation of groundwater monitoring wells.[21]

Another measure of protection of surface and groundwater is provided by the SPCC rule, codified at 40 CFR Part 112 (part of CWA) and implemented and enforced by USEPA.[22] The SPCC rule includes requirements for oil spill prevention, preparedness, and response to prevent oil discharges to navigable waters and adjoining shorelines and in doing so protects all surface waters and groundwater resources. The majority of heavy equipment used at industrial sand operations is powered by diesel fuel, which generally requires the on-site storage of diesel fuel in storage tanks. The rule requires specific facilities and those with total aggregate capacity of aboveground oil storage containers greater than 1,320 gallons to prepare, amend, and implement SPCC plans.

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[18] U.S. Environmental Protection Agency, "Summary of the Safe Drinking Water Act," Laws & Regulations, October 8, 2015, http://www.epa.gov/laws-regulations/summary-safe-drinking-water-act.

[19] Wisconsin State Legislature, "NR 809, Safe Drinking Water," January 2013, https://docs.legis.wisconsin.gov/code/admin_code/nr/800/809/.

[20] Wisconsin State Legislature, "NR 140, Groundwater Quality," July 2015, http://docs.legis.wisconsin.gov/code/admin_code/nr/100/140/II/10.

[21] Wisconsin State Legislature, "NR 141, Groundwater Monitoring Well Requirements," June 2015, https://docs.legis.wisconsin.gov/code/admin_code/nr/100/141/.

[22] USEPA, Oil Spills Prevention and Preparedness Regulations, http://www.epa.gov/oil-spills-prevention-and-preparedness-regulations.

The SPCC rule also includes the Facility Response Plan (FRP) rule. The FRP rule was published in 1994 and was codified at 40 CFR 112.20 and 112.21. An FRP demonstrates a facility's preparedness to respond to a worst-case oil discharge. Under CWA, as amended by the Oil Pollution Act, certain facilities that store and use oil are required to prepare and submit these plans. The FRP rule addresses who must prepare and submit an FRP, what must be included in the FRP, potential to cause "substantial harm" in the event of a discharge, and certification of the applicability of substantial harm criteria.

2. Stormwater Control and Management

Congress amended CWA in 1987 to control stormwater pollution caused by rain or melting snow that flows from rooftops and over paved areas, bare soil, and sloped lawns, collecting and transporting waste, litter, salt, pesticides, fertilizers, oil and grease, soil, and other materials. In 1990, federal regulations required owners of stormwater pollution sources, including many industries, municipalities, and construction sites, to have a National Pollution Discharge Elimination System (NPDES) Stormwater Permit. Permit holders are required to create plans and implement management practices that eliminate or reduce stormwater pollution. To meet the requirements of CWA, WDNR developed the Wisconsin Pollution Discharge Elimination System (WPDES) Stormwater Discharge Permit Program, which is administered under the authority of WAC Chapter NR 216.[23]

The most common wastewater discharges from mine sites are pit dewatering (from precipitation or groundwater) and wash water generated from mine processes.

WDNR regulates a number of wastewater discharges at mine sites. The most common discharges are pit dewatering (from precipitation or groundwater) and wash water generated from mine processes. The primary regulated pollutant is sediment in suspension, and the requirements for the discharges vary depending on the discharge location. Discharges to surface waters are more stringently regulated than are wastewater discharges to groundwater via seepage.[24]

WPDES general permits are issued by WDNR for specific categories of industrial, municipal, and other wastewater discharges, such as General Permit WI-0046515 for non-metallic mining. Under the authority in Ch. 283.35, Wis. Stats., the department may issue WPDES general permits applicable to categories or classes of point source discharges. When a general permit is issued, multiple facilities meeting its requirements may be covered under the same general permit. WAC Section NR 205.08 contains further requirements concerning the issuance of general permits.

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[23] WAC Chapter NR 216, Stormwater Discharge Permits, http://docs.legis.wisconsin.gov/code/admin_code/nr/200/216.

[24] Wisconsin Department of Natural Resources, "Industrial sand mining," July 6, 2015, http://dnr.wi.gov/topic/mines/sand.html.

The WPDES Stormwater Program regulates the discharge of stormwater in Wisconsin from three potential sources: construction sites, industrial facilities, and municipal separate storm sewer systems (MS4s). The first two are applicable to frac sand mining and are discussed further below.

The purpose of WAC Chapter NR 216 is to establish criteria defining those stormwater discharges needing WPDES stormwater permits, as required by Ch. 283.33, Wis. Stats., and to implement the appropriate performance standards of subchs. III and IV of WAC Chapter NR 151. The goal of this chapter is to minimize the discharge of pollutants carried by stormwater runoff from certain construction sites, industrial facilities, and municipal separate storm sewer systems as identified in the chapter. Regulated stormwater discharges are considered point sources, so owners or operators of these sources are required to receive a WPDES permit for their discharge. This permitting mechanism is designed to prevent stormwater runoff from washing harmful pollutants into local surface waters such as streams, rivers, lakes, or coastal waters. Permittees are required to use best management practices (BMPs) to control and prevent pollutants in stormwater runoff.

a. Construction Sites

Weekly on-site inspections are required through the duration of a construction project and after stormwater events.

The WPDES Construction Site Stormwater Discharge Permit is designed to help decrease the amount of sediment in waterways due to new land disturbance. Landowners of most construction projects where one or more acres of land will be disturbed must obtain a WPDES Construction Site Stormwater Discharge Permit. Permittees must develop a Stormwater Management Plan and an Erosion and Sediment Control Plan describing the BMPs that will be used on-site. The plans can be developed using the Stormwater Construction and Post-Construction Technical Standards provided by WDNR. A Construction Site Notice of Intent form and applicable fee are submitted to the department at least 14 working days before construction will begin. BMPs described in the Stormwater Management Plan and Erosion and Sediment Control Plan to help control erosion and prevent contamination of stormwater must be implemented. Weekly on-site inspections are required through the duration of the project and after stormwater events.

b. Industrial Facilities

Stormwater may come into contact with a wide variety of pollutants at industrial facilities, including oil/grease, sediment, de-icing salts, sand, pesticides, fertilizers, gasoline, and antifreeze. Most storm sewers do not connect to a wastewater treatment plant, so untreated runoff must be managed to avoid carrying pollutants directly into lakes, rivers, and groundwater.

Permitted facilities must develop a site-specific Stormwater Pollution Prevention Plan (SWPPP). The goal of the SWPPP is to encourage source-area control through identification of site-specific BMPs for stormwater pollution prevention and implementation schedules to help decrease the

amount of contaminated stormwater runoff from a facility.[25] Some industrial facilities may also be required to conduct annual chemical monitoring for pollutants in runoff from their sites. Most non-metallic mines are designed to be internally drained to capture and contain stormwater within the active mining project site.[26]

Most non-metallic mines are designed to be internally drained to capture and contain stormwater within the active mining project site.

Stormwater permittees may also be subject to the performance standards of WAC Chapter NR 151. This rule contains the non-agricultural performance standards, transportation facility performance standards, and a process for the development and dissemination of non-agricultural technical standards. WDNR has developed technical standards to assist in the design and implementation of BMPs associated with stormwater erosion control. Technical Standards provided by WDNR include:

- Stormwater Construction Technical Standards (http://dnr.wi.gov/topic/stormwater/standards/const_standards.html)
- Stormwater Post-construction Technical Standards (http://dnr.wi.gov/topic/stormwater/standards/postconst_standards.html)
- Turf Nutrient Management (http://dnr.wi.gov/topic/stormwater/standards/turf_nutrient.html)
- Technical standards for management practices created via the Standards Oversight Council (SOC) (http://socwisconsin.org/)

WAC Chapter NR 151 - Runoff Management establishes runoff pollution performance standards for non-agricultural facilities and transportation facilities and performance standards and prohibitions for agricultural facilities and practices designed to achieve water quality standards as required by Ch. 281.16 (2) and (3), Wis. Stats.[27] This chapter also specifies a process for the development and dissemination of WDNR technical standards to implement the non-agricultural performance standards as required by Ch. 281.16 (2) (b), Wis. Stats. If these performance standards and prohibitions do not achieve water quality standards, this chapter specifies how the department may develop targeted performance standards in conformance with WAC Chapter NR 151.004. WDNR administers the provisions of WAC Chapter NR 151.

WAC Chapter NR 343 - Ponds and Artificial Waterways establishes criteria defining activities

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[25] Wisconsin Department of Natural Resources, "Industrial sand mining," July 6, 2015, http://dnr.wi.gov/topic/mines/sand.html.

[26] Wisconsin Department of Natural Resources, "Silica Sand Mining in Wisconsin," January 2012, http://dnr.wi.gov/topic/Mines/documents/SilicaSandMiningFinal.pdf.

[27] Wisconsin Administrative Code, "Runoff Management," Chapter NR 151, May 2013,http://docs.legis.wisconsin.gov/code/admin_code/nr/100/151.pdf.

needing a permit for a pond or artificial water body as required by Ch. 30.19 (1g) (a) and (am), Wis. Stats. and specifies permit requirements necessary to protect public health, safety, welfare, rights, and interest and to protect riparian landowners' rights and property for pond sites regulated under this chapter.[28]

Industrial sand operations use ponds to facilitate the pumping of sand as a slurry to the processing plant, to manage stormwater, and to treat process water so it can be recycled.

Industrial sand operations use ponds to facilitate the pumping of sand as a slurry to the processing plant, to manage stormwater, and to treat process water by allowing fine-grain particles to settle out of the water so it can be recycled and used for washing sand. These ponds are regulated by NR 343, which regulates ponds and artificial waterways and specifies standards for construction, erosion control, and other standards to protect the public, health, safety, and welfare. WDNR administers the provisions of WAC Chapter NR 343.

WAC Chapter NR 528 - Management of Accumulated Sediment from Stormwater Management Structures provides a streamlined process for the management of accumulated sediment removed from stormwater management structures in a manner that protects public health, safety, and the environment and reduces the need to dispose of accumulated sediment in landfills.[29] Adopted under authority of Ch. 227.11, Wis. Stats., and Ch. 289, Wis. Stats, WDNR administers the provisions of WAC Chapter NR 528. The sediment is generally used as fill, in construction of berms, and in the mine reclamation process.[30]

WAC Chapter SPS 383 - Private Onsite Wastewater Treatment Systems (POWTS) establishes uniform standards and criteria for the design, installation, inspection, and management of a private on-site wastewater treatment system and publicly owned treatment works, to ensure the system is safe and will protect public health and the waters of the state.[31] The Department of Safety and Professional Services (DSPS) administers the provisions of WAC Chapter SPS 383.

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[28] Wisconsin Administrative Code, Ponds and Artificial Waterways," Chapter NR 343, May 2013, https://docs.legis.wisconsin.gov/code/admin_code/nr/300/343.

[29] Wisconsin Administrative Code, "Management of Accumulated Sediment from Stormwater Management Structures," Chapter NR 528, July 2015, http://docs.legis.wisconsin.gov/code/admin_code/nr/500/528.pdf.

[30] Isaac Orr and Mark Krumenacher, "Environmental Impacts of Industrial Silica Sand (Frac Sand) Mining," *Heartland Policy Study* No. 137, The Heartland Institute, May 2015, www.heartland.org/_template-assets/documents/publications/05-04-15_orr_and_krumenacher_on_frac_sand_enviro_impacts.pdf.

[31] Wisconsin Administrative Code, "Private Onsite Wastewater Treatment Systems," Chapter SPS 383, September 2013, http://docs.legis.wisconsin.gov/code/admin_code/sps/safety_and_buildings_and_environment/380_387/383.pdf.

C. Water Quantity

High-capacity wells are used by industrial sand operations for washing sand to remove fine particles of silt and clay. Use of these wells has prompted concern that industrial sand mines will affect the quantity of water available for neighboring properties.

WAC Chapter NR 812 defines a high-capacity well system as one or more wells, drill holes, or mine shafts on a property that have a combined approved pump capacity of 70 or more gallons per minute.[32] A property is defined as contiguous or adjacent land having the same owner. WDNR administers the provisions of WAC Chapter NR 812.

High-capacity well permit applications are evaluated by WDNR and similar environmental regulatory agencies in other states to evaluate the potential impacts to waters of the state. Proposed high-capacity well operations that may have the potential to significantly affect trout streams, outstanding resource waters, exceptional resource waters, or other waters of the state will be denied or limited in the amount of water that can be withdrawn. Other conditions of use designed to prevent significant adverse impacts may be specified in the permit.[33]

Additionally, WAC Chapter NR 820 establishes review criteria for high-capacity well applications involving wells proposed to be constructed near springs, trout streams, outstanding resource waters, and exceptional resource waters, or wells involving groundwater withdrawals with high water loss. WDNR will not approve a proposed well that will reduce annual spring flow by more than 20 percent.[34]

Wetland permitting is a complicated matter in every state, with overlapping regulatory control by USEPA, USACE, and various state environmental or local regulatory agencies.

D. Wetlands and Shorelands

a. Wetlands

Wetland permitting is a complicated matter in every state, with overlapping regulatory control by USEPA, USACE, and various state environmental or local regulatory agencies. Projects that propose wetland impacts, such as dredging or filling, cannot proceed without an approval known as a Water Quality Certification, a permit from the state, and possibly a separate permit from the

[32] Wisconsin Department of Natural Resources, "High capacity well," January 3, 2016, http://dnr.wi.gov/topic/wells/highcapacity.html.

[33] Wisconsin Department of Natural Resources, "Silica Sand Mining in Wisconsin," January 2012, http://dnr.wi.gov/topic/Mines/documents/SilicaSandMiningFinal.pdf.

[34] *Ibid.*

federal government.[35] USEPA and USACE are responsible for administering Section 404 of CWA to regulate the discharge of dredged and fill material into waters of the United States.[36] In Wisconsin, WDNR has accepted a delegation of authority from USEPA to implement the provisions of Section 404, and WDNR and USACE jointly administer Section 404 under a joint Memorandum of Understanding.

State regulations require that wetland impacts be avoided if possible. Permit applicants must demonstrate that they cannot avoid or reduce wetland impacts, and that the project will not have significant adverse impacts on wetland functions and values including secondary impacts.

State regulations require that wetland impacts be avoided if possible.

Several states issue general permits and individual permits for addressing wetlands issues. General permits are available for wetland restoration activities and wetland discharges up to 10,000 square feet as a result of industrial, commercial, or residential development. Ch. 281.36, Wis. Stats., establishes the state authority for granting wetland permits.[37] The summary below provides an overview of several Wisconsin regulatory rules in the WAC applicable to wetland impacts at mining operations.

WAC Chapter NR 103 establishes the water quality standards for wetlands by setting the conditions necessary to protect water-quality-related functions and values of wetlands including sediment and pollutant attenuation, storm and flood water retention, hydrologic cycle maintenance, shoreline protection against erosion, biological diversity and production, and human uses such as recreation.[38]

WAC Chapter NR 299 establishes rules regarding the application, processing, and review of state water quality certifications required by the provisions of the federal water pollution control act.[39] This chapter sets the policy of WDNR to review, consistent with federal law, activities that require a federal license or permit that may result in any discharge to waters of the state and either deny, grant, conditionally grant, or waive certification.

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[35] CWA Section 404 - Wetland Permits (http://water.epa.gov/lawsregs/guidance/wetlands/sec404.cfm).

[36] U.S. Environmental Protection Agency, "Section 404 Permit Program," October 27, 2015, http://www.epa.gov/cwa-404/section-404-permit-program.

[37] Wisconsin State Legislature, "Chapter 281.36, Permits for Discharges into Wetlands; Mitigation," July 2001, https://docs.legis.wisconsin.gov/statutes/statutes/281/III/36.

[38] Wisconsin State Legislature, "Chapter NR 103, Water Quality Standards for Wetlands," July 2015 http://docs.legis.wisconsin.gov/code/admin_code/nr/103.

[39] Wisconsin State Legislature, "Chapter NR 299, Water Quality Certification," April 2013, https://docs.legis.wisconsin.gov/code/admin_code/nr/200/299.

WAC Chapter NR 300 describes the time limits and fees for waterway and wetland permit decisions.[40]

WAC Chapter NR 350 establishes rules for development, monitoring, and long-term maintenance of wetland compensatory mitigation (replacement) projects that are approved by WDNR, and procedures and standards for the establishment and maintenance of wetland mitigation banks.[41]

WAC Chapter NR 353 establishes a streamlined process to review regulated activities associated with the restoration of former wetlands, the enhancement of degraded wetlands, and the maintenance or management of existing wetlands.[42] This chapter applies to projects whose purpose is wetland conservation that may be included as part of a stand-alone or multi-faceted wetland mitigation plan where mitigation credits may be obtained from wetland creation, restoration, or conservation.

b. Shoreland Zoning Ordinances/Permitting

The statewide shoreland zoning standards under Wisconsin's Shoreland Protection Program WAC Chapter NR 115 are implemented by counties and generally apply only to unincorporated land within 1,000 feet of the ordinary high-water mark of a lake, pond, or flowage; or within 300 feet of the ordinary high-water mark of a river or stream; or to the landward side of the floodplain, whichever distance is greater.[43]

In Wisconsin, WDNR is responsible for drafting code provisions that can be adopted by counties to regulate uses within shoreland areas.

In Wisconsin, WDNR is responsible for drafting code provisions that can be adopted by counties to regulate uses within shoreland areas. Counties, cities, and villages are required to adopt shoreland-wetland zoning ordinances to regulate activities within the shoreland zone. The minimum standards for shoreland-wetland zoning ordinances are found in WAC Chapter NR 115 for counties, and in WAC Chapter NR 116 for cities and villages.[44] While the standards vary

[40] Wisconsin State Legislature, "Chapter NR 300, Time Limits and Fees For Waterway and Wetland Permit Decisions," March 2014, https://docs.legis.wisconsin.gov/code/admin_code/nr/300/300.

[41] Wisconsin State Legislature, "Chapter NR 350, Wetland Compensatory Mitigation," July 2015, https://docs.legis.wisconsin.gov/code/admin_code/nr/300/350.

[42] Wisconsin State Legislature, "Chapter NR 353, Wetlands Conservation Activities," May 2013, https://docs.legis.wisconsin.gov/code/admin_code/nr/300/353.

[43] Wisconsin State Legislature, "Chapter NR 115, Wisconsin's Shoreland Protection Program", September 2014, https://docs.legis.wisconsin.gov/code/admin_code/nr/100/115.

[44] Wisconsin State Legislature, "Chapter NR 116, Wisconsin's Floodplain Management Program", January 2012, https://docs.legis.wisconsin.gov/code/admin_code/nr/100/116.

slightly between WAC Chapters NR 115 and NR 116, the standards for shoreland-wetland zoning establish uses that may be permitted within a shoreland, and any uses that are not listed in zoning ordinance are prohibited.

Each county adopts regulations that meet or exceed minimum state standards. These standards include setbacks for structures from property lines and waterways, minimum lot sizes and land division review, restrictions on cutting of shoreline vegetation, standards for earth moving activities, protection for shoreland-wetlands, regulation of septic systems and wells, restrictions on improvements to older structures, or uses that don't meet the shoreland standards. These restrictions apply to industrial sand mining sites as well as to more conventional land uses.[45]

E. Threatened and Endangered Species

Congress passed the Endangered Species Act (ESA) in 1973 "to conserve the ecosystem upon which endangered and threatened species depend."[46] The law incorporates the Endangered Species Preservation Act of 1966 and Endangered Species Conservation Act of 1969. It is administered by the U.S. Fish and Wildlife Service (USFWS), which has primary responsibility for terrestrial and freshwater organisms.

In 1972, Wisconsin passed its own endangered species law, created rules and regulations, and identified which species to protect.

In 1972, Wisconsin passed its own endangered species law, created rules and regulations, and identified which species to protect. Wisconsin's endangered and threatened species laws include Ch. 29.604, Wis. Stats,[47] WAC Chapter NR 27,[48] and WAC Chapter NR 2.9.[49] The laws are administered by WDNR. Permits are required before a species can be "taken" and WDNR may issue permits with specific terms and conditions to take listed threatened or endangered species. "Taking" a species is defined as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, or collecting that species or attempting to do so.

WAC Chapter 27 contains rules necessary to implement the state's endangered species law and

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[45] Wisconsin Department of Natural Resources, "Shoreland Wetland Zoning, What the Landowner Needs to Know," October 2008, http://dnr.wi.gov/topic/ShorelandZoning/documents/ShorelandZoningLandownerInfo.pdf.

[46] Endangered Species Act, http://www.fws.gov/endangered/laws-policies/.

[47] Wisconsin State Legislature, "Chapter 29.604,Endangered and Threatened Species," accessed October 6, 2016, https://docs.legis.wisconsin.gov/statutes/statutes/29/IX/604.

[48] Wisconsin State Legislature, "Chapter NR 27, Endangered and Threatened Species," June 2015, http://docs.legis.wisconsin.gov/code/admin_code/nr/27.

[49] Wisconsin State Legislature, "Chapter NR 29, Endangered Resources Information Fees," December 2010, https://docs.legis.wisconsin.gov/code/admin_code/nr/001/29/_1.

governs the taking, transportation, possession, processing, or sale of any wild animal or wild plant specified by the department's lists of endangered and threatened wild animals and wild plants.

Under WAC Chapter NR 29, the state consults with land owners and provides recommendations on how to preserve and protect native plant and animal communities and endangered, threatened, and critical species.

F. Archeological Sites/Historic Preservation

The possibility that industrial sand mines might affect historical and archeological sites is addressed in a wide range of state laws protecting these sites.

The possibility that industrial sand mines might affect historical and archeological sites is addressed in a wide range of state laws protecting these sites.

In Wisconsin, archaeological sites can be protected during the course of state agency activities (e.g., issuance of permits, ground-disturbing projects) if the site has been recorded with the Office of the State Archaeologist. Ch. 44, Wis. Stats., requires each state agency to consider whether any proposed action of the agency will affect any historic property in the inventory or on the list of locally designated historic places under Ch. 44.45, Wis. Stats.[50] If the agency determines its proposed action will affect any historic property, the agency may deny or impose conditions on a permit, license, authorization, variance, exception, or award of financial assistance in order to reduce any adverse effect on historic property.

Other states have similar programs aimed at protecting archaeological sites and historic places. In Illinois, the Illinois State Agency Historic Resources Preservation Act (20 ILCS 3420/) establishes a program whereby state agencies (1) administer the historic resources under their control, (2) prepare policies and plans to contribute to the preservation, restoration, and maintenance of state-owned historic resources, and (3) in consultation with the director of historic preservation, institute procedures to ensure that state projects consider the preservation and enhancement of both state-owned and non-state-owned historic resources.

Minnesota Statutes, Chapter 138 designates the director of the Minnesota Historical Society as the State Historic Preservation Officer (MS 138.081) and places responsibility for Minnesota's historic preservation program with the Minnesota Historical Society. The Minnesota Field Archaeology Act (MS 138.31-138.42) establishes the office of the State Archaeologist; requires licenses to engage in archaeology on nonfederal public land; establishes ownership, custody, and use of objects and data recovered during survey; and requires state agencies to submit development plans to the state archaeologist, the Minnesota Historical Society, and the

[50] Wisconsin Statutes, "Chapter 44, Historical Societies and Historical Preservation," accessed October 6, 2016, https://docs.legis.wisconsin.gov/statutes/statutes/44/II/40.

Minnesota Indian Affairs Council for review when there are known or suspected archaeological sites in the area.

The Minnesota Historic Sites Act (MS 138.661–138.669) establishes the State Historic Sites Network and State Register of Historic Places, and requires that state agencies consult with the Minnesota Historical Society before undertaking or licensing projects that may affect properties in the network or on the state or national registers of historic places.

The Minnesota Historic Districts Act (MS 138.71–138.75) designates certain historic districts and enables local governing bodies to create commissions to provide architectural control in those areas.

In addition, Minnesota Statutes, Chapter 471.193 (MS 471.193) enables local units of government to establish heritage preservation commissions. This provides perhaps the most comprehensive protection of historic properties because it is at the local government level where most decisions about land and buildings are made.

G. Occupational Health and Safety

Occupational health and safety in the industrial sand industry are extensively regulated by federal and state agencies, primarily the Mine Safety Health Administration and Occupational Health and Safety Administration.

Occupational health and safety in the industrial sand industry are extensively regulated by federal and state agencies. Among federal agencies, the Mine Safety Health Administration (MSHA) and Occupational Health and Safety Administration (OSHA), two agencies of the United States Department of Labor, are the primary regulators of workplace safety.

MSHA administers the provisions of the Federal Mine Safety Health Act ("Mine Act") to enforce compliance with mandatory safety and health standards to eliminate fatal accidents, reduce the frequency and severity of nonfatal accidents, minimize health hazards, and promote improved safety and health conditions in the nation's mines.[51]

MSHA carries out the mandates of the Mine Act at all mining and mineral processing operations in the United States, regardless of size, number of employees, commodity mined, or method of extraction. The safety- and health-related requirements for the operation of surface and underground mines are contained in the Code of Federal Regulations (CFR) Title 30, Mineral

[51] Mine Safety and Health Administration, "Federal Mine Safety & Health Act of 1977, Public Law 91-173, as amended by Public Law 95-164," accessed October 6, 2016, http://arlweb.msha.gov/regs/act/acttc.htm.

Resources. All non-metallic surface mines are inspected by MSHA at least twice per year, and underground mines are inspected four times per year.[52],[53]

Mine worker safety is also regulated by the State of Wisconsin through SPS 308. These regulations were designed to protect workers in quarries, mines, and related activities. This chapter covers openings or excavations in the earth for the purpose of extracting minerals or other materials and the equipment related to processing or manufacturing of ores, aggregates, cements, lime, clay, and silica sands in a mine, pit, or quarry.[54]

Non-mining operations associated with the industrial sand industry are subject to OSHA regulations. These industries include trucking, rail loading, sales, supply and logistics, and all industries that use the sand produced at a mine.

In addition to federal and state regulations designed to protect workers, county and municipal governments enforce regulations in the form of municipal building codes and county health ordinances. Any local standard must either match or be more protective than the minimum standards established by the state government.

H. Explosives

Blasting agents are used in industrial sand mining to loosen the sand and liberate the sand grains so it can be mined and processed. Explosives are regulated by the Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF). ATF is a law enforcement agency in the United States Department of Justice. The federal explosives law and regulations affect all persons who import, manufacture, deal in, purchase, use, store, or possess explosive materials, which are crucial to blasting operations at industrial sand mines. ATF regulations also affect those who ship, transport, cause to be transported, or receive explosive materials. ATF plays a vital role in regulating and educating the explosives industry, and in protecting the public from inadequate storage and security.

Blasting agents are used in industrial sand mining to loosen the sand and liberate the sand grains so it can be mined and processed. Explosives are regulated by the Bureau of Alcohol, Tobacco, Firearms, and Explosives.

ATF 27 CFR Part 555 sets standards and requirements for the issuance of permits for explosive materials, the conduct of businesses that have access to them, and the storage of explosive

[52] U.S. Government Publishing Office, “Code of Federal Regulations, Title 30,” October 4, 2016, http://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title30/30tab_02.tpl.

[53] United States Department of Labor, “Mine Safety and Health Administration, Frequently Asked Questions,” accessed January 18, 2016, http://www.msha.gov/faq/faqhome.htm.

[54] Wisconsin State Legislature, “Chapter SPS 308, Mines, Pits, and Quarries,” September 2013, http://docs.legis.wisconsin.gov/code/admin_code/sps/safety_and_buildings_and_environment/301_319/308.pdf.

materials. It details the records and reports required of licensees and permittees; explains exemptions, unlawful acts, penalties, seizures, and forfeitures; and regulates the marking of plastic explosives.[55]

In Wisconsin, the Wisconsin Department of Safety and Professional Services (WDSPS) regulates the use of explosives, including those used for industrial sand mining. SPS Rule 307 regulates explosives and fireworks; SPS 307.40 specifies regulation of blasting resultants such as air blast (noise), fly rock, and vibrations; SPS 307.41 requires preblasting notifications; SPS 307.42 describes requirements for blasting schedules; SPS 307.43 sets standards for instrumentation; and SPS 307.44 requires industrial sand operators to control adverse effects of blasting on neighboring properties.[56]

Many industrial sand companies have increased their efficiency by loading unit trains (trains consisting of 80 to 120 cars carrying a single commodity) on on-site rail spurs.

Additional SPS rules set standards for obtaining blasters' licenses; establish fire codes for buildings that handle explosives; provide building construction guidelines; set standards for energy conservation in buildings; and establish heating, ventilation, and cooling regulations, which include, among other things, regulations on smoke detection equipment, ducts and air transfer openings, boilers, and water heaters.[57],[58]

I. Railroads

Industrial sand is primarily shipped by rail. Transportation represents up to two-thirds of the cost of frac sand at the well head. Changing market conditions have increased the need for efficient frac sand transportation.[59] Many industrial sand companies have increased their efficiency by

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[55] U.S. Government Publishing Office, "Title 27: Alcohol, Tobacco Products, and Firearms, Part 555 Commerce and Explosives," Electronic Code of Federal Regulations, January 12, 2016, http://www.ecfr.gov/cgi-bin/text-idx?SID=9607d613928f48310ac9aeb2ca201c89&mc=true&node=pt27.3.555&rgn=div5#se27.3.555_11.

[56] Wisconsin Department of Safety and Professional Services, "Chapter SPS 307," September, 2013, http://docs.legis.wisconsin.gov/code/admin_code/sps/safety_and_buildings_and_environment/301_319/307.pdf.

[57] Wisconsin Department of Safety and Professional Services, "Chapter SPS 305," September 2015, http://docs.legis.wisconsin.gov/code/admin_code/sps/safety_and_buildings_and_environment/301_319/305.pdf.

[58] Wisconsin Department of Safety and Professional Services, "Chapter SPS 314," November 2014, http://docs.legis.wisconsin.gov/code/admin_code/sps/safety_and_buildings_and_environment/301_319/314/II/65.

[59] Swetha Gopinath and Anannya Pramanick, "Halliburton, Baker Hughes buy more sand, railcars as demand piles up," Reuters, October 21, 2014, http://www.reuters.com/article/oil-fracking-idUSL3N0SG6B520141021.

loading unit trains (trains consisting of 80 to 120 cars carrying a single commodity) on on-site rail spurs.

Railroads are regulated by the Federal Railroad Administration (FRA), which is an agency of the United States Department of Transportation (USDOT), the federal cabinet department responsible for regulating transportation. USDOT also regulates the transportation of hazardous materials. Industrial sand transportation, whether by truck, rail, or barge, must comply with USDOT regulations.

Wisconsin has seen a steady decline since 2011 in the number of train derailments, despite a dramatic increase in railroad traffic – as much as 15 to 20 percent on some rail lines – due in part to shipping industrial sand.

The purpose of FRA is to promulgate and enforce rail safety regulations, administer railroad assistance programs, conduct research and development in support of improved railroad safety and national rail transportation policy, and consolidate government support of rail transportation activities. Railroad design, construction, and operations at industrial sand facilities are regulated by FRA. Trains carrying industrial sand must adhere to all applicable FRA regulations, including requiring locomotives to sound their horns at railroad crossings, and minimum federal safety standards for all locomotives.[60]

Rail traffic is also regulated by the Wisconsin Department of Transportation (WisDOT), specifically through Ch. 195, Wis. Stats., which sets standards for safety devices, bridges, railroad crossings, snowmobile crossings, safety gates, and drawbridges.[61] These regulations are a key reason Wisconsin has seen a steady decline since 2011 in the number of train derailments, despite a dramatic increase in railroad traffic – as much as 15 to 20 percent on some rail lines – due in part to shipping industrial sand.[62]

J. Mine Reclamation

Opponents of industrial sand mining have incorrectly claimed that once land is used for industrial sand mining, it is no longer suitable for other purposes, such as agriculture, wildlife

[60] Federal Railroad Administration, "49 CFR Part 222 and 229," 2011, https://www.gpo.gov/fdsys/pkg/CFR-2011-title49-vol4/pdf/CFR-2011-title49-vol4-part222.pdf, https://www.gpo.gov/fdsys/pkg/CFR-2011-title49-vol4/pdf/CFR-2011-title49-vol4-part229.pdf.

[61] Wisconsin State Legislature, "Chapter 195, Railroad and Water Carrier Regulation," accessed January 14, 2016, http://docs.legis.wisconsin.gov/statutes/statutes/195.

[62] Taylor Chase, "New conflicts emerge as rail moves frac sand across Wisconsin landscape," *La Crosse Tribune*, July 23, 2014, http://lacrossetribune.com/jacksoncochronicle/news/local/new-conflicts-emerge-as-rail-moves-frac-sand-across-wisconsin/article_b9366858-12a7-11e4-95e3-001a4bcf887a.html.

habitat, outdoor recreation, or tourism.[63] State laws require industrial sand mine operators to reclaim, or restore, land used for industrial sand mining. Reclamation allows mining sites to be restored for productive end land uses, which include wildlife habitat, agriculture, or outdoor recreation.[64]

State laws require industrial sand mine operators to restore land for productive end land uses, which include wildlife habitat, agriculture, or outdoor recreation.

In Wisconsin, WAC Chapter NR 135 requires new non-metallic mines to apply for and receive a reclamation permit prior to beginning operations. Mining operations must prepare a reclamation plan, which is the basis for determining whether a reclamation permit will be granted. The reclamation plan acts as a blueprint describing the steps necessary to reclaim the site to achieve a desired post-mining land use. The reclamation plan must demonstrate compliance with the uniform reclamation standards provided in WAC Chapter NR 135 and provides environmental protection during and after the mining process.[65]

WAC Chapter NR 135 provides for the control of surface water and erosion that occurs during site development and site reclamation. The statewide standards require that reclamation plans have measures that protect surface waters and prevent any adverse impacts on neighboring properties. Such measures may include diverting unaffected surface flows around mines and processing operations, and protection of topsoil or surficial soil materials (as defined in NR 135.02).

Reclamation plans vary considerably from one mining site to another. The proposed post-mining land use for agriculture, surface water, wildlife habitat, etc. will dictate the final slopes, drainage patterns, site hydrology, and seed mixes and the extent to which mining-related structures, drainage structures, and sediment control structures are removed.[66]

Additionally, WDNR recommends that industrial sand operators examine long-term considerations such as connecting reclaimed mines to planned or existing trails, recreational areas, wildlife management areas, or wildlife migration corridors. Such considerations can limit or eliminate long-term perceived negative impacts on land associated with industrial sand mining.[67]

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[63] Caleb Brown, "Frac sand instability presents problems for towns," *La Crosse Tribune*, December 22, 2015, http://lacrossetribune.com/news/local/frac-sand-instability-presents-problems-for-towns/article_407c793c-ab23-5975-8723-9d1f94631ec6.html.

[64] Wisconsin Department of Natural Resources, "Non-metallic mine reclamation plans," April 15, 2015, http://dnr.wi.gov/topic/mines/reclamation.html.

[65] *Ibid.*

[66] *Ibid.*

[67] *Ibid.*

Mine reclamation in Illinois is regulated by the Surface Mined Land Conservation and Reclamation Act of 1971, which applies to all surface mining activity conducted in the state. In Minnesota, reclamation of industrial sand mining operations is addressed at the local level during the environmental review and local interim use permit processes. As summarized in Part 3 below, state rules addressing reclamation were recently proposed by the Minnesota DNR, and the rule-making process is ongoing.

Additional information regarding the potential for reclamation to restore industrial sand mines into agricultural production can be found in *Heartland Policy Study* No. 137, "Environmental Impacts of Industrial Silica Sand (Frac Sand) Mining."[68]

Part 3

Overview of Recent State Rule Review and Rule Making

Although at least 20,000 pages of environmental rules and regulations currently apply to non-metallic mining, some state policymakers think it's necessary to adopt regulations specifically targeting industrial sand mining.

Although at least 20,000 pages of environmental rules and regulations currently apply to non-metallic mining, some state policymakers think it's necessary to adopt regulations specifically targeting industrial sand mining. These initiatives are not driven or demanded by science, but by political pressure and activist groups opposed to mining. Rule-making used as a tool to restrict and control a demonized industry dilutes the sincerity of the demand for additional regulation. The industry supports regulation based on facts and sound science and applied equally across all industries.

A. Minnesota - Overview

Minnesota Gov. Mark Dayton has pushed for stricter controls to limit mining opportunities in a state where accessible industrial sand deposits are severely limited by geology. At the Minnesota State Fair on August 28, 2013, Dayton made it clear he supports a ban on frac sand mining and processing in southeast Minnesota. During his State Fair interview with Minnesota Public Radio, Dayton said:

> The fracking frankly I would keep out of Minnesota entirely. I wanted to ban further silica sand mining and any processing of that in southeast Minnesota. I would allow the existing operations that are more in the Mankato area and Minnesota River and a little bit

[68] Orr and Krumenacher, *supra* note 30.

north of the Twin Cities. These areas are not so ecologically fragile. But I couldn't get the legislature to go along with the ban in southeastern Minnesota. But we did get some very, very tight regulations, very tight restrictions, that the DNR and Pollution Control Agency are going to enforce vigilantly and we'll see how it goes. But I'm prepared to try again next year to get the legislature to say that area is off limits.[69]

The 2013 omnibus environment bill created four new sections of Minnesota statute related to industrial sand mining.

On April 22, 2014 a petition was delivered to the Governor's Office requesting a moratorium on frac sand mining in southeastern Minnesota. The governor's press secretary responded in a statement:

> During the 2013 Legislative Session, Governor Dayton strongly supported a moratorium on frac sand mining in southeastern Minnesota. Unfortunately, that proposal was not supported by the Minnesota Legislature. Legal Counsel has advised that, absent legislative enactment of the moratorium, the Governor lacks the authority to unilaterally impose his own moratorium.
>
> However, local jurisdictions, such as counties, cities, and townships, have authority under existing Minnesota Statutes to declare moratoriums on frac sand mining and processing within their jurisdictions. Citizens living in those areas should urge those local officials to enact the measures they favor.
>
> Last year's law did greatly strengthen state agencies' authority to impose stringent requirements on any frac sand mining in that region. The Environmental Quality Board, DNR, and MPCA are all actively engaged in establishing and enforcing those restrictions.[70]

The 2013 omnibus environment bill, Laws of Minnesota 2013, chapter 114, created four new sections of Minnesota statute:

- 103G.217 requires a silica sand mining trout stream setback permit for excavation or mining operations in the Driftless Area in southeastern Minnesota and the area boundaries of the Department of Natural Resources Paleozoic plateau ecological section. No excavation or mining of silica sand may occur within one mile of a designated trout stream listed in Minnesota Rules unless a silica sand mining trout stream setback permit is obtained from DNR. Applicants must provide a hydrogeological evaluation and assess potential impacts to water supply wells and designated trout streams, springs, and other hydrogeologic features and identify appropriate setbacks to protect water quality, quantity, and trout habitat.

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[69] Minnesota Public Radio, "Gov. Mark Dayton States Support for a SE MN Frac Sand Ban," August 29, 2013, http://landstewardshipproject.org/posts/490.

[70] Office of Governor Mark Dayton and Lt. Governor Tina Smith, "Statement from the Governor's Office Regarding Frac Sand Moratorium," April 22, 2014, https://mn.gov/governor/newsroom/pressreleasedetail.jsp?id=102-127215.

- 116C.99 requires the Environmental Quality Board (EQB) to establish silica sand mining model standards. The Minnesota Legislature directed EQB to consult with local governments and develop model standards and criteria for mining, processing, and transporting silica sand. The resulting guidelines document, *Tools to Assist Local Governments in Planning for and Regulating Silica Sand Projects*,[71] was published on March 19, 2014.

  The document is comprehensive and generally unbiased, but it lacks guidance on the science behind some of the recommendations, especially regarding groundwater testing. The recommendations concerning bluffs are the most problematic. The recommendations are based on listed impacts that are unjustified, and on some assumptions that are technically incorrect, unnecessarily control and restrict the property rights of land owners, and eliminate any feasible underground mining opportunities.

  The guidelines document is comprehensive but lacks guidance on the science behind some of the recommendations.

- 116C.991 requires environmental reviews for silica sand projects. 2013 legislation[72] established interim thresholds for environmental review of silica sand-related operations and directed EQB to develop new state rules for environmental review of silica sand projects. The legislation requires environmental reviews of industrial silica sand mining projects that are not required for other sand and gravel mines and other non-metallic mines.

  The revised rules changed the threshold for completion of an Environmental Assessment Worksheet (EAW) from 40 acres to 20 acres. The rules affect operations designed to store or capable of storing more than 7,500 tons of silica sand and operations with an annual throughput of more than 200,000 tons of silica sand, including operations not required to receive a permit from the Minnesota Pollution Control Agency.

  An EAW for all silica sand operations meeting the threshold must also include:

  1. A hydrogeologic investigation assessing potential groundwater and surface water effects and geologic conditions that could create an increased risk of potentially significant effects on groundwater and surface water;

  2. For a project with the potential to require a groundwater appropriation permit from the commissioner of natural resources, an assessment of the water resources available for appropriation;

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[71] Minnesota Environmental Quality Board, "Tools to Assist Local Governments in Planning for and Regulating Silica Sand Projects", March 20, 2014, https://www.eqb.state.mn.us/tools-assist-local-governments-planning-and-regulating-silica-sand-projects-0.

[72] Minnesota State Statutes, "Chapter 114, Article 4, Section 105," Office of the Revisor of Statutes, 2013, https://www.revisor.leg.state.mn.us/laws/?id=114&year=2013&type=0.

3. An air quality impact assessment that includes an assessment of the potential effects from airborne particulates and dust;

4. A traffic impact analysis, including documentation of existing transportation systems, analysis of the potential effects of the project on transportation, and mitigation measures to eliminate or minimize adverse impacts;

5. An assessment of compatibility of the project with other land existing uses; and

6. Mitigation measures that could eliminate or minimize any adverse environmental effects for the project.

- 116C.992 requires the Environmental Quality Board, in consultation with local units of government, to create and maintain a library on local government ordinances and local government permits that have been approved for regulation of silica sand projects for reference by local governments.[73]

The 2013 omnibus environment bill Chapter 114 also directs the Pollution Control Agency, Department of Natural Resources, Department of Health, and Environmental Quality Board to adopt or amend silica sand rules.

1. Minnesota - Department of Health

The Minnesota Department of Health (MDH) was directed to adopt air quality standards to protect human health from exposure to respirable crystalline silica. The standards, released in July 2013, were based upon the department's review of respirable crystalline silica (RCS) and its effect on health.

The Minnesota Department of Health was directed to adopt air quality standards to protect human health from exposure to respirable crystalline silica.

MDH established a respirable crystalline silica threshold of 3 micrograms per cubic meter (µg/m3), a chronic health-based standard based on guidance values used for decades to limit exposure in the workplace.

The American National Standards Institute (ANSI) separates health hazard categories into chronic and acute. The potential for exposure to respirable crystalline silica is considered from a chronic effects exposure perspective, where damage may accumulate after multiple exposures or over a long exposure period, or arise long after earlier exposures. The main difference between acute and chronic relates to duration of exposure and to the rapidity of onset of damage after exposure. Acute effects, which occur rapidly after a single or short-term

[73] Minnesota State Statutes, "116C.992 Technical Assistance Ordinance and Permit Library," State of Minnesota, 2015, https://www.revisor.mn.gov/statutes/?id=116C.992.

exposure, is not considered an ambient air quality or health concern near industrial sand operations.

MDH recognizes respirable crystalline silica must be present in high concentrations to cause short-term health effects in individuals exposed to silica dust in work settings. People working in these occupations in theory could be exposed to concentrations higher than what the general public would encounter in ambient air. MDH acknowledges existing ambient air standards for particulate matter (which includes crystalline silica) provide protection against health effects in short-term exposures.

The chronic health-based standard for RCS established by the MDH is many times lower than occupational RCS guidelines or standards due to adjustments for continuous exposure and consideration of uncertainty factors to protect sensitive subpopulations such as children or the elderly. MDH took the values already considered protective for workers in high-exposure industries and lowered them further based on their assumption that lower levels of exposure to RCS are better. MDH reported it believes the new chronic health-based standard to be protective of children, the elderly, and other subpopulations that could potentially be considered to be more vulnerable to exposure to respirable crystalline silica.[74]

The Environmental Quality Board, Minnesota Pollution Control Agency, and Minnesota Department of Natural Resources undertook a joint rule-making process to establish additional regulations for industrial sand mining.

2. Minnesota - EQB, MPCA, and MDNR Joint Silica Sand Rulemaking

As called for by the 2013 environment omnibus law, Chapter 114, the Environmental Quality Board (EQB), Minnesota Pollution Control Agency (MPCA), and Minnesota Department of Natural Resources (MDNR) undertook a joint rule-making process to establish additional regulations for industrial sand mining. Each agency was directed by the legislature to make certain rule changes, including:

- The commissioner of MPCA was directed to adopt rules pertaining to the control of particulate emissions from silica sand projects and consider the need for rules protecting surface water.

- The commissioner of DNR was directed to adopt rules pertaining to the reclamation of silica sand mines.

[74] Minnesota Department of Health, MDH Health-Based Guidance - Crystalline Silica, http://www.health.state.mn.us/divs/eh/hazardous/topics/silica/silicaguidance.html.

- EQB was directed to amend its rules for environmental review of silica sand mining and processing projects and to determine whether the requirements should be different for different geographic areas of the state.

Wisconsin's regulatory system has been more conducive to industrial sand mining than Minnesota's, in part due to a political climate that has a more realistic and rational approach to mining and business.

As part of the joint rule-making process, MPCA, MDNR, and EQB convened an advisory committee of 15 people intended to represent the wide range of stakeholders interested in the regulation of silica sand mining, processing, and transport. The committee was to include equal representation from local government units, industry, and concerned citizens with balanced representation from the geographic regions of the state where silica sand mining, processing, and transportation take place. The Minnesota Silica Sand Rule Making Advisory Panel met almost monthly from January 2014 through February 2015.

While it was the intent of Minnesota state regulators to have a balanced panel, anti-mining activists affiliated with the southeast Minnesota-based Land Stewardship Project actively worked to gain a majority of the seats on the advisory board. During its January 18, 2014 Citizens' Frac Sand Summit in Winona, the group proudly proclaimed successful derailment of the diversity goal by claiming eight of the 15 seats on the panel.[75]

MPCA, MDNR, and EQB have drafted rules and the agencies are researching and developing the scope of the rules, refining rule language, and writing a Statement of Need and Reasonableness (SONAR).

B. Wisconsin - Overview

Wisconsin's regulatory system has been more conducive to industrial sand mining than Minnesota's, in part due to a political climate that has a more realistic and rational approach to mining and business than the current administration in Minnesota. This may be in part because Wisconsin recognizes the history and benefit of mining in the state and has continued confidence in the environmental protections already in place.

The potential impact of mining on the environment and the health of residents has been the focus of ongoing studies and consideration of additional rules specifically addressing industrial sand mining.

[75] Land Stewardship Project, Report from the Citizens' Frac Sand Summit, Summit Podcasts, "LSP Citizens' Frac Sand Summit (part 7): LSP's Bobby King talks about the role of local government and state regulations in controlling frac sand mining," http://landstewardshipproject.org/organizingforchange/fracsandorganizing/reportfromthecitizensfracsandsummit.

1. Wisconsin - Industrial Sand Mining Strategic Analysis

In January 2012, the Wisconsin Department of Natural Resources (WDNR) released the *Silica Sand Mining in Wisconsin* report, summarizing the best available information on silica sand mining, its possible environmental impacts, and local, state, and federal regulations that address sand mining and processing.[76]

According to the WDNR report, current non-metallic mining regulations implemented at the county level and environmental regulations implemented by WDNR are adequate to ensure that permits for individual sand mining operations and processing facilities are protective of public health and the environment. As the number of sand mines and processing facilities increases, especially if clusters of these facilities begin to occur, the department may consider examining cumulative environmental impacts.

The WDNR report acknowledged that most sand mine siting is controlled through local zoning decisions and most public comments have focused on impacts the state has no authority to regulate. Those impacts include noise, lights, hours of operation, damage and excessive wear to roads from trucking traffic, public safety concerns from the volume of truck traffic, possible damage and annoyance resulting from blasting, and concerns regarding aesthetics and land use changes.

The WDNR report acknowledged that most sand mine siting is controlled through local zoning decisions and most public comments have focused on impacts the state has no authority to regulate.

In response to a petition from a state environmental activist group – not the revelation of new significant information concerning the impacts of sand mining – WDNR launched an effort to "reassess the latest scientific, natural resource, and socio-economic information relating to industrial sand mining and its associated infrastructure in Wisconsin" by conducting a strategic analysis.[77] The strategic analysis is intended to update information provided in the *Silica Sand Mining in Wisconsin* report. The Draft Strategic Analysis for Public Review was issued in June 2016 and public comment on the draft closed in August 2016.[78] The WDNR will compile the comments it received and revise the draft report in late 2016 or early 2017.

[76] Wisconsin Department of Natural Resources, "Silica Sand Mining in Wisconsin," accessed October 4, 2016, http://dnr.wi.gov/topic/mines/sand.html.

[77] Wisconsin Department of Natural Resources, "Industrial Sand Mining In Wisconsin, Strategic Analysis," June 2016, http://dnr.wi.gov/topic/EIA/ISMSA.html.

[78] Wisconsin Department of Natural Resources, "Industrial Sand Mining In Wisconsin, Strategic Analysis," June 2016, http://dnr.wi.gov/topic/EIA/ISMSA.html.

2. Wisconsin - Health Impact Assessment

From October 2014 through March 2016, the Institute for Wisconsin's Health worked with 14 health departments, the Ho-Chunk Nation, and the University of Iowa's Environmental Health Research Center to gather and analyze information on the potential public health impacts of industrial sand mining in western Wisconsin.

The assessment by the Institute for Wisconsin's Health combined health expertise, scientific data, and input from businesses, community members, and other organizations to examine air and water quality, jobs, transportation, and other issues important to community stakeholders.

Health impact assessments (HIAs) take into account health data and the perspectives of a broad range of people and organizations. The assessment by the Institute for Wisconsin's Health combined health expertise, scientific data, and input from businesses, community members, and other organizations to examine air and water quality, jobs, transportation, and other issues important to community stakeholders.

The assessment process culminated in a final report, *Health Impact Assessment of Industrial Sand Mining in Western Wisconsin*, issued in February 2016.[79] The HIA focused on air quality, water resources, land reclamation and value, and quality of life. It concluded the potential exists for both positive and negative health effects from industrial sand mining.

3. Wisconsin – Proposed Rules

On December 1, 2015, Wisconsin state Sen. Kathleen Vinehout introduced a bill that, if it became law, would require industrial sand mining operations to perform additional air monitoring and require the state to promulgate a standard for respirable silica. The two sections of the bill state:[80]

> 1. The [Department of Natural Resources] shall, by rule or in an operation permit, require an owner or operator of an industrial sand mining or processing facility to set up and operate no fewer than 2 monitors to monitor the ambient air in the vicinity of the facility for crystalline silica particles with a diameter of less than 4 micrometers, particulate matter with a diameter of less than 10 micrometers, and particulate matter with a diameter of less than 2.5 micrometers, and report the results of the monitoring to the department. The department shall specify methods for conducting the monitoring and for analyzing the results of the monitoring.

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[79] Audrey Boerner *et al*., "Health Impact Assessment of Industrial Sand Mining in Western Wisconsin," Institute for Wisconsin's Health, Inc.,2016, http://www.instituteforwihealth.org/uploads/1/2/7/8/12783470/iwhi_industrial_sand_w_covers.pdf.

[80] Wisconsin State Legislature, "2015 Senate Bill 577," January 15, 2016, https://docs.legis.wisconsin.gov/2015/related/proposals/sb577/2.

2. Standard for respirable silica. The department shall promulgate an ambient air quality standard and increments for crystalline silica particles with a diameter of less than 4 micrometers.

Air monitoring already undertaken at several sites in Wisconsin and Minnesota has shown low levels of risk to human health. The Vinehout bill would increase the cost of operating an industrial sand mine without increasing the safety of mine workers or the neighboring public.

A second Vinehout bill, introduced on December 1, 2015, authorizes eight full-time-equivalent positions in the Department of Natural Resources for monitoring industrial sand mining and processing operations and provides funding for those positions from the environmental fund.

In July 2016, the WDNR issued two new general permits for non-metallic mining operations, one specifically for industrial sand operations [81] and one for all other non-metallic mining operations.[82] The general permits cover construction sand, gravel, dimension stone, rotten granite, clay pit, crushed stone, and industrial sand operations and processing where wash water, pit dewatering, dust control and non-contact cooling wastewaters are discharged to surface waters or groundwater. The general permits also contain storm water requirements in accordance with ch. NR 216, Wis. Adm. Code.

There are relatively few industrial sand mining opportunities in Michigan due to the limited availability of sand deposits. Nevertheless, opposition develops where new mines are proposed. There are no recent laws directed at industrial sand mining.

C. Michigan - Overview

There are relatively few industrial sand mining opportunities in Michigan due to the limited availability of sand deposits. Nevertheless, opposition develops where new mines are proposed. There are no recent laws directed at industrial sand mining.

On July 20, 2011, the Michigan legislature reinstated the state's "very serious consequences" rule, known as Public Act 113 of 2011.[83] The law is noted here because it was recently a factor for issuing a citation to a new industrial sand mine in the state.

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[81] Wisconsin Department of Natural Resources, "General Permit to Discharge Under the Wisconsin Pollutant Discharge Elimination System, WPDES Permit No. WI-B046515-6," State of Wisconsin, accessed September 19, 2016, http://dnr.wi.gov/topic/stormwater/documents/B046515-6.pdf.

[82] *Ibid.*

[83] Michigan Legislature, "Michigan Zoning Enabling Act," State of Michigan, Accessed September 19, 2016, http://www.legislature.mi.gov/(S(3udfsdalj4ltzni0ksn2kr51))/mileg.aspx?page=getObject&objectName=mcl-125-3205.

In Michigan, a local ordinance may not prevent the extraction by mining of valuable natural resources from any property unless "very serious consequences" would result.

Under the law, a local ordinance may not prevent the extraction by mining of valuable natural resources from any property unless "very serious consequences" would result from the extraction. Any challenge to a local ordinance or zoning decision as violating the rule must show three things:

1. That there are valuable natural resources on the property,

2. That there is a need for the natural resources by the person or in the market served by the person, and

3. That no very serious consequences would result from the extraction, by mining, of the natural resources.

The law provides guidance as to when "very serious consequences" would result from the extraction and identifies as relevant six factors:

1. The relationship of extraction and associated activities with existing land uses.

2. The impact on existing land uses in the vicinity of the property.

3. The impact on property values in the vicinity of the property and along the proposed hauling route serving the property, based on credible evidence.

4. The impact on pedestrian and traffic safety in the vicinity of the property and along the proposed hauling route serving the property.

5. The impact on other identifiable health, safety, and welfare interests in the local unit of government.

6. The overall public interest in the extraction of the specific natural resources on the property.

The law confirms a municipality's right to regulate hours of operation, blasting hours, noise levels, dust control measures, and traffic in connection with mining operations – as long as the municipality's regulations are not preempted by other laws and as long as the regulations are "reasonable in accommodating customary mining operations."[84]

[84] *Ibid.*

D. Arkansas, Illinois, Iowa, Missouri, and Texas

New rule-making specifically targeting industrial sand mining has not been identified in Arkansas, Illinois, Iowa, Missouri, or Texas. If you are aware of such rule-making, please let us know!

Part 4

Local Control of the Permitting Process

A. Industrial Sand Ordinances, Moratoria, and Bans

Non-metallic mining is a local land use issue, and these facilities are typically permitted at the local level. Most local units of government apply restrictions on mining operations consistent with their established zoning ordinances. These restrictions vary among local governments, and such regulations have historically provided reasonable conditions addressing matters such as mining setbacks, hours of operation, noise limits, and the requirement that all federal and state rules be followed.

Despite a long history of non-metallic mining in the Midwest, the recent expansion of sand mining has resulted in the development of more restrictive local control measures, primarily in response to pressure put on local officials (decision makers) by local or regional anti-mining activists, and by local officials who may oppose mining for personal or political reasons.

Non-metallic mining is a local land use issue, and these facilities are typically permitted at the local level. Most local units of government apply restrictions on mining operations consistent with their established zoning ordinances.

This change was preceded by court decisions expanding the power of local governments to impose restrictions on non-metallic mining. In Wisconsin, the single most influential change in local control resulted from a Wisconsin Supreme Court decision in *Zwiefelhofer* v. *Town of Cooks Valley* in Chippewa County, Wisconsin.

The court held that the Town of Cooks Valley had the authority, under its general police power, to adopt a non-zoning ordinance regulating non-metallic mining. Local police power regulations are intended to protect the health, safety, and welfare of residents. The *Zwiefelhofer* decision holds that towns have certain authority to adopt ordinances requiring a license to operate a mine.

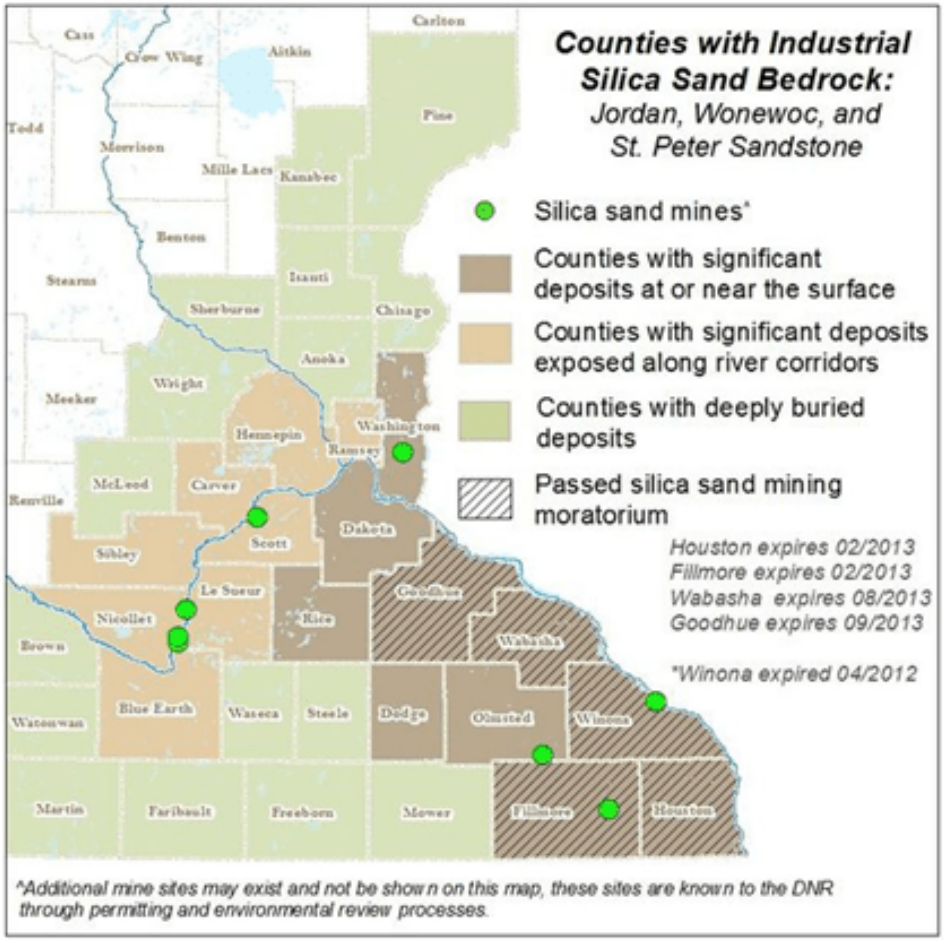
Many local governments justify the imposition of non-metallic mining licensing ordinances by saying they are needed to protect the health and welfare of nearby citizens – despite existing federal, state, and local zoning regulations designed to achieve those goals. Some local governments have clearly abused the process by enacting overly restrictive ordinances that

effectively prevent mining operations. In Allamakee County, Iowa, for example, local officials enacted an ordinance that prohibits the use of flocculants for recycling wash water, prohibits using sand in the reclamation process, and prohibits industrial sand mining within one mile of or visible from any stream, river, recreational trail, or scenic byway.[85]

Moratoria have been adopted in some townships and counties as a temporary "time out" from permitting industrial sand mines, giving local officials time to study the industrial sand industry and develop ordinances to regulate industrial sand mining at the local level.

Figures 2 and 3 demonstrate the extent to which industrial sand facilities have been suspended in Minnesota and Wisconsin, respectively. Most of these moratoria were subsequently lifted as new industrial sand mining ordinances were developed.

Figure 2
Silica Sand Mining Moratoria in Minnesota

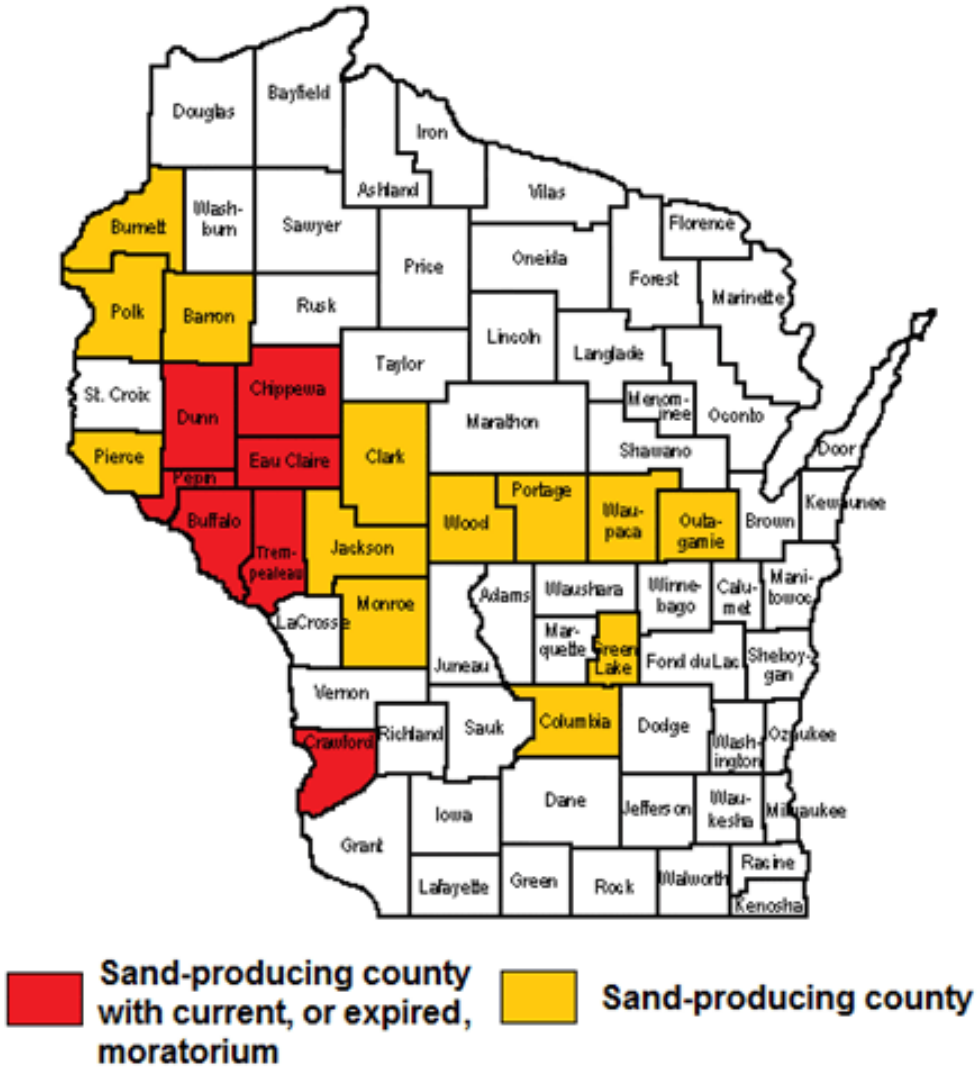


Source: Sourcewatch.org, http://www.sourcewatch.org/index.php/File:MNstatusmap.jpg.

[85] Allamakee County, Iowa, "Allamakee County Zoning Ordinance Amendment No." http://s3.documentcloud.org/documents/1279055/fracsandordinances.pdf.

Figure 2 shows many counties in Minnesota with significant deposits of industrial sand have enacted moratoria on mining, limiting Minnesota's role in supplying frac sand to oil and gas operations.[86] Those limitations, in conjunction with low oil and natural gas prices, could reduce the attractiveness of Minnesota as a future supplier of sand and serve to concentrate market share in neighboring Wisconsin.

Figure 3
Silica Sand Mining Moratoria in Wisconsin



Source: Map from http://d-maps.com/carte.php?num_car=22015&lang=en modified by the authors.

[86] Sourcewatch.org, "Minnesota and Fracking," November 4, 2015, http://www.sourcewatch.org/index.php/File:MNstatusmap.jpg.

Figure 3 shows seven of 20 industrial sand-producing counties in Wisconsin have imposed a moratorium on industrial silica sand mining in recent years. Additionally, some cities and villages have enacted their own restrictions, and in some cases moratoria, on industrial sand mining.[87]

Although many activist groups advocate for permanent bans rather than temporary moratoria, they have not traditionally been successful. Such bans likely constitute a legal "takings," or a denial of private property rights without just compensation, and are therefore unlawful.

Unlike moratoria, which impose a temporary "time out" on mining activities, some communities have sought to permanently stop industrial sand mining by enacting bans on silica sand mining operations. Although many activist groups advocate for these measures, they have not traditionally been successful. Such bans likely constitute a legal "takings," or a denial of private property rights without just compensation, and are therefore unlawful.

In Houston County, Minnesota, the County Planning Commission rejected a proposed ban on frac sand mining by a 5–2 margin among concerns that banning frac sand mining would also negatively affect agriculture and quarries and sand mines used for road construction.[88]

While anti-mining activist groups may applaud the misuse of local government powers in the form of de facto bans on industrial sand operations, policymakers must be aware that enacting unreasonable or overly-strict regulations often has unintended consequences. Such regulations incentivize industrial sand companies to seek annexations into neighboring municipalities that promise to provide a more reasonable regulatory framework.

B. Annexation

Annexation transfers parcels of land from towns to cities and villages.[89] Annexations are common for a variety of uses, such as building subdivisions, shopping malls, and water parks. Data from the Wisconsin Department of Administration (DOA) indicate approximately 2,000 petitions for annexation have been submitted in recent years and await further action.[90] These

[87] Map modified to show counties from http://d-maps.com/carte.php?num_car=22015&lang=en.

[88] "Houston County frac sand ban withdrawn," *La Crosse Tribune*, October 6, 2015, http://lacrossetribune.com/news/local/houston-county-frac-sand-ban-withdrawn/article_c4f5a585-c47a-5573-9daf-91c33b4ea0c5.html.

[89] Edward V. Schten, "Annexation," University of Wisconsin Extension Local Government Center Fact Sheet, April 1995, http://lgc.uwex.edu//program/pdf/fact4.pdf.

[90] Wisconsin Department of Administration, "Petitions," Municipal Data System, accessed January 6, 2016, http://mds.wi.gov/View/Petitions.

petitions for annexation range from tens-of-thousands of acres to less than one acre.[91]

In Wisconsin, nearly all annexations are pursued by landowners.[92] The state reviews about 300 annexation petitions a year in counties with a population of 50,000 or more (24 of 72 counties), or upon request. Because many of the counties with industrial sand mining are below this 50,000-person threshold, it is difficult to quantify how much land is being annexed for industrial sand mines and other purposes.

Some industrial sand operators have annexed into nearby cities and villages because they offered the mining company more reasonable regulations for operation than the towns and counties where the sand mine was originally located. Industrial sand companies are investing tens of millions of dollars in sand facilities, and they desire regulatory certainty that their permits will not be denied without justification or revoked after one year, and that the so-called "rules of the game" will not change.

Some industrial sand operators have annexed into nearby cities and villages because they offered the mining company more reasonable regulations for operation than the towns and counties where the sand mine was originally located.

The annexation issue has become contentious for a number of reasons. It can result in a loss of population, territory, and tax base for towns that will no longer have jurisdiction over the annexed land. These losses can be substantial.

For example, an industrial sand company proposed to build two industrial sand operations in Trempealeau County, Wisconsin. At the time the plants were proposed, the county had a moratorium on approving new permits for industrial sand mines, so the company sought to annex into the City of Whitehall, which is not subject to the county moratorium restricting the approval of new industrial sand facilities.[93] The City of Whitehall approved annexation, in part because the city estimated the industrial sand plants would generate tax revenues of about $103,000 for the Whitehall School District and about $100,000 for the City of Whitehall.

If not for the annexation, these facilities, when constructed, would have contributed to the tax base of the town from which they were annexed, and not the city. Thus, the Trempealeau County moratorium on permitting new mines removed an opportunity for these towns to add substantial revenues to their tax bases.

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[91] Wisconsin Department of Administration, "Request for Annexation Review," accessed January 19, 2016, ftp://doaftp1380.wi.gov/doadocs/MunicipalData/MBR/12934.pdf.

[92] Wisconsin Department of Administration, "A Basic Introduction To Wisconsin Municipal Annexation," Accessed January 6, 2016, http://www.doa.state.wi.us/documents/DIR/Municipal_Boundary_Review/Annexation/Resources/Annexation_Basic_Introduction_and_Review_Rules_of_Thumb.pdf.

[93] Chuck Rupnow, "Wisconsin council approves annexations for sand mining plans," *St. Paul Pioneer Press*, http://www.twincities.com/2013/11/05/wisconsin-council-approves-annexations-for-sand-mining-plans/.

Annexations can also result in a loss of regulatory power over industrial sand operations for the townships that no longer preside over the annexed land. This can have a significant impact when industrial sand operations annex into a city or village but will be using town roads to haul sand to a processing facility off-site.

Figure 4 depicts an industrial sand mine that has proposed to annex into the city, leaving Town B. Because Town B would no longer have jurisdiction over permitting the sand mining operation, it could no longer negotiate Road Upkeep and Maintenance Agreements (RUMAs) with the industrial sand mining company as a condition for obtaining a conditional use permit, although the industrial sand operator may still voluntarily enter into such an agreement.

It is often beneficial for towns and county governments to enact more reasonable regulations than to impose overly burdensome regulations that may encourage industrial sand facilities to seek annexation.

Because RUMAs, which require industrial sand producers to pay for damage done to local roads, are often negotiated as part of the permitting process, towns have no power to regulate road use if the industrial sand facility annexes into a nearby municipality. This scenario occurred in the state of Illinois when LaSalle County enacted a moratorium on permitting new sand mines.[94]

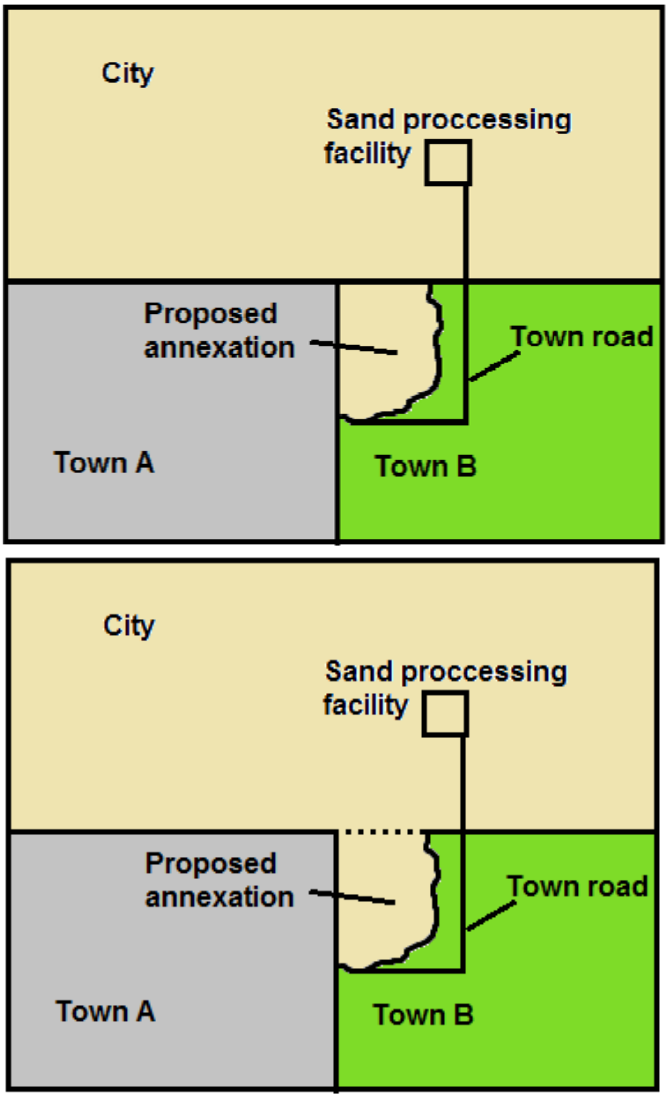
It is thus often beneficial for towns and county governments to enact more reasonable regulations and retain a greater degree of local control over, and tax revenues generated from, industrial sand operations than to impose overly burdensome regulations that may encourage industrial sand facilities to seek annexation.

While cities and villages have the upper hand when deciding whether to annex a parcel of land, a town board may bring court action to challenge detachment of territory from the town by annexation. The state is statutorily empowered to consider and advise upon shape, contiguity, and provision of municipal services if the town (or an adjoining city or village) asserts that it can better serve the land use proposed for the property. Appellate courts are broadening review authority to "prevent haphazard, unrealistic and competitive expansion of municipalities which disregards the overall public interest."[95]

[94] Julie Wernau, "Mining for fracking sand drives some Illinois farmers from land," *Chicago Tribune*, June 8, 2014, http://articles.chicagotribune.com/2014-06-08/business/ct-sand-mine-fight-0608-biz-20140608_1_sand-mine-lasalle-county-starved-rock-state-park.

[95] Wisconsin Department of Administration, "A Basic Introduction to Wisconsin Municipal Annexation," http://www.doa.state.wi.us/documents/DIR/Municipal_Boundary_Review/Annexation/Resources/Annexation_Basic_Introduction_and_Review_Rules_of_Thumb.pdf,

Figure 4
Annexation Explained



Source: Author's drawing.

Annexation is often seen as a last resort for industrial sand companies after negotiations with town and county governments have been exhausted. It is often expensive to annex into neighboring cities and villages, as these municipalities often charge mining companies royalties in exchange for redrawing the city limits. For example, the town of Independence, Wisconsin expects to collect 15 cents for each ton of finished frac sand from Superior Silica Sands, one of the country's largest providers of frac sand to the oil-drilling industry.[96]

[96] Tony Kennedy, "Wis. city's land grab to attract frac sand mine is overruled by state agency," *Minneapolis Star Tribune*, October 15, 2014, http://www.startribune.com/wis-city-s-land-grab-to-attract-frac-sand-mine-is-overruled-by-state-agency/279375102/.

Part 5

Conclusions

Contrary to claims made by mining opponents who assert the industrial sand industry is unregulated and "running roughshod" over local communities, this *Policy Study* makes clear nearly every aspect of industrial sand mining is regulated by more than 20,000 pages of federal, state, or local government laws and ordinances. This comprehensive regulatory structure is designed to protect the health and welfare of the environment, the general public, and people working at industrial sand operations.

Contrary to claims made by mining opponents who assert the industrial sand industry is "running roughshod" over local communities, a comprehensive regulatory structure is in place to protect the health and welfare of the environment, the general public, and people working at industrial sand operations.

In most states, industrial sand mines are permitted at the local level. As a result, local governments have significant powers to regulate industrial sand mining through moratoria and ordinances. Although moratoria are intended to provide local policy makers with an opportunity to study an issue and craft local ordinances to balance land use and property rights issues, activist groups, and even some local government officials, have attempted to abuse the moratorium process as a means of enacting *de facto* bans on industrial sand mining.

When properly drafted, local government ordinances can be beneficial to both industrial sand operators and neighboring communities. However, many times these ordinances are developed to be overly restrictive in a deliberate attempt to prevent industrial sand mining in a given area. These ordinances, such as the industrial sand mining ordinance adopted in Allamakee County, Iowa, are not based upon scientific evidence, which does not support a *de facto* ban on industrial sand mining, but are based on the personal disposition of anti-mining activists and local government officials who oppose industrial sand mining.

While anti-mining activist groups applaud this misuse of local government power, policymakers should be aware that enacting unreasonable or overly strict regulations often has unintended consequences. Such regulations incentivize industrial sand companies to seek annexations into neighboring municipalities that provide a more reasonable regulatory framework for industrial sand mining. Annexation is often a costly process for industrial sand operators, and they generally prefer to work with county zoning officials first, and seek annexation only after these attempts have failed.

About the Authors

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Mark Krumenacher is a senior principal and senior vice president of GZA GeoEnvironmental, Inc. and works in its Waukesha, Wisconsin office. He has served as principal, project manager, and project hydrogeologist during the past 27 years with GZA on environmental, geologic, hydrogeologic, and engineering projects throughout North America.

Krumenacher is a professional geologist with licensure nationally and in several states and is a certified hazardous materials manager. He has managed and conducted geologic, hydrogeologic, and engineering studies, remedial investigations, environmental assessments, pre-acquisition environmental due diligence, and hazardous waste management at various properties including surface and underground mines; large industrial, commercial, and urban redevelopment projects; federal Superfund sites; and state-lead environmental projects.

He has provided testimony regarding aggregate and industrial mineral mining before municipal, township, and county units of government as well as nongovernment organizations, local environmental groups, and community advisory councils to help address residents' concerns about mining. Krumenacher is actively involved with several mining associations, including the National Stone Sand and Gravel Association, Illinois Association of Aggregate Producers, National Industrial Sand Association, Industrial Minerals Association–North America, Wisconsin Industrial Sand Association, and Society for Mining Metallurgy and Exploration.

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Isaac Orr is a research fellow at The Heartland Institute. He previously worked as a research analyst and writer in the Wisconsin State Senate, and prior to that interned with the Rancher's Cattleman Action Legal Fund. He graduated in 2010 with honors from the University of Wisconsin-Eau Claire, with a B.A. in political science and a minor in geology.

In addition to coauthoring this series on frac sand mining, Orr is the author of *Heartland Policy Study* No. 132, "Hydraulic Fracturing: A Game-Changer for Energy and Economies" (November 2013), and *Heartland Policy Study* No. 142, "Bill McKibben's Terrifying Disregard for Fracking Facts" (August 2016). His letters to the editor and op-eds have been published in *USA Today*, *The Milwaukee Journal Sentinel*, *The Houston Chronicle*, *The Washington Times*, *The Hill*, *American Thinker*, and *Human Events*. He has spoken to nearly a dozen audiences and recorded more than two dozen podcasts on energy and environment topics for The Heartland Institute, available on Heartland's YouTube channel at HeartlandTube.

Orr writes, "I grew up on a dairy farm, and I want to preserve rural America, and rural American values. Along with agriculture, I am fascinated by geology, mining, groundwater, and other environmental issues."

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