Midwest Environmental Advocates

February 9, 2016

Nancy Young and Audrey Boerner
Institute for Wisconsin's Health, Inc.
749 University Row, Suite 110
Madison, Wisconsin 53703

Re: MEA's Technical Support Letter to IWHI Concerning the Health Impact Assessment of Industrial Sand Mining in Western Wisconsin

What should a Health Impact Assessment of the industrial sand mining industry in Western Wisconsin seek to accomplish?

A Health Impact Assessment ("HIA") is a recognized tool used by public health entities to plan for and limit the health impacts of planned or ongoing activities. To be an effective tool, an HIA must follow an established framework to ensure a robust analysis. The National Research Council defines an HIA as "A combination of procedures, methods and tools that systematically judges the potential, and sometimes unintended, effects of a policy, plan, or project on the health of a population and the distribution of those effects within the population."[1] The primary objective of an HIA of the industrial sand mining industry should be to provide an accurate and complete analysis of the potential health consequences, in order to better inform policy decisions.

In order to do so, an HIA should seek to identify and meaningfully engage stakeholders who are directly impacted by the industrial sand mining industry and who may benefit most from such an assessment. Identification of a proper stakeholder group is critical, as the stakeholder group is an integral part of the identification of relevant research questions, sources of data and information, and proposals for alternatives and mitigations.[2]

Furthermore, an HIA should seek to collect, analyze, and clearly present in an unbiased fashion all relevant data and information related to the potential health impacts of the industrial sand mining industry, with a priority on the inclusion of data, information and opinions provided by individuals and groups on both sides of the issue.

---

[1] National Research Council of the National Academies, *Improving Health in the United States: The Role of Health Impact Assessment*.

[2] The stakeholder group chosen for this HIA is of particular relevance, because the stakeholder group was composed entirely of individuals representing local health departments, despite the fact that local health departments are not in the best position to identify relevant research questions or sources of data and information, and are in no position to identify proposals for alternatives and mitigations, due to the fact that local health departments have no authority over the policies or regulations related to the industrial sand mining industry. Stakeholder group did not include any environmental science experts or the large, well-informed community of individuals and families who have been dealing with the impacts of this industry for several years.

Finally, in order to best protect public health from an emerging industry, responsible health professionals should follow the precautionary principle. The thrust of the precautionary principle is that if an activity poses a threat to human health or the environment, we should proceed with caution and take precautionary measures even if we do not yet have scientific evidence establishing a cause and effect relationship between the activity and harm.

We have numerous concerns about the HIA as a whole, due in large part to its failure to adhere to the aforementioned principles and methodologies. In this letter we focus on the most concerning failure of the HIA to fully evaluate and address the public health threat posed by air quality impacts – in particular, the threat posed by $PM_{2.5}$ emissions from industrial sand mining and processing.

Where did this Health Impact Assessment go wrong?

I. The HIA does not adequately assess air quality impacts in communities that are most impacted by industrial sand mining.

The first problem with the HIA's assessment of air quality impacts stems from its regional focus that fails to assess localized, cumulative impacts on individual communities. An effective HIA could maintain this regional scale and still focus on several specific communities that are heavily impacted by the industry. The HIA's conclusions about air quality impacts disregard the fact that air quality and health impacts are likely to vary depending on numerous factors, such as: the type of operation (*i.e.,* mining, processing, or both); the number other industrial operations located in the same community (or in adjacent communities); stack height[3]; number of truckloads of sand per day and trucking routes[4]; proximity to homes or other community buildings/spaces; stringency of town/county regulation; etc.

The most significant community-specific circumstance which is overlooked by a regional-level assessment is the existence of multiple industrial sand operations within the same community. The clustering of multiple operations near certain communities raises legitimate concerns about human exposure to airborne pollutants, such as $PM_{2.5}$ and PM_{10}.

---

[3] According to environmental engineer Steve Klafka, formally a member of the WDNR air pollution control program, the stack height at an industrial facility is usually chosen so the modeling shows compliance with air quality standards. Thus, if emissions are expected to be large for a particular pollutant, then 70 to 100 foot stacks are not unusual. However, if no modeling is done – something proposed by the WDNR for $PM_{2.5}$ – then the stacks will likely be shorter in order to save money. This is relevant for an assessment of potential air quality impacts, because the taller the stack, the further away the point of maximum downwind concentration will occur. Since most of the sources affected by the new DNR $PM_{2.5}$ policies will have shorter stacks (apprx. 50ft.) the likelihood is that the maximum impact of the stack emissions will be closer to the source, which is particularly meaningful in scenarios in which operations are located in the middle of a town or directly adjacent to homes. (Personal communication – 9/1/2015).

[4] Diesel emissions have the potential to significantly impact air quality. According to a 2013 study on air pollution and early deaths in the U.S., "emissions from road transportation are the largest contributors to pollutant-related premature deaths in the United States, causing an estimated 53,000 PM2.5-related deaths…" (Caiazzo, F., et al., 2013, "Air pollution and early deaths in the United States. Part I," *Atmospheric Environment, Volume 79, November 2013*). Additionally, the EPA acknowledges that studies have shown that diesel emissions can account for as much as 35% of measured $PM_{2.5}$ concentrations. (Shauer et al., 1996).

Prime examples of these potential "air pollution hot spots" include: the Town of New Auburn, which has five industrial sand operations (2 of which are located in the center of the town) located within an eight mile radius; and the Township of Arcadia, which is home to 12 industrial sand operations, 8 of which are located within a 4 mile stretch along Highway 95. There is the distinct possibility, and even likelihood, that the cumulative emissions from multiple industrial sand operations in a concentrated area are capable of having a significant impact on air quality. The HIA failed to assess the cumulative impacts of clustered industrial operations because DNR does not consider cumulative emissions/impacts when issuing permits for industrial sand operations. Existing information, which the HIA fails to adequately take into account, supports legitimate concern regarding the cumulative impact on air quality by industrial sand operations clustered within a given community.

Until the DNR requires $PM_{2.5}$ monitoring at industrial sand operations, there will be no way to know whether $PM_{2.5}$ emissions may cause localized exceedances of the ambient air standard. It is possible that multiple facilities within individual communities are contributing to a violation of the $PM_{2.5}$ air quality standards.

II. The HIA fails to fully assess potential air quality impacts from $PM_{2.5}$ emissions.

Fine particles in the $PM_{2.5}$ size range have been identified by the EPA as a cause of cardiovascular and lung disease, including lung cancer. Numerous studies by EPA, academic institutions, and industry groups demonstrate that mechanical processes such as industrial sand facilities emit $PM_{2.5}$.[5] In spite of the obvious health threat, the HIA provides no conclusions about the $PM_{2.5}$ impacts from the industrial sand mining industry. The fact the HIA does discuss $PM_{2.5}$ emissions, but fails to draw any conclusions implies that the authors of this assessment do not consider $PM_{2.5}$ emissions from industrial sand mining and processing to be of any concern to public health. The fact is that existing data demonstrates a real threat, and we certainly do not have enough information to dismiss that threat at this time.[6]

Further, the HIA concludes that health impacts from PM_{10} and PM4, or respirable silica, are unlikely, but the evidence relied on is questionable. The industry-sponsored air studies have limitations, including the study at EOG Resources' facilities. The DNR requires only PM_{10} ambient air monitoring at select facilities, which does not provide sufficient evidence that PM10 emissions are not a threat, and in fact suggests that there may be unsafe $PM_{2.5}$ emissions. Further, the HIA dismisses a published, peer-reviewed study that shows there may be unsafe levels of $PM_{2.5}$ downwind of these facilities. Finally, the HIA accepts without critical analysis the

---

[5] *Fine Particles and Coarse Particles: Concentration Relationships Relevant to Epidemiologic Studies*, Wilson and Suh, (2012); *Emission Factor Documentation for AP-42 Final Report for Emissions from Grain Elevators and Grain Processing Plants* (2003); *Emission Factor Documentation for AP-42 Final Report for Sand and Gravel Processing* (1995); *Emission Factors for Barges and Marine Vessels Final Test Report* (2001); *TEOM-Based Measurement of Industrial Unpaved Road PM10, PM2.5 and PM10-2.5 Emission Factors*; *PM4 Crystalline Silica Emission Factors and Ambient Concentrations at Aggregate-Producing Sources in California*, Richards et at., (2012)

[6] When recently lowering the NAAQS for $PM_{2.5}$, USEP provided the following description of the effects of this air pollutant: "An extensive body of scientific evidence shows that long – and – short term exposures to fine particle pollution, also known as fine particulate matter ($PM_{2.5}$), can cause premature death and harmful effects on the cardiovascular system, including increased hospital admissions and emergency department visits for heart attacks and strokes. Scientific evidence also links PM to harmful respiratory effects, including asthma."

effectiveness of the DNR's regulatory framework. These errors in the analysis undermine the reliability of the HIA's air quality analysis.

a. The HIA misinterprets air quality monitoring data regarding PM_{10}, PM_4 (respirable silica), and $PM_{2.5}$ emissions.

The HIA dismisses air quality concerns by relying on limited, industry-funded air monitoring data and conclusions. The HIA fails to provide a detailed and robust analysis of this data, instead accepting the industry's conclusions. This leads the assessment to dismiss concerns about public health impacts from particulate matter emissions without adequate data or analysis.

i. <u>Industry-funded studies do not accurately evaluate emissions from the entire industry and do not establish that there is no risk of harm from air emissions</u>.

The industry-funded studies relied upon by the HIA do not provide a reliable picture of the air quality impacts of the industrial sand mining industry as a whole. Taking the voluntary, industry-funded air quality monitoring at EOG Resources' facility as an example, there are numerous problems with the resulting data.

First, the locations of the monitors and the sampling protocol undermine the reliability of the results. The monitoring done at the EOG facilities was voluntary, and was conducted on a predictable schedule—every 3 days. The monitoring was conducted on only 120 days of the year with no guarantee that the wind was even blowing in a downwind direction towards the monitor.[7] The locations of the monitors, which the study acknowledged as being limited by the availability of electrical power, the space availability for the sampler platforms, and safe access for sampling personnel, were not ideal to monitor potential off-site emissions from the mining and processing operations. There was no monitor at the fence-line for any site, and the distance from the fence-line ranged from 30-200 feet. The monitor at the Chippewa Falls processing facility was located very close to the processing area, meaning any emissions from the 109 foot stack likely traveled right over the monitor without being detected. The monitors were admittedly sited to be "representative of the site ambient air quality," however, that is not the same as being representative of the ambient air quality off-site where the public will experience the maximum impact of the emissions. Additionally, all monitors at all sites were very susceptible to PM_4 from off-site, which would result in lower respirable crystalline silica concentrations in the measured samples.[8]

Second, the EOG facilities are not representative of the majority of mines and processing facilities in the state, and thus, the results of the EOG study cannot be extrapolated to the rest of the industry. The EOG facilities are relatively isolated from other operations (*thus*

[7] Wind was only blowing across the site and towards the downwind monitor at the Chippewa Falls Processing Facility between 4-8% of the time.

[8] PM_4 from regional background is likely to be composed primarily of $PM_{2.5}$, and since regional $PM_{2.5}$ is composed primarily of SO_2 and NO_X, that means such a sample would consist of very little silica (SiO_2).

reducing the cumulative impact). Also, things that should be considered as normal contributions to a site's emissions, such as the existence of large processing buildings, sand storage piles and truck unloading operations, are labeled as "possible biases to above-average concentrations."

Third, several problems with this study call into question the reliability of the PM_4 (or respirable crystalline silica) results .The authors of the study cite a NIOSH summary from 2002, which acknowledges the fact that the X-ray diffraction analytic technique is "not sufficiently sensitive to measure ambient concentrations of crystalline silica" accurately detect quantities of silica that are less than 30µg/sample, yet all of the conclusions in the study are based on the results of X-ray diffraction analysis, which relies on the premise that their technique is sufficiently accurate for 5µg/sample. The EOG study used a 50% cut point for PM_4, which means the samplers collected $PM_{2.5}$ at a 90% efficiency rate and that the majority of the sample collected was composed of $PM_{2.5}$. This may provide some explanation for the low concentrations of silica measured in the samples since ambient $PM_{2.5}$ is composed primarily of SO_2 and NO_X.[9] Finally, the conclusions about the danger of crystalline silica exposure are based on California's non-cancer risk threshold of 3µg/m^3; however, New York, Texas, and Vermont have all set their non-cancer risk threshold at significantly lower levels than California, 0.06µg/m^3, 0.27µg/m^3, and 0.12µg/m^3, respectively; thus, it is important to note that PM_4 measurements from the EOG study consistently exceed these more protective standards.[10]

ii. <u>PM_{10} ambient air monitoring results do not establish that there is no threat from PM_{10} emissions from the industry and actually suggest that $PM_{2.5}$ emissions may exceed standards</u>.

The HIA extrapolates broad conclusions based on limited ambient air monitoring at industrial sand operations that only sample for PM_{10}. It is important to note that while there are currently more than 80 industrial sand mines and processing facilities in operation, there are only 14 monitors at 12 facilities. Moreover, in its interpretation of the PM_{10} monitoring data, the HIA minimizes the significance of occasional high concentrations of PM_{10} picked up by industrial sand operation monitors (*"exceptions to standard operations, such as road construction, new mining activity, and deviation from fugitive dust plans"*). But the reality is that these occurrences reflect the realities of regular operations at industrial sand operations and are not anomalies as the report suggests.[11]

---

[9] The low concentrations of silica measured in the samples collected is an indication that the majority of the particulate matter collected by the samplers was from off-site and not from the site itself, because according to the EPA, the silica sand that is mined by industrial sand operations is generally made up of 95-99% silica; and thus, the measured concentrations of silica in any samples that were actually representative of site emissions should be high. (*Emission Factor Documentation for AP-42 Sand and Gravel Processing*).

[10] It should also be noted that Dr. Crispin Pierce's review of 41 MSHA past tests for respirable crystalline silica at Wisconsin sand operations using the MSHA Mine Report Search Tool found two violations of the MSHA respirable crystalline silica standard by this EOG processing facility.

[11] It should also be noted that each sample point shown on the graphs in Figure 4.3 represents a 24-hour average of PM_{10} concentrations, which means a considerable number of the measurements taken during the 24-hour period were higher (and possibly much higher) than the sample point shown on the graph. This is particularly relevant for the data points showing elevated values that significantly exceed the average measurements, because

Further, the HIA does not acknowledge that PM_{10} sampling data from industrial sand mining operations in Wisconsin demonstrates that industrial sand facilities do emit significant quantities of $PM_{2.5}$. In particular, stack tests from three separate industrial sand operations found that all or a significant portion of the particulate matter collected from their PM_{10} stack emissions tests – 100%, 75%, and 70%, respectively – was composed of PM2.5.[12] Considering that there is no comprehensive site-specific ambient air monitoring from $PM_{2.5}$ for the industry, this is a serious and unaddressed concern.

This is a significant concern because industrial sand facilities are currently allowed to emit high concentrations of PM_{10}. The National Ambient Air Quality Standard ("NAAQS") for PM_{10} is 150μg/m^3, and the current background concentration for PM_{10} used by the DNR in permitting is 29.4μg/m^3; thus, industrial sand operations are generally allowed to have PM_{10} emissions which cause a maximum impact of 120.6μg/m^3. This is relevant because with a background concentration of 19.8μg/m^3 for $PM_{2.5}$, the maximum air pollution impact an industrial operation can have before there is an exceedance of the NAAQS for $PM_{2.5}$ is 15.2μg/m^3.[13] This means only 13% of the current PM_{10} allowable emissions need to be composed of $PM_{2.5}$ before an exceedance to the NAAQS for $PM_{2.5}$ will occur. As previously mentioned, stack testing at industrial sand operations in Wisconsin has shown that $PM_{2.5}$ makes up between 70 and 100% of PM_{10} emissions at some facilities.

Moreover, due to the fact that background concentrations of $PM_{2.5}$ already consume a large portion of the air standard, even relatively low emissions of $PM_{2.5}$ may cause localized exceedances. The background concentration of $PM_{2.5}$ relative to the air quality standard is very high because there are numerous contributors to $PM_{2.5}$ including direct emissions and sources of $PM_{2.5}$ precursors such as SO_2 and NO_x. This high background concentration means that relatively small additional $PM_{2.5}$ emissions from an industrial sand operation may lead to an exceedance of the NAAQS.

iii. <u>Regional particulate matter ambient air monitors do not reflect localized impacts of industrial sand facilities</u>.

The HIA also relies on $PM_{2.5}$ concentrations as measured by regional air quality monitors, and draws conclusions from that data without understanding or acknowledging its limitations. While it may be true that ambient levels of $PM_{2.5}$ measured at regional monitors are decreasing, use of measurements by regional ambient monitors should not be used to estimate or make conclusions about the localized impacts of direct sources of $PM_{2.5}$ that are located far from the monitor. If regional ambient air monitors were representative of air quality around all industrial sources of air pollution, then there would be no need to conduct dispersion modeling or

---

other measurements during the 24-hour periods for those data points had to be even higher than those data points.

[12] Compliance stack test at Carbo Ceramics on its PO1 and PO2 sand dryer, handling, and silos (May 4, 2012); Compliance stack test at Chippewa Sand Company on its PO2A – Sand Screening & Conveying operation (May 28, 2012); and Compliance stack test at EOG Resources on its PO6 – Rail Loading operation (February 13, 2012).

[13] The current background concentration for $PM_{2.5}$ used by the DNR is 19.8μg/m^3. However, it should be noted that this value is based on regional monitoring, and thus, may not be representative of $PM_{2.5}$ background concentrations in areas with high concentrations of industrial sand facilities.

monitoring for any air pollutant. Any air pollutant emitted by an industrial source can create unsafe and unhealthy concentrations immediately downwind in adjacent neighborhoods, which is why the DNR plans to continue to estimate and monitor emissions for other air pollutants, such as PM_{10}, SO_2, NO_x and CO, despite the fact that they are also showing decreasing concentrations at regional monitors. The DNR does not know if $PM_{2.5}$ emissions from an industrial sand operation will result in concentrations immediately downwind of an industrial sand operation above the NAAQS for $PM_{2.5}$ because there has not been any monitoring of $PM_{2.5}$ required by the DNR.

b. The HIA ignored the only published, peer-reviewed study of particulate matter emissions from industrial sand facilities.

The HIA also discredited the first (*and only*) published peer-reviewed study of $PM_{2.5}$ concentrations around industrial sand mining operations in Wisconsin. One of the study's primary authors, Dr. Crispin Pierce, had this comment about the HIA's treatment of the only published, independent study of industrial sand $PM_{2.5}$ emissions:

> By not reporting our peer-reviewed and published data, the HIA authors have excluded the only published data on $PM_{2.5}$ (fine particulate) levels around frac sand facilities. These $PM_{2.5}$ particulates are more strongly associated with cardiovascular disease, lung disease and lung cancer than the PM_{10} particulate values supplied by industrial sand facility operators included in the HIA. While the reason stated for not including the $PM_{2.5}$ data is that the instrument used (the SKC deployable particulate sampler [DPS]) is not a federal reference method-designated instrument, the DPS accuracy relative to other samplers (i.e., MiniVol [Airmetrics, Inc.], and FH 62 C14 continuous ambient PM monitor [Thermo Andersen]) has been established. All the data cited in the HIA have come from industry-financed studies. The Wisconsin DNR is not monitoring PM_{10} or $PM_{2.5}$ near frac sand facilities and requires less than 10% of facilities to monitor their own emissions, and in these cases, only to monitor PM_{10} levels. As such, independent studies such as ours are needed to provide additional data to best evaluate health risks.

The HIA's air quality conclusions are suspect because it relies solely on studies that suggest there are no air quality impacts, while dismissing a peer-reviewed scientific study that suggests there may be unsafe $PM_{2.5}$ concentrations around industrial and mining operations.

c. The HIA does not assess the weaknesses of the current regulatory approach

The public health impact of any industry is influenced by the effectiveness of State and local regulations. The HIA includes no analysis of the DNR's regulation of air emissions from industrial sand mining operations, nor any discussion about local regulation. The DNR regulates industrial sand facilities under the false premise that *mechanical processes, such as those taking*

place at industrial sand operations, are not capable of producing $PM_{2.5}$. There is an extensive amount of data and research establishing that mechanical processes such as industrial sand facilities emit $PM_{2.5}$.[14] This error in the regulatory process, among others, leads to questions about the effectiveness of DNR's regulation of air emissions from industrial sand facilities.

The DNR's treatment of fugitive dust emissions from industrial sand operations raises additional concerns. However, the HIA fails to evaluate fugitive dust plan requirements or how well those plans are implemented. In practice, the DNR does not have the resources or staff time to adequately monitor or enforce compliance with fugitive dust plans. This assessment should have evaluated these plans, especially in light of the fact that this assessment lists "deviation from fugitive dust plans" as one of the primary reasons for elevated PM_{10} results that significantly exceed the average measurements. Additionally, despite the fact that fugitive emissions may account for as much as 90% of emissions from a given industrial sand operation and may be composed of as much as 30% $PM_{2.5}$[15], the DNR does not require industrial sand operations to monitor fugitive dust emissions or include fugitive dust emissions as a part of its determination of compliance with particulate matter ambient air standards.[16]

d. The HIA dismisses concerns about $PM_{2.5}$ emissions without enough data

The HIA discusses but reaches no conclusions about $PM_{2.5}$. The Air Quality section's Summary and Recommendations are entirely silent about $PM_{2.5}$ emissions, even though the HIA notes that these fine particles "are generally considered to be the most hazardous to human health."[17] Indeed, it would be impossible for the HIA to draw conclusions about the threat of $PM_{2.5}$ emissions from this industry given the dearth of reliable information. But it is disingenuous for the HIA to fail to acknowledge that we do not have enough information at this time to conclude that $PM_{2.5}$ emissions from industrial sand operations do not pose a health threat. The report leads the public to believe that industrial sand facilities do not cause air quality problems. This is irresponsible and calls into question the reliability of the entire assessment.

Sincerely,

/s/

Kellan McLemore
Staff Attorney
kmclemore@midwestadvocates.org
Sarah Geers

---

[14] *Supra*, Footnote 6.
[15] FML Sand Preliminary Determination – WDNR.
[16] In a November 5, 2013 interview with Inside Climate News, Jeffrey Johnson, an environmental engineering supervisor at the DNR sad "there are a couple of [frac sand plants] that would exceed the [federal] PM2.5 standards." (http://insideclimatenews.org/news/20131105/frac-sand-mining-boom-health-hazard-feared-lawmakers-aim-ease-regulation)
[17] HIA at 30.

Staff Attorney
sgeers@midwestadvocates.oreg
Kimberlee Wright
Executive Director