Minnesota Center for Environmental Advocacy's Comments on the City of Minneapolis' Proposed Hiawatha Campus Expansion Project

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INTRODUCTION

Despite being over 1,000 pages in length, the City of Minneapolis' (the "City") Environmental Assessment Worksheet ("EAW") for the Hiawatha Campus Expansion Project (the "Project") is deficient is many material respects. The City's environmental assessment fails to assess key environmental effects and climate change, and it ignores cumulative potential effects, climate change, and that the Project is part of a connected or phased action. The Minnesota Environmental Policy Act ("MEPA"), the law governing environmental review, requires the City to gather and study these factors, providing needed environmental transparency for a community that has suffered through historic levels of soil and air pollution for generations. In addition to the omissions in the EAW, the Project is also antithetical to Minneapolis' goals relating to non-motorized transportation and greenhouse gas emissions. Instead of the bold action promised by the City to address climate change, the Project will increase the City's greenhouse gas emissions and encourage continued reliance on automobile transportation. The Project is a considerable step backwards towards achieving many of the City's stated goals.

Most troubling is the EAW's loud silence regarding the historical environmental racism the residents of the East Phillips neighborhood have endured. For decades, East Phillips residents have breathed some of the City's most polluted air and have walked atop soil contaminated with frightening levels of acutely toxic chemicals. Asthma rates in this community are disproportionately high, and other serious adverse health conditions are linked to the elevated level of air pollution in this neighborhood. The Project resigns one of the City's most polluted areas to further pollution, forces residents to live adjacent to another industrial site, and ensures environmentally friendly development and opportunities are sited elsewhere. The City's proposal to relocate its public works infrastructure here belie its stated commitments to curbing

environmental racism and its promise to address race based health inequities. East Phillips deserves better. The City should consolidate its public works department elsewhere.

The City has a choice. It can scuttle the Project and stand by its environmental justice commitments or it can revise the EAW so that it complies with MEPA.

I. THE EAST PHILLIPS NEIGHBORHOOD DESERVES ENVIRONMENTAL JUSTICE

A. East Phillips Is A Polluted Neighborhood Predominately Comprised Of Low-Income People Of Color.

The City proposes expanding its Hiawatha Maintenance Facility in the East Phillips neighborhood.[1] Bounded by Bloomington Avenue to the west, Hiawatha Avenue to the east, 24th Avenue to the north, and Lake Street to the south, the East Phillips community is one of the most ethnically diverse neighborhoods in the state. Over 80% of its nearly 4,000 residents are non-white.[2] East Phillips also includes one of the largest American Indian populations in Minneapolis, unsurprising considering the Little Earth community—the country's first urban housing complex with Native preference—is located here.[3] By comparison, non-Hispanic Whites comprise over 60% of the City's overall demographic makeup, and American Indians account for only 1% of the City's population.[4] East Phillips residents are also financially disadvantaged. Nearly 70% of residents in this neighborhood reported income less than 185% of the poverty level, [5] and just under

[1] EAW Form for City of Minneapolis – Hiawatha Maintenance Facility Expansion, at 1 (Jan. 28, 2021), *available at* https://www2.minneapolismn.gov/media/content-assets/documents/business/planning-zoning/PW-Hiawatha-Facility-Expansion-EAW-(PDF),wcmsp-227306.pdf.

[2] *East Phillips Neighborhood Data*, Minn. Compass, https://www.mncompass.org/profiles/city/minneapolis/east-phillips (last visited Mar. 22, 2021).

[3] Dr. Cecilia Martinez, Shalini Gupta, and Marisol Becerra, *Health Impact Assessment for the Phillips Community*, Center for Earth, Energy, and Democracy 24, attached as Exhibit 1; *Our Community*, Little Earth, https://littleearth.org/community (last visited Mar. 22, 2021).

[4] *Health Impact Assessment*, supra note 3, at 24-25.

[5] *Understanding Environmental Justice in Minnesota*, Minn. Pollution Control Agency, https://mpca.maps.arcgis.com/apps/MapSeries/index.html?appid=f5bf57c8dac24404b7f8ef1717f57d00 (last visited Mar. 22, 2021).

25% of workers in East Phillips earned more than $40,000 per year, with 31% of workers making $15,000 or less.[6]

East Phillips is also polluted. East Phillips has long been one of the most environmentally unhealthy neighborhoods in the City.[7] This can be attributed largely to its location—adjacent to Hiawatha Avenue and Interstate 94—and the dense cluster of polluting businesses located in the neighborhood. These businesses have included, among others, an arsenical pesticide manufacturer,[8] an asphalt plant,[9] and a foundry.[10]

Part of this neighborhood is colloquially known as the "Arsenic Triangle." In 1994, arsenic likely disbursed decades ago from the former insecticide manufacturer was found in soil and groundwater.[11] This precipitated a massive excavation and remediation program that first removed contaminated soil from 96 properties, including 13 day care centers and four schools.[12] In 2005, modeling prepared by the United States Environmental Protection Agency ("EPA") estimated that the arsenic contamination was worse than originally thought. [13] The modeling showed that arsenic potentially disbursed nearly a mile from the Project site—the insecticide manufacturer's former location—covering an area that included over 3,500 residential properties.[14] So severe was the contamination that in September 2007, EPA added this area to the National Priority List of

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[6] *East Phillips Neighborhood Data*, Minn. Compass, https://www.mncompass.org/profiles/city/minneapolis/east-phillips (last visited Mar. 22, 2021).
[7] Erin Niehoff, *Poor Governance to Bring New Toxicity to the 'Arsenic Triangle'*, MinnPost (Aug. 25, 2020), https://www.minnpost.com/community-voices/2020/08/poor-governance-to-bring-new-toxicity-to-the-arsenic-triangle/.
[8] *CMC Heartland Lite Site*, Minn. Dep't of Agric., https://www.mda.state.mn.us/chemicals/spills/incidentresponse/superfund/cmcheartlandlite (last visited Mar. 22, 2021).
[9] *About Us*, Bituminous Roadways, Inc., https://bitroads.com/About-Us (last visited Mar. 22, 2021).
[10] *About*, Smith Foundry Co., http://www.smithfoundry.com/about (last visited Mar. 22, 2021).
[11] *South Minneapolis Residential Soil Contamination Site*, Minn. Dep't of Agric., https://www.mda.state.mn.us/chemicals/spills/incidentresponse/superfund/southmplsressoil (last visited Mar. 22, 2021).
[12] *Id.*
[13] *Id.*
[14] *Id.*

Superfund sites.[15] The remediation efforts, which took years to complete, ultimately resulted in 472 properties receiving clean soil to replace the contaminated soil that was removed.[16] Residents recall with vivid memory watching men cloaked in hazmat suits digging up their backyards.

Air quality is also poor in East Phillips. Compared to broader Minneapolis, East Phillips residents suffer from increased cancer risks[17] and a higher prevalence of asthma,[18] and the air they breathe includes elevated levels of some toxic volatile organic compounds.[19] The pollution is not improving. In March and June 2020, fine particulate matter ("PM2.5") pollution was 25% higher in the greater Phillips neighborhood than the same time in 2019.[20] Alarmingly, during March and June 2020, PM2.5 levels near major highways throughout Minneapolis were down around 20% except for the Phillips neighborhood, where they were up 25%.[21] State data shows that communities of color and indigenous communities, the majority of residents in East Phillips, disproportionately live in areas with high levels of air pollution. Over 90% of these communities live in areas that have air quality at levels above risk guidelines.[22] These trends are not coincidental.[23]

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[15] *Id.*
[16] *Id.*
[17] *Health Impact Assessment*, *supra* note 3, at 58.
[18] *See generally Asthma: Zip Code Maps*, Minn. Dep't of Health, https://data.web.health.state.mn.us/asthma_staticmaps (last visited Mar. 22, 2021).
[19] *Health Impact Assessment*, *supra* note 3, at 64.
[20] Nate Gotlieb, *Fine Particle Levels Up in Phillips*, SW. J (Oct. 22, 2020), https://www.southwestjournal.com/news/green-digest/2020/10/fine-particle-levels-up-in-phillips/
[21] *Air Pollution & Adverse Health Outcomes*, Minn. Dep't of Health 7 (Sep. 16, 2020), https://lims.minneapolismn.gov/Download/RCA/14848/Air%20Pollution%20and%20COVID%20Presentation.pdf.
[22] *Air Pollution & Adverse Health Outcomes*, Minn. Dep't of Health 10 (Sep. 16, 2020), https://lims.minneapolismn.gov/Download/RCA/14848/Air%20Pollution%20and%20COVID%20Presentation.pdf.
[23] *See, e.g.*, Isabel Baptista, Amanda Sachs, & Claudia Rot, *Local Policies for Environmental Justice, A National Scan*, The New School 4 (Feb. 2019), https://www.nrdc.org/sites/default/files/local-policies-environmental-justice-national-scan-tishman-201902.pdf (noting that "local zoning codes and land use policies historically have been tools for segregating people and concentration pollution in low-income communities and communities of color").

B. The State Legislature Recognizes Environmental Injustice In East Phillips.

In 2008, the State Legislature took action. It passed a law requiring the Minnesota Pollution Control Agency ("MPCA") conduct additional cumulative impact screening for any facility seeking a new or modified emissions permit within a confined zone.[24] This law, Minn. Stat. § 116.07.4a, obligates MPCA to analyze and consider "cumulative levels and effects of past and current pollution" before making a permitting decision.[25] Minn. Stat. § 116.07.4a applies only to a tightly circumscribed area, defined in statute to be a "community" that:

> (1) is within a half mile of a site designated by the federal government as an EPA superfund site due to residential arsenic contamination;
>
> (2) a majority of the population are low-income persons of color and American Indians;
>
> (3) a disproportionate percent of the children have childhood lead poisoning, asthma, or other environmentally related health problems;
>
> (4) is located in a city that has experienced numerous air quality alert days of dangerous air quality for sensitive populations between February 2007 and February 2008; and
>
> (5) is located near the junctions of several heavily trafficked state and county highways and two one-way streets which carry both truck and auto traffic.[26]

The law therefore only covers "a very specific part of South Minneapolis," an area that includes East Phillips and the Project site.[27] Not coincidentally, MPCA recognizes that East Phillips is an "area of environmental justice concern."[28] These areas are of specific importance for MPCA and its mission to eradicate community-wide disproportionate impacts from air pollution.[29]

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[24] *Health Impact Assessment*, *supra* note 3, at 48.
[25] *Id.*
[26] *Health Impact Assessment*, *supra* note 3, at 49; Minn. Stat. § 116.07, subd. 4a(c)(1)-(5).
[27] *Air Permitting in South* Minneapolis, Minn. Pollution Control Agency, https://www.pca.state.mn.us/air/air-permitting-south-minneapolis (last visited Mar. 24, 2021).
[28] *See Understanding Environmental Justice in Minnesota*, Minn. Pollution Control Agency, https://mpca.maps.arcgis.com/apps/MapSeries/index.html?appid=f5bf57c8dac24404b7f8ef1717f57d00 (last visited Mar. 24, 2021) (map identifying East Phillips as an area of environmental justice concern).
[29] *MPCA and Environmental Justice*, Minn. Pollution Control Agency, https://www.pca.state.mn.us/about-mpca/mpca-and-environmental-justice (last visited Mar. 24, 2021).

In passing Minn. Stat. § 116.07.4a, the Legislature explicitly recognized that air pollution in East Phillips is a threat to human health. The City's proposal to add further sources of pollution to East Phillips is diametric to explicit legislative intent.

C. The City Must Address Environmental Justice In The EAW.

MCEA recognizes that the standard EAW form, which the City used here, does not specifically demand an environmental justice assessment. And for good reason. Many if not most of the projects required to complete an EAW are proposed to be developed in an area strikingly different from East Phillips. Put simply, there is no potential for significant environmental effects related to environmental justice for the bulk of the proposed projects, unlike other EAW criteria such as air pollution, land use, and transportation that are inherently involved in every project.

But the City's analysis is "not limited to the EAW form."[30] Instead, the City must take a "hard look" at all sources of potential significant environmental effects.[31] This includes environmental justice, which answers questions related to the health of the proposed project's neighboring community, elements MEPA considers pertinent during environmental review.[32] Project proposers therefore must undertake this analysis whenever they propose new sources of pollution in communities with known environmental justice concerns.

The Project is one of these proposals and East Phillips is one of these communities. However, the EAW completely avoids engaging with the Project's environmental justice concerns.

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[30] *In re Denial of a Contested Case Hearing*, Nos. A19-0207, A19-0209, 2019 WL 5106666, at *7-8 (Minn. App. Oct. 14, 2019); *see also* Minn. R. 4410.1700, subp. 7 (2018) (explaining criteria for determining potential for significant environmental effects, and not limiting analysis to issues on EAW form); *Minn. Ctr. for Envtl. Advocacy v. Holsten*, No. A08-2171, 2009 WL 2998037, at *3 (Minn. App. Sept. 22, 2009) (finding that the agency had adequately considered the impact of the project's GHG emissions and thereby implying that such consideration was a required part of the review).

[31] *Citizens Advocating Responsible Dev. v. Kandiyohi Cty. Bd. of Commr's*, 713 N.W.2d 817, 832 (Minn. 2006).

[32] *See* Minn. Stat. §§ 116D.01 (noting MEPA's purpose is to "stimulate the health and welfare of human beings"), 116D.02, subd. 1 (noting MEPA's policy of promoting the general welfare).

Instead, the EAW simply lists the major sources of pollution that formerly occupied the Project site and identifies the existing type and quantity of that pollution. The City must do more. It must assess the impact the decades of pollution have had on the neighboring communities using analytical modeling tools and readily available data. The residents of East Phillips deserve to know the Project's complete environmental justice impacts.

Existing tools are capable of assessing of performing this assessment. The EPA's EJSCREEN, for example, combines environmental and demographic indicators into an index that shows how much a defined group contributes to a variety to predefined disparities, such as cancer risk.[33] In November 2020, a Louisiana District Court Judge cited EJSCREEN in ordering further permit assessment for a proposed petrochemical complex in "Cancer Alley," a strip running along the Mississippi River primarily composed of communities of color.[34] The Biden Administration is using EJSCREEN to spearhead its efforts to "inform equitable decision making across the federal government."[35] The City can use EJSCREEN to inform its decision to site the Project in East Phillips.

Other environmental justice assessment tools are also available. Some states, like California, have developed their own models to aid quantifying environmental justice considerations. Developed by an environmental justice working group in 2010, CalEnviroScreen

[33] *EJSCREEN: Environmental Justice Screening Tool*, U.S. Envtl. Prot. Agency, https://www.epa.gov/sites/production/files/2014-10/documents/ejscreen_102914.pdf (last visited Mar. 24, 2021).
[34] Lisa Whitley Coleman, *EJSCREEN: The Environmental Litigation Tool of the Future?* EHS Daily Advisor (Mar. 10, 2021), https://ehsdailyadvisor.blr.com/2021/03/ejscreen-the-environmental-litigation-tool-of-the-future/.
[35] Press Release, The White House, President Biden Takes Executive Actions to Tackle the Climate Crisis at Home and Abroad, Create Jobs, and Restore Scientific Integrity Across Federal Government, (Jan. 27, 2021), *available at* https://www.whitehouse.gov/briefing-room/statements-releases/2021/01/27/fact-sheet-president-biden-takes-executive-actions-to-tackle-the-climate-crisis-at-home-and-abroad-create-jobs-and-restore-scientific-integrity-across-federal-government/.

provides an assessment of cumulative impact screening across California communities.[36] Similar to EJSCREEN, CalEnviroScreen operates to account for the reality that "people are simultaneously exposed to multiple contaminants from multiple sources and also have multiple stressors based on their health status as well as living conditions."[37] It works by assigning scores to 21 indicators that characterize pollution and population characteristics, and then using the total score to compare how a specific population set compares relative to other places in the state.[38] These indicators capture traffic, diesel particulate matter, ozone, and other environmental stressors the Project will impose on East Phillips.[39] Other jurisdictions assess environmental justice before taking development actions;[40] so, too, should the City here.

Finally, the importance of conducting this analysis in environmental review for this Project is undeniable. The East Phillips community's current and historic toxic burden is disproportionately high compared to other neighborhoods in the City due, in part, to the heavy concentration of pollution sources nearby. If the City does not study environmental justice for this Project then it is hard to envision a project that will trigger this assessment. Barring any legislative or judicial intervention, environmental justice will never factor into environmental review. Surely, that is not a result the City seeks.

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[36] *Update to the California Communities Environmental Health Screening Tool: CALENVIROSCREEN 4.0 Public Review Draft*, Cal. Envtl. Prot. Agency 6 (Feb. 2021) https://oehha.ca.gov/media/downloads/calenviroscreen/document/calenviroscreen40reportd12021.pdf.
[37] *Id.* at 7.
[38] *Id.* at 11.
[39] *Id.* at 23.
[40] *See, e.g.*, *Environmental Justice Guidelines*, Va. Dep't of Transp., http://www.virginiadot.org/business/resources/Civil_Rights/ENVIRONMENTAL_JUSTICE_GUIDELINES.pdf (last visited Mar. 24, 2021).

The Project's potential impact on the health of the neighboring East Phillips community is a potential significant environmental effect the City must assess before making a decision on the need for an EIS. The City must revise the EAW to include this information.

D. Federal Law Prohibits Disparate Impacts.

A thorough environmental justice analysis is also required to ensure the Project does not violate federal law. Multiple federal statutes forbid disparate impacts in a variety of settings. Title VII, for example, prohibits adverse employment actions against a group of employees in a protected class compared with non-members of that protected class.[41] The Fair Housing Act includes a private cause of action to challenge housing practices that have a "'disproportionately adverse effect on minorities' and are otherwise unjustified by a legitimate rationale."[42]

Title VI provides similar protections. It prohibits recipients of federal financial assistance—like the City[43]—from discriminating on the basis of race, color, or national origin in their programs or activities.[44] Importantly, EPA's regulations implementing Title VI prohibit recipients of federal funds from choosing a site or location of a facility that has the effect of discriminating against individuals based on race, color, national origin, or gender.[45] Described by the Justice Department as a "powerful tool" to "advance environmental justice," Title VI embraces

[41] *Lewis v. City of Chi., Ill.*, 560 U.S. 205, 212 (2010) (noting that Congress codified disparate impact claims into Title VII to prohibit "a particular employment practice that causes a disparate impact on one of the prohibited bases" (quotation marks omitted)).
[42] *Tex. Dep't of Hous. & Cmty v. The Inclusive Cmtys. Project, Inc.*, 576 U.S. 519, 524 (2015) (quoting *Ricci v. DeStefano*, 557 U.S. 557, 577 (2009)).
[43] *See, e.g.*, *Civil Rights*, Minn. Dep't of Transp., http://www.dot.state.mn.us/civilrights/titlevi.html (last visited Mar. 24, 2021).
[44] 40 C.F.R. § 7.35(a)(1)-(3), (7)(b).
[45] 40 C.F.R. § 7.35(c).

environmental justice's basic principle "that no person should bear an unfair share of harm on account of their face, color or national origin."[46]

The EPA has determined that a Title VI violation can be shown by evidence that demonstrates a "reasonable cause for concern for the public health."[47] Public health data confirms that residents in East Phillips face elevated risks for asthma, cancers, and other adverse health conditions compared to other parts of the City. This disparity is largely due to the elevated pollution levels that blanket East Phillips, a community that in early 2020 experienced a 25% *increase* in PM2.5 pollution while *every other neighborhood* saw reductions.[48] These negative health indicators counsel strongly against siting an additional polluting facility in this neighborhood, and Title VI may outright prohibit such action. Residents in East Phillips already face elevated health risks because of the toxic air and soil in the neighborhood. The City should do the right thing and seek to consolidate its public works facility elsewhere.

II. THE EAW FAILS TO ADEQUATELY ENGAGE WITH OTHER SOURCES OF POTENTIAL SIGNIFICANT ENVIRONMENTAL EFFECTS

Despite its size, the City's EAW is missing a wealth of information. The City can cure these deficiencies by ordering an EIS or postponing the decision on the need for an EIS in order to obtain the lacking information.[49]

MEPA requires some project proposers to undertake an assessment of the potential impacts the proposed project will have on the environment. One type of assessment is the EAW, which the

[46] Memorandum from the Assistant Attorney General for Civil Rights to the Federal Funding Agency Civil Rights Directors (Aug. 19, 2010), *available at* https://www.justice.gov/crt/fcs/newsletter/Spring-2015/TitleVIandEJ.
[47] *Investigative Report for Title VI Administrative Complaint File No. 16R-99-R9*, U.S. Envtl. Prot. Agency 26-27 (Aug. 25, 2011), https://www.epa.gov/sites/production/files/2016-04/documents/ir-082511.pdf
[48] *Air Pollution & Adverse Health Outcomes*, Minn. Dep't of Health 7 (Sep. 16, 2020), https://lims.minneapolismn.gov/Download/RCA/14848/Air%20Pollution%20and%20COVID%20Presentation.pdf.
[49] Minn. R. 4410.1700, subp. 2a(A), (B)

Minnesota Rules define as "a brief document which is designed to set out the basic facts necessary to determine whether an EIS is required for a proposed project or to initiate the scoping process for an EIS."[50] An EAW, therefore, is designed to ascertain whether projects have the potential for significant environmental effects.[51] If so, then project proposers must complete a more robust EIS.[52]

In determining whether a project has the potential for significant environmental effects, four factors are considered:

> A. type, extent, and reversibility of environmental effects;
>
> B. cumulative potential effects. The RGU shall consider the following factors: whether the cumulative potential effect is significant; whether the contribution from the project is significant when viewed in connection with other contributions to the cumulative potential effect; the degree to which the project complies with approved mitigation measures specifically designed to address the cumulative potential effect; and the efforts of the proposer to minimize the contributions from the project;
>
> C. the extent to which the environmental effects are subject to mitigation by ongoing public regulatory authority. The RGU may rely only on mitigation measures that are specific and that can be reasonably expected to effectively mitigate the identified environmental impacts of the project; and
>
> D. the extent to which environmental effects can be anticipated and controlled as a result of other available environmental studies undertaken by public agencies or the project proposer, including other EISs.[53]

To help guide project proposers, the Minnesota Environmental Quality Board ("EQB") has developed a framework for completing an EAW.[54] The EAW form demands project proposers study 20 discrete criteria, including air, water, and noise pollution, transportation, and cumulative potential effects.[55] These criteria are not suggestions; rather, they are specific environmental

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[50] Minn. R. 4410.0200, subp. 24.
[51] Minn. R. 4410.1700, subp. 1.
[52] Minn. R. 4410.1700, subp. 1.
[53] Minn. R. 4410.1700, subp. 7.
[54] Minn. R. 4410.1300; *Finalized EAW Form*, Minn. Envtl. Quality Bd. (July 2013), https://www.eqb.state.mn.us/sites/default/files/documents/Finalized%20EAW%20Form%20July2013.pdf.
[55] *Finalized EAW Form*, *supra* note 54.

considerations that must be studied. Project proposers that fail to study all the required environmental criteria set forth by EQB must postpone the decision on the need for an EIS or order an EIS.[56]

The EAW fails to sufficiently engage with three potential environmental effects: 1) impacts to human health; 2) cumulative potential effects; and 3) contributions to climate change. The EAW also fails to recognize that the Project is part of a connected or phased action and, therefore, the City does not assess the potential environmental effects of the anticipated future developments.

A. The EAW Does Not Adequately Address The Project's Potential Impacts To Human Health.

The City must consider the Project's impacts on the health and wellbeing of the East Phillips community. MEPA's stated purpose includes the promotion of "efforts that will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of human beings."[57] Animating this purpose is the procedural requirement that "governmental bodies [ ] consider the significant environmental consequences of a project 'to the fullest extent practicable.'"[58] This sweeping directive commands the City to consider the impact the Project will have on the people of East Phillips, a community the state and city has identified as areas of concern because of environmental and socioeconomic factors.[59]

EQB requires project proposers to discuss how the proposed project will affect air quality.[60] EQB explains that this section must include a discussion on the human health impacts related to

[56] Minn. R. 4410.1700, subp. 2a.
[57] Minn. Stat. § 116D.01.
[58] *Iron Rangers for Responsible Ridge Action v. Iron Range Res.*, 531 N.W.2d 874, 880 (Minn. App. 1995) (quoting Minn. Stat. § 116D.03, subd. 1).
[59] *See MPCA and Environmental Justice*, *supra* note 29; *Sustainability Policies*, City of Minneapolis, https://www2.minneapolismn.gov/government/departments/coordinator/sustainability/policies/green-zones-initiative/ (last visited Mar. 24, 2021).
[60] *Finalized EAW Form*, *supra* note 54.

air quality.[61] The City failed to follow this directive. Instead, the EAW simply explains that the Project is anticipated to emit a bevy of toxic pollutants, including varying sizes of particulate matter, SO2, NOx, and volatile organic compounds.[62] The City, however, neglected to take the additional and required step of explaining the potential effects these pollutants will have on human health.[63] MEPA requires meaningful engagement with the potential environmental effects, not simply a list of pollutants.[64]

The impacts to human health related to the Project's anticipated air pollution are well known. Take particulate matter, which the City acknowledges will be released from the Project during construction and operation.[65] Particulate matter is a well-studied pollutant. It has been linked to changes in blood chemistry and mechanics that increase the risk of heart disease and acute coronary failure, increased incidence of lung cancer, cardiopulmonary disease, oxidative stress and inflammatory in pulmonary tissue, increased incidence of COPD, development of asthma, and death.[66] Other pollutants the City acknowledges will escape the Project have undergone similar studies. Until the City assesses the potential impacts the Project's air emissions will have on human health, the full extent of the Project's environmental effects will remain unknown and the City cannot make an informed decision on the need for an EIS.

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[61] *Id.*
[62] EAW, *supra* note 1, at 33-37.
[63] Dr. Ranajit Sahu, *Comments on the Environmental Assessment Worksheet (EAW) for the Hiawatha Maintenance Facility (HMF) Expansion Focusing on Air Quality Impacts* 2 (Mar. 19, 2021), attached as Exhibit 2.
[64] *See, e.g.*, *White v. Minn. Dep't of Natural Res.*, 567 N.W.2d 724, 731 (Minn. App. 1997) (approving of EAW's environmental analysis of increased tourism to the region instigated by the proposed project).
[65] EAW, *supra* note 1, at 34-36
[66] Jonathan O. Anderson, Josef G. Thundiyil, & Andrew Stolbach, *Clearing the Air: A Review of the Effects of Particulate Matter Air Pollution on Human Health*, Am. C. of Med. Toxicology (Dec. 23, 2011), https://link.springer.com/content/pdf/10.1007/s13181-011-0203-1.pdf; Robert D. Brook et. al, *Particulate Matter Air Pollution and Cardiovascular Disease*, Am. Heart Ass'n (May, 10, 201), https://www.ahajournals.org/doi/full/10.1161/CIR.0b013e3181dbece1.

To ascertain the health risks the Project poses, the City should conduct an environmental risk analysis. This analysis characterizes baseline risks to the East Phillips residents and then studies the "incremental risk increase due to the additional pollution the [P]roject will emit."[67] To conduct this analysis, the City can draw upon the extensive guidance put forth by the Environmental Protection Agency ("EPA") and MPCA.[68] The City's analysis must identify hazards, "toxicity inputs for various health endpoints such as cancer, non-cancer chronic, and acute conditions" while studying all likely routes of exposure, "such as inhalation, ingestion, dermal contact, home-grown gardens, [and] mother's milk for infants."[69] This risk assessment "should also explicitly consider not just adults but also infants, children, the elderly and other sensitive sub-populations that are present in the general vicinity of the [P]roject area."[70] Without this vital information, the City is unable to fully evaluate the Project's potential for significant environmental impacts to the East Phillips community. MCEA urges the City to conduct a risk analysis prior to making a decision on the need for an EIS.

B. The EAW Does Not Adequately Discuss Cumulative Potential Effects.

MEPA also requires project proposers to assess a project's cumulative potential effects.[71] "Cumulative potential effects" is defined in the Minnesota Rules to "mean the effect on the environment that results from the incremental effects of a project in addition to other projects in the environmentally relevant area that might reasonably be expected to affect the same environmental resources."[72] These "other projects" include existing facilities and other sources of

[67] Dr. Ron Sahu, *supra* note 63, at 2.
[68] *Id.*; *see also Risk Assessment*, U.S. Envtl. Prot. Agency, https://www.epa.gov/risk (last visited Mar. 24, 2021).
[69] Dr. Ron Sahu, *supra* note 63, at 2.
[70] *Id.*
[71] *Finalized EAW Form*, *supra* note 54.
[72] Minn. R. 4410.0200, subp. 11a.

pollution that are continuing to impact the environment and people's health. This analysis is vital to the RGU's decision on the need for an EIS.[73] An EIS must be ordered for projects where the cumulative potential effect is significant or where "the contribution from the project is significant when viewed in connection with other contributions to the cumulative potential effect," taking into consideration mitigation proposals.[74]

Here, the City has not conducted a cumulative potential effects analysis. In response to the EAW form's prompt, "[d]iscuss the nature of the cumulative potential effects and summarize any other available information relevant to determining whether there is potential for significant environmental effects due to these cumulative effects," the City answers, "[n]o cumulative potential environmental effects are anticipated for this project."[75]

To fully discharge its duty to assess cumulative potential impacts, the City must conduct an "air quality analysis [that] includes an understanding of not just the [Project] but also air quality impacts from other existing sources and activities."[76] To complete this analysis, the City must first discuss a pre-Project or baseline condition, which will inform the selected area of impact.[77] The City must then 1) identify meteorological and air monitoring data in the Project area; 2) map a comprehensive list of emissions sources and activities within the selected area; 3) determine an emissions inventory that includes both annual and daily time scales; and 4) properly identify the type and quantity of Project emissions.[78] Once the City collects this information, it can then complete a cumulative impact analysis that is a standard assessment in many government ordered

[73] Minn. R. 4410.1700, subp. 7.
[74] Minn. R. 4410.1700, subp. 7(B).
[75] EAW, *supra* note 1, at 43.
[76] Dr. Ron Sahu, *supra* note 63, at 2.
[77] *Id.* at 3.
[78] *Id.* at 4.

environmental reviews, such as the National Environmental Policy Act ("NEPA").[79] In addition to being a required component of an EAW, the Project's cumulative impact analysis will provide additional environmental transparency and engender community trust in an area that has been burdened by prior governmental action.[80]

The City must also revise its discussion in response to future projects that "may interact with environmental effects of the proposed project within the geographic area."[81] The City's answer, that "[n]o other projects that may contribute to cumulative environmental effects of this project are currently planned within the immediate vicinity of the Site," is incomplete. The Project site is located two blocks north of the Hi-Lake Shopping Center, located on East Lake Street between 21st Ave. and Hiawatha Ave. This area was heavily damaged during the 2020 summer uprising and plans to rebuild in this area have been ongoing for months. The City's EAW must discuss how the potential environmental effects from these rebuilding efforts will interact with the environmental effects of the Project. This demands the City to, at a minimum, analyze the diesel-powered construction vehicles when assessing how the additional diesel-powered vehicles at the Project site will affect air quality.

The justifications for requiring these additional analyses are eminently sound. Air pollution is a composite of toxins in a predefined area of space that is the product of various nearby emission sources. If a new source of emissions were merely tasked with measuring only its own contribution to air quality, it would often be impossible to determine if that new source would potentially violate local, state, or federal air quality limits, or be harmful to community health. Indeed, it is the collection of air pollution in the area that sets, for example, federal national ambient air quality

[79] *Id.*
[80] *Id.*
[81] EAW, *supra* note 1, at 42.

standards, not the total emissions from an emissions source.[82] A project's contribution to air quality must, therefore, consider itself in context, which is what the cumulative potential effects analysis demands.

Unless the City revises the EAW to include the required cumulative potential effects analysis, the City cannot make a legally sound decision on the need for an EIS. It is arbitrary and capricious for an agency to make a decision without considering all of the important aspects of the problem.[83] The City must undertake this analysis now or risk remand from the Court of Appeals.

C. The EAW Fails To Consider Its Contribution To Climate Change.

The EAW entirely omits another potentially significant environmental impact: the Project's contribution to climate change. Without considering the Project's climate impacts, the City cannot make a reasoned decision about its environmental effects. Minnesota law requires that every EAW analyze (1) the amount of GHG emissions that will be produced by the project, (2) mitigation measures that could reduce those emissions, and (3) the impacts of climate change on the project.[84] For this reason, MCEA requests that the City revise the EAW to include this vital information.

As acknowledged by the City, GHG emissions are already impacting Minnesota's climate, and these changes are affecting the health and well-being of the state's residents.[85] These impacts are particularly significant for lower-income communities and communities of color, who already

[82] *NAAQS Table*, U.S. Envtl. Prot. Agency, https://www.epa.gov/criteria-air-pollutants/naaqs-table (last visited Mar. 24, 2021).
[83] *See CARD*, 713 N.W.2d 817, 832 (Minn. 2006) (noting that an agency's decision is arbitrary and capricious where an agency "entirely failed to consider an important aspect of the problem").
[84] *In re Denial of a Contested Case Hearing*, 2019 WL 5106666, at *7-8.
[85] *Greenhouse Gas Emissions in Minnesota: 1990-2016*, Minn. Pollution Control Agency & Minn. Dep't of Commerce 3 (Jan. 2019), https://www .pca.state.mn.us/sites/default/files/lraq-2sy19.pdf.

experience disproportionate environmental health burdens and who are often less able than others to adapt to or recover from climate impacts.[86]

Minnesota courts recognize the threat of climate change. A recent Court of Appeals decision requires an estimation and analysis of GHG emissions for any project expected to produce emissions with the potential to create significant environmental effects.[87] Minnesota law and environmental guidance obligate project proposers to include in the EAW an analysis of mitigation measures that could reduce greenhouse gas emissions. And, to accurately assess the environmental impacts, the EAW must analyze the effects a changing climate will have on the project.

MCEA respectfully requests the City revise the EAW to address GHG emissions from the Project, and to consider the effects climate change will have on the Project.

1. The City must revise the EAW to analyze all the greenhouse gases that the Project will emit.

The EAW analysis of the GHG emissions that the Project will produce is incomplete. The EAW's GHG analysis is limited to a projection of the air pollutants the boilers and water storage tanks and heaters may emit annually.[88] The EAW fails to quantify, or even mention, the GHG emissions from the City's fleet vehicles, from the privately owned vehicles that will be driven to the site, during demolition and construction, or emissions from any other sources, such as the propane-fueled forklifts that are slated to be used on site. The City can discharge this duty in different ways, such as completing a GHG analysis based on guidance issued by the Council for

[86] *Climate Change, Public Health and Environmental Justice: Caring for Our Most Vulnerable Communities*, Envtl. Prot. Agency (Jan. 5, 2017), https://blog.epa.gov/2017/01/05/ej-climate-change.
[87] *In re Denial of a Contested Case Hearing*, 2019 WL 5106666, at *7-8.
[88] EAW, *supra* note 1, at 36.

Environmental Quality ("CEQ"), or by using various tools and models that have been created to help quantify GHG emissions.[89]

i. Minnesota law and public policy require the examination of GHG emissions in the Project EAW because the Project's GHG emissions have the potential for significant environmental effects.

Under MEPA, an RGU must identify and consider all impacts "that may be reasonably expected to occur from the project" to determine whether the project has "the potential for significant environmental effects."[90] The "hard look" the RGU must undertake is not limited to answering the questions on the EAW form."[91] This includes an analysis of GHG emissions if the emissions are "reasonably expected" to occur from the project with a potential for significant environmental effects.[92] In this case, a significant amount of GHG emissions are "reasonably expected" from the Project during construction and operation. Accordingly, Minnesota law requires an analysis of all GHG emissions for the Project to be included in the EAW.

Public policy demands a similar analysis. Minnesota leaders have called for steep reductions in GHG emissions throughout the state—reductions that will not be accomplished without significant action across all sectors. Minnesota's 2007 Next Generation Energy Act acknowledged the threat GHG emissions pose to public health and welfare by setting a goal to reduce statewide emissions 80 percent below 2005 levels by 2050.[93] Unfortunately, Minnesota is

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[89] *DRAFT Recommendations: Integrating Climate Information into MEPA Program Requirements*, Minn. Envtl. Quality Bd. (Dec. 2020), https://www.eqb.state.mn.us/sites/default/files/documents/DRAFT%20Recommendations%20-%20Integrating%20Climate%20Information%20into%20MEPA%20Program%20Requirements_0.pdf.

[90] Minn. R. 4410.1700, subp. 6 (2018).

[91] *Citizens Advocating Responsible Dev.*, 713 N.W.2d at 832 (hard look); *Matter of Denial of a Contested Case Hearing*, 2019 WL 5106666, at *7-8; *see also* Minn. R. 4410.1700, subp. 7 (2018) (explaining criteria for determining potential for significant environmental effects, and not limiting analysis to issues on EAW form); *Minn. Ctr. for Envtl. Advocacy*, 2009 WL 2998037, at *3 (finding that the agency had adequately considered the impact of the project's GHG emissions and thereby implying that such consideration was a required part of the review).

[92] *Matter of Denial of a Contested Case Hearing*, 2019 WL 5106666, at *7.

[93] Minn. Stat. § 216H.02, subd. 1, subd. 2 (2019).

not on track to meet this goal.[94] Recognizing that a coordinated approach is needed to address the existential threat of climate change, the governor's office has created a Climate Change Subcabinet, which will identify strategies to help Minnesota meet or exceed its goals for reduction of GHG emissions and enhance climate resiliency in Minnesota.[95] Incorporating an analysis of GHG emissions into the Project's EAW, therefore, will advance a critical goal of the State of Minnesota.[96]

The Minnesota Attorney General ("AG") has also endorsed including a GHG emissions accounting and analysis in environmental review. In a comment to the federal Council on Environmental Quality ("CEQ"), the Minnesota Attorney General joined other states' attorneys general in asserting that agencies' obligation under the National Environmental Policy Act ("NEPA"), the federal analog to MEPA, is to carefully consider every significant environmental impact of a project. This review "must necessarily include examining a project's contribution to climate change through its GHG emissions."[97] Disclosing and examining GHG impacts, the AG explained, provides the public with information that increases their ability to ask agencies and project proponents to move toward greener and sustainable projects.[98] Accordingly, to comply with the "hard look" at environmental issues required by NEPA (the same standard used for

[94] Gov. Tim Walz, Executive Order 19-37, Establishing the Climate Change Subcabinet and the Governor's Advisory Council on Climate Change to Promote Coordinated Climate Change Mitigation and Resilience Strategies in the State of Minnesota (Dec. 2, 2019), https://mn.gov/governor/assets/2019_12_2_EO_19-37_Climate_tcm1055-412094.pdf.
[95] *Id.*
[96] *See, e.g.*, *Minnesota Takes Action on Climate Change*, State of Minn., https://climate.state.mn.us/ (last visited Mar. 24, 2021) (noting state's goals and progress towards reaching climate goals).
[97] Comments of the Attorneys General of California, Colorado, Connecticut, Delaware, the District of Columbia, Illinois, Maine, Maryland, Massachusetts, Minnesota, New Mexico, New Jersey, New York, North Carolina, Oregon, Pennsylvania, Rhode Island, Vermont, and Washington to the Council on Environmental Quality 10 (Aug. 26, 2019), *available at* https://oag.ca.gov/system/files/attachments/press-docs/NEPA%20GHG%20Guidance%20Multistate%20Comments_8-26-19.finalsubmission-w-Attachments.pdf.
[98] *Id.* at 11.

MEPA) an analysis of the project's likely climate change impacts is required.[99] Analyzing GHG emissions in the Project's EAW, therefore, is needed to comply with the AG's interpretation of the laws governing environmental review.

Finally, EQB—the state agency tasked with developing rules for the environmental review process under MEPA—agrees that GHG emissions must be addressed in environmental review. In January 2020, EQB convened a team to provide recommendations for including climate change-related information—including a discussion of mitigation, adaptation, and resiliency planning—in environmental review documents.[100] This decision was based on the "general agreement" that climate information must be gathered during environmental review to inform decision making on proposed projects.[101] In creating the task force, EQB specifically noted that an effective climate change assessment must include a GHG emissions analysis and discuss mitigation, adaptation, and resiliency planning. Draft recommendations to amend the EAW form to align it with State law with respect to GHG emissions have been published and EQB is currently seeking public comment on the recommendations.[102]

At present, the EAW for the Project fails to fully analyze the Project's GHG emissions. In order to comply with Minnesota law, public policy, the AG's interpretation, and EQB's approach, the City must revise the EAW to include such an analysis because the Project is reasonably expected to emit GHGs with the potential for significant environmental effects.

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[99] *Id.* at 11.
[100] *Environmental Review Implementation Subcommittee*, Minn. Envtl. Quality Bd., 1 (Jan. 22, 2020), https://www.eqb.state.mn.us/sites/default/files/documents/ERIS_Meeting_Jan_2020%20_final.pdf.
[101] *Id.*
[102] *DRAFT Recommendations*, *supra* note 89.

ii. The Project will produce GHG emissions with the potential to cause significant environmental effects.

Developments such as this one have the potential to generate significant GHG emissions, including from the following sources:

- **Demolition and construction** – GHGs result from producing construction materials such as cement and steel, as well as transporting materials and operating heavy equipment.[103]
- **Electricity generation** – Although greenhouse gases from the electric sector are decreasing, electricity generation is the single largest source of greenhouse gas emissions in buildings.[104] While Minnesota's energy grid is becoming cleaner and the electrical sector overall has decreased its GHG emissions, electricity is still a significant source of GHGs.
- **Space and water heating** – Particularly when powered with gas or propane rather than electricity, water heaters and furnaces can be a significant source of emissions—in Minnesota, natural gas is the largest contributor to emissions within the residential and commercial sectors.[105]
- **Vehicle Operation** – Gasoline, propane, and diesel- powered cars trucks and other vehicles, such as forklifts, emit GHGs during operation. Emissions from vehicles are a large and increasing portion of the State's total GHG emissions.[106]
- **Facility Operations** – GHGs will be emitted during day-to-day operations of the facility, including from painting, welding, and other metal fabrication.[107]

Clearly, this Project has the potential to produce significant GHG emissions through demolition, construction, operation, and from mobile sources such as cars trucks and other equipment. Its significant building footprint will require significant energy to power, heat and

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[103] *Buildings and Built Infrastructure*, Envtl. & Energy Study Inst., https://www.eesi.org/topics/built-infrastructure/description (last visited April 26, 2020).

[104] Oswaldo Lucon, et al., *Buildings, in IPCC, Climate Change 2014: Mitigation of Climate Change, Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (2014), https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_frontmatter.pdf.

[105] *Greenhouse Gas Emissions Data: Interactive Sector Details*, Minn. Pollution Control Agency, https://www.pca.state.mn.us/air/greenhouse-gas-emissionsdata (last visited April 26, 2020).

[106] *Greenhouse Gas Emissions Data*, Minn. Pollution Control Agency, https://www.pca.state.mn.us/air/greenhouse-gas-emissions-data (last visited Mar. 24, 2021).

[107] *See, e.g.*, *Guide to Greenhouse Gas Management for Small Business & Low Emitters*, U.S. Envtl. Prot. Agency (Aug. 2020), https://www.epa.gov/sites/production/files/2017-01/documents/guide_to_greenhouse_gas_management_for_small_business_low_emitters.pdf.

cool.[108] This energy use will produce GHG emissions throughout the lifetime of the project, and these emissions have the potential to create climate impacts.

Because of the potential for a significant environmental impact, the City must revise the EAW to analyze this impact, despite the challenges associated with quantifying direct climate impacts from an individual development or source. As explained by the CEQ, climate change manifests from the incremental addition of GHG emissions from millions of individual sources that collectively have a large impact.[109] Any single project, no matter how large, is unlikely to cause a measurable change in the global climate on its own. If a RGU could simply avoid assessing GHGs by stating that any individual source is not significant because it alone will not have a global impact, then no project's emissions will ever be reviewed.[110] Because emissions from the Project will be significant in quantity and will add to the effects of climate change, the City must analyze them in the EAW.

iii. The City may use guidance from CEQ and other tools to guide its GHG emissions analysis.

For direction in performing a GHG analysis for the Project, the City may look to the CEQ—the agency charged with overseeing the implementation of the National Environmental Policy Act ("NEPA"). Under the Obama Administration, CEQ issued guidance for agencies to use when assessing a project's climate impacts.[111] It is well established in Minnesota that interpretations of

[108] EAW, *supra* note 1, at 34.
[109] Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews, 81 Fed. Reg. 51866 (Aug. 5, 2016), *available at* https://www.govinfo.gov/content/pkg/FR-2016-08-05/pdf/2016-18620.pdf.
[110] *Id.*
[111] *Id*. While the CEQ guidance issued under the Obama administration was officially withdrawn by the Trump administration, in the absence of new, finalized guidance from the CEQ or the EQB, the withdrawn guidance remains useful as a roadmap for conducting a GHG analysis. This is particularly true because the Minnesota Office of the Attorney General has commented favorably on the Obama administration guidance and endorsed the approach taken by the CEQ.

NEPA's requirements may be used when interpreting the requirements of MEPA, making use of this guidance appropriate here.[112]

CEQ guidance provides a structure for agencies to use when assessing the impacts of a project on the climate. Moreover, it explains common pitfalls and ways that agencies *should not* perform a GHG analysis. Among other things, the guidance instructs agencies to:

- Quantify a proposal's projected direct and indirect GHG emissions using available GHG quantification tools;[113]
- Analyze the cumulative impacts and short- and long-term effects of the GHG emissions;[114] and
- Consider alternatives and mitigation measures that would reduce GHG emissions or increase carbon sequestration and how those alternatives would contribute to the federal, state, or local plans for GHG emission reductions.[115]

The first step in this process is to create a GHG inventory that quantifies projected emissions. The RGU should estimate the primary sources of GHG emissions to the extent possible. This is necessary to both understand the full environmental impacts of the project, and to identify opportunities to reduce the project's impacts on the climate. In circumstances where quantifying emissions is prohibitively difficult, a California guide to environmental review recommends performing a qualitative analysis based on "scientific and factual data."[116]

There are several resources available that can assist the City in assessing the GHG emissions from the Project. The Greenhouse Gas Protocol has developed worksheets and guidance

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[112] *See In re N.D. Pipeline Co. LLC*, 869 N.W.2d 693, 698 (Minn. App. 2015) (explaining that Minnesota courts may look to federal courts' interpretation of NEPA when applying MEPA).
[113] *Final Guidance*, *supra* note 109.
[114] *Id.*
[115] *Id.*; *see also* Comments of the Attorneys General, *supra* note 97, at 18, 21 (supporting the approach of the Obama administration CEQ guidance with respect to consideration of cumulative, short- and long-term effects; and mitigation measures).
[116] *Evaluating Greenhouse Gas Emissions as Part of California's Environmental Review Process: A Local Official's Guide*, Inst. for Local Gov't 5 (Sept. 2011), https://lagunabeachcity.net/civicax/filebank/blobdload.aspx?BlobID=7751.

for calculating GHG emissions from specific sectors, including specific resources for calculating emissions from refrigeration and air conditioning as well as stationary combustion.[117] These calculation tools include step-by-step guides to quantifying emissions data. The World Resources Institute has also developed a guidebook for developing a customized GHG calculation tool based off The GHG Protocol's guidance.[118] In addition, EQB also has staff who can assist local governments with conducting environmental review.[119]

In addition to ample guidance, there are a number of calculator tools available to quantify GHG emissions. For many sources of emissions, simple calculations are enough and additional modeling software is not necessary. For instance, emissions from electricity generation and space and water heating can be estimated by multiplying EPA emissions factors by anticipated energy or fuel usage.[120] In instances where expected energy usage is unknown, the RGU could consider using average estimates. For example, the City could assume the average 16,750 kilowatt hours of energy usage per thousand square feet of commercial floor space,[121] and use a simple modeling tool to estimate expected residential energy use given total square footage and occupancy.[122] The table below illustrates a sample calculation for expected GHG emissions for the commercial and

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[117] *Calculation Tools*, The Greenhouse Gas Protocol, https://ghgprotocol.org/calculation-tools (last visited Mar. 24, 2021).
[118] Florence Daviet, *Designing a Customized Greenhouse Gas Calculation Tool*, World Res. Inst. (June 2006), https://www.wri.org/publication/designing-customizedgreenhouse-gas-calculation-tool.
[119] *See Guidance for Practitioners and Proposers*, Minn. Envtl. Quality Bd., https://www.eqb.state.mn.us/content/environmental-review-guidance-practitioners-and-proposers (last visited Mar. 25, 2021).
[120] *Emission Factors for Greenhouse Gas Inventories*, Envtl. Prot. Agency, (2018), https://www.epa.gov/sites/production/files/2018-03/documents/emission0-factors_mar_2018_0.pdf.
[121] *CEQA & Climate Change: Evaluating and Addressing Greenhouse Gas Emissions from Projects Subject to the California Environmental Quality Act*, Cal. Air Pollution Control Officers Ass'n 75 (Jan. 2008), https://www.contracosta.ca.gov/DocumentCenter/View/34122/CAPCOA-2008-CEQA-and-Climate-Change-PDF.
[122] *See, e.g.*, *Energy Use Calculator*, Compare Power, https://comparepower.com/kwh-electricity-energy-usage-calculator/ (last visited Mar. 25, 2021).

office portion of this project, using the aforementioned average energy usage and EPA emissions factors.

Square Footage	Estimated Annual Energy Usage (MWh)	Emissions Factor (lb CO_2/MWh)	Expected Annual CO_2 Emissions (lb)
327,100	5,479	1,248	6,840,258

This simple spreadsheet calculation can be used to calculate CH_4 and N_2O emissions as well as CO_2. The tools exist for the City to complete this necessary assessment.

Modeling software tools are also available to assist with calculating expected emissions. The Massachusetts Executive Office of Energy and Environmental Affairs recommends using energy modeling software such as eQUEST, Energy-10, Visual DOE, and DOE2 to calculate projected energy usage from stationary sources and energy consumption for use in environmental review.[123] This type of modeling software can be particularly useful for comparing emissions under various mitigation scenarios: eQUEST can be used to determine the energy performance of up to nine different design alternatives.[124]

In sum, guidance and calculation tools are readily available online for the City to use in performing its GHG emissions analysis. These tools will allow the City to reasonably and properly assess the GHG emissions from the Project, which in turn will allow the City to determine the scale of the impacts of the Project and actions that can best be taken to mitigate those impacts.

[123] *MEPA Greenhouse Gas Emissions Policy and Protocol*, Mass. Executive Office of Energy and Envtl. Affairs, http://eeaonline.eea.state.ma.us/eea/emepa/pdffiles/misc/GHG%20Policy%20FINAL.pdf. (last visited Mar. 25, 2021).
[124] *eQUEST…the Quick Energy Simulation Tool*, Energy Design Res. 5, http://www.doe2.com/download/equest/eQUESTv3-Overview.pdf (last visited Mar. 25, 2021).

2. The City must revise the EAW to analyze mitigation measures.

The EAW also contains a very cursory discussion of potential mitigation measures that would reduce GHG emissions from the construction and operation of the Project. Minnesota environmental law, rules, and guidance all instruct the agency conducting the review to provide a robust discussion of mitigation measures when analyzing a project's climate change impacts. To comply, the City must revise the EAW to provide the required analysis.

i. A full analysis of mitigation measures is required as part of environmental review.

To fulfill the purpose of environmental review, the RGU must provide a robust discussion of potential mitigation measures sufficient for meaningful public review. MEPA's purpose includes "understanding the impact which a proposed project will have on the environment," and making the information about impacts "available to governmental units and citizens early in the decision making process."[125] The Minnesota Supreme Court has agreed with the U.S. Supreme Court's analysis in *Robertson v. Methow Valley Citizens Council* that a mitigation analysis in an EAW "gives the public the assurance that the agency has indeed considered environmental concerns in its decisionmaking process . . . and, perhaps more significantly, provides a springboard for public comment."[126] Here, the public is entitled to information about mitigation measures that could reduce the Project's environmental effects early enough to allow meaningful comments on how the Project should be modified or improved. This information also benefits other permitting agencies that rely on the EAW as the best available information about a project's environmental effects. By identifying practices that can avoid, minimize, or compensate for its emissions in the

[125] Minn. R. 4410.0300, subd. 3.
[126] *Minn. Ctr. for Envtl. Advocacy v. Minn. Pollution Control Agency*, 644 N.W.2d 457, 468 (Minn. 2002) (quoting *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 349 (1989)).

EAW, governmental units that will issue permits and approvals can require improvements that make the Project better and more resilient.

Rules and guidance make clear that the mitigation discussion should include both the practices the project proposer *plans* to implement as part of the project, as well as those practices they *could* implement. Minnesota Rule 4410.1200 requires all EAWs to discuss "resource protection measures that have been incorporated into the project design"—in other words, mitigation measures planned as part of the project. This requirement is also reflected in the EAW form: The catch-all final question in the EAW form requires the agency to describe any additional environmental effects not addressed in the rest of the EAW, and to "identify measures that will be taken to minimize and mitigate these effects."[127] This language makes clear that the EAW must detail all mitigation measures a project proponent plans to implement.

EQB guidance also confirms the EAW must include a discussion of mitigation practices that *could be* implemented. According to EQB guidance:

> Information that reduces uncertainties about impacts and their significance belongs in an EAW. Any information that helps clarify the likelihood or level of significance of a potential impact is useful in an EAW because it helps the RGU make a better determination about the need for an EIS. It could be . . . information about how the impact *could be mitigated* and how that mitigation will be imposed."[128]

In addition to these rules and guidance, CEQ, Minnesota Attorney General, and EQB have all expressly stated that when GHG emissions are evaluated as part of environmental review, a discussion of mitigation measures should be included. In its guidance on assessing a project's climate impacts, CEQ instructed agencies to "Consider alternatives and mitigation measures that

[127] *See* EAW, *supra* note 1, at 42.
[128] *EAW Guidelines: Preparing Environmental Assessment Worksheets* Minn. Envtl. Quality Bd. 5 (2013), https://www.eqb.state.mn.us/sites/default/files/documents/EAW%20guidelines%202013%20revision.pdf.

would reduce GHG emissions … and how those alternatives would contribute to the federal, state, or local plans for GHG emission reductions."[129] The Minnesota Attorney General agreed, noting in its comment to CEQ that when a proposed project has climate change impacts, a robust analysis of mitigation measures from GHG emissions is required.[130] And EQB, in creating the task force to provide recommendations regarding the addition of climate-change related information to environmental review documents, specifically stated that an effective climate change assessment would need to include a discussion of mitigation measures.[131]

In sum, to comply with the requirements of environmental review, the Project's EAW should include a full discussion of mitigation measures, especially for the Project's impact on climate change. The analysis must include not only a detailed description of the mitigations the Project plans to implement and the efficacy of these practices, but also mitigations that *could be* implemented to further reduce environmental effects. The EAW for this Project does not fulfill this requirement for a robust mitigation analysis.

ii. The City must revise the EAW to analyze potential mitigation measures.

For a development like the Project, numerous types of mitigating measures could reduce the emissions of climate-harming GHGs from the construction or operation. It is possible, and even likely, that the Project already includes certain design features that could be considered mitigation. Without an identification and analysis of these features in the EAW, however, that EAW is incomplete.

There are a number of mitigation measures the City can implement to reduce GHG emissions from the Project. First, the City can reduce overall energy use in Project buildings by

[129] *Final Guidance*, *supra* note 109, at 18-19.
[130] Comments of the Attorneys General, *supra* note 97, at 22.
[131] *EQB Recommended Strategies*, *supra* note 100, at 1.

implementing improved efficiency measures and offsetting some energy use through onsite renewable energy generation. Guidance in both California and New York State recommend measures such as: installing efficient appliances and light bulbs; constructing LEED certified buildings; maximizing interior daylighting; and installing solar[132] or wind generation onsite.[133] While MCEA applauds the City's commitments to LEED certification, the City can make further improvements to increase the Project's efficiency.

Another option to reduce GHG emissions from new buildings is electrification of space and water heating. In most regions of the United States, electrification reduces carbon emissions compared with burning natural gas.[134] And as Minnesota's electric grid continues to decarbonize, GHG emissions from electric appliances will continue to drop.[135] In addition, by eliminating the cost of extending gas mains, constructing service lines, and installing meters, completely electrified new buildings will generally be less expensive than buildings that rely on natural gas, over the long run.[136] Finally, electric space and water heaters can be used as flexible energy storage, allowing electricity demand to more closely track generation, which permits deeper penetration and utilization of renewable energy sources.[137] The City's EAW completely fails to

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[132] The EAW curiously states that the Project can "serve as a catalyst for Green development – *solar energy*, storm water treatment and retention, a LEED certified building, and a green community buffer *are all part of the design*." EAW, *supra* note 1, at 6. However, the EAW provides no further discussion about solar energy facilities. And while the provided architectural drawings appear to show some solar infrastructure, there is a breathtaking amount of underutilized rooftop space. The City must fully disclose its solar energy plans for MCEA to effectively comment on its sufficiency.

[133] *CEQA and Climate Change: Addressing Climate Change Through California Environmental Quality Act (CEQA) Review*, Cal. Governor's Office of Planning and Research, (June 19, 2008), http://opr.ca.gov/docs/june08-ceqa.pdf; *Assessing Energy Use and Greenhouse Gas Emissions in Environmental Impact Statements*, N.Y. State Dep't of Envtl. Conservation, (July 15, 2009), https:// www.hdec.ny.gov/docs/administration_pdf/ eisghgpolicy.pdf.

[134] Sherri Billimoria et al., *The Economics of Electrifying Buildings*, Rocky Mountain Inst. 20 (2018), https://rmi.org/insight/the-economics-of-electrifying-buildings/.

[135] *Id.*

[136] *Id*. at 36, 46.

[137] *Id*. at 41.

consider any alternative to the new "Main Building Boiler" such as electric heat pumps or geothermal heating.

Finally, commercial buildings can be constructed using building materials with recycled content or with low-carbon or "green" concrete. Cement production, which is a key component of concrete, results in about seven percent of the world's carbon dioxide emissions.[138] The use of green concrete can therefore significantly reduce a building's emissions and has been endorsed by the U.S. Conference of Mayors as a tool in the fight against climate change.[139] New York State guidance also recommends constructing green roofs and using high-albedo roofing materials.[140]

Given the significant amount of missing information in the EAW, the City lacks the necessary factual record required to determine the actual environmental effect of the project and to perform a competent mitigation analysis. In light of this missing information and pursuant to Minn. R. 4410.1700, subd. 2a, the City must revise the EAW to include all of this information.

3. The City must revise the EAW to analyze the effects of climate change on the Project.

In addition to analyzing the GHG emissions and mitigation methods, the EAW should also consider the effects that a changing climate will have on the Project, particularly with regard to an increase in heavy rainfalls, which will lead to greater-than-expected stormwater. Minnesota's climate is already changing, and the EAW presents an opportunity to look forward and prepare in advance for events that could be hazardous to the environment and residents if not addressed.

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[138] Cailin Crow, *How "green" Concrete Can Help Cities Fight Climate Change*, Smart Cities Dive (Aug. 15, 2019), https://www.smartcitiesdive.com/news/us-conference-of-mayors-urges-cities-to-use-green-concrete-material-carbon-/560977/.

[139] *Id.*

[140] *Assessing Energy Use and Greenhouse Gas Emissions in Environmental Impact Statements*, *supra* note 133, at 20.

i. An assessment of the effects of climate change on the Project is needed as part of environmental review.

Multiple sources, including CEQ, EQB, and the Minnesota Attorney General, call for analyzing the effects of climate change on a project during environmental review. As stated by CEQ, climate change can make communities more susceptible to some impacts and lessen their resilience to others, thereby exacerbating expected environmental impacts of a project.[141] Accordingly, the City should consider the effects of climate change, such as increasing drought, high intensity precipitation events, increased fire risk, and ecological change.[142] As the Minnesota Attorney General explains, "Increasing resiliency to a changing climate is a critically important challenge for many communities … To protect residents, infrastructure, and industries, states must adapt to address these impacts."[143] Similarly, when EQB created the task force to recommend climate-change related additions to environmental review forms, the board expressly noted that to be effective, a climate change assessment would need to discuss resiliency planning. [144]

Clearly, planning for the changes that Minnesotans are already seeing in their communities is an important part of reviewing the environmental impacts of any project. Currently, the City does not have any adaptation or resiliency assessment as part of the EAW for the Project. It should revise the EAW to include this important information.

ii. The City should analyze the potential for increased stormwater and other effects of climate change.

One of the effects of climate change already affecting Minnesotans is an increase in rainfall and extreme precipitation events. Minnesota has seen a 20 percent increase in one-inch storm

[141] *Final Guidance*, *supra* note 109, at 21.
[142] *Id*. at 24.
[143] Comments of the Attorneys General, *supra* note 97, at 22.
[144] *EQB Recommended Strategies*, *supra* note 100, at 2.

events and a 65 percent increase in three-inch storm events over the past 100 years.[145] Furthermore, "mega-rains" covering large areas are four times more common after the year 2000 than in the 30 years before 2000 in the state.[146] These changes in climate impact stormwater management. Accordingly, the EAW should reference climate change in its consideration of stormwater infrastructure and management on the site. If the larger amounts of rainfall have not been considered, precipitation from a large weather event is likely to overcome the stormwater retention system and could cause local water and groundwater contamination. To ensure that the Project will be able to adapt to the increasingly wet weather resulting from climate change, the City should revise the EAW to consider those increases and their potential impacts on the watershed.

The City must revise the EAW to better inventory the GHG emissions anticipated from the Project, identify mitigation measures, and assess how the Project itself will be impacted by climate change.

D. The EAW Uses Incorrect Emissions Calculations To Support The Permitting Analysis.

The City must also revise its air emission calculations to provide a more accurate and complete picture of the Project's projected air emissions. The EAW currently relies upon EPA's AP-42 compilation of emission factors.[147] But "AP-42 was not meant to be the source of emissions data for the purpose of calculating potential-to-emit . . . or maximum emissions estimates[] necessary for the purposes for permit applicability determinations.[148] This is because an AP-42

[145] *2019 Environment and Energy Report Card: Climate*, Minn. Envtl. Quality Bd. (2019), https://www.eqb.state.mn.us/content/2019-environment-and-energy-report-card-climate.
[146] *Id.*
[147] Dr. Ron Sahu, *supra* note 63, at 5.
[148] *Id.*

emission factor "represents an average of emission rates in a particular sector and is therefore not a reliable indicator of emissions from a particular source or activity."[149]

EPA guidance documents underscore this point. In the 2020 Fifth Edition Compilation of Air Pollutant Emissions Factors, EPA explains:

> Use of these factors as source-specific permit limits and/or as emission regulation compliance determinations is not recommended by EPA. Because emission factors essentially represent an average of a range of emission rates, approximately half of the subject sources will have emission rates greater than the emission factor and the other half will have emission rates less than the factor. As such, a permit limit using an AP-42 emission factor would result in half of the sources being in noncompliance.[150]

EPA recently reaffirmed its position regarding the unreliability of AP-42 emission factors. In a November 2020 enforcement action alert, EPA "reminded permitting agencies, consultants, and regulated entities that AP-42 emission factors are only based on averages of data from multiple sources, and therefore 'are not likely to be accurate predictors of emission from any one specific source, except in very limited scenarios.'"[151]

The Project is not one of those limited scenarios. Nevertheless, the City relies heavily on the unreliable AP-42 emission factors in the EAW.[152] Even the emission factors rated as "A" such as CO_2 and SO_2[d] "are not designed to be used by a single source where other, more reliable, site-specific, data are available."[153] In this case, the City should use actual emission data from stack tests conducted on similar equipment. These test results should be available from the MPCA.[154] If

[149] *Id.*
[150] *Id.*
[151] *Id.* at 5-6, attach. B.
[152] *Id.* at 6.
[153] *Id.*
[154] *Id.* at 7.

the City insists on using AP-42 factors, the City must use maximum or high values from the underlying supporting data.[155] Either way, the City must revise the EAW.

E. The EAW Does Not Consider The Project As One Part Of The City's Broader Plans To Restructure Its Public Works Facilities.

The EAW recognizes that the Project is part of the City's broader plan to restructure and reorganize its public works department and related infrastructure. However, the EAW does not sufficiently disclose or discuss the City's continuing plans. Instead, the EAW discusses the Project in isolation without detailing the City's intentions for the facilities from which it will relocate staff and equipment into the new site in East Phillips. The Project must be assessed for what it is: a phased or connected action that is part of the City's larger plans.

EQB instructs project proposers that all "connected actions" are to be reviewed as one project.[156] EQB rules explain that connected actions and phased actions "shall be considered a single project for purposes of the determination of the need for an EIS."[157] The applicable rules provide, in relevant part, that two projects are connected actions if the responsible government unit determines that "one project would directly induce the other."[158] Similarly, a "phased action" includes two or more projects undertaken by the same proposer that "are substantially certain to be undertaken sequentially over a limited period of time."[159] The Project meets both of these definitions.

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[155] *Id.*
[156] *EAW Guidelines*, *supra* note 128, at 15.
[157] Minn. R. 4410.1700, subp. 9.
[158] Minn. R. 4410.0200, subp. 9c(A).
[159] Minn. R. 4410.0200, subp. 60(A).

For years, the City has announced its intention to update public works facilities.[160] The EAW explains that the Project "will involve the relocation and consolidation of water distribution maintenance office, shop, yard and vehicle/equipment storage functions, and sewer and stormwater office staff from elsewhere."[161] In explaining the Project's broader purpose, the EAW states that the Project is "part of on-going efforts to increase the efficiency of facility operations and provide value for residents and customers, as well as improve working conditions for employees" and that "over the years the City has been upgrading facilities and consolidating operations of maintenance facilities located throughout the City."[162] The City's own words define the Project as part of a larger project that is to be undertaken over a period of time.

Yet, the City omits any discussion about how the Project fits into its larger planned development. This is a material omission. MEPA requires that "connected actions or phased actions must be considered in total when determining the need for an EAW, preparing the EAW, and determining the need for an EIS."[163] Under the applicable rules, the City must, at a minimum, "briefly describe the past and future stages or components to which the subject of the present EAW is related."[164] This includes, for example, discussion about what will happen to other sites the City proposes to consolidate to the Project site. Until the City sufficiently discloses its broader plans, the EAW is incomplete.

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[160] *See, e.g.*, Steve Brandt, *Minneapolis Waterworks Shop a Blast from the Past*, Star Trib. (Apr. 25, 2015) https://www.startribune.com/minneapolis-waterworks-shop-a-blast-from-the-past/301287711/?refresh=true (reporting on the City's plans to relocate and consolidate its public works department).
[161] EAW, *supra* note 1, at 1.
[162] *Id.* at 4.
[163] Minn. R. 4410.1000 subt. 4.
[164] Minn. R. 4410.1000 subt. 4.

Under MEPA, an RGU must consider the cumulative environmental effects of all parts of a connected or phased project.[165] The City must complete this analysis for all public works restructuring projects that are "substantially certain to be undertaken." If, as the City intends, this consolidation project will ignite future plans for the then-vacated buildings located "elsewhere" throughout the city, the City must identify those future plans and discuss their cumulative environmental effects now. MCEA requests the City revise the EAW to disclose this needed information.

III. THE PROJECT IS CONTRARY TO THE CITY, COUNTY, AND STATE'S PROMISES TO ADDRESS ENVIRONMENTAL INJUSTICE

The residents of East Phillips have received promises that City, county, and state leaders take environmental justice seriously. The City's 2040 Plan explicitly recognizes that "[l]ow-income residents, Indigenous people and residents of color in Minneapolis are disproportionally impacted by the cumulative effects of traffic, stationary sources of air pollution, brownfield sites, blight, substandard housing, lack of access to jobs, and the adverse effects of climate change."[166] Environmental justice directly advances the City's number one goal of the 2040 Plan to "Eliminate disparities" that cause people of color and indigenous people to disproportionately shoulder the public health burdens imposed by industrial pollution.[167] Multiple state agencies, including MPCA and the Minnesota Department of Transportation, announced commitments "to making sure that

[165] *See Pope Cty. Mothers v. Minn. Pollution Control Agency*, 594 N.W.2d 233, 236-38 (Minn. App. 1999) (noting that connected or phased actions are considered a single project, and "careful assessment of their cumulative environmental effects is critical if the EAW is 'to set out the basic facts necessary to determine whether an [EIS] is required for a proposed action" (quoting Minn. Stat. § 116D.04, subd.1a(c) (1998) (alteration in original))).

[166] *Environmental Justice and Green Zones: Establish Environmental Justice Frameworks for Policy, Resources, and Regulation*, City of Minneapolis, https://minneapolis2040.com/policies/environmental-justice-and-green-zones/ (last visited Mar. 25, 2021).

[167] *Eliminate Disparities*, City of Minneapolis, https://minneapolis2040.com/goals/eliminate-disparities/ (las visited Mar. 25, 2021).

pollution does not have a disproportionate impact on any group of people—the principle of environmental justice."[168]

But these promises are meaningless without action. As planned, the Project relegates residents of East Phillips to live alongside more polluting industrial neighbors, dashing optimism that City and state leaders are taking this issue seriously. The City has a real opportunity to convey to its citizenry that it is actively working to curb continued environmental injustice that has plagued East Phillips for generations.

A. The Project Conflicts With The City's Green Zone Initiatives.

Recognizing that low-income and communities of color "are overburdened by environmental conditions such as traffic and stationary pollution sources," the City developed Green Zone initiatives that are "aimed at improving health and supporting economic development using environmentally conscious efforts in communities that face the cumulative effects of environmental pollution, as well as social, political and economic vulnerability."[169] Part of this work resulted in two discrete "Green Zones"—the Southside Green Zone and the Northside Green Zone.

The Southside Green Zone, which was created via a 2017 City County Resolution, includes the greater Phillips community and the Cedar-Riverside neighborhood.[170] It is headed by a Council that "serves as an advisory board to the City Council and Mayor on the implementation and evaluation of the Southside Green Zone Work Plan."[171] Its charge is to hold "the City of

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[168] *MPCA and Environmental Justice*, *supra* note 29; *see also Environmental Justice at MNDOT*, Minn. Dep't of Transp., http://www.dot.state.mn.us/environmentaljustice/ (last visited Mar. 25, 2021).
[169] *Green Zones Initiative*, City of Minneapolis, https://www2.minneapolismn.gov/government/departments/coordinator/sustainability/policies/green-zones-initiative/ (last visited Mar. 25, 2021).
[170] *Id.*
[171] *Southside Green Zone Council*, City of Minneapolis, https://lims.minneapolismn.gov/Boards/sgz (last visited Mar. 25, 2021).

Minneapolis and related partners accountable to the timely and effective implementation of the [Southside Green Zone Work Plan]."[172]

Important work has resulted. In 2014, the Minnesota Department of Health ("MDH") released a legislatively mandated report aimed at advancing health equity in Minnesota.[173] This report revealed that the broad health-based inequities that impair the lives of low-income communities and people of color are a product of structural racism.[174] The report recommended utilizing "Health Impact Assessments to develop inclusive and equitable policies, plans and programs."[175] The resulting Health Impact Assessment for the Phillips Community recommends the City "discourage and advocate against development or development that will contribute to net additional pollution, especially pollution that negatively affects human health and avoid decisions that add pollution emission in an area deemed disproportionally pollution burdened relative to other city neighborhoods."[176] The Assessment further recommended "the City adopt ordinances that prioritize over-burdened neighborhoods for pollution reductions," citing ordinances in California and New Jersey as examples.[177]

In 2019, the Southside Green Zone Council, a body appointed by the Minneapolis City Council, approved recommendations to help the City achieve climate and environmental justice in the greater Phillips neighborhood.[178] The recommendations were designed to serve as a

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[172] *Id.*
[173] *Health Impact Assessment*, *supra* note 3, at 7.
[174] *Advancing Health Equity in Minnesota*, Minn. Dep't of Health 3 (Feb. 2014), https://www.health.state.mn.us/communities/equity/reports/ahe_leg_report_020114.pdf.
[175] Dr. Cecilia Martinez, Shalini Gupta, and Marisol Becerra, *Executive Summary: Health Impact Assessment for the Phillips Community*, Center for Earth, Energy, and Democracy 6, https://www.eastphillipsneighborhoodinstitute.org/wp-content/uploads/2020/10/05-HIA_Executive-Summary-3.pdf.
[176] *Id.* at 12.
[177] *Id.*
[178] *Achieving Climate and Environmental Justice in the Southside Green Zone*, Southside Green Zone Council, https://www2.minneapolismn.gov/media/content-assets/documents/departmentx2fdivisions/Achieving-Climate-and-Environmental-Justice-in-the-Southside-Green-Zone.pdf (last visited Mar. 25, 2021).

"guidebook for the City of Minneapolis to address long standing, systemic and intersecting environmental justice issues in the area."[179] The recommendations promised to move "the City of Minneapolis tangibly toward meeting its stated Climate Change, Racial Justice and Environmental Justice goals."[180] Many of these recommendations are enshrined in the City's 2040 Plan, which explicitly contemplates taking actions that will advance the Southside Green Zone's environmental justice goals.[181]

The Project, however, does the opposite. Rather than reducing disparities in East Phillips and taking steps to heal long-standing and systemic environmental racism, the City seeks to continue the unbroken line of polluting enterprises that operate on this plot of land. In pushing this Project forward, the City is ignoring pleas from East Phillips leaders urging a more sustainable and environmentally benign use of the site.[182] The Project squarely undercuts the City's environmental justice initiatives and goals, and undermines the work of the Southside Green Zone Council. The City's proposal cannot be reconciled with its statements promising to address environmental injustice in one of the City's most diverse and polluted neighborhood. Unless the Project is relocated elsewhere, the City's environmental justice goals are void of meaning.

B. The Project Contradicts Hennepin County's Environmental Justice Promises.

Hennepin County (the "County") also recognizes that vulnerable residents shoulder a disproportionate share of the risks from climate change and environmental injustice. In its recently released Draft Climate Action Plan, the County recognizes that communities of color and low-income families—the dominant household demographic in East Phillips—are the most at risk from

[179] *Id.* at 4.
[180] *Id.* at 6.
[181] *Environmental Justice and Green Zones*, *supra* note 166.
[182] *See, e.g.*, *Our Current Proposal*, E. Phillips Neighborhood Inst., https://www.eastphillipsneighborhoodinstitute.org/our-current-proposal/ (last visited Mar. 25, 2021).

poor air quality and the anticipated effects of climate change.[183] The County understands that tackling this problem requires action; it intends to, among other things, develop a climate analysis framework with a health and equity lens, and giving community partners a voice in the development and implementation of the County's climate action plan.[184]

The County understandings its obligation of eliminating racial disparities in responding to climate change.[185] While the City enjoys a degree of autonomy from the County, the Project also bucks the County's stated intention of ensuring our most vulnerable populations are not subject to continuous environmental injustice. The Project, as currently proposed, cannot be reconciled with the County's promises to eliminate environmental injustice. MCEA requests the City explain how the Project aligns with the County's upcoming Climate Action Plan.

C. The Project Is Contrary To The State's Goals To Address Environmental Impact Disparities.

The state, through its agencies, also promises bold action on environmental justice. MPCA, for example, "is committed to making sure that pollution does not have a disproportionate impact of any group of people."[186] It believes "that no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental, and commercial operations or policies."[187] MPCA animates these statements through its "Environmental Justice Framework," a 2015 document that "provides direction and guidance to modify our practices and integrate environmental justice principles into our work."[188]

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[183] *Draft Climate Action Plan*, Hennepin Cty. 16 (Feb. 2021), https://www.hennepin.us/-/media/hennepinus/your-government/projects-initiatives/documents/hennepin-county-draft-climate-action-plan.pdf.
[184] *Id.* at 50.
[185] *Id.* at 59.
[186] *MPCA and Environmental Justice*, *supra* note 29.
[187] *Id.*
[188] *Environmental Justice Framework*, Minn. Pollution Control Agency (Dec. 17, 2015), https://www.pca.state.mn.us/sites/default/files/p-gen5-05.pdf.

Understanding that this work must be pursued across all levels of government, MPCA promised to collaborate with the City and County to reduce disparities in exposures and health effects.[189] The Minnesota Department of Transportation has made similar commitments. It promises to "[a]void, minimize or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations."[190]

The Project undermines promises made by the State. Building an equitable future for all Minnesotans requires fidelity to the commitments of our state leaders and agencies. As currently proposed, the Project will continue to burden residents in East Phillips, who have shouldered "a disproportionate share of the negative environmental consequences resulting from industrial, governmental, and commercial operations or policies."[191] MCEA respectfully requests the City relocate the Project away from East Phillips to honor environmental justice commitments from Minnesota and its agencies.

IV. THE PROJECT IS CONTRARY TO THE CITY'S TRANSPORTATION GOALS

The City has bold plans for the future. Some of the promises the City outlines in its 2040 are to increase adoption of transit, bicycling, and other transportation alternatives. These promises are echoed in the City's Transportation Action Plan,[192] Vision Zero Action Plan,[193] the Complete

[189] *Id.* at 15.
[190] *Environmental Justice at MNDOT*, *supra* note 168.
[191] *MPCA and Environmental Justice*, *supra* note 29.
[192] *Transportation Action Plan*, City of Minneapolis, http://go.minneapolismn.gov/ (last visited Mar. 25, 2021).
[193] *Vision Zero Action Plan*, City of Minneapolis, https://www.minneapolismn.gov/government/programs-initiatives/visionzero/vz-action-plan/ (last visited Mar. 25, 2021).

Streets Policy,[194] and other public commitments. Unfortunately, the Project is a direct impediment to fulfilling these promises.

Most troubling is the proposed surface parking and ramp, which combined will add almost 900 parking spaces. Building this amount of parking infrastructure encourages continued use of single passenger automobile trips for City employees traveling to the Project site each day. This squarely conflicts with the City's call in the 2040 Plan to reduce the total vehicle miles traveled.[195] Moreover, this volume of parking makes it almost impossible for the City's Transit Demand Management ("TDM") strategies to have meaningful effect. The EAW's TDM calls for reducing single occupancy vehicle trips to 20% in 2030.[196] But the volume of free parking spaces for City employees will impair this progress. Unless parking spaces are reduced or driving is otherwise discouraged—by limiting the number of employee vehicles that can park at the Project site each day or requiring vehicles to pay for a parking permit—City employees have no incentive to ditch their vehicles for more sustainable transportation methods. And, even if the City's TDM strategies are somehow accomplished, the consequence is a surplus of parking spaces, which, with a cost of nearly $20,000 per space, means taxpayers are funding significant yet temporary parking infrastructure.[197] Taxpayer money is better spent elsewhere.

This Project's plan to construct massive vehicle parking facilities makes even less sense when the surrounding transit options are considered. The Project is located in one of the most transit-dense parts of the City. It is mere blocks from the Blue Line Lake Street Station and is

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[194] *Complete Streets*, City of Minneapolis, https://minneapolis2040.com/policies/complete-streets/ (last visited Mar. 25, 2021).
[195] *Transportation*, City of Minneapolis, https://minneapolis2040.com/topics/transportation/ (last visited Mar. 25, 2021).
[196] EAW, *supra* note 1, at Attach. H.
[197] *Parking Structure Cost Outlook for 2019*, WGI, https://wginc.com/parking-outlook/ (last visited Mar. 25, 2021).

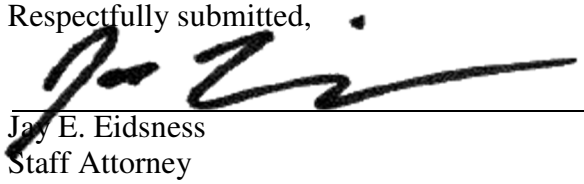
served by multiple bus routes, including high frequency routes that depart multiple times per hour. And the Midtown Greenway, the City's premier bicycle corridor, passes directly south of the Project site. Utilization of these convenient carbon-free and low-carbon transportation options will be stymied by the City's massive investment in on-site parking infrastructure. Motivating a City employee to commute via transit is a hard sell when ample free parking exists on-site. The City should dramatically scale back its proposed parking infrastructure to encourage its employees to commute using existing infrastructure.

CONCLUSION

Despite its length, the EAW fails to comply with MEPA. It is missing critical information to adequately assess the Project's potential environmental impacts to the neighboring residents and natural environment. At a minimum, the City must revise the EAW so it complies with MPEA and includes the required information.

The far superior course of action is for the City to stand behind its promises to address environmental racism within its neighborhoods and relocate the Project elsewhere. Minneapolis can be a leader in our nation's reckoning with the role government has played in the growing environmental justice crisis that plagues cities all across the country. The City has a real opportunity to make a positive difference for a community that has unfairly suffered for so long. MCEA joins the growing chorus of residents, neighbors, and community leaders demanding environmental justice for East Phillips.

Respectfully submitted,



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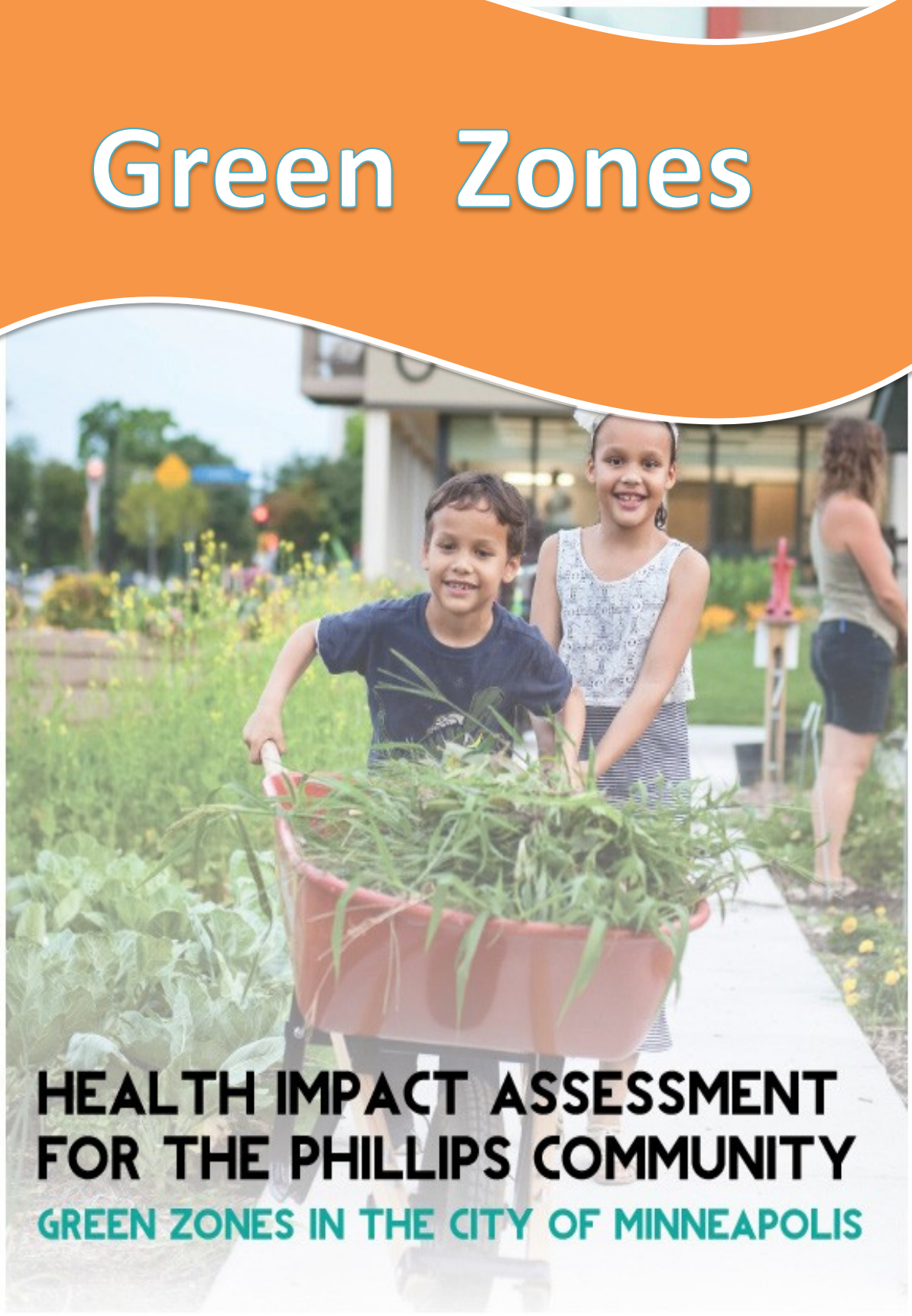
Green Zones



HEALTH IMPACT ASSESSMENT FOR THE PHILLIPS COMMUNITY

GREEN ZONES IN THE CITY OF MINNEAPOLIS

. . . the unequal distribution of power, in all its forms, is the major source of inequity, and that community empowerment can have a sustained impact of this distribution of power. 'Empowerment' refers to the process by which communities re-negotiate power in order to gain control over the factors that shape their lives, including access to information and opportunity, decision-makers, and policy making.

--Jandu, M. B., Bourcier, E., Choi, T., & Yen, S. G. (n.d.). Equity Metrics for Health Impact Assessment Practice, Version I. Society of Practitioners Health Impact Assessment

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Report compiled by **Center for Earth, Energy and Democracy**

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with assistance from Shalini Gupta and Marisol Becerra

Hope Community has applied strategic and innovative strategies for over 40 years to foster connections that strengthen the power of community members and communities. Located in Phillips Community, Hope worked with residents to create a long-term vision for their community. Acting on that vision, Hope's housing and place-based development work is transforming a formerly abandoned intersection of two major corridors in Minneapolis. Beyond physical development, Hope has a long history of community building and organizing for equity. More than 600 youth and adults are involved with Hope each year to learn, connect, and grow while building community assets, community leadership, and community change.

Isuroon is a grassroots nonprofit organization that promotes the well- being and empowerment of Somali women in Minnesota and beyond. Led by the very women they serve, the group has earned a trusted place in the community because of their cultural insight and collaborative approach. Isuroon envisions a world where Somali women and girls are healthy, connected and empowered and their families are thriving in Minnesota and globally. The organization is dedicated to building Somali women and girls social connectedness and self-sufficiency so that they can lead healthier, more productive lives in Minnesota and globally.

PILLSBURY UNITED COMMUNITIES
WAITE HOUSE

Waite House Waite House programs integrate civic engagement with human services to bring about positive change within our core focus areas of Employment and Training, Health and Nutrition, Youth Development, and Basic Needs. Waite House was established in 1958 in Minneapolis' Phillips Community and in 2012 moved into a larger space in a former park district building on 11th Avenue and 23rd Street. Each year, more than 4,500 Phillips Community members build social and economic capital via programs administered by 17 diverse staff and 120 volunteers, including 4 AmeriCorps members and students from six local colleges.

Land Stewardship Project is a private, nonprofit organization founded in 1982 to foster an ethic of stewardship for farmland, to promote sustainable agriculture and to develop sustainable communities. LSP is dedicated to creating transformational change in our food and farming system. LSP's work has a broad and deep impact, from new farmer training and local organizing, to federal policy and community based food systems development. At the core of all our work are the values of stewardship, justice and democracy.

Nexus Community Partners is an innovative community-building intermediary whose mission is to "build more engaged and powerful communities of color by supporting community building initiatives that expand community wealth and foster social and human capital." The key to building more engaged and powerful communities of color lies in the interconnectedness between authorship, leadership and ownership. Nexus work to ensure that all community members, especially those who have been marginalized, have access to wealth creation and ownership, meaningful leadership opportunities, and the power to drive changes which affect their lives. Nexus is committed to social justice, maintains an unwavering focus on equity, and has an ability to work with multiple stakeholders, connecting their work to become part of long-term fundamental change.

Center for Earth, Energy and Democracy (CEED) creates sustainable and just communities by providing research, policy and educational tools that strengthen the advocacy impact of frontline communities facing environmental injustice. Its work is focused on ensuring that justice is a fundamental principle guiding strategies for addressing climate change, environmental degradation and long-term sustainability. CEED's programs are guided by the principle that all members of society have the right to effectively participate in energy and environmental decisions that affect their health and livelihoods, and their community. CEED works to ensure that the voice of Indigenous peoples, communities of color, and those with moderate and low incomes are included in energy and environmental solutions.

Preface

In 2014, the Minnesota Department of Health (MDH) released the legislatively mandated report Advancing Health Equity in Minnesota. The report was initiated because "disparities in health status outcomes for certain populations are continuing unabated, including disparities based on race or ethnicity" (16). The existence of health disparities across race, ethnicity and socio-economic conditions has been well documented over the last several decades. Yet, the challenge to reduce these disparities continues. As noted by the National Conference of State Legislatures, "(d)espite ongoing efforts to reduce health disparities in the United States, racial and ethnic disparities in both health and health care persist. Even when income, health insurance, and access to care are accounted for, disparities remain" (17).

The problem of health disparities is complex. The field of public health has engaged in a range of efforts to understand its complexity and develop actions (policies and programs) to promote greater equity in health conditions. Yet, a problematic piece of the health disparities puzzle is that people's health is a function of the social and environmental conditions where they live and work. Moreover, these conditions are mostly beyond their control. Neighborhoods and local communities are an intricate system of social networks (family, friendship, kinship and acquaintance networks); economic organizations (businesses and industry); physical infrastructure (housing; transportation systems and roadways); and community-building institutions (community centers, churches, parks, and schools) assets (18).

It was not until the early 2000s that the social determinants of health (SDOH) became an acknowledged and important framework for addressing health conditions. In 1988, the Institute of Medicine, in its report the Future of Public Health, concluded that public health is "neither clearly defined, adequately supported, nor fully understood" and that the mission of public health should be to fulfill "society's interest in assuring conditions in which people can be healthy" (19). In 2008, the World Health Organization's Commission on Social Determinants of Health called for worldwide action to address the social, economic and

environmental conditions that impact health, stating, "social injustice is killing people on a grand scale" (20).

In the U.S., health outcomes are also linked to race and income. The impact of discriminatory practices by health care providers and disparities in medical care provision on public health has been widely documented (21). The social determinants of health framework highlights that the responsibility for the underlying social and economic conditions have been regarded as outside the health sector, instead residing in other sectors such as housing, community an economic development, pollution regulation, and transportation.

Herein lies the challenge: if health disparities are to be reduced, then the health sector must develop ways to work with other sectors. But, equally as important, public health has to do a better job of understanding and working with communities that have been subjected to historic and contemporary inequality. As American Public Health Association President Georges C. Benjamin stated (2015):

> *If we travel upstream to uncover the roots of disease and disability–and by that same token, to uncover the roots of today's persistent health disparities–the roles of racism, discrimination and bias in perpetuating generational cycles of poor health and risky health behaviors are easier to see. It is easy to see how the blatantly discriminatory policies of our nation's past made it impossible for certain groups of Americans to attain optimal health. What is much harder–and oftentimes uncomfortable—is to realize that the legacy of our history did not disappear with the signing of new laws. It is uncomfortable, but we must continue to confront and acknowledge that history if we truly want to eliminate health disparities and create a nation in which every person has the opportunity to live a long and healthy life (22).*

This Health Impact Assessment (HIA) is instructive and unique from other HIAs for several reasons. First, it was initiated due to a state legislation mandate to specifically address health equity, which led to adoption of the HIA as an assessment tool. Second, the HIA was originally a joint agency project between the Minnesota Department of Health and the Minnesota Pollution Control Agency in order to model interagency collaboration to address environmental and health equity concerns. Third, the policy or program to be addressed by the HIA was not pre-determined. In fact, the policy was identified by the HIA Community

Steering Team after the geographic area was selected for the HIA. Lastly, given all of the above, the role and responsibility of the two state agencies and the purpose of the HIA in public decision-making at the state or local level provided a learning opportunity for community engagement at the state level.

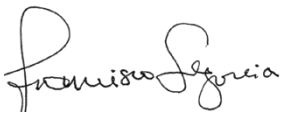
In late 2016, it came to the Community Steering Team's (CST) attention that the MDH HIA staff had not moved forward on the HIA in any substantial manner. A new MDH representative assumed the agency's HIA staff position and began to meet with the CST. Unfortunately, the information and guidance provided over the course of the previous year by the CST to MDH did not transfer to the new MDH staff person. A draft HIA was compiled by MDH and sent to the MPCA but was not ultimately released due to cited concerns from the HIA's CST. (23). From the CSTs perspective, this was due to a number of reasons, including: 1) the impending deadline for MDH to submit the HIA as a deliverable required a fast-tracked report due to the lack of progress in 2015; 2) the CST trust level with MDH had eroded and the later time sensitive requests from MDH were challenging for the community organizations given the extensive time already invested with the previous staff member; 3) the data and indicators which the CST requested were not included in the draft report, likely because of the staff transition.

Additionally, the significant work conducted by the CST (surveys, data collection, listening sessions, and focus groups) was not acknowledged in the MDH report. The CST's place-based health equity framework and discussion around the CST's concern that healthy sustainability initiatives by the city have a strong anti-gentrification lens were also limited. The CST decided that continuing the HIA with MDH was not in the best interest of the community. The CST informed MDH that the HIA would continue development, and requested that the Center for Earth, Energy and Democracy (CEED) create the report in consultation with the CST. Given the limited resources available to conduct the HIA, and the limited timeframe required for completion, the HIA design was re-evaluated. Rather than a comprehensive HIA, the CST determined that a scaled down HIA was most appropriate. The

HIA document here reflects the health equity framework and perspective of the HIA CST on Green Zones in the Phillips Community.

Signed,

Phillips Health Impact Assessment - Community Steering Team Organizations




PEACE
FREE

Phillips Community HIA: Screening Process

The screening phase in a conventional HIA establishes the value of conducting an HIA That is, screening determines whether an HIA is needed and if it is likely to be useful (24). In this case, the decision to conduct an HIA was made because of ongoing state concerns about health equity in Minnesota. In 2014, the Minnesota Department of Health released its *Advancing Health Equity in Minnesota Legislative Report*, which reported on health inequities in the state. In a departure from the standard behavioral orientation (diet, exercise, etc.), the report focused on structural factors that produce and re-produce health disparities across Minnesota populations asserting that "(t)hese health disparities persist and are neither random nor unpredictable. The groups that experience the greatest disparities in health outcomes also have experienced the greatest inequities in the social and economic conditions that are such strong predictors of health" (25). One of its recommendations was to utilize Health Impact Assessments to develop inclusive and equitable policies, plans and program (26).

Enhancement of current analytic capacity and use of data includes expanded use of health impact assessments as a tool to inform MDH programs and policy. Health Impact Assessment (HIA) is a tool or process to assess the potential impacts of proposed policies, plans or programs on the health of populations. Two of the five core values of HIA are democracy and equity. Practitioners support democracy by ensuring that everyone has a voice in decisions, and especially those that are impacted by the decision. Also, it is the responsibility of HIA practitioners to advance equity.

Further, the report identified utilization of HIAs as a tool for addressing equity and democracy in the following ways: "1) by selecting policies, programs or projects that improve the health of the most vulnerable or disadvantaged populations; 2) by engaging community members in decisions that affect their health and well-being; 3) by increasing the transparency of the evidence and the decision-making process; and 4) by creating

recommendations that advance health equity and eliminate disparities. HIAs are an important tool to promote health equity in policies, plans and programs" (27).

In the same year that Advancing Health Equity in Minnesota was released, the Minnesota Legislature provided funding to the Minnesota Department of Health (MDH) and the Minnesota Pollution Control Agency (MPCA) to assess the scope and impacts of air pollution on urban environments in Minnesota. The legislation provided over $1.8 million to continue PFC biomonitoring and for addressing "other environmental risks." The legislation: authorized $913,000 the first year and $913,000 the second year from the environmental fund to continue perfluorochemical biomonitoring in eastern metropolitan communities, as recommended by the Environmental Health Tracking and Biomonitoring Advisory Panel, and address other environmental health risks, including air quality. Of this amount, $812,000 the first year and $812,000 the second year are for transfer to the Department of Health (28).

Under the legislation, the two agencies were given discretion to decide the type of project that would be undertaken to address environmental risks and air quality.29 Following the appropriation, MPCA and MDH developed the Urban Air Quality and Respiratory Health Initiative. This Initiative involved a joint agency project team consisting of staff from MPCA's Air Assessment Section (Environmental Analysis and Outcomes Division); MDH's Environmental Surveillance & Assessment Section (Environmental Health Division); and the Minnesota Environmental Public Health Tracking Program. According to MDH, the goal of the Urban Air Quality and Respiratory Health Initiative was to use data to inform communities regarding air quality issues in the Twin Cities urban area; promote coordination between state government agencies; and demonstrate the use of HIAs as a tool to inform public health decisions. The Initiative also was intended to increase the understanding of health and environmental disparities that impact Minnesotans (30).

The joint agency project team identified three deliverables for the Initiative: a scientific summary of air quality trends and impacts which resulted in the technical report Life and Breath: How Air Pollution Affects the Twin Cities; (31) a community-friendly information

repository for air quality information which resulted in the Be Air Aware website;32 and a "Health Impact Assessment (HIA) of urban community health concerns" (33). The technical report and Be Air Aware website were completed in 2015. In addition to the use of data to inform Twin Cities communities about urban air quality, other goals of the Initiative were promotion of interagency coordination and use of the HIA as a tool to inform public health decisions (34).

The joint agency project team determined that the HIA should address the issue of air quality with a focus on a vulnerable community in the Twin Cities region. Preliminarily, vulnerability at this stage was defined as a community with higher rates of asthma-related hospitalizations or relatively higher levels of exposure to air pollution due to proximity to emissions sources such as major highways. The HIA project received $220,000,35 and the Climate and Health Program in the Environmental Health Division in MDH was designated as the lead principal for the project.

According to MDH staff, in light of the Advancing Health Equity in Minnesota report, (36) it was decided that the HIA would adopt a "community-centered strategy." The agency contracted with Nexus Community Partners; a Twin Cities organization recommended by the Blue Cross Blue Shield Foundation (a major funder of HIAs in Minnesota) to coordinate the community engagement process. Under contract with MDH, Nexus Community Partners was responsible for community recruitment and served as the coordinator of the Community Steering Team, which also included designated MDH HIA staff. In addition, Nexus made recommendations for funding support to ensure equity and capacity building of community organizations participating in the HIA project. From the two year legislative appropriation (FY14-15), $70,000 was allocated by MDH to Nexus Community Partners for community engagement, and $150,000 was estimated by MDH to have been spent on staff support for the HIA and related activities over the two years.37 The intent of the funding to community organizations was to provide resources and support for their active engagement and participation, which would thereby support greater inclusion of community voices, skills, and knowledge in the HIA process (38).

Identification of the Phillips Community as the Spatial Community for the HIA

Prior to the Community Steering Team (CST) involvement, the screening process undertaken by MDH and MPCA focused on the criteria for determining the vulnerable community in the Twin Cities region that would be the subject of the HIA. Based on existing data and using a Geographic Information System (GIS) analysis, the following indicators were used to screen for potential communities for the project:

- Rates of asthma hospitalization (See Figure 1)
- Proximity to major roadways and major air permitting facilities (See Figure 2)
- Low-income residents (See Figure 3)
- Population people of color (See Figure 4)

Each of the indicators were assigned a score of 0, 1, or 2 based on relative magnitude. MDH then developed a composite score (0 – 10), equally weighting the five factors. The results are shown in Figure 5. The higher scored areas were considered by MDH to have the probability of higher health risks and were included in the cohort of potential geographical areas for the HIA (39).

Minnesota Environmental Public Health Tracking Program, Minnesota Public Health Data Access Portal.
https://apps.health.state.mn.us/mndata/webmap/asthma.html

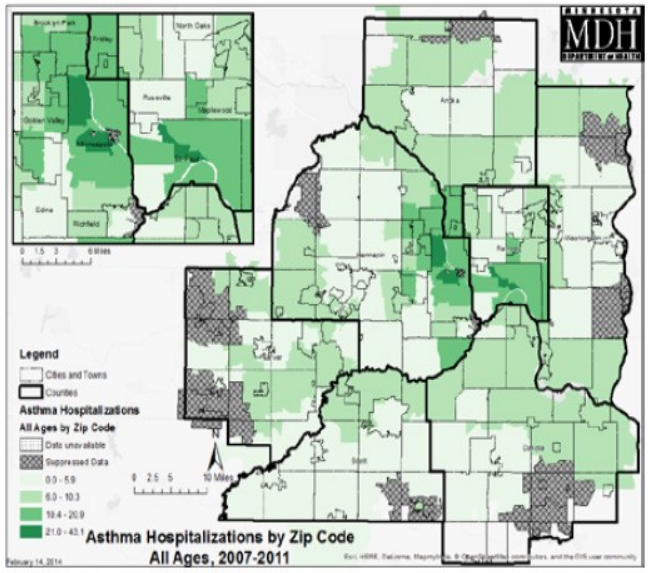


Fig. 1: Asthma Hospitalizations by Zip Code

Interstates, US and State Highways. Minnesota Department of Transportation (MnDOT): http://www.dot.state.mn.us/maps/gdma/gis-data.html
"What's in my Neighborhood?" Minnesota Pollution Control Agency Spatial Data Application Online. Selected Active Air Permit Holders.
http://pca-gis02.pca.state.mn.us/wimn2/index.html

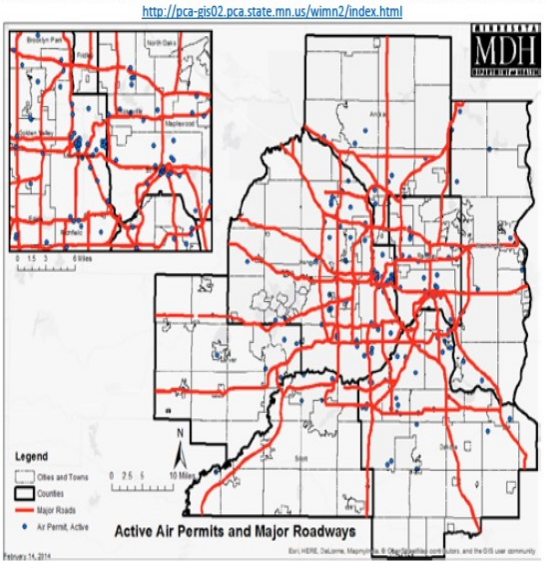


Fig. 2: Air Pollution Sources

American Census Bureau 2010 Decennial Census via Metropolitan Council for GIS Applications.
https://gisdata.mn.gov/dataset/us-mn-state-metc-society-census2010realign

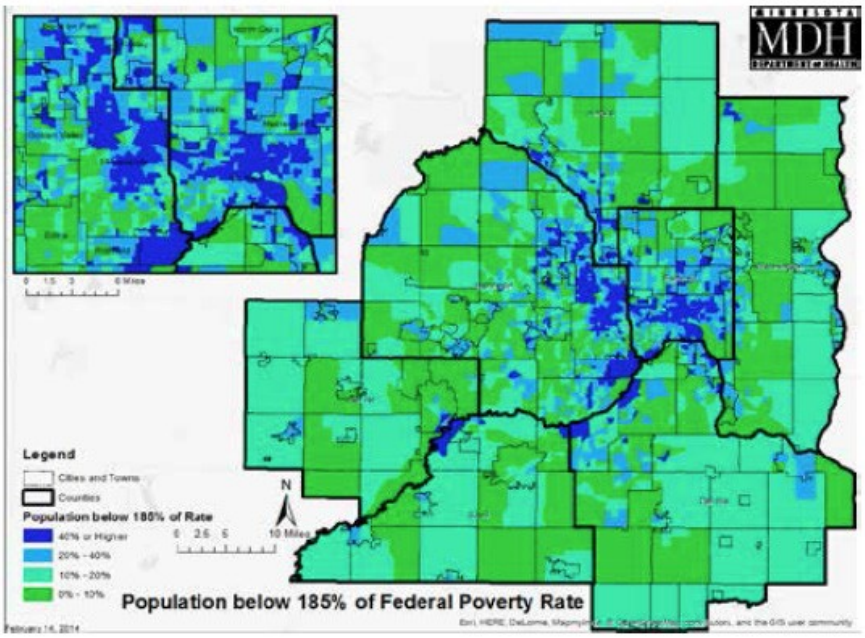


Figure 3: Low Income Population

American Census Bureau 2010 Decennial Census via Metropolitan Council for GIS Applications.
https://gisdata.mn.gov/dataset/us-mn-state-metc-society-census2010realign

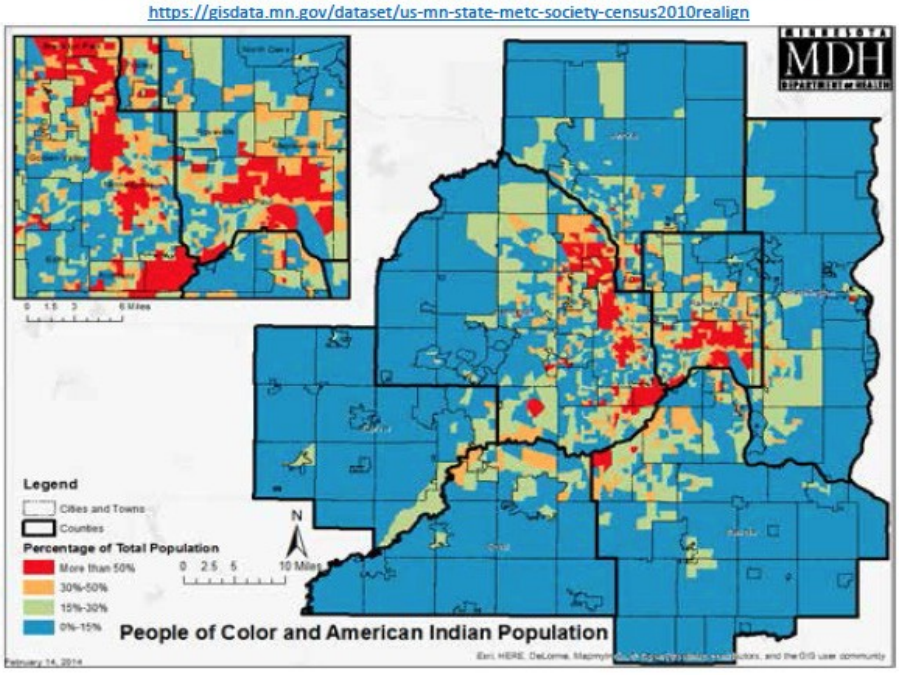


Fig. 4: People of Color Population

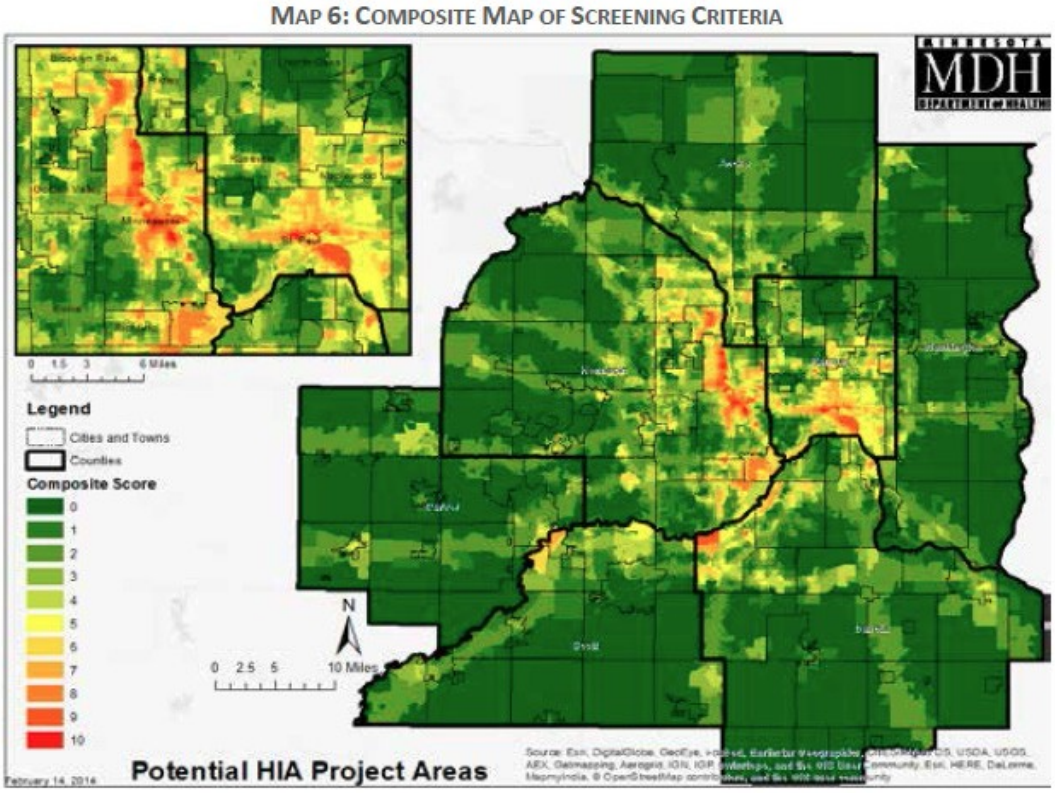


Fig. 5: Composite Map of Screening Criteria

From this analysis, MDH identified the following potential spatial communities for the HIA:

- North Minneapolis along I-94
- Central area of St. Paul
- Brooklyn Center
- Northwest area of Burnsville
- Central area of Minneapolis

The final determination of the "central area of Minneapolis" (and specifically the Phillips Community) as the HIA study area was made by MDH and Nexus Community Partners based on an assessment of local organizational capacity to participate in the HIA process, existing community relationships, and ongoing community planning and participation in various efforts to improve the health of the community.40 Selection of the policy or program to be addressed by the HIA was delegated to Nexus Community Partners and the community organizations participating in the HIA.

Community Steering Team

A set of five community organizations recruited by Nexus Community Partners committed to participate on the HIA Community Steering Team (CST):

- Waite House
- Hope Community
- Isuroon
- Land Stewardship Project
- Center for Earth, Energy and Democracy
- Nexus Community Partners

The primary condition for participation in the CST was that the community organization must be located in, or serving, residents in the Phillips Community (Waite House, Hope Community, Isuroon, Land Stewardship Project). In addition, the Center for Earth, Energy and Democracy (CEED), an environmental justice research and policy education organization based in Minneapolis, served as a community-based technical assistance partner. While not

physically located in Phillips, CEED had extensive experience working with community groups and organizations located in, and serving community residents in the neighborhood.

The CST formally met monthly, and often twice monthly throughout the MDH sponsored portion of the project. In addition to these meetings, CST members also met with MDH staff routinely to advise and consult on the HIA environmental justice framework, data collection, and indicator development. CEED facilitated two screening sessions for the steering team; assisted with the development of a survey for Phillips residents; linked the steering team to the Minneapolis Health Department and MPCA research activities; assisted with utilization of the Twin Cities Environmental Justice Mapping Tool to identify additional sites in the neighborhood for the Minneapolis Air Quality study sites; and provided technical feedback on questions per the steering team's request.

A community survey was also developed by CEED with input from the CST and was translated into Spanish and Somali. MDH was responsible for compiling the survey data.

Phillips Community HIA: Scoping Process

The scoping process in the HIA focuses on two objectives. The first is to identify the population that is likely to be affected by policies or programs. This can include specific communities, geographic regions; populations based on certain demographic, economic, racial and ethnic criteria; or vulnerable populations (41). The HIA literature recommends that scoping should include identification of alternatives to the proposed policy or action. For this HIA, the process for identifying the proposed policy/program was designated to the CST. The CST therefore, did not address alternative actions.

The second objective of the HIA involves identifying the health effects to be evaluated, populations affected, sources of data, and methods for assessment.42 This HIA, as noted in the previous section, focused on the geographic area of the Phillips Community. The Phillips community is one of four areas in the Twin Cities with a high composite indicator score

based on the following data: asthma hospitalizations; point and non-point emissions; low-income population; population people of color. In aggregate, these criteria were used by MDH to classify the Phillips as a vulnerable community. Once the urban Phillips community was selected and the CST was formed, the next phase was to select the policy to be examined by the HIA. In the first set of meetings, the CST deliberated about theissues affecting the community and its socioeconomic historical context.

Socio-spatial History of the Community: Why is this important?

The Phillips Community, like most urban communities, has undergone demographic, economic and infrastructure changes over the years. These changes are not isolated from regional socio-economic and demographic shifts, national urban and economic development patterns, and increasingly over the last few decades, global economic factors. In a 2011 report, Choice Place and Opportunity: An Equity Assessment of the Twin Cities Region, the Metropolitan Council identified several Racially Concentrated Areas of Poverty (RCAPs) in the metropolitan area. The study defined RCAPs as census tracts where 50% or more of the residents are people of color and 40% or more of the residents have family incomes less than 185% of the federal poverty threshold (43).

Data from the report also highlights a trend of increasing concentration of RCAPs since the 1990s. For example, in 1990, 86 census tracts in the Twin Cities region were considered areas of concentrated poverty, decreasing to 74 census tracts in 2000, but increasing to 106 census tracts according to 2007-2011 data. Incorporating race and poverty, or Racially Concentrated Areas of Poverty shows a similar trend. In 1990, 31 census tracts were identified RCAPs (representing 3% of the region's residents). By 2000, this had increased to 53 census tracts and 6% of the region's total population. In 2007-2011, 80 census tracts with 9% of the region's residents lived in an RCAP. The racial concentration of poverty increased even as the Metropolitan Council notes, "the growing economy of the 1990s reduced poverty at the regional level and reduced the number of census tracts that qualified as areas of concentrated poverty" (44). Although more census tracts are designated as concentrated

areas of poverty, a greater percentage of the population live in racially concentrated areas of poverty. This data illustrates the continuing and growing problem of income-based, but even more importantly, the problem of race-based segregation in the Twin Cities region. South Minneapolis (where the Phillips community is located) is one of the seven RCAPs in the Twin Cities, (45) and was identified as the fastest growing among the region's RCAPs. As seen in Figure 6, all of Phillips Community census tracts meet RCAP criteria, and partial areas of eight other Minneapolis neighborhoods are part of the Metropolitan Council designated South Minneapolis RCAP (46).

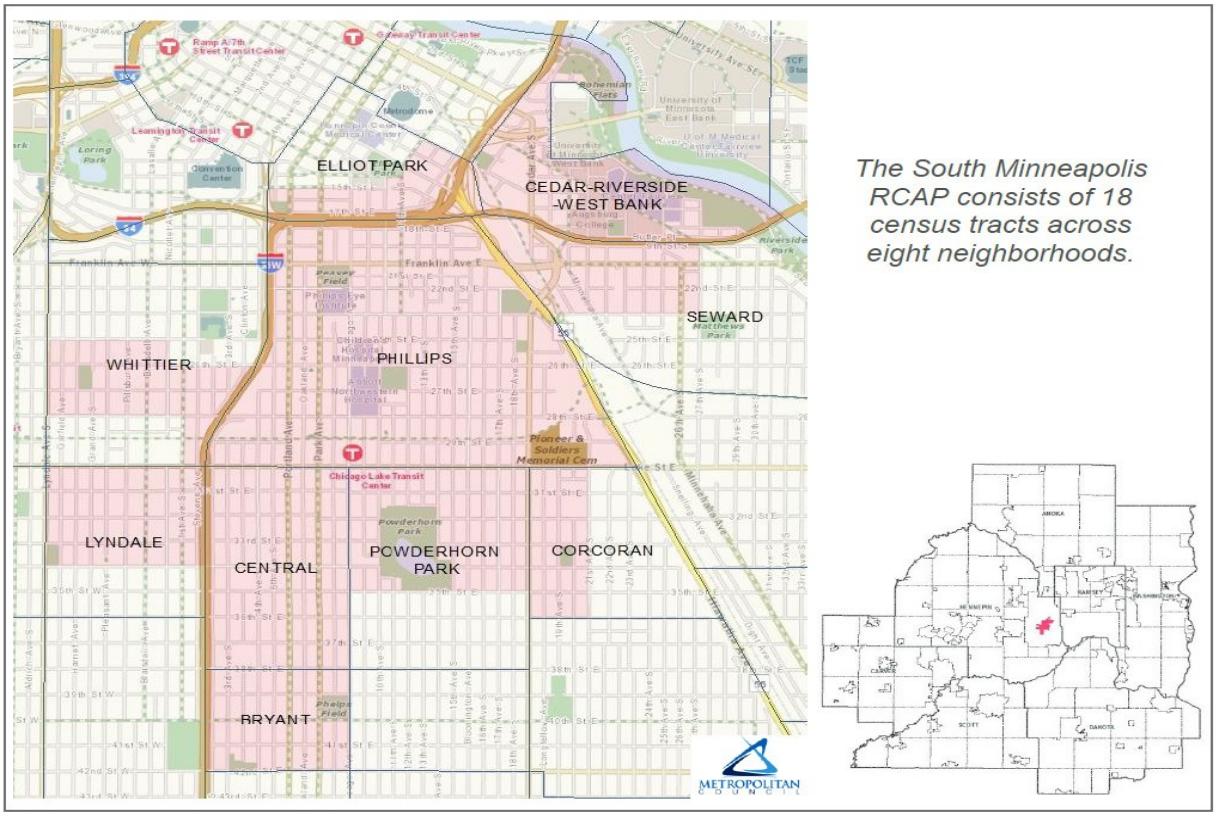


Fig. 6: Racially Concentrated Areas of Poverty Tracts in South Minneapolis, 2007-2011 (147)

Although its white population decreased by 30 percent in the 1990s, this area's overall population grew by 17 percent due to an increase in Latino and Somali immigrants (48). A number of noted effects of this demographic shift is the growth of Latino and Somali serving

small businesses supported by organizations such as the Latino Economic Development Corporation, and an expanding set of social service agencies for these populations. Although once a neighborhood that was home to one of the largest urban American Indian communities, Phillips has experienced a decrease in this population. However, the neighborhood remains a hub for Native-serving organizations including the first urban American Indian community center, and urban offices for several tribal governments. It has also been designated as the city's American Indian Cultural Corridor (49).

These demographic shifts in the Phillips Community mirror trends in the Twin Cities region. While in aggregate, Minneapolis shows an increase in its diversity of population, this diversity is accompanied by a spatial racial and income segregation not unlike other major cities in the U.S. The following demographic assessment utilized data from the American Communities Survey (ACS) 2010-2014 and MNCompass, a Minnesota demography project.50 MNCompass provides neighborhood level demographic profiles for neighborhoods in Minneapolis using ACS 2010-2014 data. Demographics on age, race, ethnicity, and Income are provided in the following sections.

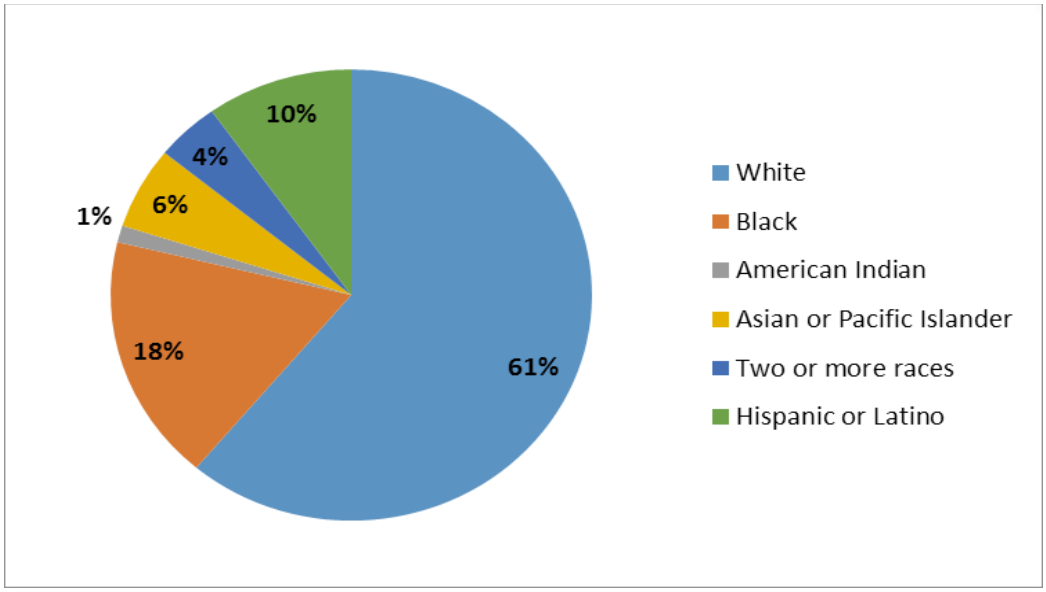
Race and Ethnicity in Phillips

Phillips is a highly diverse community. Blacks comprise 38% percent of Phillips' total population, and represent the largest racial/ethnic group; Latinos make up 26% percent; and non-Hispanic Whites make up 20% percent of Phillips residents. American Indians are 7% percent of the population in the Phillips Community, which is one of the largest American Indian populations among Minneapolis neighborhoods. Approximately 5% percent of community residents identify as Asian or Pacific Islander. Residents who identify with two or more races account for 4% percent of residents.

People of color constitute almost four-fifths of the population in the Phillips Community, which is significantly higher than the City's overall demographic distribution. In comparison, Non-Hispanic Whites comprise 61%, or three- fifths of the city's residents; Blacks, comprise

18%; Latinos are 10% and Asian or Pacific Islanders make up 6% of the city's population. Residents who identify as two or more races account for 4% percent; American Indians represent 1% percent. It is important to note that a proportion of the population in these racial categories are immigrant or New Americans (identified as foreign-born in the U.S Census).

Chart 1: Population by Racial and Ethnicity – Phillips Community



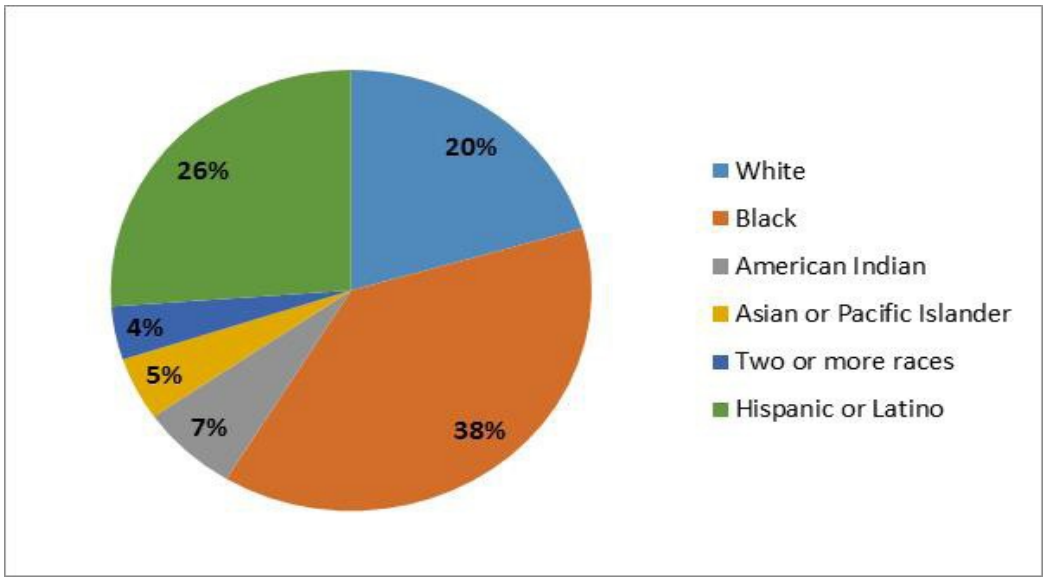


Chart 2: Population by Racial and Ethnicity – City of Minneapolis

Fig 7: City of Minneapolis People of Color

Map created by Center for Earth. Energy and democracy using U.S. Census 2010 data from MNCompass and shapefiles from Open Data Minneapolis

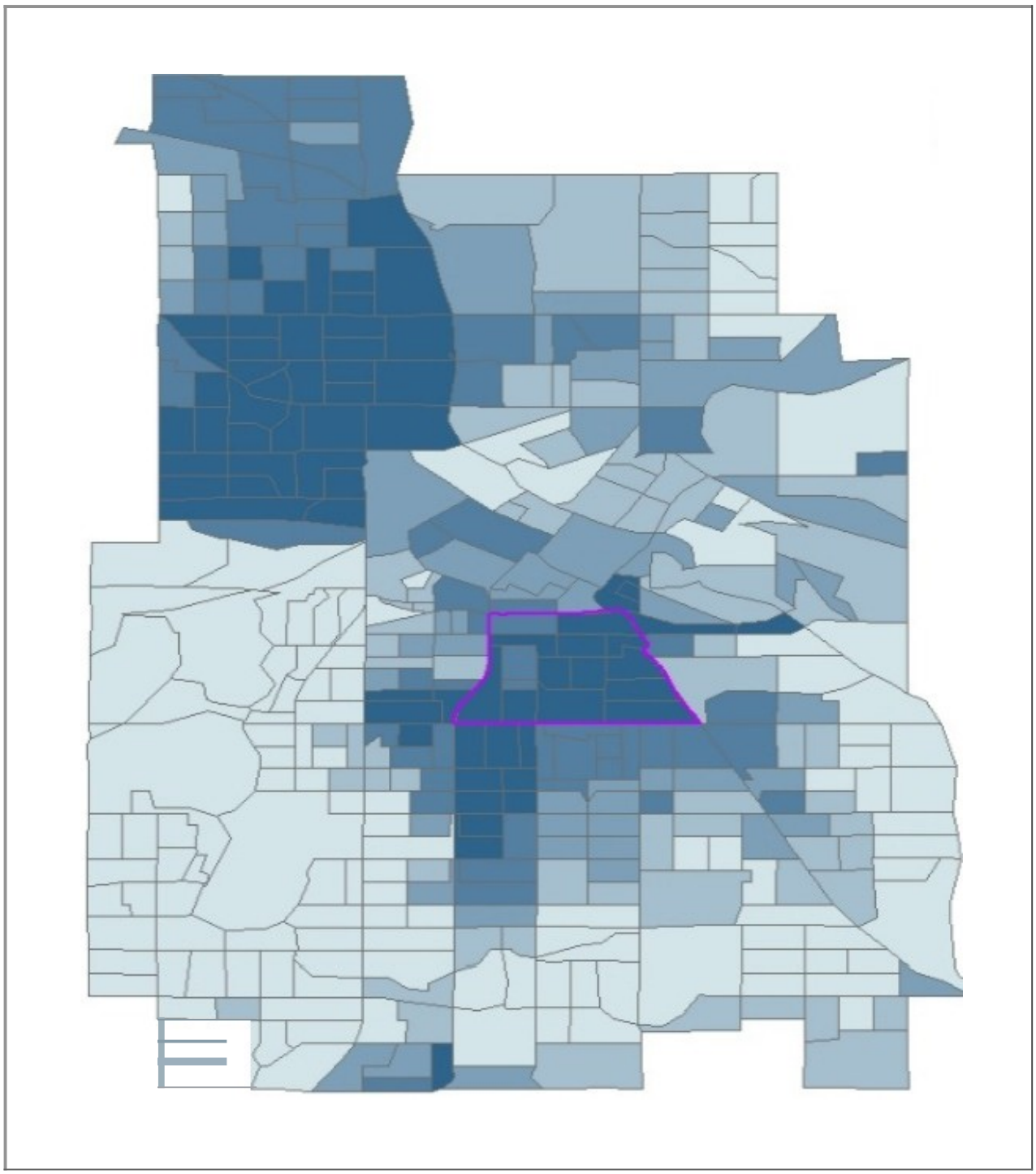
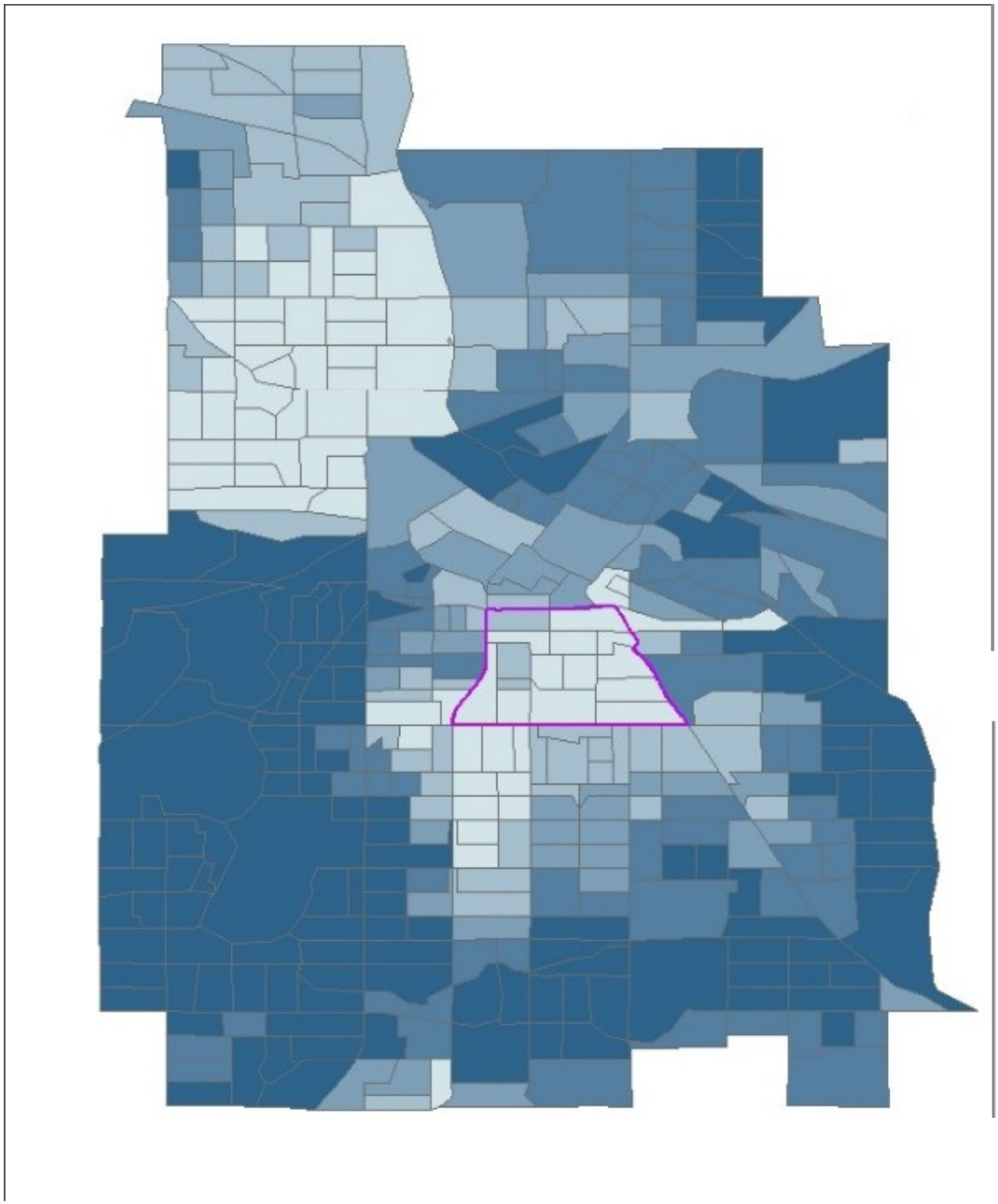


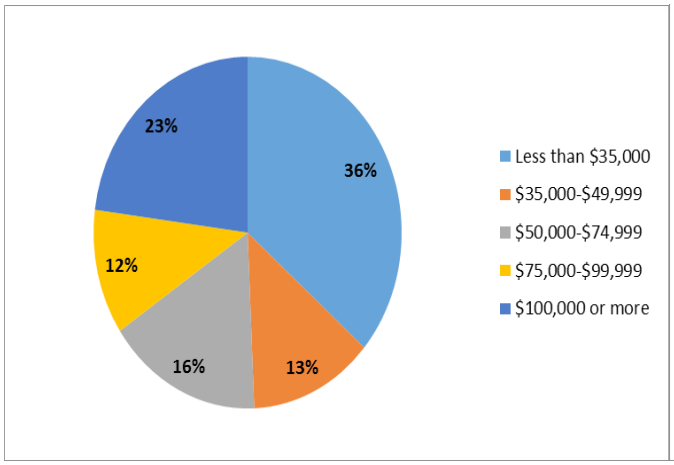
Fig. 8: City of Minneapolis White Non Hispanic Population- Census 2010



Income in Phillips Community

The household income distribution in the Phillips Community shows more striking concerns. Sixty-three per- cent of households have an income of less than $35,000; and only 5 percent have household incomes of $100,000 or more. In contrast, approximately one-third of Minneapolis households have incomes less than $35,000 dollars in household income, and 23 percent of households have incomes of $100,000 dollars or more. The CST identified use of household income versus family income because of its common use in public programs. However, it is also important to note that household income includes the total income of people who occupy a housing unit regardless of relationship. A household may consist of a person living alone or multiple unrelated individuals or families living together. In contrast, a family consists of two or more people (one of whom is the householder) related by birth, marriage, or adoption residing in the same housing unit (51).

Phillips Community



City of Minneapolis

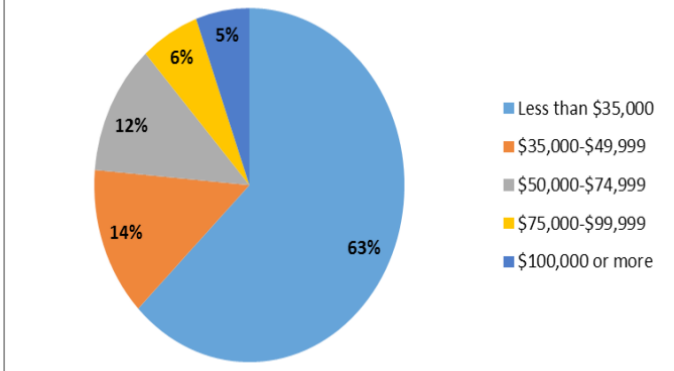


Chart 3. Income in Phillips Community and City of Minneapolis

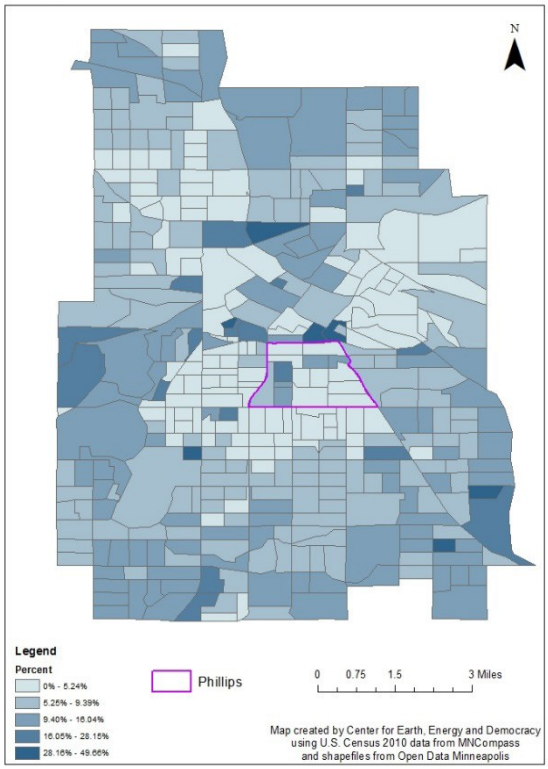
Age of Residents in Phillips

According to the American Communities Survey 2010-2014, the Phillips community is comprised of 21,015 residents. Children under the age of 18 make up 32 percent of residents

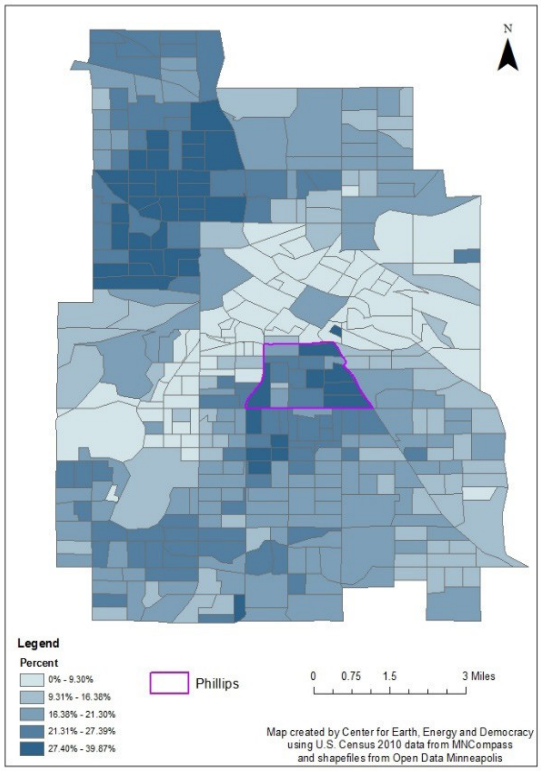
in Phillips. Senior citizens age 65 and older make up 7 percent of the population. Combined, children under 18 years of age and senior citizens over age 65 are 39 percent of Phillips total population. As a result, over a third of Phillips residents are most vulnerable to environmental exposures - as children and senior citizens are considered most at risk to harmful effects of toxic pollution. In comparison, children under 18 are 20% percent of the total population in Minneapolis, and 9% percent of the total population is comprised of senior citizens age 65 and over. The largest difference in age demographics between Phillips community and City of Minneapolis is children under the age of 18 as Phillips has 12% percent more youth in comparison to the aggregate city population.

Figure 9. Senior Citizens and Children Under 14, Minneapolis 2010

Minneapolis Senior Citizens Age 65 and Over - Census 2010



Minneapolis Children Under 14 years - Census 2010



Foreign Born

A significant population in the Phillips community are new immigrants. In the U.S. Census, nativity refers to whether a person is native- or foreign born. Native-born population refers to an individual who is a U.S. citizen or U.S. national at birth. Foreign-born population includes anyone who was not a U.S. citizen or U.S. national at birth. Respondents who are not U.S. citizens as well as those who have become U.S. citizens through naturalization are considered foreign born. According to 2010 census data retrieved from Minnesota Compass, foreign-born residents constitutes 33.9 percent of Phillips residents (combining East Phillips, Phillips West, and Midtown Phillips) (52). For this HIA report we did not disaggregate this data by race and ethnicity. As a result, the proportion of each racial category that is foreign born is not addressed here, but it is clearly an important issue for addressing the neighborhood's assets and needs. CST members identified this as essential for understanding the racial community dynamics, and for identifying the components of sustainability that ought to be a part of developing a place-based strategy for sustainable development.

At a national level, the U.S. Census reports that the pattern of races reported by the foreign born is notably different from the native category. While most native and foreign-born populations reported only one race, the distribution of races reported differed. Those that are foreign born were more likely to identify as Asian and Some Other Race, but were less likely to report White, Black, and Two or More Races. Most native-born identified as White (78 percent), followed by Black (13 percent). By comparison, 46 percent of foreign-born individuals identified as White (46 percent), Asian (23 percent), and Some Other Race (21 percent). With respect to ethnicity, approximately 15 percent of the total U.S. population identified as being of Hispanic origin with 10 percent being native-born (53).

Summary

These demographics are important for addressing health disparities in Minneapolis, and in the Phillips Community. There is substantial research that documents the link between the physical, social and economic conditions of a neighborhood and an individual's health. The

concentration of race and poverty in the Twin Cities is not, unfortunately, a unique occurrence. Braveman et al., reveal that in the United States, people of color are more likely to live in poor neighborhoods, and that this uneven pattern is not fully explained solely by income (54). In other words, race continues to be a major factor in determining where one lives; and further, where one lives has an impact on one's health (55). MDH concurred in its Advancing Health Equity report, concluding that where you live matters, and neighborhoods with different socio-economic characteristics but only 3 miles geographically apart could "equal up to 13 years difference in life span difference" (56). Braveman et al., note that although the issue is complex, "the overwhelming weight of evidence indicates that both features of neighborhoods and characteristics of individual resident's influence health. Both places and people matter" (57).

The factors that contribute to these conditions are complex and include a set of cross-sector issues such as access to retail food markets with quality, affordable nutritious food; housing conditions (affordable housing; quality of housing; neighborhood housing stock); environmental conditions (indoor and outdoor air quality; number and type of polluting industries; existence of brownfields and other legacy toxic contamination); education (school infrastructure; funding; teacher experience); safety (police relations; crime; quality of physical infrastructure); green space and other amenities; transportation (access, cost, and quality of service of public transit); economic conditions (access to safe and livable wage jobs) wages, small business support -- to name a few. As a National Academies of Sciences report stated, "[h]ealth can no longer be seen solely as the result of personal choice and behavior . . ."

> *The root causes that have been identified indicate that many policies or programs thought to be unrelated to health may have important health consequences. Indeed, it has been argued that major health problems, such as the obesity epidemic and its associated health and monetary costs are essentially unintended consequences of various social and policy factors related, for example to the mass production and distribution of energy-dense foods and the engineering of physical activity out of daily life through changes in how transportation is organized and how neighborhoods are designed and built (58).*

Green Zones Policy: Environmental Justice

Recognition that environmental pollution, not unlike other social issues in the United States, has a racial and income dimension gave rise to a field of environmental research and advocacy known as environmental justice. A substantial body of research exists to study the phenomenon of racial and income disparities with respect to environment and health. These studies range investigate the ethical and legal issues of environmental disparities with respect to public health. Results from these studies are varied, but one thing is certain –a pattern of disproportionately higher environmental risks in minority and poor communities exists in the U.S. (59, 60, 61). Even when viewed more granularly, community by community, and block by block, the trend of concentrating environmental hazards in minority neighborhoods persists.

This unequal spatial distribution of environmental risks on the basis of race and income is the central focus of environmental justice concerns in the United States. This includes issues such as:

MULTIPLE CONTAMINATION SITES. In any given community, there are multiple facilities ranging from very small businesses to large-scale industrial emitters. Permitting is based on individual facility emissions and does not integrate the problem of multiple emitting facilities in the process.

MULTIPLE POLLUTANT EXPOSURE. Concentration of emitting facilities in communities can result in multiple toxic pollutants. However, risk assessments are based on single pollutant exposures.

CUMULATIVE HEALTH IMPACTS. Information on the cumulative or interactive impact of multiple substances on human health is not addressed within the current regulatory framework.

CHRONIC LONG-TERM EFFECTS. The health impacts of toxic substance exposure can be long term. Negative health impacts due to unequal exposures to populations may not be detected.

SENSITIVE POPULATIONS. The research has shown that exposure and health impacts on children and older adults can be more severe and extensive, because of their development stages, and behaviors (e.g., hand to mouth contact of young children). However, other socio-economic factors that can exacerbate the health effects of environmental pollution has also been identified, although this research is relatively immature.

A review of research by the California Environmental Protection Agency and the Office of Health Hazard Assessment identifies that inequality exists when "disparities in exposure, where some people are exposed to more harmful pollutants than others, especially in minority and low-SES communities" (62). The report also states that evidence "suggests that cumulative exposures from multiple sources of environmental pollution may be more harmful than single exposures (63, 64).

The California EPA report highlights two concerns related to health and environmental disparities concerns: 1) exposure disparities which includes facility proximity to residents, frequency and severity of toxic releases; types of modeled and monitored air pollutants; and other factors related to disproportionate exposure; and 2) the disparities in environmental

conditions and sensitivity based on intrinsic factors (age, pre-existing conditions, gender); sensitivity based on non-intrinsic factors; health disparities, socio-economic factors, and their relationship to pollutant related diseases (mortality disparities, infant mortality disparities, perinatal outcome disparities, cancer disparities, cardiovascular disparities) (65).

A third inequity problem concerns disparities in the quality of public infrastructure across communities. This inequality results in differential capacities of communities to withstand pollution burdens or other environmental hazards. Although disasters such as Hurricane Katrina and Superstorm Sandy catalyzed much public discussion about the effects of weather-related disasters on poor rural and urban communities, much remains to be done to integrate the issues associated with this problem in the public health research and practice agenda. The concern for not only mitigating existing harmful pollution emissions, other environmental effects such as the increasing negative impacts from climate change, as Hurricane Katrina and Superstorm Sandy demonstrate, make it increasingly important to both reduce pollution and build adaptive and resiliency capacities at the community level. As Ebi et al., state that it is "the unprecedented nature of climate change also may bring unanticipated consequences for public health" (66).

The challenge to equitable health outcomes, particularly with respect to environmental health, is that the regulatory framework for protecting public health is inadequate for addressing the legacy of racial and income environmental inequalities. In urban and rural communities. For example, scientific and regulatory protocols (as noted) are based on single pollutant toxicity; permitting is based on individual facility emissions; and air quality compliance is required at the state level, which does not address issues of concentrated "hot spots."

In an environmental justice study on transportation, Genges articulates a fundamental methodological problem (67):

> *Finally, the state of practice in equity analysis suffers from a substantial conceptual flaw that has the unfortunate effect of preserving the status quo. Equity analyses*

typically use as the basis of comparison a criterion of proportionality when assessing the fairness of a proposed project or a plan, and thereby fail to account for any pre-existing disadvantage . . . If, for example, an 'EJ population' is found to experience benefits and burdens from a proposed project that are approximately the same as the "control population," the project is deemed to have no disproportionate effect, and it can proceed without violating environmental justice provisions.

Another barrier to addressing environmental disparities is a perception that Indigenous, communities of color and low-income communities are less concerned about environmental issues than their white middle-class counterparts. Historically, this perception was characterized as the "jobs vs. environment" dichotomy. Contrary to popular perceptions that communities of color and low-income communities are more concerned about job opportunities than environmental health issues, these communities have been in the forefront of addressing environmental pollution and public health.

Public health must overcome the inequities present in conventional approaches to assessing environmental risks. These approaches to analyzing the effect of human exposure to an individual pollutant does not address the cumulative environmental risks that impact many environmental justice communities. Thus, these approaches produce skewed data that distorts the reality of long-term human exposure to multiple pollutants and other social, economic, and environmental hazards. Rather than reinforcing a status quo of racial and

economic disparities in environmental protection, environmental and health policy should compel solutions that prevent such disparities.68

In the field of environmental justice, there has been a consistent call for addressing these methodological shortcomings. The 2004 report Ensuring Risk Reduction in Communities with Multiple Stressors: Environmental Justice and Cumulative Risks/Impacts sponsored by the National Environmental Justice Advisory Council emphasized the need to address the inequity of public health research through the development and implementation of cumulative risk assessment. According to the NEJAC report, this methodological approach would provide an evaluation of the combined effects of multiple environmental stressors rather than the conventional focus on individual pollutants. The NEJAC also called for an emphasis on place-based assessments and the inclusion of the effects of psychosocial, physical, and other environmental stressors that may compound health risks in a community. Both before and after this report, developing effective methodologies for addressing cumulative impacts has been a major concern (69).

Health disparities identified by the environmental justice literature, and the methodological challenges to addressing them, are parallel to the Social Determinants of Health (SDOH) framework. Jandu et al., summarize SDOH research findings: "Research over the past two decades repeatedly demonstrates the relationship between poor health outcomes and socio economic factors such as inadequate and unsafe housing, work environments, and neighborhoods, low educational attainment, social exclusion, poverty, racism and other structural inequities" (70).

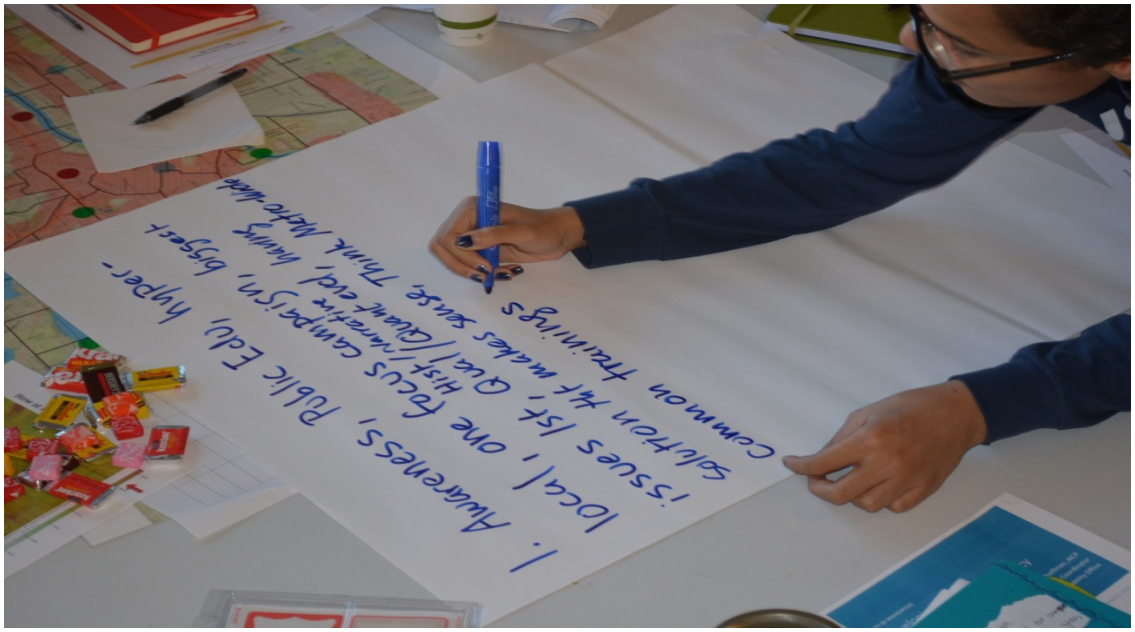
Spatial analysis has the potential to contribute to environmental justice community knowledge and empowerment. It has been noted that "environmental equity is an inherently geographic problem" (71). A geographical (spatial) assessment of environmental risk by community or neighborhood is one aspect of evaluating environmental and health equity. Another includes assessment of health impacts (epidemiology and toxicology) of pollutants on community residents. And lastly, but just as critical, is the level of community participation

in the development and implementation of environmental regulation and remediation. Community participation is the cornerstone of democratic self-governance, and should be an essential component of environmental policy and planning. Effective and meaningful participation is dependent upon a number of factors including access to information, and opportunities for engagement in all phases of decision-making processes.

The methodological and regulatory problems listed above are well documented and illustrate the complexities of conducting an environmental justice community-level analysis. Scientific methodologies require very specific controlled conditions and are incommensurate with realities at the community level. Moreover, increasingly knowledge and decision-making about environmental issues has become the domain of the 'expert'. Bonhanm and Nathan state, "without investing time working with the community, some researchers' perceptions of reality may be very different from the community's perceptions and expectations" (72). Yet even environmental health researchers concerned about bridging research with community needs tend to place primacy on the research over community understanding, regardless of its methodological deficiencies in explaining community impact. Despite its challenges, Bonham and Nathan conclude that, "community-based environmental health research cannot be conducted in isolation of the people within the community" (73).

This HIA, both in terms of process and content, demonstrates the challenges of the expert-community tension. The CST, concerned with the implications of the draft HIA developed by MDH, made the decision to develop an alternative assessment. In doing so, the CST developed its own community-based process. As, Jandu et al. note "(c)ommunity empowerment addresses these social, political, economic, and environmental determinants that underpin health and health inequities. Empowerment implies more than the participation of communities, but rather community ownership of processes, planning, and actions that seek to change the determinants of health" (74).

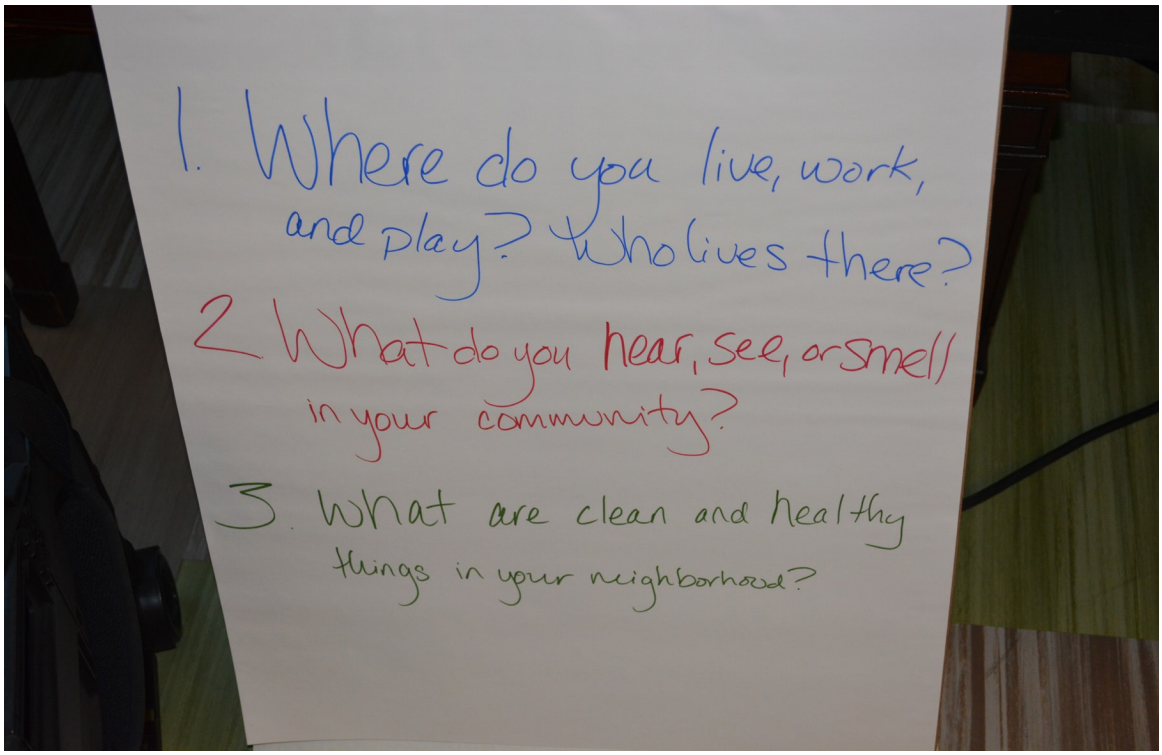
The CST adopted an Environmental Justice-Social Determinants of Health framework to identify the policy/program for the HIA. An important consideration was the fact that the Phillips Community has been the site of ongoing environmental concerns. The neighborhood's rejection of a waste transfer station provided the impetus for public funding for one of the city's first "green" projects – the Greenway and the Green Institute (75). In addition, the location of an arsenic-based pesticide plant that left legacy pollution led to its listing on the National Priority List of Superfund Sites. Its selection by MDH as a candidate in the pool of geographic areas for the HIA due to air emissions data validates that the neighborhood continues to experience environmental concerns that affect public health.



Green Zones

The Green Zones initiative was first introduced to the City of Minneapolis in the Climate Action Plan by the Environmental Justice Working Group as a cross-cutting strategy for meeting the City's climate mitigation goals. The Environmental Justice Working Group's (EJWG) recommendation was as follows (76):

> *The Green Zones Initiative will create a city designation for neighborhoods or clusters of neighborhoods that face the cumulative impacts of environmental, social, political and economic vulnerability. Communities with Green Zone designation would then be able to access benefits offered by the city (as well as state and federal agencies), ranging from targeted pollution reduction to increased funding opportunities for energy-efficiency, onsite renewable energy, and other low-emission infrastructure. Green Zone designation would ensure that communities most highly impacted by environmental hazards and economic stressors receive much-needed resources and support.*



The EJWG investigated a number of initiatives (e.g., EcoDistricts, Smart Growth strategies) across various cities and states to determine the most promising model for equitably addressing both legacy pollution and prioritizing new environmental sustainability

investments in Minneapolis. Green Zones was identified because of its origins as an environmental justice-oriented strategy to address pollution burdens and was developed with substantial and meaningful environmental justice community participation. As a result of effective university-community partnerships, a body of research resulted in one of the most comprehensive environmental justice screening tools in the nation, which was then modified by the State of California and is utilized in the form of the CalEnviro Screen. From this work, some key California environmental justice organizations continued to work to develop a policy/program initiative that would address community concerns. Green Zones is the result of this effort. Using the California example was important to local efforts in Minneapolis because of the centrality of environmental justice and equity in the development and implementation of Green Zones in California. Since then, Los Angeles unanimously passed (three members in absentia) a city ordinance that establishes "clean up, green up" (CUGU) districts in April 2016.77 The purpose of CUGU Districts "is to reduce cumulative health impacts resulting from land uses including, but not limited to, concentrated industrial land use, on-road vehicle travel, and heavily freight-dominated transportation corridors, which are incompatible with the sensitive uses to which they are in close proximity, such as homes, schools and other sensitive uses" (78).

Additionally, in their Advancing Climate Equity in California Climate Policy report, Zabin et al., identify Green Zones as a mechanism for targeting greenhouse gas reducing public projects to reach "disadvantaged communities" for "comprehensive GHG reduction and community resilience investments . . . devised through a multi-stakeholder, community engagement process that includes both environmental justice and labor organizations" (79). In concert with other existing policies and programs, Green Zones "shift focus from 'access to benefits' from a variety of programs to comprehensive and coordinated green infrastructure investments. For example, a Green Zone could entail a community-led plan and community benefit agreements for co-siting community solar programs, transit-oriented development, and affordable housing developments" (80).

Members of the EJWG of the Minneapolis Climate Action Plan engaged with community organizations working on the California initiative. As a result, the EJWG included in their recommendations language that would support targeting the City's most environmentally vulnerable neighborhoods: "The Green Zone Initiative will create a city designation for neighborhoods or clusters of neighborhoods that face the cumulative impacts of environmental, social, political and economic vulnerability" (81).

> *Develop a Green Zone Initiative. The Green Zone Initiative will create a city designation for neighborhoods or clusters of neighborhoods that face the cumulative impacts of environmental, social, political and economic vulnerability. A Green Zone is an environmental and economic development tool that targets new green infrastructure and retrofits to an area in a comprehensive manner. Green Zones could correspond with targeted housing and commercial retrofit campaigns, to increase energy efficiency or boost renewable energy installation. Areas with Green Zone designation may better be positioned to access benefits offered by the city as well as state and federal agencies, ranging from targeted pollution reduction to increased funding opportunities" (82).*

Using the SDOH and EJ frameworks, the CST determined that health in the Phillips Community is based on cross-sectoral issues, and as such the Green Zones was an appropriate policy for a comprehensive assessment of health impacts. In addition to reducing environmental harms and risks that negatively impact health, the CST also noted that inequity can also result from lack of access to green and sustainable resources and investments. For example, significant attention has developed with respect to making communities more climate resilient in the face of impending risks posed by climate change. In addition, a national and global agenda of creating more environmentally sustainable communities has led to an increasing focus on 'green' investment in technology and development resources.

Initiatives at the federal level including the Environmental Protection Agency's EJ Plan2020, Housing and Urban Development's Sustainable Communities, and Department of Energy's Building Better Initiative illustrate the increasing understanding for a cross-sector, cross-agency, cross-departmental framework that "cultivates strong partnerships to improve on-the-ground results, and charts a path forward for achieving better environmental outcomes and reducing disparities in the nation's most overburdened communities" (84). According to

EJ Plan 2020, "achieving this vision will help to make our vulnerable, environmentally burdened, and economically disadvantaged communities healthier, cleaner and more sustainable places in which to live, work, play and learn" (85).

The CST's approach to the HIA closely aligned with other studies focusing on equity and community engagement in planning. As Genges notes in his study, accessibility is defined as "the potential of opportunities for interaction" (86). He further elaborates:

> *The importance of this concept stems from the fact that the very purpose of cities is the access they provide to help people prosper by offering a wide range of jobs, a variety of goods to meet needs, an assortment of amenities and services to satisfy diverse taste, and to fulfill social desires for interacting with other people. Accessibility is a measure of how effectively people can reach the goods, services, and opportunities they need to achieve well-being and to participate fully in society. Where people live has a power effect on their capacity to achieve a high quality of life in part through the accessibility that a place provides (87).*

The CST acknowledged that a full and comprehensive HIA was beyond present resource availability. However, the team also placed a high priority on a comprehensive framework. Therefore, the first several months were devoted to developing a list of sector-based issues of concern to Phillips Community residents. These are shown in Figure 10. Not surprisingly, the CST identified the major sectors that are considered essential to viable and sustainable community development.

The CST provided MDH staff with several sets of indicators that were deemed appropriate for assessing the condition of the Phillips Community. These indicators were identified through a process of reviewing the research literature corresponding to the priority sectors, as well as reviewing indicators developed by other HIA efforts. As noted, because of the staff transition, MDH was unable to provide the CST with data collection and analysis. The CST also began to develop an initial matrix of the identified sectors; the sustainability goals; and existing/potential policies and programs that contributed to the sector goals (Figure 11).

As the CST continued its HIA efforts, the City of Minneapolis established an informal city appointed Working Group to make recommendations to the City on Green Zone designation. The HIA CST made the decision to continue its independence from local and state

governmental efforts in order to maintain its integrity as a community- based body. Given the resources and timeframe for completion of the HIA, the CST determined that that a full HIA was not possible. The Committee on Health Impact Assessment describes HIA variations (88).

- Rapid HIA is one that is completed in a short time (weeks to months) and is focused on smaller and less complex proposals. Rapid HIAs generally involve primarily literature review and descriptive or qualitative analysis.
- Desktop HIA refers to a rapid HIA that entails little or no public engagement. Another version called a rapid- appraisal HIA includes explicit public engagement through an initial half-day workshop for stakeholders (89 90).
- Intermediate HIA is one that requires more time and resources and involves more complex pathways, more stakeholder engagement, and a more detailed analysis but includes little collection of new data.
- Comprehensive HIA's are most commonly differentiated from rapid and intermediate HIAs by the scope of potential impacts and the need for collection of new primary data. They can take longer than a year to complete.

The CST determined that a combination of a Rapid HIA and an Intermediate HIA would be most appropriate, which would include a literature review and descriptive or qualitative analysis with relatively little primary data collection. However, because the HIA had extensive community involvement and direction it embodies components of the Intermediate HIA. Primary data collection efforts were made by the CST during 2015. This included survey development, translation and dissemination; additional monitoring site requests in the Minneapolis Air Quality study; and five qualitative community focus groups in Philips with 10-25 participants each. MDH staff was appointed to process this data, but the work was not transferred to the new MDH staff or the CST.

A sub-set of issue areas for this initial assessment at this stage were identified by the CST given the time frame, resources available, and CEED's areas of work: air quality and energy in

housing. Second tier issue areas were identified as food, housing quality and affordability, and economic development/employment. This HIA focuses on air quality and energy.

Air Quality

Regulatory Context

Air pollution emissions include point sources (permitted stationary industrial facilities (such as industrial facilities, power plants, etc.); nonpoint sources (land runoff, precipitation, atmospheric deposition, drainage, seepage, etc.); and mobile sources (on-road automobiles, trucks and off-road construction and agricultural vehicles). Under the Clean Air Act (CAA), the U.S. Environmental Protection Agency (EPA) is authorized to regulate air pollution. The EPA sets ambient air quality standards for six criteria air pollutants (91):

- Particulate matter
- Ground-level Ozone
- Carbon monoxide (CO)
- Sulfur dioxide (SO2)
- Nitrogen dioxide (NO2)
- Lead (Pb)

In addition, to these criteria air pollutants, there are a set of 187 hazardous air pollutants (HAPs) which are known to cause cancer and other serious health impacts. The federal CAA requires the EPA to regulate these toxic air pollutants by setting standards for emissions from facilities in an industry group (or "source category"). Within eight years of setting the technology standards, the Clean Air Act directs the EPA to assess the remaining health risks from each source category to determine whether the standards protect public health with an ample margin of safety, and protect against adverse environmental effects.

Minnesota

The Minnesota Pollution Control Agency defines air toxics as more inclusive then HAPs and conducts risk assessments and an Air Emissions Risk Analysis (AERA) on additional toxics. These AERA analyses are mandatory for any project that undergoes Environmental Review and increases air emissions of a single criteria pollutant by 250 tons per year or more, after the use of control equipment. All mandatory AERAs require a cumulative effects analysis. The cumulative air emissions process involved with this includes the emissions at the specific facility in question, along with nearby facilities and background air pollutant concentrations. An AERA also includes information about the demographics of the neighborhood around a facility for any air toxics with an inhalation health benchmark (92 93).

Outside of mandatory AERAs, MPCA also has the authority to request a discretionary AERA. AERA's are essentially a screening tool to assess air toxics – the agency advises communities to engage the agency early in a permitting action. Among the reasons the MPCA can conduct a discretionary AERA include situations applicable to environmental justice communities, are in cases where:

- "an existing air emission source is the subject of significant public interest," and
- "the specifics of a new facility or existing facility expansion indicate a need for further analysis prior to public notice, the location of the facility is of concern, there are uniquely sensitive receptors near the facility, the type of facility and/or change is of concern, the amount and types of emissions from the facility are of concern." (95) (emphasis added).

According to the MPCA, it has authority to gather information that is relevant to pollution or to MPCA rules or statutes. Representatives of the MPCA may also examine records of all kinds and may have access to property to obtain information or conduct surveys or investigations (Minn. Stat. § 116.091). The MPCA also has authority to craft permit conditions to prevent pollution and to protect human health and the environment, even though the requirements do not specifically exist in rule (Minn. Stat.§ 116.07, subd. 4a and Minn. R.

7007.0800, subp. 2). The general permitting rule also authorizes the MPCA to craft permit conditions that protect human health and the environment (Minn. R. 7001.0150, subp. 2). A permit applicant is required to provide all information required by the rules and must supplement the application if all relevant facts have not been supplied. Minn. R. 7007.1000, subp.2 also provides the MPCA the authority to deny a permit if there is a potential for adverse effects to human health or the environment (96). The voluntary AERA and the above cited authority of MPCA provide some important levers for environmental justice communities like Phillips.

South Minneapolis Cumulative Effects Legislation

For South Minneapolis specifically, statute 116.07.4a which became law in 2008, requires additional cumulative impact screening in a certain area for any facility seeking a new or modified permit. When implemented, this was the first statute of its kind in the nation. Accordingly, MPCA must analyze and consider "cumulative levels and effects of past and current pollution" before a permit may be issued for a facility located in the area described by the statute, which states (97).

The language states that this is strictly tied to a certain area of South Minneapolis (Figure 12). It applies to both new facilities in the area needing an air permit, as well as modifications to existing air permits (expansion, change in equipment operations, ownership). The passage of this nationally recognized legislation has resulted in the development of a methodology for analyzing and considering cumulative levels and effects as part of MPCA's air permitting process. This allows for an institutional training and know-how of MPCA staff and analytic processes that can be expanded.

Fig 12: South Minneapolis Area - Cumulative Levels and Effects Analysis for Air Permits (98)

Health Considerations

The impact of air quality on public health is multi-dimensional and complex. For example, the health impact of air pollution is modified by weather patterns, and physical surroundings (i.e. buildings, tree canopy, etc.). High temperatures can increase air pollutants like the respiratory irritant ozone. The increased frequency and length of heat waves can make seasonal increases in ozone even higher.

The effects of air pollution on human health has been well researched and includes problems ranging from acute minor irritations to chronic respiratory and heart disease. Those most vulnerable to increased risk of morbidity and mortality from exposure to air pollution are children, the elderly, and those with existing conditions such as heart failure, coronary heart disease, and chronic lung disease (99). Worldwide, the U.S. ranks third with an estimated

41,200 premature deaths per year due to outdoor air quality conditions, following China (275,600) and India (120,600) (100).

From an environmental justice framework, the problem is that environmental hazards, including but not limited to emissions that impair air quality, are disproportionately located in communities of color and low-income communities. Numerous studies have found higher emissions in low-income and disadvantaged areas (101,102,103). The most polluted locations have significantly higher-than-average percentages of blacks, Latinos, and Asian-American residents (104).

The concentration of "polluting facilities and unwanted land uses has almost certainly played an important role in the disproportionate exposure to air pollution experienced by residents of various EJ communities" (105). Research indicates that climate change directly affects local air quality conditions by altering chemical reaction rates, as well as affecting the development, transport, dispersion, and deposition of air pollutants. These direct effects of climate change increase the burden of illness and mortality across different communities and regions (106). For example, studies estimate that air pollution-related deaths will increase in over 17 states due to changes in climate. It is projected that PM2.5 will affect premature mortality rates in the Great Lakes area, while the southern states are expected to experience greater incidence of ozone related deaths (107). States most vulnerable to climate change related increases of SO2 are those that already have elevated emissions (eastern states) and the Midwest region may be more vulnerable to climate change increases of NOX emissions (108). Some projections also suggest that air pollution in the summer will worsen in the Northeastern and Midwestern regions.

In some cases, the Urban Heat Island effect, in combination with increased CO2 levels can result in longer growing seasons for ragweed and other urban aeroallergens (109). Ozone is the primary constituent in urban smog, and is formed from the interaction of heat, sunlight, NOx, and VOCs. Both VOCs and NOx originate from anthropogenic sources, but wind patterns ultimately determine where they are transmitted and deposited (110). Increased

ozone can exacerbate asthma and allergic conditions while also reducing lung function. Although this is a concern for the population as a whole, asthma continues to disproportionately affect minority children, particularly in large urban areas (111). A 2015 study using Minnesota data, found that "populations on the lower end of the socio-economic spectrum and minorities are disproportionately exposed to traffic and air pollution and at higher risk for adverse health outcomes" and that a major source of these disparities is the transportation infrastructure (112).

In the *Life and Breath* study by MDH and MPCA, it was recognized that "numerous studies have shown that PM2.5 and ozone are not only harmful in themselves, but that they coexist with other harmful pollutants influenced by the same sources and weather patterns" (113). The study also found that "(w)hile air quality in Minnesota currently meets federal standards, even low and moderate levels of air pollution can contribute to serious illnesses and early death. About 6 to13 percent of all residents who died, and about 2 to 5 percent of all residents who visited the hospital or emergency room for heart and lung problems, did so partly because of fine particles in the air or ground-level ozone. This roughly translates to approximately 2,000 deaths, 400 hospitalizations, and 600 emergency room visits" *113). It also concluded that while everyone is impacted by air pollution, the sick, elderly and children with uncontrolled asthma were disproportionately affected:

> *"… ZIP codes with larger populations of people of color and American Indians and residents living in poverty are more vulnerable to air pollution…[and] the impacts of air pollution fall disproportionately on the elderly (65 and older), who have higher rates of heart and lung conditions, and children under 18, who have higher rates of asthma. The elderly experience much higher rates of hospitalization for heart and lung problems and death due to air pollution. Children experience much higher rates of emergency department visits for asthma due to air pollution than adults" (114).*

There is a significant body of research that has focused on the unequal geographic distribution of air pollution with respect to the racial and income composition of communities. Some of these studies have found that the location and emission of point source industrial facilities are disproportionately sited in, and therefore, can disproportionately impact low income and/or communities of color. In a recently published

national level study, Ard (2015) examines inequality in air pollution from 1995 to 2004 (116). This study suggested that two major factors have contributed to an aggregate decrease in air emissions. The first is the national economic shift over the last several decades that led to deindustrialization. The second is reductions due to effective federal regulations. However, Ard also found that despite overall decreases, point source air pollution is increasingly concentrated around low income communities of color.

Air Quality Data and Information

There are a number of air quality databases that exist at the local, state and federal level. This section provides an overview for community organizations of some of the key air data available. Also provided are brief descriptions with evaluation of strengths and shortcomings for assessing air quality in the Phillips Community.

National Level Data

NATIONAL AIR EMISSIONS INVENTORY: The National Emissions Inventory (NEI) is a national database with comprehensive estimates of criteria pollutants, criteria precursors, and hazardous air pollutants from air emissions sources. The NEI includes point source emissions; nonpoint sources; on-road sources; and non-road sources. It is released every three years and

based on data provided by state, local, and tribal air agencies for sources in their jurisdictions, which is then supplemented by data developed by the US EPA (117).

AIR QUALITY INDEX (AQI): The AQI is a numerical index used by government agencies to communicate to the public how polluted the air is currently and forecasted. It focuses on health effects that may be "experienced within a few hours or days after breathing polluted air" and for which the EPA has established national standards to protect public health (118). Raw measurements from air monitoring stations from across the country are collected and converted into a separate AQI value for five of the major air pollutants regulated by the Clean Air Act (ground-level ozone, particle pollution, carbon monoxide, nitrogen dioxide, and sulfur dioxide) using standards developed by EPA. The EPA considers ground-level ozone and airborne particles as two pollutants that pose the greatest threat to human health in the U.S.

A higher AQI value means a higher level of air pollution and the greater the health concern. According to EPA, an AQI value of 50 represents good air quality and an AQI value over 300 represents hazardous air quality. An AQI value of 100 generally corresponds to the national air quality standard for the pollutant, which is the level EPA has set to protect public health. AQI values below 100 are considered satisfactory. When AQI values are above 100, air quality is considered unhealthy-at first for certain sensitive groups of people, then for everyone as AQI values get higher. AQI values are then converted to categories which inform the public about the potential health risks associated with each category: Good, Moderate, Unhealthy for Sensitive Groups, Unhealthy, Very Unhealthy, and Hazardous (119).

The EPA AQI is the most cited source for air quality indicators. The EPA AQI is also used and promoted by the U.S. Centers for Disease Control and Prevention (CDC). Although the five pollutants for AQI are good indicators of daily air quality, the index has limitations. The AQI's five criteria pollutants are not the only pollutants that pose health risks. Other air toxics such as lead and mercury are health hazards. In addition, the AQI does not include temperature or pollen levels, which can exacerbate sensitivity to air pollutants.

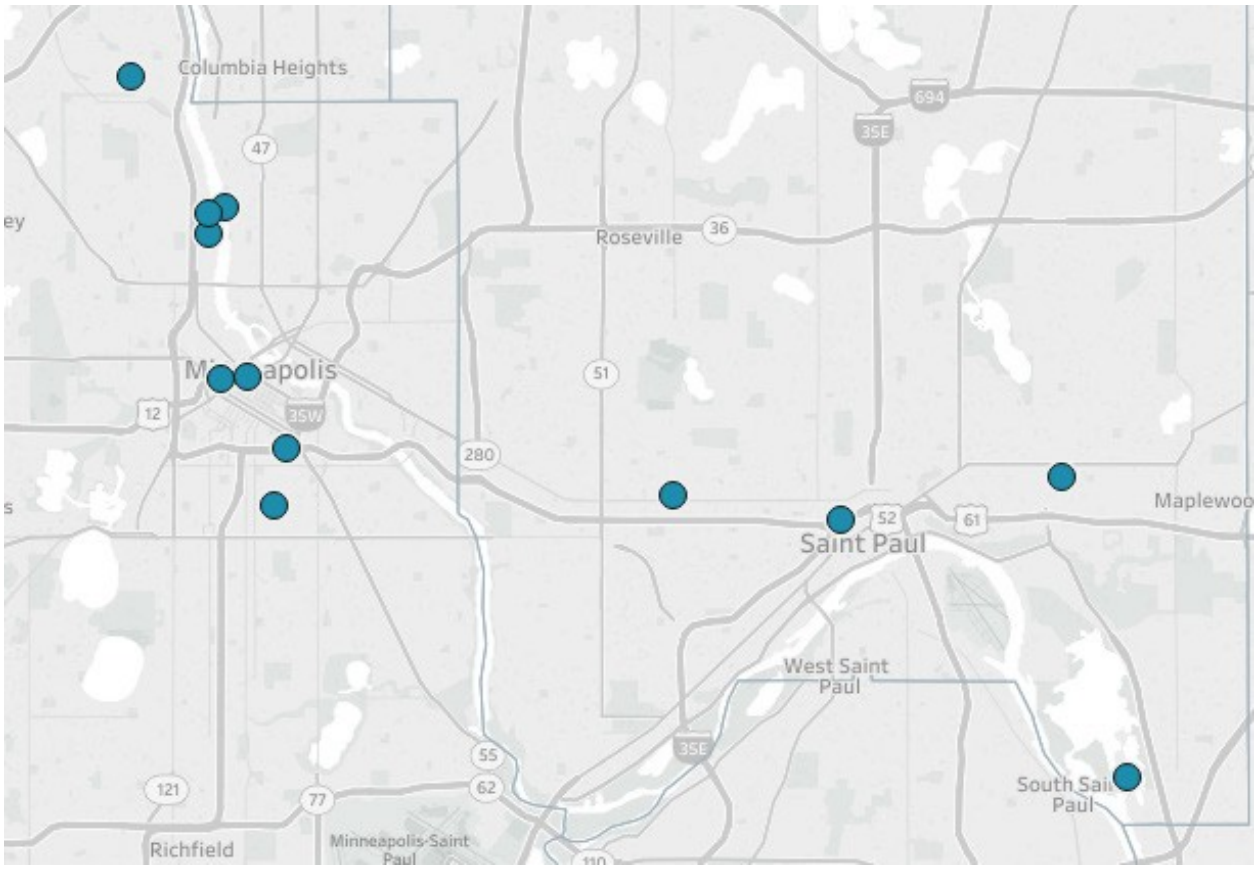
AIRNOW: AirNow is an EPA online program that provides public access to national air quality information (121). AirNow uses the EPA's Air Quality Index (AQI) to offer daily forecasts and real-time AQI conditions for over 300 cities across the United States. AirNow makes available links to more detailed state and local air quality web sites. However, one of its limitations is that it cannot disaggregate between mobile and stationary sources. AirNow is an indicator of overall air quality, not specific to industrial emissions.

State and Local Level Air Data

The Minnesota Pollution Control Agency (MPCA) collects, analyzes and tracks numerous data sets to determine emissions of air pollutants. A public portal of some of their data sets are found at: https://www.pca.state. mn.us/air/emissions-data, with a summary of a few of the most important and relevant datasets below.

MPCA AQI: The MPCA uses EPA's AQI to report daily air quality conditions. Minnesota's AQI is determined by hourly measurements of the five criteria pollutants: particulate matter, ozone, sulfur dioxide, nitrogen dioxide, and carbon monoxide (122). In this index, the pollutant with the highest AQI value determines the overall AI for that hour. Data available runs multiple years; with an online data portal allowing for singular criteria pollutant data viewing at a time. With monitors located across the state, and used to monitor compliance with federal and state air quality standards and benchmarks. The MPCA submits this air pollution monitoring data to the U.S. Environmental Protection Agency. A public portal on Criteria Air Pollutant data can be found at https://www.pca.state.mn.us/air/criteria-pollutant-data-explorer. According to this MPCA data portal, there are currently 8 state air quality monitors active in Minneapolis, and 4 in St. Paul (Figure 13) (123). The monitors do not measure all or the same air pollutants (i.e. fine particulates, those considered a higher health risk, are measured only at some sites in the city).

Fig. 13: State Air Monitoring Sites, 2017: Minneapolis and St. Paul (124)



MPCA POINT SOURCE AIR EMISSIONS DATA: The MPCA estimates emissions from large permitted facilities annually in order to fulfill state and federal mandates. Point Sources are large stationary sources that typically have an air permit; for example, power plants, industrial plants, and refineries. According to the MPCA, there are over 2,000 point sources in Minnesota. Even though point sources of air pollution represent a smaller percentage of emissions over mobile (transportation) sources overall, they still can constitute nearly 22% of the air pollution (125). MPCA describes the pollutants included in this database as follows (126):

- **Criteria air pollutants** - include six major pollutants for which there are federal standards. These pollutants are particulate matter (PM2.5 and PM10), sulfur dioxide

(SO2), nitrogen oxides (NOX), ozone (O3), carbon monoxide (CO) and Lead (Pb). Ozone is not directly emitted so a group of ozone precursors called volatile organic compounds (VOCs) is included instead. Criteria air pollutants are estimated annually. Data for criteria air pollutants are available for all years.

- **Air toxics** – Many other pollutants are released in smaller amounts than most of the criteria pollutants but are still toxic. The Environmental Protection Agency (EPA) refers to chemicals that can cause serious health and environmental hazards as air toxics. Air toxics include chemicals such as benzene and formaldehyde. Air toxics are estimated every three years. Data for air toxics are only currently available for 2008 and 2011. Air toxics data for 2014 will be available soon.
- **Greenhouse gases** – The MPCA tracks and reports emissions for six greenhouse gases: carbon dioxide (CO2), nitrous oxide (N_2O), methane (CH_2), sulfur hexafluoride (SF_2), and two classes of compounds known collectively as hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs). Greenhouse gas emissions are estimated annually and reported in CO2-equivalents (CO2-e). Data for greenhouse gas emissions are available for all years starting in 2012.

The MPCA provides point source (facility specific) air emissions data via its air emissions data portal (127). The data portal (available at: https://www.pca.state.mn.us/air/point-source-air-emissions-data) also provides interactive mapping. A 2015 snapshot of the Phillips Community from the MPCA point source data portal shows five major facilities as emitters in the community (Figure 14, Table 2). Collectively, these five facilities in the Phillips area are emitting nearly 54 million pounds of greenhouse gases, along with notable amounts of particulate matter, nitrogen dioxide and VOCs (precursors to ground level ozone formation). In an environmental justice community like Phillips, where all sources matter and reductions across sectors (or source categories) should be considered, it is important to assess their contribution.

Fig.14: Point Sources within Phillips Neighborhood Boundary in 2015 (128)

Table 2: List of Point Sources and Emissions (LB) in Phillips Neighborhood in 2015 (129)

Facility	CO	CO2 e	PM25	PM10	PM	NOX	SO2	Ammonia	Lead	VOC
Abbott Northwestern Hospital	31,711	46,700,000	567	634	764	41,033	353	297	-	2,187
Bituminous Roadways Inc Minneapolis	41,903	2,157	2,759	2,621	5,215	2,605	479	-	-	2,530
Metro Transit Light Rail Facility	1,196	1,676,127	17	17	17	1,424	9	46	-	6,128
Smith Foundry	1,190	1,741,593	36,997	39,619	54,242	1,445	11	46	57	145
Wells Fargo Home Mortgage	2,504	3,754,159	89	85	99	3,617	524	28	-	193
Total Emissions	78,504	53,874,036	40,429	42,976	60,337	50,124	1,376	417	57	11,183

MINNESOTA RISK SCREENING TOOL (MNRISKS): The Minnesota Risk Screening tool at the MPCA, known as MNRiskS, uses emissions inventory data to model potential risk to adult and child health on a cumulative basis from point, mobile and area sources. It has been in development since 2003 with it becoming an important and unique state effort for assessing cumulative air pollution health risks. Though statewide, the spatial resolution is also resolved down to the neighborhood level (130). It can be viewed in a tabular format or in mapped GIS versions.

MNRiskS is an important tool and upon request, MPCA can generate source or pollution profiles for an area (i.e. neighborhood). There is also an effort to have a pubic portal for this information. A run of the MNRiskS 2008 model showed elevated cancer risk for Phillips residents and clear areas of concern (Figure 16) (131). If we use a threshold of 10E-5,132 there is an increased inhalation risk of cancer causing pollutants for adults in Minneapolis as a whole and in Phillip specifically. It is important to note that this is assessed for the adult population, and not children, which constitute a significant proportion of Phillips residents.

Fig. 15: Resident Cancer Risk – metro core – all sources MNRiskS modeling tool (data 2008)

MINNESOTA AIR TOXICS DATA. The term air toxics refers to a group of over 100 air pollutants that may cause cancer or other serious health effects. Since there are no state guidelines or air toxics, MPCA uses health benchmarks to assess health risk from both short and long-term exposure. By seeing if a measured value of a toxic pollutant is above or below this defined health benchmark, they assess whether it will cause adverse health effects. This is largely done toxic by toxic and governmental bodies can use them to inform regulatory and environmental decision making. Minnesota works to manage air toxics by requiring pollution control equipment, setting limits on emissions, and monitoring outdoor air pollution levels (133).

The MPCA monitors three types of air toxics: VOCs (55), carbonyls (7), and metals (13).. Data is available between 2002- 2016, with samples collected at 6 of the state's Twin Cities sites. The data is updated each May with results from the previous calendar year. Samples are collected once every six days, over a 24-hour period (the resulting concentration is a 24-hour average). At the online portal, a singular toxic pollutant can be searched, though no cumulative or additive assessment is shown: https://www.pca. state.mn.us/air/air-toxics-data-explorer.

COMMUNITY AIR MONITORING PROJECT: The MPCA administered a community air monitoring project in 2013 through financial support from the Minnesota Legislature (134). The two-year study examined concerns for environmental justice by monitoring air quality in seven low income communities and/or communities of color that may be disproportionately affected by pollution from industry, air and highway traffic. Monitoring focused on fine particles (PM2.5) and air toxics such as carbonyls, metals, and volatile organic compounds. These communities were monitored for three months at a time. The first community monitoring was on October 1, 2013.

The Phillips Community Little Earth Residential Complex (2438 18th Avenue Street) and a Greenway site (cross street 28th Street) were included as monitoring sites. Air monitoring

occurred at Little Earth between October- December 2013 and at the Greenway site between July-October 2014. While the MPCA came to the general conclusion that individual pollutant levels monitored were below health benchmarks, the limited timeframe of the study (3 months) did not allow for a valid assessment of chronic health benchmarks, which would have required at least a year of data. This is due to the fact that emissions of some pollutants vary by season. However, some preliminary findings did indicate issues of concern. For example, formaldehyde show elevated levels at the Greenway site, and at other sites around the Twin Cities (135, 136).

POLYCYCLIC AROMATIC HYDROCARBONS (PAH) STUDY: MPCA completed a 2-year study on PAHs in 2015. The study focused on 16 locations in Phillips, and one site in Mille Lacs (Figure 17). PAHs are a class of chemical products from combustion and evaporation of petroleum products that can result in serious health effects including respiratory problems and lung cancer. Sources include tobacco, wood smoke, vehicles, and other fuels (137).

This study allowed PCA to measure PAHs on site over 72-hour periods every twelve days. The methodological approach ensured data points for each day of the week, with approximately 30 total measurements for each location per year. The study is the first such project in Minnesota to collect direct PAH measurements and use a cancer risk assessment estimate on PAH air pollution (138). High exposures to PAHs over long periods of time are. associated with elevated lung cancer incidence (139).

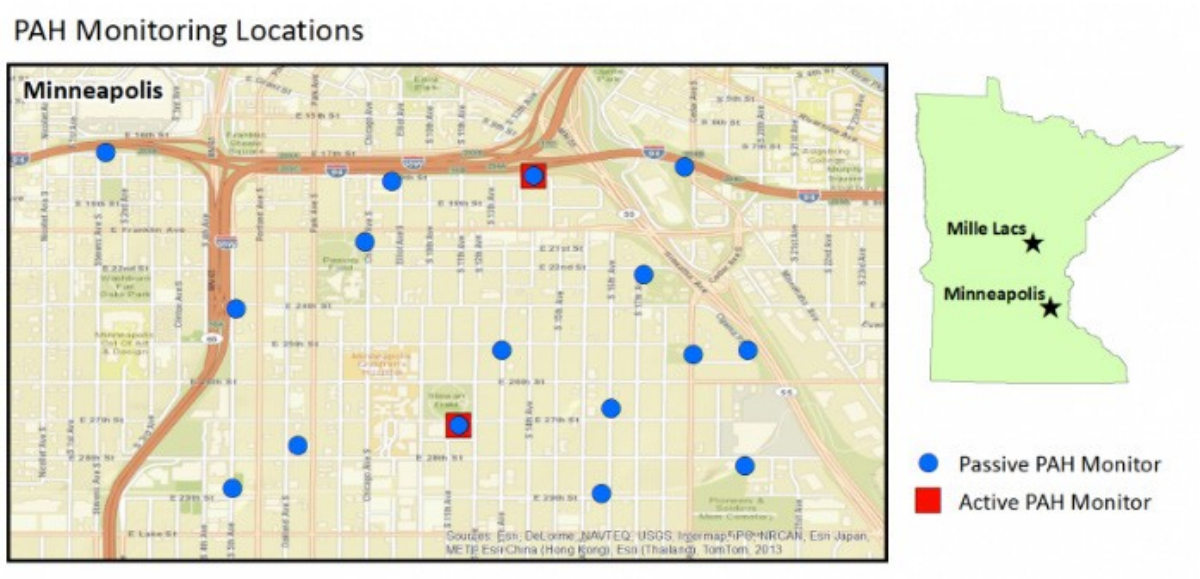
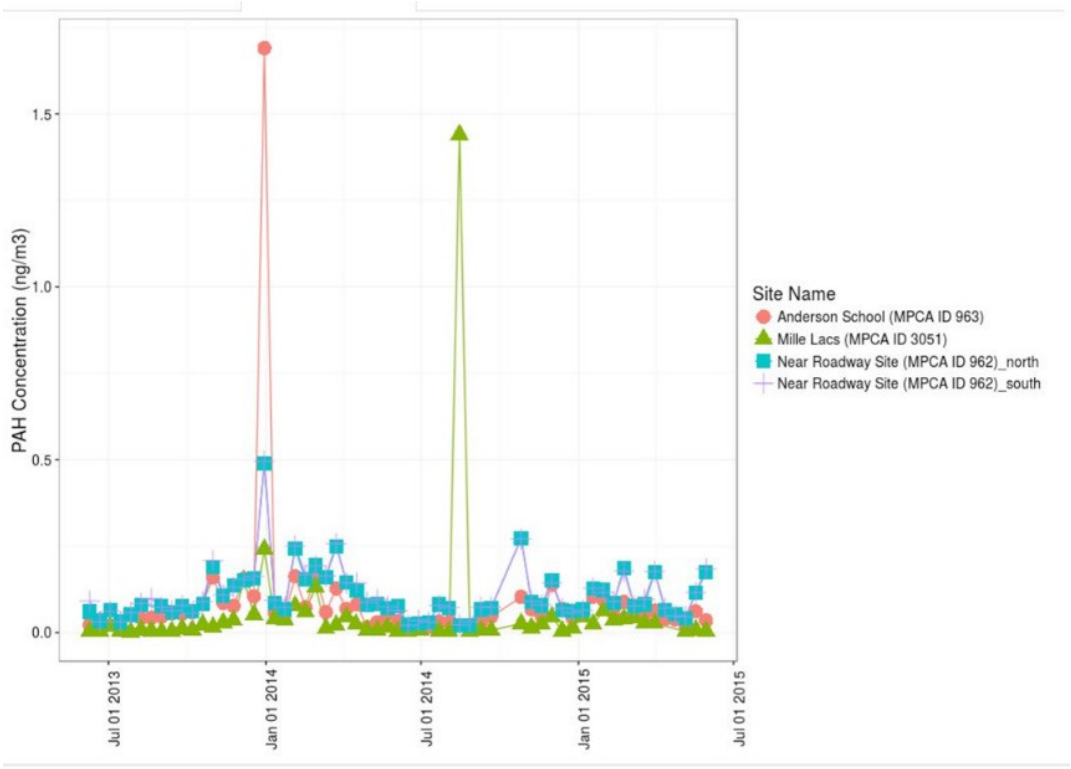


Fig. 16. PAH Monitoring Locations

Measurements for PAHs occurred between June 2013 to June 2015. As part of the study, the potential human health effects (mainly cancer risk) were assessed. The MPCA PAH study found on-road vehicles such as heavily trafficked roadways and bus stops yield higher levels of potential exposures of PAHs (140). In an MPCA cumulative risk assessment of all air toxics (including PAHs, VOCs, metals, etc.) at two of the sites, HC Andersen School and Near Roadway, the estimated lifetime risks from inhalation of air toxics was estimated to be 8 to 9 additional cases of cancer in a population of one hundred thousand (141). The MPCA PAH study also found high exposures over short time periods were significantly elevated at both Andersen School and Mille Lacs (Figure 18) (142).

Figure 17: MPCA PAH Community Study Results - Anderson School, Near Roadway, Mille Lacs (143)



MINNEAPOLIS AIR QUALITY STUDY: From November 2013 to August 2015, the City of Minneapolis Health Department conducted an air quality study. The two-year study collected data eight times quarterly, on residential, commercial Park Board and City property (Figure 18) and analyzed 62 volatile organic compounds (VOCs) to assess whether VOCs were over the health risk value (HRV). A Health Risk Value is defined as "the concentration of a chemical (or defined mixture of chemicals) that is likely to pose little or no risk to human health" (144).

Through utilization of the Twin Cities Environmental Justice Mapping Tool developed by CEED, the CST advocated for five additional canisters on key community sites in the Phillips Community in collaboration with the Minneapolis Health Department's 2-year Air Quality Study. According to Nexus Community partners, the five sites were:

- 740 East 16th Street
- American Indian OIC, 1845 East Franklin Avenue
- Little Earth of United Tribes, 2495 18th Avenue South
- Cristo Rey High School, 2924 South 4th Avenue
- Bloomington and 29th

Due to limited funding by the city, the CST allocated its own budgeted resources toward two extra "sponsored" canisters for inclusion into the study.

The city's health department has mapped out initial raw data results for each of the sites by individual pollutant and are available online (145). A cumulative assessment of all 62 VOCs is currently unavailable. An example of the Minneapolis results for just one of the 62 pollutants studies, tetrachloroethene (a chemical widely used in degreasing and dry-cleaning operations, with severe health impacts), is in Figure 18.:

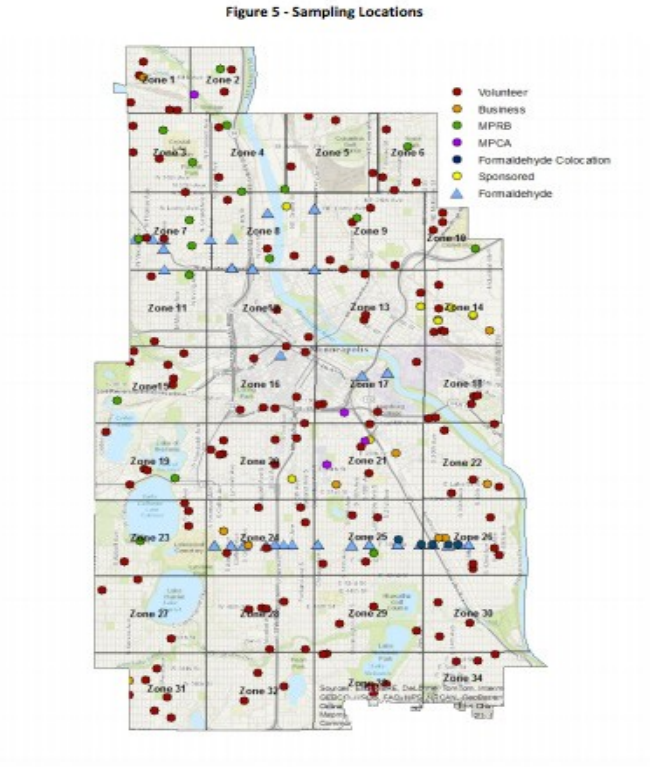


Fig. 18: Minneapolis Air Quality Monitoring (VOCs) Sampling Locations

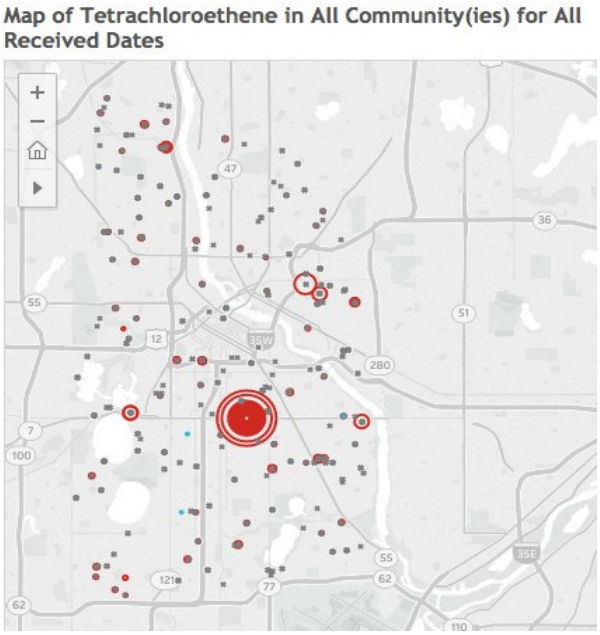
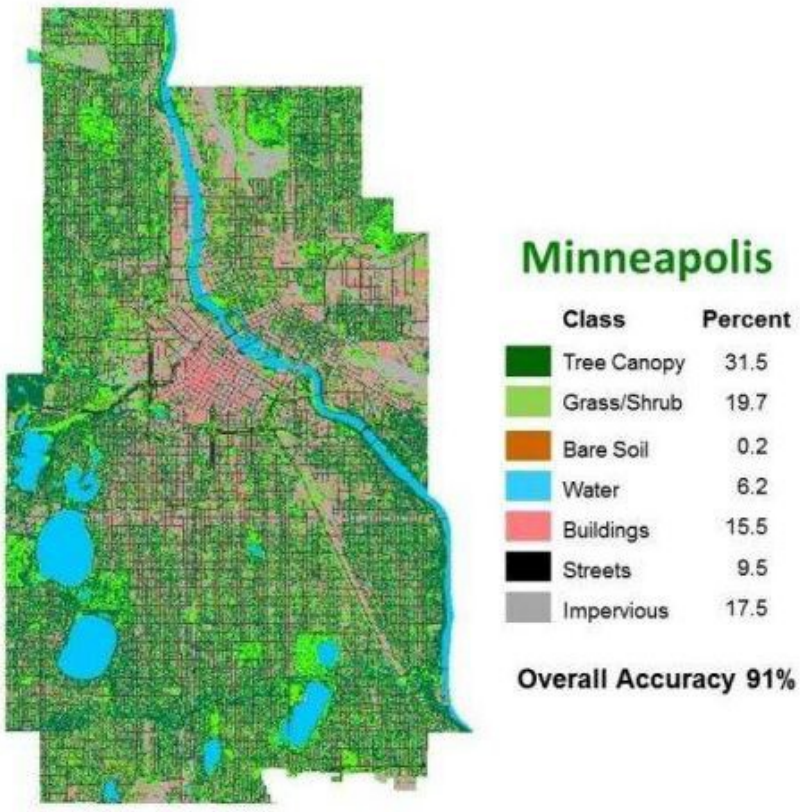


Fig. 19: Minneapolis Air Quality Study - Map of Tetrachloroethene

The City of Minneapolis is working with Virginia Tech to develop a land-use regression model (LUR) in order to estimate concentrations at locations where measurements were not taken or available. Additional focused sampling is also under consideration, which could be targeted to Phillips and other areas of concern in the city.

MINNEAPOLIS TREE CANOPY STUDY: Tree canopy, also known as tree cover, can provide improvements in air quality (146). Land tree cover is a common air quality indicator that can assess environmental assets in a given area. The University of Minnesota's Remote Sensing and Geospatial Analysis Lab classified and mapped land tree cover in Minneapolis-St. Paul using Quickbird satellite imagery (147). This resource provides maps of Minneapolis with land cover classifications to observe the distribution of tree cover across geographic areas in the city. An assessment of the city found that Minneapolis has 31.5% percent land tree cover and St. Paul 32.5% percent respectively (Figures 20) (148). Analysis of this data could show the variability of tree canopy across neighborhoods and assist with targeting public and private incentive programs for planting

New research methodologies, such as the U.S. Forest Survey's study of tree moss in Portland, are also being utilized by government agencies to easily assess, at low cost, levels of localized pollution of toxins (150). Since moss lack roots, they tend to absorb water and nutrients from the atmosphere – thus taking up and storing the compounds that are in its surrounding air. The Portland study was the first to use moss to generate a comprehensive and detailed map of air pollution in a U.S. city. Such cost-effective studies can be assessed to see if they can be replicated in Minneapolis in order to get more direct, localized data in air pollution hotspots.



Energy in Housing

Compromised access to affordable and sustainable energy services can have both acute and chronic impacts on individual and family health. In this HIA, the impact of energy on health is addressed through the concept of energy insecurity (151). When a household is energy secure, its members "are able to obtain the energy needed to heat/cool their home and operate lighting, refrigeration, and appliances while maintaining expenditures for other necessities (e.g., rent, food, clothing, transportation, child care, medical care)" (152). A household is energy insecure when it "lacks consistent access to the amount or the kind of energy needed for a healthy and safe life for its members" (153). Hernandez, et al., describe

this condition as the "inability to adequately meet basic household heating, cooling, and energy needs . . . and is a pervasive and often-overlooked problem for low-income families with children" (154). The problem is that low- and moderate-income households have differentiating access to energy services (i.e., on-site renewable energy or energy efficiency) and may pay a higher percentage of their income for energy.

The economic pressure placed on family incomes by energy costs, also affects access to quality and affordable housing. Substandard housing presents a higher likelihood of hazards such as rodent infestation water leaks, mold, the presence of lead paint, and a host of other issues (155). In 2006, a study examining children's health of low-income children 3 years old or younger in five cities (including the City of Minneapolis) discovered an association between access to affordable energy and children's health. Based on data of children from primary care clinics and emergency departments, the study found that children of low-income families who were not receiving energy assistance were 30% more likely to be admitted to the hospital and 20% more likely to be at nutritional risk for growth and developmental problems (156). This supports other research that suggests that energy insecurity is associated with "poor health status, life-time hospitalizations, and . . . developmental concerns among infants and toddlers" (157).

A 2011 survey of low-income households by the National Energy Assistance Directors Association (NEADA) found that in the Midwest, energy costs induce family coping mechanisms that have significant impacts on health and well-being. For example, in their study they found (158):

- 29% of households used the kitchen stove or oven to heat their homes.
- 21% went without food for at least one day
- 29% said they did not make full rent or mortgage payment
- 33% went without medical or dental care
- 33% did not fill a prescription or took less than the full dose.
- 16% had someone become sick because their home was too cold

A summary of the health effects of energy costs and access on children's' health was compiled by the Child Health Impact Working Group and is shown in Table 4.

Table 4: Unhealthy Consequences of Energy Costs on Children's Health (159)

High energy costs force budget tradeoffs that jeopardizes child health Families spend less on food, medications, housing in order to pay high energy costs	Heat or eat – food insecurity and other nutritional risk due to trade- offs between energy and food expenditures Seasonal food insecurity	Poor Growth Malnutrition – infection cycle leading to increased illness Cognitive development deficits of malnutrition affecting school performance
High energy costs force the use of risky alternatives of heat Families use ovens, stoves, space heaters, or fireplaces to augment primary heating sources	Increased risk of contact burns Increased risk of carbon monoxide poisonings Increased risk of house fires	Possible long-term consequences of burns or carbon monoxide exposure Economic impact of preventable hospitalizations
High energy costs combined with unaffordable housing force families to endure unhealthy housing conditions. Rodent and cockroach infestation. Water leaks and mold Peeling paint and ledad paint	Increased incidence of severity of asthma. Increased incidence of lead poisoning Preventable injuries from fires, burns, falls Increased rates of infectious diseases such as diarrhea and respiratory conditions	Increased health care utilization, including emergency visits and hospitalizations. Missed school due to illness. Cognitive and development deficits due to lead poisoning
High energy costs result in unpaid bills, emergencies and utility disconnection. Families make partial rent or mortgage payments or miss entire payments because of unaffordable energy bills	Potential cold exposure. Increased use of alternative heating sources Possible loss of utilities required for basic health and safety: light, refrigeration, cooking, water, heating Increased risk of housing instability due to utility disconnection	Adverse physical health impacts, including lack of primary care, untreated or undertreated medical conditions, growth delay Adverse mental health impacts including anxiety, depression, behavioral disorders Adverse behavioral, development, and educational impacts, including developmental delay, grade repetition

Climate Impacts on Energy and Health

Energy security is also a function of weather and climatic conditions, which in turn, can influence a household's ability to maintain safe and healthy conditions. The Center for Disease Control (CDC) found that between 2006 and 2010, 10,649 deaths were due to weather-related causes. Excessive natural heat was either the underlying cause or a contributing cause for 3,332 (31%) of these deaths; exposure to excessive natural cold or hypothermia accounted for 6,660 (63%) of deaths; and the remaining 6% were attributed to floods, storms, or lightning. How much of a contributing factor was the lack of energy affordability or access was not a part of the report. It is clear however, that while a great deal of attention is paid to disaster-related climate change impacts on communities, exposure to heat and cold is an equally if not more important health problem. It is also clear that cold temperatures have a significant impact on vulnerable populations. In a review of the research by Reames, numerous studies confirmed that hypothermia experienced by elderly patients were both more severe and more likely where the exposure was indoors versus outdoors. In fact, half of hypothermia-related deaths were related to indoor exposures, and a racial disparity was found with a higher morbidity among elderly Blacks. Yet, as the study points out, most public health agencies often focus on preventative measures for outdoor related hypothermia emergencies.

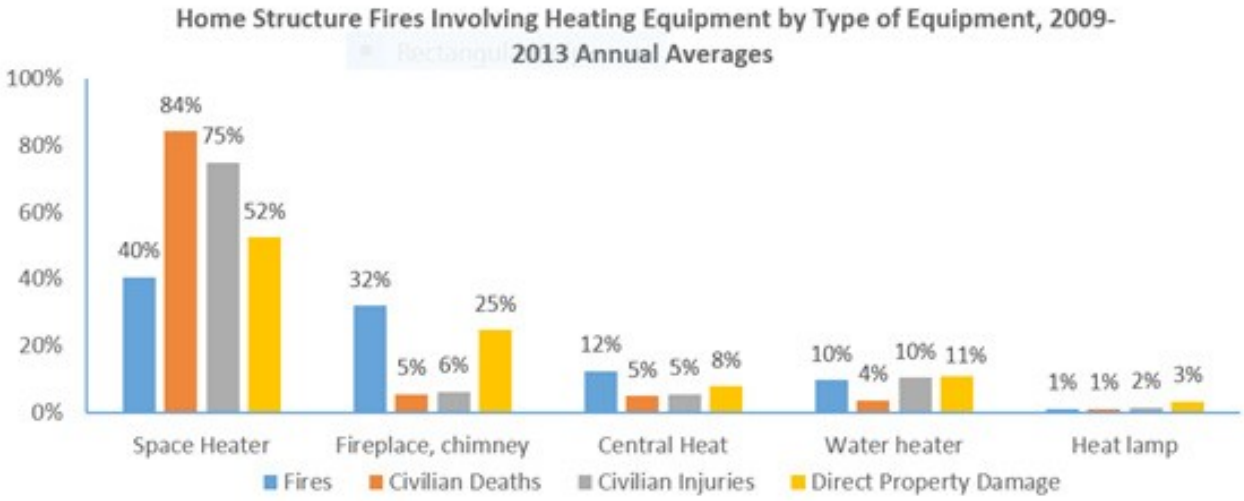
In instances of severe weather and power outages, research also indicates that the use of alternative heating sources leads to increased incidences of health hazards. For example, the use of space heaters, fireplaces, ovens and stoves as alternative heat sources can result in an increased risk of contact burns, carbon monoxide exposure, and deadly house fires.

Nationally, home heating equipment is one of the leading cause of fires in U.S. homes. According to a recent report released by the National Fire Protection Association (Figure 20):

- Heating equipment fires accounted for 16% of all reported home fires in 2009-2013 and 19% of home fire deaths

- Space heaters are the type of heating equipment most often involved in home heating fires, figuring in two of every five of these fires and accounting for 84% of associated civilian deaths, 75% of civilian injuries, and 52% of direct property damage.

Fig. 20: Home Structure Fires by Type of Equipment, 2009 - 2013 (annual average)



The U.S. Fire Administration reports that 37% of residential fire injuries and 46% of residential fatalities occur in the winter months. Moreover, 11% of these are children under the age of ten. In Minnesota, cooking equipment and heating related equipment were the leading causes of residential fires. There were 10 civilian fire-related deaths in 2014, and 33 reported injuries. "Respiratory distress" was the chief complaint for Minneapolis Fire Department emergency medical services. Energy security, therefore, is a critical issue for health both in terms of added risks associated with heating appliances in times of cold weather, but also contributes to a range of indoor health conditions that directly affects family well-being.

Energy Accessibility Profile

A major barrier for communities to address health related energy impacts is that energy consumption and expenditure data at the household level is not publicly accessible. The Energy Information Agency's (EIA) Residential Energy Consumption Survey (RECS) is the best available public data that provides detailed household-level energy consumption information for a representative sample of occupied, primary residences in the US. The RECS survey is based on five-year intervals, and the latest available comprehensive data is for 2009, with 2015 data expected in 2018. Unfortunately, the data is aggregated at a Census regional and divisional scale, and therefore is not available at the state or local level. Nonetheless, RECS data provides useful information about energy use and expenditures, which can serve as a starting point for more localized assessments of household energy use and costs.

According to RECS survey data, space heating accounts for over half (51%) of total household energy consumption in the Midwest, for a total of 1.487 quadrillion British Thermal Units (Btus) (160). This should be distinguished from the national trend, which shows a steady

decrease in space heating as a share of household energy use. The reason for this is likely the Midwestern climate, which has a high number of heating degree days (days below 65 degrees F).

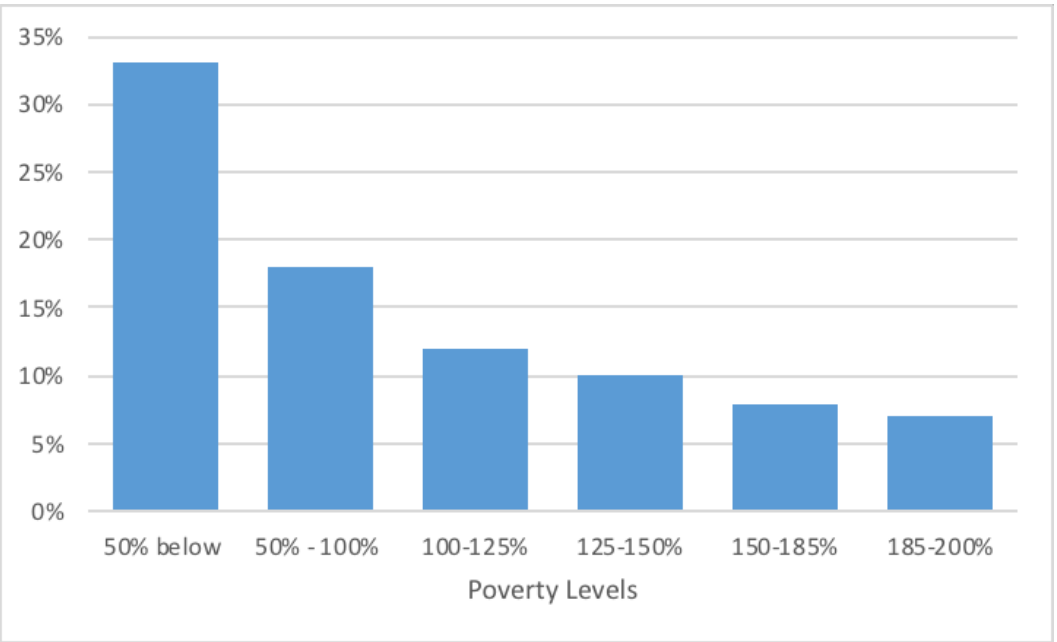
It is important to note that the RECS energy consumption data provides quantified information about consumption patterns. In this section, consumption by income level is of particular concern. However, the consumption data does not provide us with the character of such consumption. For example, some equity-oriented energy research distinguishes between basic needs energy consumption and luxury energy consumption. Lower income households may have higher consumption levels because of the lack of access to newer, efficient appliances, leaving these households more dependent on costly inefficient technologies for heating, cooling, cooking, and refrigeration. Higher income households may have sufficient disposable income to purchase the latest efficient technologies, thereby reducing their consumption on a per use basis. However, these households may have significantly higher luxury consumption such as pools, hot tubs, larger homes, higher number of appliances and electronics. Nonetheless, the following discussion is a useful starting point for energy-income analysis.

Energy Burden

The issue of energy equity is not well addressed in the energy field. Nonetheless, it is gaining greater attention as equity issues become more prevalent in environmental planning and policy. One way to evaluate a family's access to affordable energy services is by assessing the energy burden, which is defined as the proportion of household income required for energy payments (161). There is no standard definition of affordability in the U.S. In fact, the energy needed for a healthy home environment can vary by region and climate, seasonal weather patterns, and other external factors. Still, energy is an important contributing factor for health outcomes and the U.S. lags other countries in addressing issues of energy burden disparities.

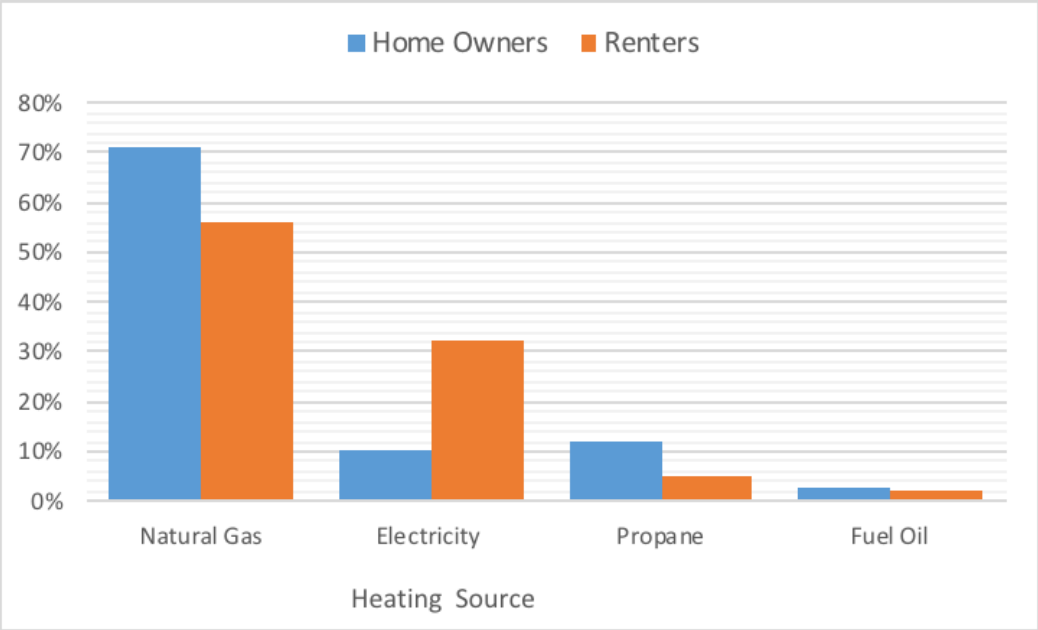
Research has consistently shown that energy burden is highest among low-income families, the elderly, and those on fixed incomes (162, 163). Moreover, as energy prices increase, the amount of household income available for nutrition, health care and safety is affected. Figures 21 and 22 provide a summary description of energy burden by poverty level. As can be seen, in Minnesota, those households 50% below the poverty level, devote nearly a third of their income to energy costs (164).

Fig. 21: Minnesota: Percentage of Household Income for Energy Bills by Poverty Level (165)



In 2015, the primary heating fuel for Minnesota households was natural gas (71% for homeowners and 56% for renters). While only 10% of homeowners used electricity for home heating, 32% of renters utilized electricity as the primary heating source. Propane was used by 12% of homeowners and 5% of renters, with fuel oil comprising 3% and 2% of the state's heating needs respectively (Figure 22).

Fig. 22: Heating Fuel Source for Renters and Homeowners: Minnesota (166)



Even as natural gas, fuel oil and propane prices decline and electricity prices remain somewhat stable, there are important economic impacts associated with energy costs. In Minnesota, households in the lowest income bracket, that are most likely to be renters, can pay as much as 33 percent of their income in energy costs. (167).

Moreover, Minnesota has experienced an increase in the Home Energy Affordability Gap since 2011. The Home Energy Affordability Gap is model developed by Fisher, Sheehan & Colton (FSC) to quantify the gap between "affordable" home energy bills and "actual" home energy bills. In 2015, Minnesota low-income households exceed- ed the affordable level of energy costs by $1,163 per household with an aggregate total of over $675 million.168 In Hennepin County, where the Phillips community is located, households at less than 50% of the poverty level have an affordability gap of $1,628 per year; on average, these households devote 29.8 percent of their income to energy; with a total county energy shortfall of $47.4 million annually (169). For Minneapolis where Phillips is located, and where 23% of its families/households live in poverty, this is of considerable concern (170).

A large part of the energy burden faced by low-income households in neighborhoods like Phillips is a function of the older and inefficient housing stock that is prevalent in low-income neighborhoods. Energy use intensity (EUI) is a measure that can be used as a basic proxy for a household's overall energy efficiency (171). It is basically a households' consumption of energy per square foot (kBtu/sq ft). A higher EUI means greater energy use per square foot and implies relatively less efficient housing infrastructure when compared to a similar sized home (172). As is shown in Figure 23, household EUIs vary by income, with the lowest income bracket consuming almost 24,000 Btu per square foot more than those households in the highest income. This also translates into higher energy costs per square foot. The energy cost differences between the highest and lowest income levels in the RECS data is 42 cents per square foot (173).

Fig. 23: Energy Use Intensity – Household Consumption and Expenditures per Square Foot,

This, coupled with spotty deployment of energy-efficiency programs in low-income neighborhoods because of unaffordable upfront capital costs and other "first come, first-served self-referral operating procedures" (175), has resulted in disparities in access to efficiency and renewable energy options. The effect is that low income households continue to pay more in energy terms per square foot of their home than their wealthier counterparts.

Spatially oriented research is also showing that disparities in energy use intensity (EUI) exists geographically across race and household income (176,177). To date, very little research in the United States has focused on the issue of fuel vulnerability or energy affordability using a geographic analysis at the neighborhood or community level. Nearly all the research and policy development on energy issues (like energy burden) has been conducted at the individual or household level, using income as the determining factor. While useful, there is a critical gap in data and information around how energy efficiency and other energy service programs can be targeted to vulnerable places like the Phillips community.

Efforts such as the Twin Cities Energy Vulnerability/Poverty Index being developed by the Center for Earth, Energy and Democracy, uses multiple variables related to income and housing stock characteristics, to determine energy vulnerability in Minneapolis and St. Paul (Figure 24). The orange and red areas highlight those census tracts that have relatively higher levels of energy vulnerability.

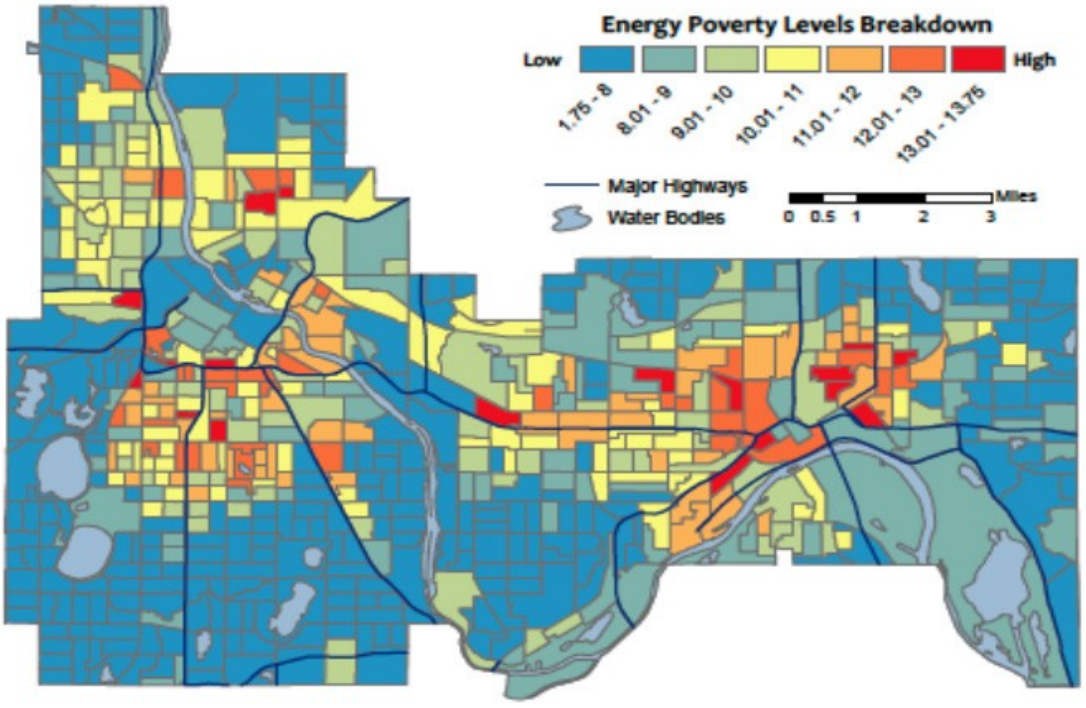


Figure 24: Energy Poverty in Minneapolis and Saint Paul (178)

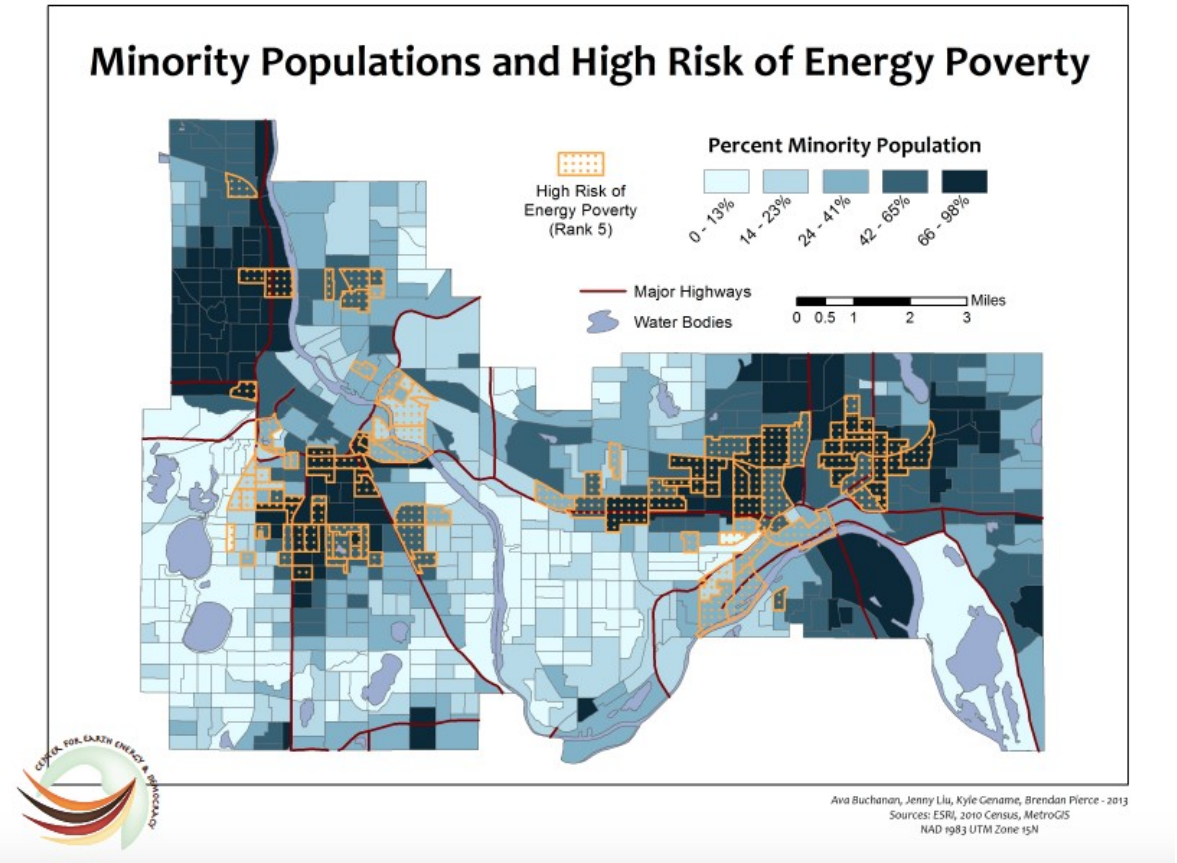


Figure 25: Energy Vulnerability and Communities of Color (179)

When overlaid with the racial demographics of Minneapolis and St. Paul, there is a high level of correlation with the energy vulnerable areas and those with a high number of residents of color (Figure 25). While this methodology is still in development, these initial results begin to show the link between affordable energy access, income and race. Coupled with the health impacts associated with lack of affordable energy discussed earlier in this section, this type of neighborhood level analysis begins to give guidance as to where energy resources can be targeted and highlights the need for more integration of energy, demographic and health metrics.

Energy Assistance Programs

The considerable number of households at risk for utility disconnections due to unpaid utility bills has critical health implications (180). There are two types of energy assistance programs serving low-income households to help re- duce their energy vulnerability. These are the weatherization services to reduce energy consumption from electricity, natural gas and other energy sources in homes; and rate-payer energy assistance programs which provide assistance for energy bills (181).

Public and private resources provide funding for these programs. Public funding comes from two federal programs, the Low -ncome Home Energy Assistance Program (LIHEAP) and the Weatherization Assistance Program (WAP). LIHEAP is a block grant program that assists low-income households to meet their home energy costs. In addition, LIHEAP offers assistance in times of exceptional need or crisis, and up to 15% can be used for low-cost residential weatherization and energy-related home repairs (25%of the grant if a waiver is approved).

WAP is a federal formula grant program available to states for energy efficiency for low-income households and is administered by the Department of Energy (DOE). While an important source of funding, LIHEAP actually exceeds WAP funding, yet both these programs are vastly under-funded and are consistently unable to meet existing needs. The National Energy Assistance Directors Association (NEADA) reported that the number of households receiving energy assistance declined by 17 percent between 2010 and 2013 due to decrease in funding. Even at its peak, LIHEAP only served 21% of eligible households (182). These energy assistance programs also fall short when energy prices increase. The number of average annual low-income heating and cooling bills "covered" by LIHEAP in Minnesota in 2015 was 108,220 (183).

In addition to LIHEAP and WAP, there are a number of other federal programs that have had an energy services component including HUD housing programs, the Temporary Assistance to Needy Families (TANF), and the Community Services Block Grant (CSBG). State funding

sources include ratepayer funds (a surcharge on customers' utility bills), and state general funds. In fact, rate-payer assistance constitutes 80 percent of total resources for low-income households, with energy efficiency constituting only 20 percent (LIHEAP Clearinghouse). In addition to public sources, there is non-governmental support for various energy programs, which includes private nonprofit and religious organizations (184).

This growing gap between rising energy prices and funding of energy assistance programs such as the federally supported LIHEAP, has resulted in many families accumulating substantial unpaid utility bills, "leading to arrearages and disconnections that adversely affect child and family well-being" (185). While there are utility shut-off protections in Minnesota, such as the Cold Weather Rule (CWR), there are limitations that can still result in economic hardship. For example, the CWR protection can be compromised if the rate-payer misses payments, and the rule is only in effect from October 15th to April 15th of each year (186). While many families may avoid disconnection using such protections in winter, they may face energy burdens at other times of the year when the CWR is not in effect. Thus, many families can incur a debt problem, and the potential threat of disconnection, resulting in "budget trade-offs even in warmer months, spending less on food, medical care, and housing, so they can pay down arrearages accumulated during the winter" (187).

Recommendations

As a result of this initial HIA, the following recommendations were developed as priority areas for action for the City of Minneapolis Green Zones Initiative. While these recommendations are tailored toward the City and focused on Phillips, many of the recommendations are applicable to county and state government, as well as other geographic neighborhoods that face similar pollution burdens and the demographic profiles of Phillips.

Policy and Planning Recommendations

CUMULATIVE IMPACTS. Cumulative pollution impacts should be part of decision-making by the City and State, as well as appropriate planning departments for future development and redevelopment projects. To the estent permitted by law, the City should discourage and advocate against development or redevelopment that will contribute to net additional pollution, especially pollution that negatively affects human health and avoid decisions that add pollution emissions in an area deemed disproportionally pollution burdened relative to other city neighborhoods. It is recommended that the City adopt ordinances that prioritize over-burdened neighborhoods for pollution reductions. Model ordinances such as the Clean Up Green Up ordinance passes in Los Angeles, California and other models out of Newark, New Jersey, can be used as exemplars (14).

QUALITY OF LIFE. As environmental improvements and sustainability measures improve quality of life in the Phillips community, and other potential Minneapolis Green Zones, the City must be proactive to prevent the direct and indirect displacement of residents currently living in these areas. Anti-displacement measures should be developed and implemented, including the development of metrics for continued assessment.

CLIMATE RESILIENCY. Green Zones should be utilized by the City as a means of increasing climate resiliency of vulnerable and overburdened communities. As the City acts to address

the impacts of climate change, there must be specific attention to the uneven and unequal infrastructure across the City's neighborhoods. Without explicit attention to inequality, there is an increased risk that the pollution and environmental health issues outlined in this report will be exacerbated by the effects of climate change. All aspects of climate resiliency planning and sustainable development practices, including comprehensive planning, transportation, housing, land use and energy planning should prioritize vulnerable and overburdened communities for climate resiliency.

POLLUTION REDUCTION. A comprehensive and coordinated green transition of higher polluting small businesses toward lesser pollution options should be developed. Investments in small businesses build the economic vitality of the community, and incentives for local hiring practices can be included to create job opportunities and resident health.

ENVIRONMENTAL JUSTICE OMBUDSMAN. The City should create an environmental justice position or Green Zones Ombudsperson. This position would serve as the liaison between the City's Green Zone efforts and Green Zone residents, small businesses, schools, and community-based organizations. The goal is to have maximum community involvement in the City's green transition efforts.

GREEN INVESTMENT. Green and resiliency-oriented (tree canopy, garden programs, public parks infrastructure, bike paths, etc.) investments offered by the City of Minneapolis should prioritize residents, non-profit organizations, and small businesses in Green Zones. This includes energy efficiency, renewable energy, zero emissions transportation, public transit expansion and any other sustainable-oriented programs.

Anti-displacement. In order to ensure that these green investments benefit residents in these communities, and don't result in displacement, the city must assess and develop anti-displacement strategies immediate. The City *must* prioritize equitable growth as a goal for its comprehensive planning and take risks in developing innovative strategies to achieve this goal.

> *"If sustainable community development is to address the social imperative, sustainable community development projects will have to actively plan how to keep such communities accessible to a diverse range of income groups, professions, and retailers."*
>
> *Ann Dale and Lenore L. Newman, Local Environment. Vol. 14, No. 7, August 2009, 669–681*

Community Engagement Recommendations

The City should actively promote meaningful participation and involvement by identifying risks to the public health and the environment, and by providing an opportunity to select alternatives an/or mitigation measures that will minimize such risks. Decision-making and planning should be proactively transparent. Green Zone and place-based sustainability planning in EJ neighborhoods in the City of Minneapolis must have meaningful and effective collaborative partnerships with community-based organizations (CBOs). Strategies include partnerships with residents in over-burdened neighborhoods and with well-respected CBOs serving the community. Several tools can be utilized to enhance this process, specifically (15):

COMMUNITY BENEFIT AGREEMENTS. A Community Benefits Agreement (CBA) is a legally binding contract (or set of related contracts), which can establish a set of community benefits of a development project. A CBA can help to ensure community involvement, and if the process is implemented well, can provide a venue for business-community relations. While, it is an undertaking, CBAs can be developed between the City, private entities, and community groups to provide points of agreement for building long term community improvements in Green Zone policy and project development. This can include up front agreed upon decision-making timelines, level and points of communication, intellectual property rights of research, protocol on funds raised by the City for community outreach, and decision-making structures.

COMMUNITY-BASED ORGANIZATION PARTNERSHIPS. There is great variability across departments in their community engagement proficiency. The City should develop partnerships with CBOs that have experience in community organizing, service provision,

leadership development, technical and analytical capacities, and/or those with demonstrated effective relationships with local residents, particularly Indigenous, people of color, and immigrant populations. It the city is going to make progress in addressing environmental and public health disparities across neighborhoods, it is imperative that relationships between city departments and community residents are improved.

MONITORING AND ASSESSMENT. The City should develop an inter-departmental information and planning hub that collects data on resources, incentives and programs available for Green Zones. This would include data on health, environmental justice resources, incentives, and regulations would be incorporated. To create a better basis of information for decision-making with regard to public health and the environment. Require development and redevelopment projects that have the potential to generate additional pollution to provide information in the form of an Environmental Justice Review Checklist. In addition, in order to create a better basis of information for decision-making with regard to public health and the environment the City should develop Natural Resources Index that identifies areas that can be considered disproportionately burdened with pollution, and can assist monitoring and assessment, and decision-making.

Air Quality Recommendations

COMPREHENSIVE AIR QUALITY ASSESSMENT. A comprehensive review and compilation of environmental conditions based on existing air quality and pollution studies conducted by the city, state agencies, and academic researchers. This review should be coupled with an updated cumulative impacts assessment for Green Zones neighborhoods utilizing the MNRiskS assessment model at the Minnesota Pollution Control Agency. The assessment should also include recommendations for pollution reductions in these neighborhoods.

PRIORITIZING AREAS WITH SENSITIVE POPULATIONS. A priority for pollution reduction and other health-oriented green investment should be prioritized immediately in areas where sensitive populations (the elderly, and children) reside. This includes developing a City strategy for monitoring the environmental-public health linkages in these areas, and assigning

responsibility for developing programs to address existing health impairing conditions, as well as benchmarks and assessment strategies to ensure progress.

TRANSPORTATION POLLUTION. Mobile sources of pollution are a significant health risk, and research indicates that communities of color are disproportionately burdened by these emissions. Heavy-duty vehicles are of high concern. Strategies to reduce emissions and that provide infrastructure that will reduce these emissions is of vital importance. Federal, State, County and City resources becoming available for pollution reduction (such as VOCs, diesel fuel, nitrogen oxide) and more location-based air monitoring/research, should be targeted to Green Zone neighborhoods with the highest transportation emissions effects. Expansion/modification and other related projects planned for highways (35W and 94) adjacent to the Green Zone areas should assess impacts on local air quality and resident health. Actions should be taken to decrease the disproportionate transportation pollution burden faced by Green Zone residents.

Energy in Housing Recommendations

ENERGY AND HEALTH. Energy planning by the Minneapolis Clean Energy Partnership (CEP) should integrate health and other co-benefits in its agenda. The CEP should evaluate energy infrastructure and efficiency with specific attention to neighborhoods in the Green Zones, and identify strategies that can aggregate and target clean energy investments at a neighborhood level. The city should request CenterPoint and Xcel Energy to make available household or neighborhood level data, for public research and evaluation.

ENERGY EFFICIENCY. Energy efficiency investments in both single family detached and multi-family rental units. This includes developing assessments on energy vulnerability among residents in the city, identifying the challenges to energy security, and developing strategies to address these conditions. The City should work with state agencies and expand its relationships with organizations with a focus on energy and environmental justice, rather than continue to rely on mainstream energy service and advocacy organizations. All energy

programs should be developed in a manner to ensure benefits are received by renters, mitigating the risk that efficiency investments are used to upgrade and displace current occupants.

ENERGY PROGRAMS EVALUATION. An evaluation should be conducted on the penetration of existing local, state and federal low-income ratepayer and efficiency programs in Green Zones neighborhoods. This includes programs such as the Low-Income CIP, the Cold Weather Rule, the Weatherization Assistance Program, LIHEAP, and other related local energy service programs. The gaps in improving health of low- income residents of color should be assessed, and strategies for improvement implemented.

Conclusion

The recommendations outlined above are focused on a sub-set of issue areas given the time frame and resources available for the Phillips Community HIA on Minneapolis Green Zones. Thus, a further recommendation by the Community Steering Committee is that a second phase of this Green Zones health assessment be conducted for the next priority issue areas for the community, namely: food, housing quality/access, and economic development/ employment.

The Phillips Community Health Impact Assessment Community Steering Team puts these recommendations forward not as isolated recommendations to be chosen, but as a comprehensive set of strategies that are needed to in order for the Minneapolis Green Zones Initiative to be implemented with equity as its center, and for the benefit of Phillips Community residents.

phase of this Green Zones health assessment be conducted for the next priority issue areas for the community, namely: food, housing quality/access, and economic development/ employment.

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EXHIBIT 2

March 19, 2021 Comments on the Environmental Assessment Worksheet (EAW) for the Hiawatha Maintenance Facility (HMF) Expansion focusing on Air Quality Impacts by Dr. Ranajit (Ron) Sahu[1]

As noted in the EAW "The Minneapolis Public Works Department is proposing to expand their Hiawatha Maintenance Facility, located at 1911 East 26th Street, into the property immediately to the south. This will involve the relocation and consolidation of water distribution maintenance office, shop, yard and vehicle/equipment storage functions, and sewer and stormwater office staff from elsewhere, requiring the demolition of the former Roof Depot warehouse building, and construction of approximately 328,000 square feet of new buildings, and parking (surface and structured) for an additional 360 City and personal vehicles."[2]

My comments below focus on the broad air quality aspects of this proposed HMF Expansion project that the City of Minneapolis (City) should have included in the EAW. I provide these comments based on my professional experience and background and careful review of the EAW including all attachments relevant to air quality matters. This includes Section 16 (Air Quality) and Attachment G as well as Section 6 (Project Description), Section 10 (Geology, Soils, and Topography/land Forms), Section 11 (Water Resources), Section 12 (Contamination/Hazardous

[1] Resume provided in Attachment A.
[2] EAW, p. 2.

Materials/Wastes), Section 18 (Transportation), and finally, Section 19 (Cumulative Potential Effects).

The EAW is deficient in three material respects. The City 1) failed to discuss the potential risk to human health caused by the air pollution from the HMF; 2) improperly narrowed the scope of the air quality analysis; and 3) applied an incorrect emissions calculation, resulting in a possible underestimation of the pollution from the project.

(a) Omission of Any Discussion of Risk in the EAW

The EAW completely omits any discussion of risk associated with the anticipated air pollution. This is surprising because air pollution is regulated largely because of the human and ecological risks posed by air pollutants.[3] Of course environmental risk is not just from [the project's] air pollution generating activities and sources. Therefore, I urge the City to include explicit discussions and analyses for risk, including characterizing baseline risks to persons living near the proposed HMF site and then the incremental risk increase due to the additional pollution the project will emit. This analysis would provide a more meaningful and holistic picture of the impacts of this project on the surrounding area.

The City can perform baseline and incremental risk assessments by reviewing the extensive guidance put forth by US EPA and the Minnesota PCA. So, in the interest of brevity, I am not including specifics of such guidance. Standard formalism of identifying hazards, addressing toxicity inputs for various health endpoints such as cancer, non-cancer chronic, and acute conditions should be included. All likely routes of exposure such as inhalation, ingestion, dermal contact, home-grown gardens, mother's milk for infants, etc. should be included. The risk assessment should also explicitly consider not just adults but also infants, children, the elderly and other sensitive sub-populations that are present in the general vicinity of the project area.

(b) Incomplete Air Quality Analysis Presented in the EAW

The EAW mistakenly focuses very narrowly on the permit status of the proposed HMF Expansion facility as opposed to providing a broader understanding of the air quality conditions in the area

[3] Air pollution is also regulated for nuisance reasons.

that the project is located. A proper air quality analysis includes an understanding of not just the HMF Expansion project but also air quality impacts from other existing sources and activities. The EAW should address air quality broadly from all nearby sources and activities, and for all potential air pollutants that can be emitted.

Thus, the EAW must first discuss the current baseline (i.e., pre-project) conditions. This, in turn, should first select an appropriate area of impact.[4] Then, it should identify:

(i) meteorology in the area based on monitored or other reliable meteorological data. Wind speed and wind direction should be depicted on monthly wind rose diagrams and the data should also be summarized in tables. This information will inform the movement of air pollution from the HMF Expansion;

(ii) all air monitoring data in this area – i.e., for each monitor and for each pollutant. This should be summarized for at least the last 5 years, if possible, to enable not just the concentration values to be easily discerned, but also to determine any trends. Explanations for any observed trends should be discussed in the EAW.

To the extent that there are insufficient nearby monitors to properly characterize this area, the EAW should identify that as a data-gap and explain how that gap should be filled either by the City or other entities such as the MPCA;

(iii) next, the baseline analysis should provide a comprehensive list of emissions sources and activities within the selected area. In addition to permitted stationary emissions sources, this analysis should also include all smaller, non-permitted stationary sources as well as the traffic volumes in the major roadways (i.e., highways, arterials) within the project area; and finally, any other sources of air emissions such as construction or demolition activities. This source list should be depicted on a map;

[4] Identifying the area of impact can be an iterative exercise, depending on modeling leading to adjustments to the impacted area. But, as a starting point, a radius of several miles centered around the proposed project is appropriate since vehicle traffic from the proposed project will be routed to surrounding streets.

(iv) next, the City should attempt to determine the emissions from the sources in (iii) above – i.e., an emissions inventory. This inventory should include at least two time scales: annual as well as a shorter scale (typically daily). Seasonal or periodic sources should be addressed on respective time scales or their durations should be noted, such as for construction or demolition-related activities. The inventory should address the major (criteria) pollutants including PM2.5, PM10, total suspended PM, NOx, SO2, CO, and VOCs as well as major hazardous pollutants, as applicable from specific sources/activities – such as lead (a criteria pollutant), diesel particulate matter (DPM), benzene/toluene/ethylbenzene/xylenes (BTEX), 2,3-butadiene, formaldehyde, etc.

It is important to note that depending on where air monitors are located, the impacts of some of the baseline sources may be accounted in the air monitoring data, depending on meteorological conditions. The EAW should attempt to define which sources/activities are already likely to be affecting specific monitors so as to avoid double-counting of such sources and their impacts in subsequent analyses. It is likely that, for baseline purposes, expert judgments will be needed to complete the inventory and address, qualitatively, the source emissions/monitored concentrations nexus;

(iv) project emissions, much like has been done in the EAW in Attachment G subject to the comments on the inappropriateness of the emissions calculations methods noted in the next comment, below.

(v) cumulative impacts analysis, including project emissions and actual or projected emissions from the baseline sources plus any new or modified sources or activities that are expected or likely to begin emitting in the same time frame as the project emissions. This is a standard analysis in most environmental assessment under the National Environmental Protection Act (NEPA) and various state assessments.

Given the prior adverse environmental impacts that have occurred in the general vicinity of the project, it is entirely appropriate to complete a thorough assessment of baseline, project, and cumulative impacts as briefly described above; identify data gaps such as the need for more monitoring if needed; and ultimately engender community trust building by conducting complete and technically competent analyses.

(c) Incorrect Emissions Calculations Used to Support the Permitting Analysis

Tables in Attachment G make clear that most of the emissions calculations for the proposed project relied on EPA's AP-42 compilation of emission factors,[5] as seen in the footnotes to the various tables (see, for example, Table 2, Table 3, Table 5, Table 6, body of Table 7, Table 8, Table 9, Table 10, Table 11, Table 12, Table 13, and Table 15). As explained below, the City must revise its calculations to accurately show the emissions from the project and to reassess whether the HMF Expansion will require an air emissions permit.

AP-42 was not meant to be the source of emissions data for the purpose of calculating potential-to-emit (PTE) or maximum emissions estimates, necessary for the purposes for permit applicability determinations. As explained in the AP-42 documentation itself, an AP-42 emission factor (even if rated at a high level[6]) represents an average of emission rates in a particular sector and is therefore not a reliable indicator of emissions from a particular source or activity:

> Use of these factors as source-specific permit limits and/or as emission regulation compliance determinations is not recommended by EPA. Because emission factors essentially represent an average of a range of emission rates, approximately half of the subject sources will have emission rates greater than the emission factor and the other half will have emission rates less than the factor. *As such, a permit limit using an AP-42 emission factor would result in half of the sources being in noncompliance.*[7]

EPA has recently reaffirmed its position regarding the unreliability of AP-42 emission factors in an enforcement alert issued in November 2020.[8] EPA reminded permitting agencies, consultants, and regulated entities that AP-42 emission factors are only based on averages of data from multiple sources, and therefore "are not likely to be accurate predictors of emissions from any one specific

[5] https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors

[6] AP-42 factor generally have letter-grade ratings A through F, with A being the highest rated factors. Factors rated D and below are especially poor.

[7] AP-42, Fifth Edition Compilation of Air Pollutant Emissions Factors, Volume 1: Stationary Point and Area Sources. Introduction, at 2 (emphasis added), https://www.epa.gov/sites/production/files/2020-09/documents/c00s00.pdf.

[8] U.S. EPA, Enforcement Alert: EPA Reminder About Inappropriate Use of AP-42 Emission Factors," Nov. 2020, https://www.epa.gov/sites/production/files/2021-01/documents/ap42-enforcementalert.pdf. Provided in Attachment B.

source, except in very limited scenarios."[9] EPA also explained that "[i]n developing emission factors, test data are typically taken from normal operating conditions and generally avoid conditions that can cause short-term fluctuations in emissions" which "can stem from variations in process conditions, control device conditions, raw materials, ambient conditions, or other similar factors." EPA emphasized that "even factors that are rated 'A' or 'B' are not designed to be used by a single source where other, more reliable, site-specific, data are available." EPA declared: "Remember, AP-42 emission factors should only be used as a last resort."[10]

As just one example of a poor emission factor from AP-42 used in the permit emission calculations in Attachment G (Table 2, Table 3, Table 5, Table 6, Table 9, and Tale 13), I excerpt below the cited Table 1.4-2 from AP-42 used to estimate PM emissions. Note that the PM (total) factor 7.6 lb/million scf) is rated D, a very poor and unreliable rating.

TABLE 1.4-2. EMISSION FACTORS FOR CRITERIA POLLUTANTS AND GREENHOUSE GASES FROM NATURAL GAS COMBUSTION[a]

Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
CO_2[b]	120,000	A
Lead	0.0005	D
N_2O (Uncontrolled)	2.2	E
N_2O (Controlled-low-NO_x burner)	0.64	E
PM (Total)[c]	7.6	D
PM (Condensable)[c]	5.7	D
PM (Filterable)[c]	1.9	B
SO_2[d]	0.6	A
TOC	11	B
Methane	2.3	B
VOC	5.5	C

[9] *Ibid* at 1.
[10] *Ibid* at 3 (emphasis in original).

This is just one example. All of the AP-42 emission factors used are similarly deficient and the emissions calculations should be redone. As alternatives, the City should look to actual measured emissions data from stack tests for similar sources which should be available from state agencies, including the MPCA. If AP-42 is to be used, the underlying data should be reviewed and maximum or high values from the underlying supporting data should be used instead of the average data typically reported in AP-42. As it stands, the EAW's reliance on the permitting analysis is not only too narrow, as noted by the absence of air quality and risk analyses discussed above, it is also flawed given the almost total reliance on unreliable calculations.

Attachment A – Resume

RANAJIT (RON) SAHU, Ph.D, QEP, CEM (Nevada)

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EXPERIENCE SUMMARY

Dr. Sahu has over thirty one years of experience in the fields of environmental, mechanical, and chemical engineering including: program and project management services; design and specification of pollution control equipment for a wide range of emissions sources including stationary and mobile sources; soils and groundwater remediation including landfills as remedy; combustion engineering evaluations; energy studies; multimedia environmental regulatory compliance (involving statutes and regulations such as the Federal CAA and its Amendments, Clean Water Act, TSCA, RCRA, CERCLA, SARA, OSHA, NEPA as well as various related state statutes); transportation air quality impact analysis; multimedia compliance audits; multimedia permitting (including air quality NSR/PSD permitting, Title V permitting, NPDES permitting for industrial and storm water discharges, RCRA permitting, etc.), multimedia/multi-pathway human health risk assessments for toxics; air dispersion modeling; and regulatory strategy development and support including negotiation of consent agreements and orders.

He has over twenty eight years of project management experience and has successfully managed and executed numerous projects in this time period. This includes basic and applied research projects, design projects, regulatory compliance projects, permitting projects, energy studies, risk assessment projects, and projects involving the communication of environmental data and information to the public.

He has provided consulting services to numerous private sector, public sector and public interest group clients. His major clients over the past twenty six years include various trade associations as well as individual companies such as steel mills, petroleum refineries, chemical plants, cement manufacturers, aerospace companies, power generation facilities, lawn and garden equipment manufacturers, spa manufacturers, chemical distribution facilities, land development companies, and various entities in the public sector including EPA, the US Dept. of Justice, several states (including Oregon, New Mexico, Pennsylvania, and others), various agencies such as the California DTSC, and various municipalities. Dr. Sahu has performed projects in all 50 states, numerous local jurisdictions and internationally.

In addition to consulting, for approximately twenty years, Dr. Sahu taught numerous courses in several Southern California universities including UCLA (air pollution), UC Riverside (air pollution, process hazard analysis), and Loyola Marymount University (air pollution, risk assessment, hazardous waste management). He also taught at Caltech, his alma mater (various engineering courses), at the University of Southern California (air pollution controls) and at California State University, Fullerton (transportation and air quality).

Dr. Sahu has and continues to provide expert witness services in a number of environmental areas discussed above in both state and Federal courts as well as before administrative bodies (please see Annex A).

EXPERIENCE RECORD

2000-present **Independent Consultant.** Providing a variety of private sector (industrial companies, land development companies, law firms, etc.), public sector (such as the US Department of Justice), and public interest group clients with project management, environmental consulting, project management, as well as regulatory and engineering support consulting services.

1995-2000 Parsons ES, **Associate, Senior Project Manager and Department Manager for** Air Quality/Geosciences/Hazardous Waste Groups, Pasadena. Responsible for the management of a group of approximately 24 air quality and environmental professionals, 15 geoscience, and 10 hazardous waste professionals providing full-service consulting, project management, regulatory compliance and A/E design assistance in all areas.

Parsons ES, **Manager for Air Source Testing Services**. Responsible for the management of 8 individuals in the area of air source testing and air regulatory permitting projects located in Bakersfield, California.

1992-1995 Engineering-Science, Inc. **Principal Engineer and Senior Project Manager** in the air quality department. Responsibilities included multimedia regulatory compliance and permitting (including hazardous and nuclear materials), air pollution engineering (emissions from stationary and mobile sources, control of criteria and air toxics, dispersion modeling, risk assessment, visibility analysis, odor analysis), supervisory functions and project management.

1990-1992 Engineering-Science, Inc. **Principal Engineer and Project Manager** in the air quality department. Responsibilities included permitting, tracking regulatory issues, technical analysis, and supervisory functions on numerous air, water, and hazardous waste projects. Responsibilities also include client and agency interfacing, project cost and schedule control, and reporting to internal and external upper management regarding project status.

1989-1990 Kinetics Technology International, Corp. **Development Engineer.** Involved in thermal engineering R&D and project work related to low-NOx ceramic radiant burners, fired heater NOx reduction, SCR design, and fired heater retrofitting.

1988-1989 Heat Transfer Research, Inc. **Research Engineer**. Involved in the design of fired heaters, heat exchangers, air coolers, and other non-fired equipment. Also did research in the area of heat exchanger tube vibrations.

EDUCATION

1984-1988 Ph.D., Mechanical Engineering, California Institute of Technology (Caltech), Pasadena, CA.

1984 M. S., Mechanical Engineering, California Institute of Technology (Caltech), Pasadena, CA.

1978-1983 B. Tech (Honors), Mechanical Engineering, Indian Institute of Technology (IIT) Kharagpur, India

TEACHING EXPERIENCE

Caltech

"Thermodynamics," Teaching Assistant, California Institute of Technology, 1983, 1987.

"Air Pollution Control," Teaching Assistant, California Institute of Technology, 1985.

"Caltech Secondary and High School Saturday Program," - taught various mathematics (algebra through calculus) and science (physics and chemistry) courses to high school students, 1983-1989.

"Heat Transfer," - taught this course in the Fall and Winter terms of 1994-1995 in the Division of Engineering and Applied Science.

“Thermodynamics and Heat Transfer,” Fall and Winter Terms of 1996-1997.

U.C. Riverside, Extension

"Toxic and Hazardous Air Contaminants," University of California Extension Program, Riverside, California. Various years since 1992.

"Prevention and Management of Accidental Air Emissions," University of California Extension Program, Riverside, California. Various years since 1992.

"Air Pollution Control Systems and Strategies," University of California Extension Program, Riverside, California, Summer 1992-93, Summer 1993-1994.

"Air Pollution Calculations," University of California Extension Program, Riverside, California, Fall 1993-94, Winter 1993-94, Fall 1994-95.

"Process Safety Management," University of California Extension Program, Riverside, California. Various years since 1992-2010.

"Process Safety Management," University of California Extension Program, Riverside, California, at SCAQMD, Spring 1993-94.

"Advanced Hazard Analysis - A Special Course for LEPCs," University of California Extension Program, Riverside, California, taught at San Diego, California, Spring 1993-1994.

"Advanced Hazardous Waste Management" University of California Extension Program, Riverside, California. 2005.

Loyola Marymount University

"Fundamentals of Air Pollution - Regulations, Controls and Engineering," Loyola Marymount University, Dept. of Civil Engineering. Various years since 1993.

"Air Pollution Control," Loyola Marymount University, Dept. of Civil Engineering, Fall 1994.

"Environmental Risk Assessment," Loyola Marymount University, Dept. of Civil Engineering. Various years since 1998.

"Hazardous Waste Remediation" Loyola Marymount University, Dept. of Civil Engineering. Various years since 2006.

University of Southern California

"Air Pollution Controls," University of Southern California, Dept. of Civil Engineering, Fall 1993, Fall 1994.

"Air Pollution Fundamentals," University of Southern California, Dept. of Civil Engineering, Winter 1994.

University of California, Los Angeles

"Air Pollution Fundamentals," University of California, Los Angeles, Dept. of Civil and Environmental Engineering, Spring 1994, Spring 1999, Spring 2000, Spring 2003, Spring 2006, Spring 2007, Spring 2008, Spring 2009.

International Programs

"Environmental Planning and Management," 5 week program for visiting Chinese delegation, 1994.

"Environmental Planning and Management," 1 day program for visiting Russian delegation, 1995.

"Air Pollution Planning and Management," IEP, UCR, Spring 1996.

"Environmental Issues and Air Pollution," IEP, UCR, October 1996.

PROFESSIONAL AFFILIATIONS AND HONORS

President of India Gold Medal, IIT Kharagpur, India, 1983.

Member of the Alternatives Assessment Committee of the Grand Canyon Visibility Transport Commission, established by the Clean Air Act Amendments of 1990, 1992.

American Society of Mechanical Engineers: Los Angeles Section Executive Committee, Heat Transfer Division, and Fuels and Combustion Technology Division, 1987-mid-1990s.

Air and Waste Management Association, West Coast Section, 1989-mid-2000s.

PROFESSIONAL CERTIFICATIONS

EIT, California (#XE088305), 1993.

REA I, California (#07438), 2000.

Certified Permitting Professional, South Coast AQMD (#C8320), since 1993.

QEP, Institute of Professional Environmental Practice, since 2000.

CEM, State of Nevada (#EM-1699). Expiration 10/07/2021.

PUBLICATIONS (PARTIAL LIST)

"Physical Properties and Oxidation Rates of Chars from Bituminous Coals," with Y.A. Levendis, R.C. Flagan and G.R. Gavalas, *Fuel*, **67**, 275-283 (1988).

"Char Combustion: Measurement and Analysis of Particle Temperature Histories," with R.C. Flagan, G.R. Gavalas and P.S. Northrop, *Comb. Sci. Tech.* **60**, 215-230 (1988).

"On the Combustion of Bituminous Coal Chars," PhD Thesis, California Institute of Technology (1988).

"Optical Pyrometry: A Powerful Tool for Coal Combustion Diagnostics," *J. Coal Quality*, **8**, 17-22 (1989).

"Post-Ignition Transients in the Combustion of Single Char Particles," with Y.A. Levendis, R.C. Flagan and G.R. Gavalas, *Fuel*, **68**, 849-855 (1989).

"A Model for Single Particle Combustion of Bituminous Coal Char." Proc. ASME National Heat Transfer Conference, Philadelphia, **HTD-Vol. 106**, 505-513 (1989).

"Discrete Simulation of Cenospheric Coal-Char Combustion," with R.C. Flagan and G.R. Gavalas, *Combust. Flame*, **77**, 337-346 (1989).

"Particle Measurements in Coal Combustion," with R.C. Flagan, in "**Combustion Measurements**" (ed. N. Chigier), Hemisphere Publishing Corp. (1991).

"Cross Linking in Pore Structures and Its Effect on Reactivity," with G.R. Gavalas in preparation.

"Natural Frequencies and Mode Shapes of Straight Tubes," Proprietary Report for Heat Transfer Research Institute, Alhambra, CA (1990).

"Optimal Tube Layouts for Kamui SL-Series Exchangers," with K. Ishihara, Proprietary Report for Kamui Company Limited, Tokyo, Japan (1990).

"HTRI Process Heater Conceptual Design," Proprietary Report for Heat Transfer Research Institute, Alhambra, CA (1990).

"Asymptotic Theory of Transonic Wind Tunnel Wall Interference," with N.D. Malmuth and others, Arnold Engineering Development Center, Air Force Systems Command, USAF (1990).

"Gas Radiation in a Fired Heater Convection Section," Proprietary Report for Heat Transfer Research Institute, College Station, TX (1990).

"Heat Transfer and Pressure Drop in NTIW Heat Exchangers," Proprietary Report for Heat Transfer Research Institute, College Station, TX (1991).

"NOx Control and Thermal Design," Thermal Engineering Tech Briefs, (1994).

“From Purchase of Landmark Environmental Insurance to Remediation: Case Study in Henderson, Nevada,” with Robin E. Bain and Jill Quillin, presented at the AQMA Annual Meeting, Florida, 2001.

“The Jones Act Contribution to Global Warming, Acid Rain and Toxic Air Contaminants,” with Charles W. Botsford, presented at the AQMA Annual Meeting, Florida, 2001.

PRESENTATIONS (PARTIAL LIST)

"Pore Structure and Combustion Kinetics - Interpretation of Single Particle Temperature-Time Histories," with P.S. Northrop, R.C. Flagan and G.R. Gavalas, presented at the AIChE Annual Meeting, New York (1987).

"Measurement of Temperature-Time Histories of Burning Single Coal Char Particles," with R.C. Flagan, presented at the American Flame Research Committee Fall International Symposium, Pittsburgh, (1988).

"Physical Characterization of a Cenospheric Coal Char Burned at High Temperatures," with R.C. Flagan and G.R. Gavalas, presented at the Fall Meeting of the Western States Section of the Combustion Institute, Laguna Beach, California (1988).

"Control of Nitrogen Oxide Emissions in Gas Fired Heaters - The Retrofit Experience," with G. P. Croce and R. Patel, presented at the International Conference on Environmental Control of Combustion Processes (Jointly sponsored by the American Flame Research Committee and the Japan Flame Research Committee), Honolulu, Hawaii (1991).

"Air Toxics - Past, Present and the Future," presented at the Joint AIChE/AAEE Breakfast Meeting at the AIChE 1991 Annual Meeting, Los Angeles, California, November 17-22 (1991).

"Air Toxics Emissions and Risk Impacts from Automobiles Using Reformulated Gasolines," presented at the Third Annual Current Issues in Air Toxics Conference, Sacramento, California, November 9-10 (1992).

"Air Toxics from Mobile Sources," presented at the Environmental Health Sciences (ESE) Seminar Series, UCLA, Los Angeles, California, November 12, (1992).

"Kilns, Ovens, and Dryers - Present and Future," presented at the Gas Company Air Quality Permit Assistance Seminar, Industry Hills Sheraton, California, November 20, (1992).

"The Design and Implementation of Vehicle Scrapping Programs," presented at the 86th Annual Meeting of the Air and Waste Management Association, Denver, Colorado, June 12, 1993.

"Air Quality Planning and Control in Beijing, China," presented at the 87th Annual Meeting of the Air and Waste Management Association, Cincinnati, Ohio, June 19-24, 1994.

Annex A

Expert Litigation Support

A. Occasions where Dr. Sahu has provided Written or Oral testimony before Congress:

1. In July 2012, provided expert written and oral testimony to the House Subcommittee on Energy and the Environment, Committee on Science, Space, and Technology at a Hearing entitled "Hitting the Ethanol Blend Wall – Examining the Science on E15."

B. Matters for which Dr. Sahu has provided affidavits and expert reports include:

2. Affidavit for Rocky Mountain Steel Mills, Inc. located in Pueblo Colorado – dealing with the technical uncertainties associated with night-time opacity measurements in general and at this steel mini-mill.

3. Expert reports and depositions (2/28/2002 and 3/1/2002; 12/2/2003 and 12/3/2003; 5/24/2004) on behalf of the United States in connection with the Ohio Edison NSR Cases. *United States, et al. v. Ohio Edison Co., et al.*, C2-99-1181 (Southern District of Ohio).

4. Expert reports and depositions (5/23/2002 and 5/24/2002) on behalf of the United States in connection with the Illinois Power NSR Case. *United States v. Illinois Power Co., et al.*, 99-833-MJR (Southern District of Illinois).

5. Expert reports and depositions (11/25/2002 and 11/26/2002) on behalf of the United States in connection with the Duke Power NSR Case. *United States, et al. v. Duke Energy Corp.*, 1:00-CV-1262 (Middle District of North Carolina).

6. Expert reports and depositions (10/6/2004 and 10/7/2004; 7/10/2006) on behalf of the United States in connection with the American Electric Power NSR Cases. *United States, et al. v. American Electric Power Service Corp., et al.*, C2-99-1182, C2-99-1250 (Southern District of Ohio).

7. Affidavit (March 2005) on behalf of the Minnesota Center for Environmental Advocacy and others in the matter of the Application of Heron Lake BioEnergy LLC to construct and operate an ethanol production facility – submitted to the Minnesota Pollution Control Agency.

8. Expert Report and Deposition (10/31/2005 and 11/1/2005) on behalf of the United States in connection with the East Kentucky Power Cooperative NSR Case. *United States v. East Kentucky Power Cooperative, Inc*., 5:04-cv-00034-KSF (Eastern District of Kentucky).

9. Affidavits and deposition on behalf of Basic Management Inc. (BMI) Companies in connection with the BMI vs. USA remediation cost recovery Case.

10. Expert Report on behalf of Penn Future and others in the Cambria Coke plant permit challenge in Pennsylvania.

11. Expert Report on behalf of the Appalachian Center for the Economy and the Environment and others in the Western Greenbrier permit challenge in West Virginia.

12. Expert Report, deposition (via telephone on January 26, 2007) on behalf of various Montana petitioners (Citizens Awareness Network (CAN), Women's Voices for the Earth (WVE) and the Clark Fork Coalition (CFC)) in the Thompson River Cogeneration LLC Permit No. 3175-04 challenge.

13. Expert Report and deposition (2/2/07) on behalf of the Texas Clean Air Cities Coalition at the Texas State Office of Administrative Hearings (SOAH) in the matter of the permit challenges to TXU Project Apollo's eight new proposed PRB-fired PC boilers located at seven TX sites.

14. Expert Testimony (July 2007) on behalf of the Izaak Walton League of America and others in connection with the acquisition of power by Xcel Energy from the proposed Gascoyne Power Plant – at the State of

Minnesota, Office of Administrative Hearings for the Minnesota PUC (MPUC No. E002/CN-06-1518; OAH No. 12-2500-17857-2).

15. Affidavit (July 2007) Comments on the Big Cajun I Draft Permit on behalf of the Sierra Club – submitted to the Louisiana DEQ.

16. Expert Report and Deposition (12/13/2007) on behalf of Commonwealth of Pennsylvania – Dept. of Environmental Protection, State of Connecticut, State of New York, and State of New Jersey (Plaintiffs) in connection with the Allegheny Energy NSR Case. *Plaintiffs v. Allegheny Energy Inc., et al.,* 2:05cv0885 (Western District of Pennsylvania).

17. Expert Reports and Pre-filed Testimony before the Utah Air Quality Board on behalf of Sierra Club in the Sevier Power Plant permit challenge.

18. Expert Report and Deposition (October 2007) on behalf of MTD Products Inc., in connection with *General Power Products, LLC v MTD Products Inc*., 1:06 CVA 0143 (Southern District of Ohio, Western Division) .

19. Expert Report and Deposition (June 2008) on behalf of Sierra Club and others in the matter of permit challenges (Title V: 28.0801-29 and PSD: 28.0803-PSD) for the Big Stone II unit, proposed to be located near Milbank, South Dakota.

20. Expert Reports, Affidavit, and Deposition (August 15, 2008) on behalf of Earthjustice in the matter of air permit challenge (CT-4631) for the Basin Electric Dry Fork station, under construction near Gillette, Wyoming before the Environmental Quality Council of the State of Wyoming.

21. Affidavits (May 2010/June 2010 in the Office of Administrative Hearings))/Declaration and Expert Report (November 2009 in the Office of Administrative Hearings) on behalf of NRDC and the Southern Environmental Law Center in the matter of the air permit challenge for Duke Cliffside Unit 6. Office of Administrative Hearing Matters 08 EHR 0771, 0835 and 0836 and 09 HER 3102, 3174, and 3176 (consolidated).

22. Declaration (August 2008), Expert Report (January 2009), and Declaration (May 2009) on behalf of Southern Alliance for Clean Energy in the matter of the air permit challenge for Duke Cliffside Unit 6. *Southern Alliance for Clean Energy et al., v. Duke Energy Carolinas, LLC*, Case No. 1:08-cv-00318-LHT-DLH (Western District of North Carolina, Asheville Division).

23. Declaration (August 2008) on behalf of the Sierra Club in the matter of Dominion Wise County plant MACT.us

24. Expert Report (June 2008) on behalf of Sierra Club for the Green Energy Resource Recovery Project, MACT Analysis.

25. Expert Report (February 2009) on behalf of Sierra Club and the Environmental Integrity Project in the matter of the air permit challenge for NRG Limestone's proposed Unit 3 in Texas.

26. Expert Report (June 2009) on behalf of MTD Products, Inc., in the matter of *Alice Holmes and Vernon Holmes v. Home Depot USA, Inc., et al.*

27. Expert Report (August 2009) on behalf of Sierra Club and the Southern Environmental Law Center in the matter of the air permit challenge for Santee Cooper's proposed Pee Dee plant in South Carolina).

28. Statements (May 2008 and September 2009) on behalf of the Minnesota Center for Environmental Advocacy to the Minnesota Pollution Control Agency in the matter of the Minnesota Haze State Implementation Plans.

29. Expert Report (August 2009) on behalf of Environmental Defense, in the matter of permit challenges to the proposed Las Brisas coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).

30. Expert Report and Rebuttal Report (September 2009) on behalf of the Sierra Club, in the matter of challenges to the proposed Medicine Bow Fuel and Power IGL plant in Cheyenne, Wyoming.

31. Expert Report (December 2009) and Rebuttal reports (May 2010 and June 2010) on behalf of the United States in connection with the Alabama Power Company NSR Case. *United States v. Alabama Power Company*, CV-01-HS-152-S (Northern District of Alabama, Southern Division).

32. Pre-filed Testimony (October 2009) on behalf of Environmental Defense and others, in the matter of challenges to the proposed White Stallion Energy Center coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).

33. Pre-filed Testimony (July 2010) and Written Rebuttal Testimony (August 2010) on behalf of the State of New Mexico Environment Department in the matter of Proposed Regulation 20.2.350 NMAC – *Greenhouse Gas Cap and Trade Provisions,* No. EIB 10-04 (R), to the State of New Mexico, Environmental Improvement Board.

34. Expert Report (August 2010) and Rebuttal Expert Report (October 2010) on behalf of the United States in connection with the Louisiana Generating NSR Case. *United States v. Louisiana Generating, LLC*, 09-CV100-RET-CN (Middle District of Louisiana) – Liability Phase.

35. Declaration (August 2010), Reply Declaration (November 2010), Expert Report (April 2011), Supplemental and Rebuttal Expert Report (July 2011) on behalf of the United States in the matter of DTE Energy Company and Detroit Edison Company (Monroe Unit 2). *United States of America v. DTE Energy Company and Detroit Edison Company*, Civil Action No. 2:10-cv-13101-BAF-RSW (Eastern District of Michigan).

36. Expert Report and Deposition (August 2010) as well as Affidavit (September 2010) on behalf of Kentucky Waterways Alliance, Sierra Club, and Valley Watch in the matter of challenges to the NPDES permit issued for the Trimble County power plant by the Kentucky Energy and Environment Cabinet to Louisville Gas and Electric, File No. DOW-41106-047.

37. Expert Report (August 2010), Rebuttal Expert Report (September 2010), Supplemental Expert Report (September 2011), and Declaration (November 2011) on behalf of Wild Earth Guardians in the matter of opacity exceedances and monitor downtime at the Public Service Company of Colorado (Xcel)'s Cherokee power plant. No. 09-cv-1862 (District of Colorado).

38. Written Direct Expert Testimony (August 2010) and Affidavit (February 2012) on behalf of Fall-Line Alliance for a Clean Environment and others in the matter of the PSD Air Permit for Plant Washington issued by Georgia DNR at the Office of State Administrative Hearing, State of Georgia (OSAH-BNR-AQ-1031707-98-WALKER).

39. Deposition (August 2010) on behalf of Environmental Defense, in the matter of the remanded permit challenge to the proposed Las Brisas coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).

40. Expert Report, Supplemental/Rebuttal Expert Report, and Declarations (October 2010, November 2010, September 2012) on behalf of New Mexico Environment Department (Plaintiff-Intervenor), Grand Canyon Trust and Sierra Club (Plaintiffs) in the matter of *Plaintiffs v. Public Service Company of New Mexico* (PNM), Civil No. 1:02-CV-0552 BB/ATC (ACE) (District of New Mexico).

41. Expert Report (October 2010) and Rebuttal Expert Report (November 2010) (BART Determinations for PSCo Hayden and CSU Martin Drake units) to the Colorado Air Quality Commission on behalf of Coalition of Environmental Organizations.

42. Expert Report (November 2010) (BART Determinations for TriState Craig Units, CSU Nixon Unit, and PRPA Rawhide Unit) to the Colorado Air Quality Commission on behalf of Coalition of Environmental Organizations.

43. Declaration (November 2010) on behalf of the Sierra Club in connection with the Martin Lake Station Units 1, 2, and 3. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Case No. 5:10-cv-00156-DF-CMC (Eastern District of Texas, Texarkana Division).

44. Pre-Filed Testimony (January 2011) and Declaration (February 2011) to the Georgia Office of State Administrative Hearings (OSAH) in the matter of Minor Source HAPs status for the proposed Longleaf Energy Associates power plant (OSAH-BNR-AQ-1115157-60-HOWELLS) on behalf of the Friends of the Chattahoochee and the Sierra Club).

45. Declaration (February 2011) in the matter of the Draft Title V Permit for RRI Energy MidAtlantic Power Holdings LLC Shawville Generating Station (Pennsylvania), ID No. 17-00001 on behalf of the Sierra Club.

46. Expert Report (March 2011), Rebuttal Expert Report (June 2011) on behalf of the United States in *United States of America v. Cemex, Inc.*, Civil Action No. 09-cv-00019-MSK-MEH (District of Colorado).

47. Declaration (April 2011) and Expert Report (July 16, 2012) in the matter of the Lower Colorado River Authority (LCRA)'s Fayette (Sam Seymour) Power Plant on behalf of the Texas Campaign for the Environment. *Texas Campaign for the Environment v. Lower Colorado River Authority,* Civil Action No. 4:11-cv-00791 (Southern District of Texas, Houston Division).

48. Declaration (June 2011) on behalf of the Plaintiffs MYTAPN in the matter of Microsoft-Yes, Toxic Air Pollution-No (MYTAPN) v. State of Washington, Department of Ecology and Microsoft Corporation Columbia Data Center to the Pollution Control Hearings Board, State of Washington, Matter No. PCHB No. 10-162.

49. Expert Report (June 2011) on behalf of the New Hampshire Sierra Club at the State of New Hampshire Public Utilities Commission, Docket No. 10-261 – the 2010 Least Cost Integrated Resource Plan (LCIRP) submitted by the Public Service Company of New Hampshire (re. Merrimack Station Units 1 and 2).

50. Declaration (August 2011) in the matter of the Sandy Creek Energy Associates L.P. Sandy Creek Power Plant on behalf of Sierra Club and Public Citizen. *Sierra Club, Inc. and Public Citizen, Inc. v. Sandy Creek Energy Associates, L.P.,* Civil Action No. A-08-CA-648-LY (Western District of Texas, Austin Division).

51. Expert Report (October 2011) on behalf of the Defendants in the matter of *John Quiles and Jeanette Quiles et al. v. Bradford-White Corporation, MTD Products, Inc., Kohler Co., et al.,* Case No. 3:10-cv-747 (TJM/DEP) (Northern District of New York).

52. Declaration (October 2011) on behalf of the Plaintiffs in the matter of *American Nurses Association et. al. (Plaintiffs), v. US EPA (Defendant)*, Case No. 1:08-cv-02198-RMC (US District Court for the District of Columbia).

53. Declaration (February 2012) and Second Declaration (February 2012) in the matter of *Washington Environmental Council and Sierra Club Washington State Chapter v. Washington State Department of Ecology and Western States Petroleum Association,* Case No. 11-417-MJP (Western District of Washington).

54. Expert Report (March 2012) and Supplemental Expert Report (November 2013) in the matter of *Environment Texas Citizen Lobby, Inc and Sierra Club v. ExxonMobil Corporation et al.,* Civil Action No. 4:10-cv-4969 (Southern District of Texas, Houston Division).

55. Declaration (March 2012) in the matter of *Center for Biological Diversity, et al. v. United States Environmental Protection Agency,* Case No. 11-1101 (consolidated with 11-1285, 11-1328 and 11-1336) (US Court of Appeals for the District of Columbia Circuit).

56. Declaration (March 2012) in the matter of *Sierra Club v. The Kansas Department of Health and Environment*, Case No. 11-105,493-AS (Holcomb power plant) (Supreme Court of the State of Kansas).

57. Declaration (March 2012) in the matter of the Las Brisas Energy Center *Environmental Defense Fund et al., v. Texas Commission on Environmental Quality,* Cause No. D-1-GN-11-001364 (District Court of Travis County, Texas, 261st Judicial District).

58. Expert Report (April 2012), Supplemental and Rebuttal Expert Report (July 2012), and Supplemental Rebuttal Expert Report (August 2012) on behalf of the states of New Jersey and Connecticut in the matter of the Portland Power plant *State of New Jersey and State of Connecticut (Intervenor-Plaintiff) v. RRI Energy Mid-Atlantic Power Holdings et al.,* Civil Action No. 07-CV-5298 (JKG) (Eastern District of Pennsylvania).

59. Declaration (April 2012) in the matter of the EPA's EGU MATS Rule, on behalf of the Environmental Integrity Project.

60. Expert Report (August 2012) on behalf of the United States in connection with the Louisiana Generating NSR Case. *United States v. Louisiana Generating, LLC*, 09-CV100-RET-CN (Middle District of Louisiana) – Harm Phase.

61. Declaration (September 2012) in the Matter of the Application of *Energy Answers Incinerator, Inc.* for a Certificate of Public Convenience and Necessity to Construct a 120 MW Generating Facility in Baltimore City, Maryland, before the Public Service Commission of Maryland, Case No. 9199.

62. Expert Report (October 2012) on behalf of the Appellants (Robert Concilus and Leah Humes) in the matter of Robert Concilus and Leah Humes v. Commonwealth of Pennsylvania Department of Environmental Protection and Crawford Renewable Energy, before the Commonwealth of Pennsylvania Environmental Hearing Board, Docket No. 2011-167-R.

63. Expert Report (October 2012), Supplemental Expert Report (January 2013), and Affidavit (June 2013) in the matter of various Environmental Petitioners v. North Carolina DENR/DAQ and Carolinas Cement Company, before the Office of Administrative Hearings, State of North Carolina.

64. Pre-filed Testimony (October 2012) on behalf of No-Sag in the matter of the North Springfield Sustainable Energy Project before the State of Vermont, Public Service Board.

65. Pre-filed Testimony (November 2012) on behalf of Clean Wisconsin in the matter of Application of Wisconsin Public Service Corporation for Authority to Construct and Place in Operation a New Multi-Pollutant Control Technology System (ReACT) for Unit 3 of the Weston Generating Station, before the Public Service Commission of Wisconsin, Docket No. 6690-CE-197.

66. Expert Report (February 2013) on behalf of Petitioners in the matter of Credence Crematory, Cause No. 12-A-J-4538 before the Indiana Office of Environmental Adjudication.

67. Expert Report (April 2013), Rebuttal report (July 2013), and Declarations (October 2013, November 2013) on behalf of the Sierra Club in connection with the Luminant Big Brown Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 6:12-cv-00108-WSS (Western District of Texas, Waco Division).

68. Declaration (April 2013) on behalf of Petitioners in the matter of *Sierra Club, et al., (Petitioners) v Environmental Protection Agency et al. (Resppondents),* Case No., 13-1112, (Court of Appeals, District of Columbia Circuit).

69. Expert Report (May 2013) and Rebuttal Expert Report (July 2013) on behalf of the Sierra Club in connection with the Luminant Martin Lake Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 5:10-cv-0156-MHS-CMC (Eastern District of Texas, Texarkana Division).

70. Declaration (August 2013) on behalf of A. J. Acosta Company, Inc., in the matter of *A. J. Acosta Company, Inc., v. County of San Bernardino*, Case No. CIVSS803651.

71. Comments (October 2013) on behalf of the Washington Environmental Council and the Sierra Club in the matter of the Washington State Oil Refinery RACT (for Greenhouse Gases), submitted to the Washington State Department of Ecology, the Northwest Clean Air Agency, and the Puget Sound Clean Air Agency.

72. Statement (November 2013) on behalf of various Environmental Organizations in the matter of the Boswell Energy Center (BEC) Unit 4 Environmental Retrofit Project, to the Minnesota Public Utilities Commission, Docket No. E-015/M-12-920.

73. Expert Report (December 2013) on behalf of the United States in *United States of America v. Ameren Missouri*, Civil Action No. 4:11-cv-00077-RWS (Eastern District of Missouri, Eastern Division).

74. Expert Testimony (December 2013) on behalf of the Sierra Club in the matter of Public Service Company of New Hampshire Merrimack Station Scrubber Project and Cost Recovery, Docket No. DE 11-250, to the State of New Hampshire Public Utilities Commission.

75. Expert Report (January 2014) on behalf of Baja, Inc., in *Baja, Inc., v. Automotive Testing and Development Services, Inc. et. al*, Civil Action No. 8:13-CV-02057-GRA (District of South Carolina, Anderson/Greenwood Division).

76. Declaration (March 2014) on behalf of the Center for International Environmental Law, Chesapeake Climate Action Network, Friends of the Earth, Pacific Environment, and the Sierra Club (Plaintiffs) in the matter of *Plaintiffs v. the Export-Import Bank (Ex-Im Bank) of the United States*, Civil Action No. 13-1820 RC (District Court for the District of Columbia).

77. Declaration (April 2014) on behalf of Respondent-Intervenors in the matter of *Mexichem Specialty Resins Inc., et al., (Petitioners) v Environmental Protection Agency et al.,* Case No., 12-1260 (and Consolidated Case Nos. 12-1263, 12-1265, 12-1266, and 12-1267), (Court of Appeals, District of Columbia Circuit).

78. Direct Prefiled Testimony (June 2014) on behalf of the Michigan Environmental Council and the Sierra Club in the matter of the Application of DTE Electric Company for Authority to Implement a Power Supply Cost Recovery (PSCR) Plan in its Rate Schedules for 2014 Metered Jurisdictional Sales of Electricity, Case No. U-17319 (Michigan Public Service Commission).

79. Expert Report (June 2014) on behalf of ECM Biofilms in the matter of the US Federal Trade Commission (FTC) v. ECM Biofilms (FTC Docket #9358).

80. Direct Prefiled Testimony (August 2014) on behalf of the Michigan Environmental Council and the Sierra Club in the matter of the Application of Consumers Energy Company for Authority to Implement a Power Supply Cost Recovery (PSCR) Plan in its Rate Schedules for 2014 Metered Jurisdictional Sales of Electricity, Case No. U-17317 (Michigan Public Service Commission).

81. Declaration (July 2014) on behalf of Public Health Intervenors in the matter of *EME Homer City Generation v. US EPA* (Case No. 11-1302 and consolidated cases) relating to the lifting of the stay entered by the Court on December 30, 2011 (US Court of Appeals for the District of Columbia).

82. Expert Report (September 2014), Rebuttal Expert Report (December 2014) and Supplemental Expert Report (March 2015) on behalf of Plaintiffs in the matter of *Sierra Club and Montana Environmental Information Center (Plaintiffs) v. PPL Montana LLC, Avista Corporation, Puget Sound Energy, Portland General Electric Company, Northwestern Corporation, and Pacificorp (Defendants)*, Civil Action No. CV 13-32-BLG-DLC-JCL (US District Court for the District of Montana, Billings Division).

83. Expert Report (November 2014) on behalf of Niagara County, the Town of Lewiston, and the Villages of Lewiston and Youngstown in the matter of CWM Chemical Services, LLC New York State Department of Environmental Conservation (NYSDEC) Permit Application Nos.: 9-2934-00022/00225, 9-2934-00022/00231, 9-2934-00022/00232, and 9-2934-00022/00249 (pending).

84. *Declaration (January 2015) relating to Startup/Shutdown in the MATS Rule (EPA Docket ID No. EPA-HQ-OAR-2009-0234) on behalf of the Environmental Integrity Project.*

85. Pre-filed Direct Testimony (March 2015), Supplemental Testimony (May 2015), and Surrebuttal Testimony (December 2015) on behalf of Friends of the Columbia Gorge in the matter of the Application for a Site Certificate for the Troutdale Energy Center before the Oregon Energy Facility Siting Council.

86. Brief of Amici Curiae Experts in Air Pollution Control and Air Quality Regulation in Support of the Respondents, On Writs of Certiorari to the US Court of Appeals for the District of Columbia, No. 14-46, 47, 48. *Michigan et. al., (Petitioners) v. EPA et. al., Utility Air Regulatory Group (Petitioners) v. EPA et. al., National Mining Association et. al., (Petitioner) v. EPA et. al.,* (Supreme Court of the United States).

87. Expert Report (March 2015) and Rebuttal Expert Report (January 2016) on behalf of Plaintiffs in the matter of *Conservation Law Foundation v. Broadrock Gas Services LLC, Rhode Island LFG GENCO LLC, and Rhode Island Resource Recovery Corporation (Defendants)*, Civil Action No. 1:13-cv-00777-M-PAS (US District Court for the District of Rhode Island).

88. Declaration (April 2015) relating to various Technical Corrections for the MATS Rule (EPA Docket ID No. EPA-HQ-OAR-2009-0234) on behalf of the Environmental Integrity Project.

89. Direct Prefiled Testimony (May 2015) on behalf of the Michigan Environmental Council, the Natural Resources Defense Council, and the Sierra Club in the matter of the Application of DTE Electric Company for Authority to Increase its Rates, Amend its Rate Schedules and Rules Governing the Distribution and Supply of Electric Energy and for Miscellaneous Accounting Authority, Case No. U-17767 (Michigan Public Service Commission).

90. Expert Report (July 2015) and Rebuttal Expert Report (July 2015) on behalf of Plaintiffs in the matter of *Northwest Environmental Defense Center et. al., v. Cascade Kelly Holdings LLC, d/b/a Columbia Pacific Bio-Refinery, and Global Partners LP (Defendants)*, Civil Action No. 3:14-cv-01059-SI (US District Court for the District of Oregon, Portland Division).

91. Declaration (August 2015, Docket No. 1570376) in support of "Opposition of Respondent-Intervenors American Lung Association, et. al., to Tri-State Generation's Emergency Motion;" Declaration (September 2015, Docket No. 1574820) in support of "Joint Motion of the State, Local Government, and Public Health Respondent-Intervenors for Remand Without Vacatur;" Declaration (October 2015) in support of "Joint Motion of the State, Local Government, and Public Health Respondent-Intervenors to State and Certain Industry Petitioners' Motion to Govern, *White Stallion Energy Center, LLC v. US EPA*, Case No. 12-1100 (US Court of Appeals for the District of Columbia).

92. Declaration (September 2015) in support of the Draft Title V Permit for Dickerson Generating Station (Proposed Permit No 24-031-0019) on behalf of the Environmental Integrity Project.

93. Expert Report (Liability Phase) (December 2015) and Rebuttal Expert Report (February 2016) on behalf of Plaintiffs in the matter of *Natural Resources Defense Council, Inc., Sierra Club, Inc., Environmental Law and Policy Center, and Respiratory Health Association v. Illinois Power Resources LLC, and Illinois Power Resources Generating LLC (Defendants)*, Civil Action No. 1:13-cv-01181 (US District Court for the Central District of Illinois, Peoria Division).

94. Declaration (December 2015) in support of the Petition to Object to the Title V Permit for Morgantown Generating Station (Proposed Permit No 24-017-0014) on behalf of the Environmental Integrity Project.

95. Expert Report (November 2015) on behalf of Appellants in the matter of *Sierra Club, et al. v. Craig W. Butler, Director of Ohio Environmental Protection Agency et al.,* ERAC Case No. 14-256814.

96. Affidavit (January 2016) on behalf of Bridgewatch Detroit in the matter of *Bridgewatch Detroit v. Waterfront Petroleum Terminal Co., and Waterfront Terminal Holdings, LLC.*, in the Circuit Court for the County of Wayne, State of Michigan.

97. Expert Report (February 2016) and Rebuttal Expert Report (July 2016) on behalf of the challengers in the matter of the Delaware Riverkeeper Network, Clean Air Council, et. al., vs. Commonwealth of Pennsylvania Department of Environmental Protection and R. E. Gas Development LLC regarding the Geyer well site before the Pennsylvania Environmental Hearing Board.

98. Direct Testimony (May 2016) in the matter of Tesoro Savage LLC Vancouver Energy Distribution Terminal, Case No. 15-001 before the State of Washington Energy Facility Site Evaluation Council.

99. Declaration (June 2016) relating to deficiencies in air quality analysis for the proposed Millenium Bulk Terminal, Port of Longview, Washington.

100. Declaration (December 2016) relating to EPA's refusal to set limits on PM emissions from coal-fired power plants that reflect pollution reductions achievable with fabric filters on behalf of Environmental Integrity Project, Clean Air Council, Chesapeake Climate Action Network, Downwinders at Risk represented by Earthjustice in the matter of *ARIPPA v EPA, Case No. 15-1180.* (D.C. Circuit Court of Appeals).

101. Expert Report (January 2017) on the Environmental Impacts Analysis associated with the Huntley and Huntley Poseidon Well Pad on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

102. Expert Report (January 2017) on the Environmental Impacts Analysis associated with the Apex Energy Backus Well Pad on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

103. Expert Report (January 2017) on the Environmental Impacts Analysis associated with the Apex Energy Drakulic Well Pad on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

104. Expert Report (January 2017) on the Environmental Impacts Analysis associated with the Apex Energy Deutsch Well Pad on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

105. Affidavit (February 2017) pertaining to deficiencies water discharge compliance issues at the Wood River Refinery in the matter of *People of the State of Illinois (Plaintiff) v. Phillips 66 Company, ConocoPhillips Company, WRB Refining LP (Defendants)*, Case No. 16-CH-656, (Circuit Court for the Third Judicial Circuit, Madison County, Illinois).

106. Expert Report (March 2017) on behalf of the Plaintiff pertaining to non-degradation analysis for waste water discharges from a power plant in the matter of *Sierra Club (Plaintiff) v. Pennsylvania Department of Environmental Protection (PADEP) and Lackawanna Energy Center*, Docket No. 2016-047-L (consolidated), (Pennsylvania Environmental Hearing Board).

107. Expert Report (March 2017) on behalf of the Plaintiff pertaining to air emissions from the Heritage incinerator in East Liverpool, Ohio in the matter of *Save our County (Plaintiff) v. Heritage Thermal Services, Inc. (Defendant), Case No. 4:16-CV-1544-BYP*, (US District Court for the Northern District of Ohio, Eastern Division).

108. Rebuttal Expert Report (June 2017) on behalf of Plaintiffs in the matter of *Casey Voight and Julie Voight (Plaintiffs) v Coyote Creek Mining Company LLC (Defendant),* Civil Action No. 1:15-CV-00109 (US District Court for the District of North Dakota, Western Division).

109. Expert Affidavit (August 2017) and Penalty/Remedy Expert Affidavit (October 2017) on behalf of Plaintiff in the matter of *Wildearth Guardians (Plaintiff) v Colorado Springs Utility Board (Defendant,)* Civil Action No. 1:15-cv-00357-CMA-CBS (US District Court for the District of Colorado).

110. Expert Report (August 2017) on behalf of Appellant in the matter of *Patricia Ann Troiano (Appellant) v. Upper Burrell Township Zoning Hearing Board (Appellee)*, Court of Common Pleas of Westmoreland County, Pennsylvania, Civil Division.

111. Expert Report (October 2017), Supplemental Expert Report (October 2017), and Rebuttal Expert Report (November 2017) on behalf of Defendant in the matter of *Oakland Bulk and Oversized Terminal (Plaintiff) v City of Oakland (Defendant,)* Civil Action No. 3:16-cv-07014-VC (US District Court for the Northern District of California, San Francisco Division).

112. Declaration (December 2017) on behalf of the Environmental Integrity Project in the matter of permit issuance for ATI Flat Rolled Products Holdings, Breckenridge, PA to the Allegheny County Health Department.

113. Expert Report (Harm Phase) (January 2018), Rebuttal Expert Report (Harm Phase) (May 2018) and Supplemental Expert Report (Harm Phase) (April 2019) on behalf of Plaintiffs in the matter of *Natural Resources Defense Council, Inc., Sierra Club, Inc., and Respiratory Health Association v. Illinois Power Resources LLC, and Illinois Power Resources Generating LLC (Defendants)*, Civil Action No. 1:13-cv-01181 (US District Court for the Central District of Illinois, Peoria Division).

114. Declaration (February 2018) on behalf of the Chesapeake Bay Foundation, et. al., in the matter of the Section 126 Petition filed by the state of Maryland in *State of Maryland v. Pruitt (Defendant)*, Civil Action No. JKB-17-2939 (Consolidated with No. JKB-17-2873) (US District Court for the District of Maryland).

115. Direct Pre-filed Testimony (March 2018) on behalf of the National Parks Conservation Association (NPCA) in the matter of *NPCA v State of Washington, Department of Ecology and BP West Coast Products, LLC*, PCHB No. 17-055 (Pollution Control Hearings Board for the State of Washington.

116. Expert Affidavit (April 2018) and Second Expert Affidavit (May 2018) on behalf of Petitioners in the matter of *Coosa River Basin Initiative and Sierra Club (Petitioners) v State of Georgia Environmental Protection Division, Georgia Department of Natural Resources (Respondent) and Georgia Power Company (Intervenor/Respondent)*, Docket Nos: 1825406-BNR-WW-57-Howells and 1826761-BNR-WW-57-Howells, Office of State Administrative Hearings, State of Georgia.

117. Direct Pre-filed Testimony and Affidavit (December 2018) on behalf of Sierra Club and Texas Campaign for the Environment (Appellants) in the contested case hearing before the Texas State Office of Administrative Hearings in Docket Nos. 582-18-4846, 582-18-4847 (Application of GCGV Asset Holding, LLC for Air Quality Permit Nos. 146425/PSDTX1518 and 146459/PSDTX1520 in San Patricio County, Texas).

118. Expert Report (February 2019) on behalf of Sierra Club in the State of Florida, Division of Administrative Hearings, Case No. 18-2124EPP, Tampa Electric Company Big Bend Unit 1 Modernization Project Power Plant Siting Application No. PA79-12-A2.

119. Declaration (March 2019) on behalf of Earthjustice in the matter of comments on the renewal of the Title V Federal Operating Permit for Valero Houston refinery.

120. Expert Report (March 2019) on behalf of Plaintiffs for Class Certification in the matter of *Resendez et al v Precision Castparts Corporation* in the Circuit Court for the State of Oregon, County of Multnomah, Case No. 16cv16164.

121. Expert Report (June 2019), Affidavit (July 2019) and Rebuttal Expert Report (September 2019) on behalf of Appellants relating to the NPDES permit for the Cheswick power plant in the matter of *Three Rivers Waterkeeper and Sierra Club (Appellees) v. State of Pennsylvania Department of Environmental Protection (Appellee) and NRG Power Midwest (Permittee)*, before the Commonwealth of Pennsylvania Environmental Hearing Board, EHB Docket No. 2018-088-R.

122. Affidavit/Expert Report (August 2019) relating to the appeal of air permits issued to PTTGCA on behalf of Appellants in the matter of *Sierra Club (Appellants) v. Craig Butler, Director, et. al., Ohio EPA (Appellees)* before the State of Ohio Environmental Review Appeals Commission (ERAC), Case Nos. ERAC-19-6988 through -6991.

123. Expert Report (October 2019) relating to the appeal of air permit (Plan Approval) on behalf of Appellants in the matter of *Clean Air Council and Environmental Integrity Project (Appellants) v. Commonwealth of Pennsylvania Department of Environmental Protection and Sunoco Partners Marketing and Terminals L.P.*, before the Commonwealth of Pennsylvania Environmental Hearing Board, EHB Docket No. 2018-057-L.

124. Expert Report (December 2019), Affidavit (March 2020), and Supplemental Expert Report (July 2020) on behalf of Earthjustice in the matter of *Objection to the Issuance of PSD/NSR and Title V permits for Riverview Energy Corporation*, Dale, Indiana, before the Indiana Office of Environmental Adjudication, Cause No. 19-A-J-5073.

125. Affidavit (December 2019) on behalf of Plaintiff-Intervenor (Surfrider Foundation) in the matter of *United States and the State of Indiana (Plaintiffs), Surfrider Foundation (Plaintiff-Intervenor), and City of Chicago (Plaintiff-Intervenor) v. United States Steel Corporation (Defendant),* Civil Action No. 2:18-cv-00127 (US District Court for the Northern District of Indiana, Hammond Division).

126. Declarations (January 2020, February 2020, May 2020, July 2020, and August 2020) in support of Petitioner's Motion for Stay of PSCAA NOC Order of Approval No. 11386 in the matter of the *Puyallup Tribe of Indians v. Puget Sound Clean Air Agency (PSCAA) and Puget Sound Energy (PSE),* before the State of Washington Pollution Control Hearings Board, PCHB No. P19-088.

127. Expert Report (April 2020) on behalf of the plaintiff in the matter of Orion Engineered Carbons, GmbH (Plaintiff) vs. Evonik Operations, GmbH (formerly Evonik Degussa GmbH) (Respondent), before the German Arbitration Institute, Case No. DIS-SV-2019-00216.

128. Expert Independent Evaluation Report (June 2020) for *PacifiCorp's Decommissioning Costs Study Reports dated January 15, 2020 and March 13, 2020 relating to the closures of the Hunter, Huntington, Dave Johnston, Jim Bridger, Naughton, Wyodak, Hayden, and Colstrip (Units 3&4) plants*, prepared for the Oregon Public Utility Commission (Oregon PUC).

129. Direct Pre-filed Testimony (July 2020) on behalf of the Sierra Club in the matter of *the Application of the Ohio State University for a certificate of Environmental Compatibility and Public Need to Construct a Combined Heat and Power Facility in Franklin County, Ohio*, before the Ohio Power Siting Board, Case No. 19-1641-EL-BGN.

130. Expert Report (August 2020) and Rebuttal Expert Report (September 2020) on behalf of WildEarth Guardians (petitioners) in the matter of *the Appeals of the Air Quality Permit No. 7482-M1 Issued to 3 Bear Delaware Operating – NM LLC (EIB No. 20-21(A) and Registrations Nos. 8729, 8730, and 8733 under General Construction Permit for Oil and Gas Facilities (EIB No. 20-33 (A)*, before the State of New Mexico, Environmental Improvement Board.

131. Expert Report (July 2020) on the *Initial Economic Impact Analysis (EIA) for A Proposal To* Regulate *NOx Emissions from Natural Gas Fired Rich-Burn Natural Gas Reciprocating Internal Combustion Engines (RICE) Greater Than 100 Horsepower* prepared on behalf of Earthjustice and the National Parks Conservation Association in the matter of Regulation Number 7, Alternate Rules before the Colorado Air Quality Control Commission.

132. Expert Report (August 2020) and Supplemental Expert Report (February 2021) on the Potential Remedies to Avoid Adverse Thermal Impacts from the Merrimack Station on behalf of Plaintiffs in the matter of *Sierra Club Inc. and the* Conservation *Law Foundation (Plaintiffs) v. Granite Shore Power, LLC et. al., (Defendants)*, Civil Action No. 19-cv-216-JL (US District Court for the District of New Hampshire.)

133. Expert Report (August 2020) and Supplemental Expert Report (December 2020) on behalf of Plaintiffs in the matter of *PennEnvironment Inc., and Clean Air Council (Plaintiffs) and Allegheny County Health Department (Plaintiff-Intervenor) v. United States Steel Corporation (Defendant)*, Civil Action No. 2-19-cv-00484-MJH (US District Court for the Western District of Pennsylvania.)

134. Pre-filed Direct Testimony (October 2020) and Sur-rebuttal Testimony (November 2020) on behalf of petitioners (Ten Persons Group, including citizens, the Town of Braintree, the Town of Hingham, and the City of Quincy) in the matter of Algonquin Gas Transmission LLC, Weymouth MA, No. X266786 Air Quality Plan Approval, before the Commonwealth of Massachusetts, Department of Environmental Protection, the Office of Appeals and Dispute Resolution, OADR Docket Nos. 2019-008, 2019-009, 2019010, 2019-011, 2019-012 and 2019-013.

135. Expert Report (November 2020) on behalf of Protect PT in the matter of *Protect PT v. Commonwealth of Pennsylvania Department of Environmental Protection and Apex Energy (PA) LLC*, before the Commonwealth of Pennsylvania Environmental Hearing Board, Docket No. 2018-080-R (consolidated with 2019-101-R)(the "Drakulic Appeal").

136. Expert Report (December 2020) on behalf of Plaintiffs in the matter of *Sierra Club Inc. (Plaintiff) v. GenOn Power Midwest LP (Defendants)*, Civil Action No. 2-19-cv-01284-WSS (US District Court for the Western District of Pennsylvania.)

137. Pre-filed Testimony (January 2021) on behalf of the Plaintiffs (Shrimpers and Fishermen of the Rio Grande Valley represented by Texas RioGrande Legal Aid, Inc.) in the matter of the Appeal of Texas Commission on Environmental Quality (TCEQ) Permit Nos. 147681, PSDTX1522, GHGPSDTX172 for the Jupiter Brownsville Heavy Condensate Upgrader Facility, Cameron County, before the Texas State Office of Administrative Hearings, SOAH Docket No. 582-21-0111, TCEQ Docket No. 2020-1080-AIR.

C. Occasions where Dr. Sahu has provided oral testimony <u>in depositions, at trial or in similar proceedings</u> include the following:

138. Deposition on behalf of Rocky Mountain Steel Mills, Inc. located in Pueblo, Colorado – dealing with the manufacture of steel in mini-mills including methods of air pollution control and BACT in steel mini-mills and opacity issues at this steel mini-mill.

139. Trial Testimony (February 2002) on behalf of Rocky Mountain Steel Mills, Inc. in Denver District Court.

140. Trial Testimony (February 2003) on behalf of the United States in the Ohio Edison NSR Cases, *United States, et al. v. Ohio Edison Co., et al.*, C2-99-1181 (Southern District of Ohio).

141. Trial Testimony (June 2003) on behalf of the United States in the Illinois Power NSR Case, *United States v. Illinois Power Co., et al.*, 99-833-MJR (Southern District of Illinois).

142. Deposition (10/20/2005) on behalf of the United States in connection with the Cinergy NSR Case. *United States, et* al. *v. Cinergy Corp., et al.*, IP 99-1693-C-M/S (Southern District of Indiana).

143. Oral Testimony (August 2006) on behalf of the Appalachian Center for the Economy and the Environment re. the Western Greenbrier plant, WV before the West Virginia DEP.

144. Oral Testimony (May 2007) on behalf of various Montana petitioners (Citizens Awareness Network (CAN), Women's Voices for the Earth (WVE) and the Clark Fork Coalition (CFC)) re. the Thompson River Cogeneration plant before the Montana Board of Environmental Review.

145. Oral Testimony (October 2007) on behalf of the Sierra Club re. the Sevier Power Plant before the Utah Air Quality Board.

146. Oral Testimony (August 2008) on behalf of the Sierra Club and Clean Water re. Big Stone Unit II before the South Dakota Board of Minerals and the Environment.

147. Oral Testimony (February 2009) on behalf of the Sierra Club and the Southern Environmental Law Center re. Santee Cooper Pee Dee units before the South Carolina Board of Health and Environmental Control.

148. Oral Testimony (February 2009) on behalf of the Sierra Club and the Environmental Integrity Project re. NRG Limestone Unit 3 before the Texas State Office of Administrative Hearings (SOAH) Administrative Law Judges.

149. Deposition (July 2009) on behalf of MTD Products, Inc., in the matter of *Alice Holmes and Vernon Holmes v. Home Depot USA, Inc., et al*.

150. Deposition (October 2009) on behalf of Environmental Defense and others, in the matter of challenges to the proposed Coleto Creek coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).

151. Deposition (October 2009) on behalf of Environmental Defense, in the matter of permit challenges to the proposed Las Brisas coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).

152. Deposition (October 2009) on behalf of the Sierra Club, in the matter of challenges to the proposed Medicine Bow Fuel and Power IGL plant in Cheyenne, Wyoming.

153. Deposition (October 2009) on behalf of Environmental Defense and others, in the matter of challenges to the proposed Tenaska coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH). (April 2010).

154. Oral Testimony (November 2009) on behalf of the Environmental Defense Fund re. the Las Brisas Energy Center before the Texas State Office of Administrative Hearings (SOAH) Administrative Law Judges.

155. Deposition (December 2009) on behalf of Environmental Defense and others, in the matter of challenges to the proposed White Stallion Energy Center coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).

156. Oral Testimony (February 2010) on behalf of the Environmental Defense Fund re. the White Stallion Energy Center before the Texas State Office of Administrative Hearings (SOAH) Administrative Law Judges.

157. Deposition (June 2010) on behalf of the United States in connection with the Alabama Power Company NSR Case. *United States v. Alabama Power Company*, CV-01-HS-152-S (Northern District of Alabama, Southern Division).

158. Trial Testimony (September 2010) on behalf of Commonwealth of Pennsylvania – Dept. of Environmental Protection, State of Connecticut, State of New York, State of Maryland, and State of New Jersey (Plaintiffs) in connection with the Allegheny Energy NSR Case in US District Court in the Western District of Pennsylvania. *Plaintiffs v. Allegheny Energy Inc., et al.,* 2:05cv0885 (Western District of Pennsylvania).

159. Oral Direct and Rebuttal Testimony (September 2010) on behalf of Fall-Line Alliance for a Clean Environment and others in the matter of the PSD Air Permit for Plant Washington issued by Georgia DNR at the Office of State Administrative Hearing, State of Georgia (OSAH-BNR-AQ-1031707-98-WALKER).

160. Oral Testimony (September 2010) on behalf of the State of New Mexico Environment Department in the matter of Proposed Regulation 20.2.350 NMAC – *Greenhouse Gas Cap and Trade Provisions,* No. EIB 10-04 (R), to the State of New Mexico, Environmental Improvement Board.

161. Oral Testimony (October 2010) on behalf of the Environmental Defense Fund re. the Las Brisas Energy Center before the Texas State Office of Administrative Hearings (SOAH) Administrative Law Judges.

162. Oral Testimony (November 2010) regarding BART for PSCo Hayden, CSU Martin Drake units before the Colorado Air Quality Commission on behalf of the Coalition of Environmental Organizations.

163. Oral Testimony (December 2010) regarding BART for TriState Craig Units, CSU Nixon Unit, and PRPA Rawhide Unit) before the Colorado Air Quality Commission on behalf of the Coalition of Environmental Organizations.

164. Deposition (December 2010) on behalf of the United States in connection with the Louisiana Generating NSR Case. *United States v. Louisiana Generating, LLC*, 09-CV100-RET-CN (Middle District of Louisiana).

165. Deposition (February 2011 and January 2012) on behalf of Wild Earth Guardians in the matter of opacity exceedances and monitor downtime at the Public Service Company of Colorado (Xcel)'s Cherokee power plant. No. 09-cv-1862 (D. Colo.).

166. Oral Testimony (February 2011) to the Georgia Office of State Administrative Hearings (OSAH) in the matter of Minor Source HAPs status for the proposed Longleaf Energy Associates power plant (OSAH-BNR-AQ-1115157-60-HOWELLS) on behalf of the Friends of the Chattahoochee and the Sierra Club).

167. Deposition (August 2011) on behalf of the United States in *United States of America v. Cemex, Inc.*, Civil Action No. 09-cv-00019-MSK-MEH (District of Colorado).

168. Deposition (July 2011) and Oral Testimony at Hearing (February 2012) on behalf of the Plaintiffs MYTAPN in the matter of Microsoft-Yes, Toxic Air Pollution-No (MYTAPN) v. State of Washington, Department of Ecology and Microsoft Corporation Columbia Data Center to the Pollution Control Hearings Board, State of Washington, Matter No. PCHB No. 10-162.

169. Oral Testimony at Hearing (March 2012) on behalf of the United States in connection with the Louisiana Generating NSR Case. *United States v. Louisiana Generating, LLC*, 09-CV100-RET-CN (Middle District of Louisiana).

170. Oral Testimony at Hearing (April 2012) on behalf of the New Hampshire Sierra Club at the State of New Hampshire Public Utilities Commission, Docket No. 10-261 – the 2010 Least Cost Integrated Resource Plan (LCIRP) submitted by the Public Service Company of New Hampshire (re. Merrimack Station Units 1 and 2).

171. Oral Testimony at Hearing (November 2012) on behalf of Clean Wisconsin in the matter of Application of Wisconsin Public Service Corporation for Authority to Construct and Place in Operation a New Multi-Pollutant Control Technology System (ReACT) for Unit 3 of the Weston Generating Station, before the Public Service Commission of Wisconsin, Docket No. 6690-CE-197.

172. Deposition (March 2013) in the matter of various Environmental Petitioners v. North Carolina DENR/DAQ and Carolinas Cement Company, before the Office of Administrative Hearings, State of North Carolina.

173. Deposition (August 2013) on behalf of the Sierra Club in connection with the Luminant Big Brown Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 6:12-cv-00108-WSS (Western District of Texas, Waco Division).

174. Deposition (August 2013) on behalf of the Sierra Club in connection with the Luminant Martin Lake Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 5:10-cv-0156-MHS-CMC (Eastern District of Texas, Texarkana Division).

175. Deposition (February 2014) on behalf of the United States in *United States of America v. Ameren Missouri*, Civil Action No. 4:11-cv-00077-RWS (Eastern District of Missouri, Eastern Division).

176. Trial Testimony (February 2014) in the matter of *Environment Texas Citizen Lobby, Inc and Sierra Club v. ExxonMobil Corporation et al.,* Civil Action No. 4:10-cv-4969 (Southern District of Texas, Houston Division).

177. Trial Testimony (February 2014) on behalf of the Sierra Club in connection with the Luminant Big Brown Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 6:12-cv-00108-WSS (Western District of Texas, Waco Division).

178. Deposition (June 2014) and Trial (August 2014) on behalf of ECM Biofilms in the matter of the *US Federal Trade Commission (FTC) v. ECM Biofilms* (FTC Docket #9358).

179. Deposition (February 2015) on behalf of Plaintiffs in the matter of *Sierra Club and Montana Environmental Information Center (Plaintiffs) v. PPL Montana LLC, Avista Corporation, Puget Sound Energy, Portland General Electric Company, Northwestern Corporation, and Pacificorp (Defendants)*, Civil Action No. CV 13-32-BLG-DLC-JCL (US District Court for the District of Montana, Billings Division).

180. Oral Testimony at Hearing (April 2015) on behalf of Niagara County, the Town of Lewiston, and the Villages of Lewiston and Youngstown in the matter of CWM Chemical Services, LLC New York State Department of Environmental Conservation (NYSDEC) Permit Application Nos.: 9-2934-00022/00225, 9-2934-00022/00231, 9-2934-00022/00232, and 9-2934-00022/00249 (pending).

181. Deposition (August 2015) on behalf of Plaintiff in the matter of *Conservation Law Foundation (Plaintiff) v. Broadrock Gas Services LLC, Rhode Island LFG GENCO LLC, and Rhode Island Resource Recovery Corporation (Defendants)*, Civil Action No. 1:13-cv-00777-M-PAS (US District Court for the District of Rhode Island).

182. Testimony at Hearing (August 2015) on behalf of the Sierra Club in the matter of *Amendments to 35 Illinois Administrative Code Parts 214, 217, and 225* before the Illinois Pollution Control Board, R15-21.

183. Deposition (May 2015) on behalf of Plaintiffs in the matter of *Northwest Environmental Defense Center et. al., (Plaintiffs) v. Cascade Kelly Holdings LLC, d/b/a Columbia Pacific Bio-Refinery, and Global Partners LP (Defendants)*, Civil Action No. 3:14-cv-01059-SI (US District Court for the District of Oregon, Portland Division).

184. Trial Testimony (October 2015) on behalf of Plaintiffs in the matter of *Northwest Environmental Defense Center et. al., (Plaintiffs) v. Cascade Kelly Holdings LLC, d/b/a Columbia Pacific Bio-Refinery, and Global Partners LP (Defendants)*, Civil Action No. 3:14-cv-01059-SI (US District Court for the District of Oregon, Portland Division).

185. Deposition (April 2016) on behalf of the Plaintiffs in *UNatural Resources Defense Council, Respiratory Health Association, and Sierra Club (Plaintiffs) v. Illinois Power Resources LLC and Illinois Power Resources Generation LLC (Defendants)*, Civil Action No. 1:13-cv-01181 (Central District of Illinois, Peoria Division).

186. Trial Testimony at Hearing (July 2016) in the matter of Tesoro Savage LLC Vancouver Energy Distribution Terminal, Case No. 15-001 before the State of Washington Energy Facility Site Evaluation Council.

187. Trial Testimony (December 2016) on behalf of the challengers in the matter of the Delaware Riverkeeper Network, Clean Air Council, et. al., vs. Commonwealth of Pennsylvania Department of Environmental Protection and R. E. Gas Development LLC regarding the Geyer well site before the Pennsylvania Environmental Hearing Board.

188. Trial Testimony (July-August 2016) on behalf of the United States in *United States of America v. Ameren Missouri*, Civil Action No. 4:11-cv-00077-RWS (Eastern District of Missouri, Eastern Division).

189. Trial Testimony (January 2017) on the Environmental Impacts Analysis associated with the Huntley and Huntley Poseidon Well Pad Hearing on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

190. Trial Testimony (January 2017) on the Environmental Impacts Analysis associated with the Apex energy Backus Well Pad Hearing on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

191. Trial Testimony (January 2017) on the Environmental Impacts Analysis associated with the Apex energy Drakulic Well Pad Hearing on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

192. Trial Testimony (January 2017) on the Environmental Impacts Analysis associated with the Apex energy Deutsch Well Pad Hearing on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

193. Deposition Testimony (July 2017) on behalf of Plaintiffs in the matter of *Casey Voight and Julie Voight v Coyote Creek Mining Company LLC (Defendant)* Civil Action No. 1:15-CV-00109 (US District Court for the District of North Dakota, Western Division).

194. Deposition Testimony (November 2017) on behalf of Defendant in the matter of *Oakland Bulk and Oversized Terminal (Plaintiff) v City of Oakland (Defendant,)* Civil Action No. 3:16-cv-07014-VC (US District Court for the Northern District of California, San Francisco Division).

195. Deposition Testimony (December 2017) on behalf of Plaintiff in the matter of *Wildearth Guardians (Plaintiff) v Colorado Springs Utility Board (Defendant)* Civil Action No. 1:15-cv-00357-CMA-CBS (US District Court for the District of Colorado).

196. Deposition Testimony (January 2018) in the matter of National Parks Conservation Association (NPCA) v. State of Washington Department of Ecology and British Petroleum (BP) before the Washington Pollution Control Hearing Board, Case No. 17-055.

197. Trial Testimony (January 2018) on behalf of Defendant in the matter of *Oakland Bulk and Oversized Terminal (Plaintiff) v City of Oakland (Defendant,)* Civil Action No. 3:16-cv-07014-VC (US District Court for the Northern District of California, San Francisco Division).

198. Trial Testimony (April 2018) on behalf of the National Parks Conservation Association (NPCA) in the matter of NPCA v State of Washington, Department of Ecology and BP West Coast Products, LLC, PCHB No. 17-055 (Pollution Control Hearings Board for the State of Washington.

199. Deposition (June 2018) (harm Phase) on behalf of Plaintiffs in the matter of *Natural Resources Defense Council, Inc., Sierra Club, Inc., and Respiratory Health Association v. Illinois Power Resources LLC, and Illinois Power Resources Generating LLC (Defendants)*, Civil Action No. 1:13-cv-01181 (US District Court for the Central District of Illinois, Peoria Division).

200. Trial Testimony (July 2018) on behalf of Petitioners in the matter of *Coosa River Basin Initiative and Sierra Club (Petitioners) v State of Georgia Environmental Protection Division, Georgia Department of Natural Resources (Respondent) and Georgia Power Company (Intervenor/Respondent)*, Docket Nos: 1825406-BNR-WW-57-Howells and 1826761-BNR-WW-57-Howells, Office of State Administrative Hearings, State of Georgia.

201. Deposition (January 2019) and Trial Testimony (January 2019) on behalf of Sierra Club and Texas Campaign for the Environment (Appellants) in the contested case hearing before the Texas State Office of Administrative Hearings in Docket Nos. 582-18-4846, 582-18-4847 (Application of GCGV Asset Holding, LLC for Air Quality Permit Nos. 146425/PSDTX1518 and 146459/PSDTX1520 in San Patricio County, Texas).

202. Deposition (February 2019) and Trial Testimony (March 2019) on behalf of Sierra Club in the State of Florida, Division of Administrative Hearings, Case No. 18-2124EPP, Tampa Electric Company Big Bend Unit 1 Modernization Project Power Plant Siting Application No. PA79-12-A2.

203. Deposition (June 2019) relating to the appeal of air permits issued to PTTGCA on behalf of Appellants in the matter of *Sierra Club (Appellants) v. Craig Butler, Director, et. al., Ohio EPA (Appellees)* before the State of Ohio Environmental Review Appeals Commission (ERAC), Case Nos. ERAC-19-6988 through -6991.

204. Deposition (September 2019) on behalf of Appellants relating to the NPDES permit for the Cheswick power plant in the matter of *Three Rivers Waterkeeper and Sierra Club (Appellees) v. State of Pennsylvania Department of Environmental Protection (Appellee) and NRG Power Midwest (Permittee)*, before the Commonwealth of Pennsylvania Environmental Hearing Board, EHB Docket No. 2018-088-R.

205. Deposition (December 2019) on behalf of the Plaintiffs in the matter of David Kovac, individually and on behalf of wrongful death class of Irene Kovac v. BP Corporation North America Inc., Circuit Court of Jackson County, Missouri (Independence), Case No. 1816-CV12417.

206. Deposition (February 2020) and testimony at Hearing (August 2020, virtual) on behalf of Earthjustice in the matter of *Objection to the Issuance of PSD/NSR and Title V permits for Riverview Energy Corporation*, Dale, Indiana, before the Indiana Office of Environmental Adjudication, Cause No. 19-A-J-5073.

207. Hearing (July 14-15, 2020, virtual) on behalf of the Sierra Club in the matter of *the Application of the Ohio State University for a certificate of Environmental Compatibility and Public Need to Construct a Combined Heat and Power Facility in Franklin County, Ohio*, before the Ohio Power Siting Board, Case No. 19-1641-EL-BGN.

208. Hearing (September 2020, virtual) on behalf of WildEarth Guardians (petitioners) in the matter of *the Appeals of the Air Quality Permit No. 7482-M1 Issued to 3 Bear Delaware* Operating *– NM LLC (EIB No. 20-21(A)*

and Registrations Nos. 8729, 8730, and 8733 under General Construction Permit for Oil and Gas Facilities (EIB No. 20-33 (A), before the State of New Mexico, Environmental Improvement Board.

209. Deposition (December 2020, March 4-5, 2021, all virtual) in support of Petitioner's Motion for Stay of PSCAA NOC Order of Approval No. 11386 in the matter of the *Puyallup Tribe of Indians v. Puget Sound Clean Air Agency (PSCAA) and Puget Sound Energy (PSE),* before the State of Washington Pollution Control Hearings Board, PCHB No. P19-088.

210. Hearing (September 2020, virtual) on the *Initial Economic Impact Analysis (EIA) for A Proposal To* Regulate *NOx Emissions from Natural Gas Fired Rich-Burn Natural Gas Reciprocating Internal Combustion Engines (RICE) Greater Than 100 Horsepower* prepared on behalf of Earthjustice and the National Parks Conservation Association in the matter of Regulation Number 7, Alternate Rules before the Colorado Air Quality Control Commission.

211. Deposition (December 2020, virtual and Hearing February 2021, virtual) on behalf of the Plaintiffs (Shrimpers and Fishermen of the Rio Grande Valley represented by Texas RioGrande Legal Aid, Inc.) in the matter of the Appeal of Texas Commission on Environmental Quality (TCEQ) Permit Nos. 147681, PSDTX1522, GHGPSDTX172 for the Jupiter Brownsville Heavy Condensate Upgrader Facility, Cameron County, before the Texas State Office of Administrative Hearings, SOAH Docket No. 582-21-0111, TCEQ Docket No. 2020-1080-AIR.

212. Deposition (January 2021, virtual) on behalf of Plaintiffs in the matter of *PennEnvironment Inc., and Clean Air Council (Plaintiffs) and Allegheny County Health Department (Plaintiff-Intervenor) v. United States Steel Corporation (Defendant)*, Civil Action No. 2-19-cv-00484-MJH (US District Court for the Western District of Pennsylvania.)

213. Deposition (February 2021) on behalf of Plaintiffs in the matter of *Sierra Club Inc. (Plaintiff) v. GenOn Power Midwest LP (*Defendants*)*, Civil Action No. 2-19-cv-01284-WSS (US District Court for the Western District of Pennsylvania.)

Attachment B – EPA Enforcement Alert

EPA United States Environmental Protection Agency
Office of Enforcement and Compliance Assurance

Enforcement Alert

Publication no. EPA 325-N-20-001 November 2020

EPA Reminder About Inappropriate Use of AP-42 Emission Factors

Purpose

This purpose of this Enforcement Alert is to remind permitting agencies, consultants, and regulated entities that improperly using AP-42 emission factors can be costly to their businesses, inefficient, and in some circumstances, can subject regulated entities to enforcement and penalties. The Environmental Protection Agency (EPA) is concerned that some permitting agencies, consultants, and regulated entities may incorrectly be using AP-42 emission factors in place of more representative source-specific emission values for Clean Air Act permitting and compliance demonstration purposes.

Consequences of Using AP-42 Factors

Permitting agencies, consultants, and regulated entities should be aware that even emission factors with more highly rated AP-42 grades of "A" or "B" are only based on averages of data from multiple, albeit similar, sources (*See* the Attachment for an overview of the history of AP-42 emission factors and the AP-42 emission factor rating system). Accordingly, these factors are not likely to be accurate predictors of emissions from any one specific source, except in very limited scenarios. While emission factors are helpful in making emission estimates for area-wide inventories for specific source types, AP-42 provides the following warning:

> "Use of these factors as source-specific permit limits and/or as emission regulation compliance determinations is not recommended by EPA. Because emission factors essentially represent an average of a range of emission rates, approximately half of the subject sources will have emission rates greater than the emission factor and the other half will have emission rates less than the factor. As such, a permit limit using an AP-42 emission factor would result in half of the sources being in noncompliance."[1]

With the advent of 1-hour and short-term National Ambient Air Quality Standards (NAAQS), permit limits must be able to account for short term fluctuations. AP-42 emission factors also do not account for short term variation in emissions as the emission factors are intended for use in developing area-wide annual or triannual inventories. In developing emission factors, test data are typically taken from normal operating conditions and generally avoid conditions that can cause short-term fluctuations in emissions. These short-term fluctuations in emissions can stem from variations in process conditions, control device conditions, raw materials, ambient conditions, or other similar factors. This means that if facilities use AP-42 emission factors as permit limits, facilities increase their chances of violating their short-term permit limits. It also increases the likelihood of a geographic area's non-compliance with the NAAQS.

DISCLAIMER: This document aims to explain the application of certain EPA regulatory provisions using plain language. Nothing in this Alert revises or replaces any regulatory provisions, any other part of the Code of Federal Regulations, the Federal Register, or the Clean Air Act. Following the approaches for determining a single storage vessel's potential for VOC emissions and attempting to comply with the closed vent system requirements as discussed in this Alert do not equate to or guarantee compliance with the Clean Air Act, its implementing regulations, and associated state/local requirements. For more information, visit: www.epa.gov/compliance.

[1] AP-42, Fifth Edition Compilation of Air Pollutant Emissions Factors, Volume 1: Stationary Point and Area Sources. Introduction, p. 2 (emphasis added).

It is also important to understand that there is a great deal of variability in the emissions data that are used to generate the emission factors. This variability is not necessarily reflected in the emission factor. AP-42 describes this as follows:

> "The extent of between-source variability that exists, even among similar individual sources, can be large depending on process, control system, and pollutant. Although the causes of this variability are considered in emission factor development, this type of information is seldom included in emission test reports used to develop AP-42 factors. As a result, some emission factors are derived from tests that may vary by an order of magnitude or more. Even when the major process variables are accounted for, the emission factors developed may be the result of averaging source tests that differ by factors of five or more."[2]

In addition to potential permit noncompliance, or increased risk of area noncompliance with the NAAQS, using an emission factor as an emission limit could have monetary implications for an individual source or permitting agency. For example, many permitting agencies collect permitting fees based on the amount of pollution emitted. If a facility uses an emission factor to estimate and report emissions, but the actual emission rate is lower than the emission factor, then the facility will report more emissions and consequently pay more in fees. On the other hand, if a facility emits at a rate above the emission factor, not only is the source violating its permit limit and the Clean Air Act, it is also not paying the appropriate amount in fees.

Another potential monetary implication for facilities is an enforcement action assessing penalties for violating the Clean Air Act. As described in a 2006 report issued by the EPA Inspector General:

> "…according to EPA enforcement records, three industries – petroleum refineries, wood products, and ethanol production – operated with insufficient control equipment primarily because emission limits were significantly underestimated due to the emission factors used. EPA, through separate enforcement actions, required companies in these industries to install additional emission controls, resulting in the combined reduction of over 1,000,000 tons of pollutants."[3]

For example, the EPA Inspector General's 2006 report documented an EPA investigation in the Wood Products industry that found a nationwide pattern of Clean Air Act violations by one company. EPA found that the company had used an AP-42 emission factor designated as "poor" for volatile organic compound (VOC) emissions that resulted in the company underestimating such emissions and claiming that its facilities were not subject to permitting requirements. To resolve the violations, the company entered into a consent decree with the United States, which required the company to pay a civil penalty of $1.1 million and to install air pollution control equipment at a cost of $70 million.[4]

One example of a present-day concern is the use of a default vapor pressure value for estimating VOC emissions from heated tanks that store heavy refinery liquids such as No. 6 fuel oil. The true vapor pressure (TVP) of a stored liquid is important when calculating the emissions from tanks using the equations in AP-42, Chapter 7, Liquid Storage Tanks. The default vapor pressure is only an estimate and may not be correct for every blend of No. 6 fuel oil. Direct emissions testing of No. 6 fuel oil tanks and TVP testing in 2012 and 2013, suggested that in those cases the use of the default vapor pressure in AP-42 had resulted in emissions estimates that were understated by a factor of 100 for permitting and reporting purposes. Reliance on the default vapor pressure in AP-42 and the resulting emission factors, instead of directly measuring VOC emissions and vapor pressure, can be very costly for businesses as shown by two recently concluded cases, summarized in the following two boxes.

[2] AP-42, Fifth Edition Compilation of Air Pollutant Emissions Factors, Volume 1: Stationary Point and Area Sources. Introduction, p. 3 (emphasis added).
[3] U.S. EPA Office of Inspector General, *EPA Can Improve Emissions Factors Development and Management*, Report No. 2006-P-00017, March 22, 2006.
[4] Id.

Sprague Resources LP operates heated asphalt and No. 6 fuel oil storage tanks at seven facilities across New England. Applying VOC testing results rather than AP-42 estimates, EPA found that Sprague had unpermitted facilities that required permits, and also had facilities with permits that failed to fully account for VOC emissions. Sprague entered into a settlement with the United States and the Commonwealth of Massachusetts that required the company to pay $350,000 civil penalties, obtain revised state air pollution control permits, limit the amount of asphalt and No. 6 fuel oil stored in and passed through the tanks at six facilities, and provide odor controls on tanks at two facilities.

Global Partners LP operates heated asphalt and No. 6 fuel oil storage tanks at a facility in South Portland, Maine. Applying VOC testing results rather than AP-42 estimates, EPA found that Global's permit failed to fully account for VOC emissions. Global entered into a settlement with the United States that required the company to obtain a revised state air pollution control permit, limit the amount of asphalt and No. 6 fuel oil stored in and passed through the tanks at the facility, install odor controls on tanks, pay a $40,000 penalty, and invest $150,000 in a local wood-stove replacement project.

Regulated entities of any size who voluntarily discover, promptly disclose, expeditiously correct, and take steps to prevent recurrence of potential violations may be eligible for a reduction or elimination of any civil penalties that otherwise might apply. Most violations can be disclosed and processed via EPA's automated online "eDisclosure" system (seehttps://www.epa.gov/compliance/epas-edisclosure). To learn more about the EPA's violation disclosure policies, including conditions for eligibility, please review EPA's Audit Policy website at https://www.epa.gov/compliance/epas-audit-policy. Many states also offer incentives for self-policing; please check with the appropriate state agency for more information.

What Can Be Done?

Consultants and facility owners/operators should obtain and use the most representative emissions data, which in many cases may be source-specific emissions data, when determining applicability, applying for a permit, or demonstrating compliance with permit limits.

Various EPA publications (e.g., https://www.epa.gov/emc) describe the benefits and limitations of different ways to quantify source-specific emissions. These techniques in order of accuracy are:

- **Continuous Emissions Monitoring System (CEMS)** – CEMs offers a highly accurate source-specific method that continuously monitors the emissions coming out of a particular stack; however, although the accuracy of this method is high, the cost is also the highest at $20,000-$50,000 per year.
- **Stack Testing** – Like a CEMS, source-specific data are generated at a particular stack but emissions are only measured for a specific time, typically for a few hours during normal operations. Costs for stack testing typically run $20,000, but testing may only be necessary every 2 to 5 years.
- **Vendor Guarantees and Stack Test Data from Similar Facilities** – If representative source-specific data cannot be obtained, emissions information from equipment vendors, particularly emission performance guarantees or actual test data from similar equipment, is a better source of information for permitting decisions than an AP-42 emission factor.
- **Material Balance Calculations** – While the material balance calculations are not generally considered as accurate as direct measurements, they may provide more reliable average emission estimates for certain sources where a high percentage of material is lost to the atmosphere (e.g., solvent VOC emissions). The costs for recordkeeping are approximately $2,000-$10,000 per year. This method works well for materials and processes that are well understood.
- **Optical Remote Sensing** – Measurement techniques involving differential absorption light detection and ranging (known as DIAL) and solar occultation flux or SOF can be used to measure emissions from sources such as coke ovens, storage tanks, wastewater treatment plants, and process units that are otherwise difficult to measure by other means. Measurement bias on the order of ±30 percent is expected but the data can be more accurate than engineering estimates or emission factors.
- **Emission Factors** – When source-specific emissions or other more reliable approaches are unavailable, AP-42 emission factors may be the only way to estimate emissions. Again, the limitations of the factor in accurately representing the facility's emissions and the environmental/financial risk of using the emission factor for a particular situation should be carefully considered. **Remember, AP-42 emission factors should only be used as a last resort. Even then the facility assumes all risk associated with their use!**

Attachment – History of AP-42

Before the EPA existed, the U.S. Public Health Service (PHS) published "A Compilation of Air Pollutant Emission Factors" in 1968.* The purpose of the report was to assist the various agencies responsible for compiling air pollution emission inventories for communities across the nation by providing them with relevant data. PHS recognized that measuring each individual source of air pollution in a particular airshed was impractical, and so, to simplify the airshed emission inventory process, while still maintaining a reasonably accurate inventory, PHS developed emission factors based on the technical literature and a limited number of source-specific tests. The resulting emission factors were simple averages of the rate at which pollutants were emitted from the burning or processing of a given quantity of material. In some cases, emission factors were based on only one or two data points.

* The PHS assigned the number 999-AP-42 to this publication. 999 was the series number, AP was an abbreviation for air pollution, and 42 was the document number. Thus, the origin of today's AP-42!

With the creation of the EPA, publication of the emission factors was continued with "Compilation of Air Pollutant Emission Factors, Second Edition," by the EPA Office of Air Quality Planning and Standards in 1973. The 3rd and 4th editions of AP-42 were released in 1977 and 1985. EPA published the most recent AP-42, the 5th edition in 1995[5], and has published multiple supplements and updates since. Currently, AP-42 contains more than 21,500 emission factors for over 200 air pollutants. Within AP-42, each emission factor is given a rating between "A" (excellent) and "E" (poor) (see Table 1 below). It is important to note that half of the emission factors are rated "D" or "E" and one-fifth are unrated. This means that less than one-third of the emission factors are rated between "Excellent" and "Average."

As we work to improve our ability to estimate emissions nationally, the grading in AP-42 helps us better understand the quality of the data. But even factors that are rated "A" or "B" are not designed to be used by a single source where other, more reliable, site-specific, data are available.

Table 1: Explanation of AP-42 Emission Factor Quality Ratings

Rating	Explanation
"A" – Excellent	Emission factor is developed from tests conducted with sound, or generally sound, methodology. Test data are from many randomly chosen facilities and the source category population is sufficiently specific to minimize variability. Data may, or may not, be reported in enough detail for adequate validation.
"B" – Above Average	Same as "A," but test data are from a "reasonable number" of facilities. Although no specific bias is evident, it's not clear if the facilities represent a random sample of the industry. The source category population is sufficiently specific to minimize variability.
"C" – Average	Same as "B," but the factor can be developed from an unproven or new methodology. Test data may be lacking a significant amount of background information. Although no specific bias is evident, it's not clear if the facilities tested represent a random sample of the industry. The source category population is specific enough to minimize variability.
"D" – Below Average	Same as "C," but test data are from a small number of facilities, and there may be reason to suspect the facilities do not represent a random sample of the industry. There may also be evidence of variability within the source population.
"E" – Poor	Factor is developed from: (1) tests based on an unproven or new methodology, or tests that may be lacking a significant amount of background information, or (2) tests based on a generally unacceptable method, but the method may provide an "order of magnitude" value for the source. Facilities tested may not represent a random sample of the industry and there is evidence of variability within the source category population.

[5] AP-42, Fifth Edition Compilation of Air Pollutant Emissions Factors, Volume 1: Stationary Point and Area Sources. Introduction, pp. 9-10.

EXHIBIT 1