# Port of Duluth-Superior

## Great Lakes Gateway, Great Lakes Risk

**~250 t**
criteria pollutants emitted at berth annually

**55K**
below-median-income residents in surrounding communities

**$8M+**
estimated annual public health cost of port emissions

**ZERO**
mandatory at-berth emissions controls

*Sources: ICCT Port Emissions Screening (2024); USACE Waterborne Commerce Statistics; EPA BenMAP methodology; U.S. Census ACS*

## Port Overview

The Port of Duluth-Superior is the largest port on the Great Lakes by tonnage, handling iron ore, coal, grain, limestone, and other bulk commodities across terminals on the western tip of Lake Superior. The port straddles the Minnesota-Wisconsin border, with facilities in both Duluth, MN and Superior, WI. Approximately 800–1,100 vessel visits move 35–46 million short tons of cargo through the port each year, with 90% of traffic consisting of domestic "Lakers" — Great Lakes freighters that ship goods among the upper four Great Lakes.

Eighty percent of the iron ore used in America's first-pour steelmaking comes from Minnesota's Mesabi Iron Range and moves through the Port of Duluth-Superior. The bulk commodity focus means vessels spend extended periods at berth during loading and unloading, running auxiliary diesel engines throughout — generating disproportionate at-berth emissions per vessel call relative to faster-turnaround container ports.

## Who Is Affected

Duluth and Superior are working-class communities with median household incomes below the national average. While the port's emissions footprint is smaller than larger coastal port complexes, it is concentrated in a compact metropolitan area of approximately 115,000 people — meaning a larger share of the population lives in close proximity to port terminal operations.

| Community | Population | Key Health Burden |
|---|---|---|
| Lincoln Park (Duluth) | 5,000+ | Low-income neighborhood adjacent to port industrial area |
| West Duluth | 8,000+ | Proximity to bulk cargo terminals and rail yards |
| Superior, WI waterfront | 10,000+ | Adjacent to port facilities, oil refinery, and rail operations |
| Morgan Park | 2,000+ | Historic industrial neighborhood; legacy contamination |
| Gary-New Duluth | 2,000+ | Downstream of port operations along St. Louis River |

**Environmental Justice**

Duluth's poverty rate is 16.8%, nearly double the national average. Port-adjacent neighborhoods in both Duluth and Superior include communities with limited access to healthcare and elevated vulnerability to environmental health stressors. The port's cross-state jurisdiction means residents on both sides of the Minnesota-Wisconsin border face vessel emissions, but regulatory authority is split between two state environmental agencies — the Minnesota Pollution Control Agency (MN PCA) and the Wisconsin Department of Natural Resources (WI DNR).[1]

## Health Impact Analysis

Using the ICCT's Port Emissions Screening data and the EPA's concentration-response methodology, we model the health outcomes attributable to at-berth vessel emissions and the benefits of their reduction.

The scenario below models outcomes using the performance of currently deployed, CARB-certified barge-mounted capture systems (99% PM2.5, 95% NOx removal — independently verified by Yorke Engineering LLC). The bulk commodity vessel profile at Duluth-Superior —

with extended berth times for loading iron ore, coal, and grain — creates longer per-vessel emission events that are well suited to capture technology deployment.

| Health Outcome | Current Annual Burden | With At-Berth Capture |
|---|---|---|
| PM2.5 emissions at port (tonnes/yr) | ~60 t | 69–99% reduction |
| NOx emissions at port (tonnes/yr) | ~130 t | Up to 95% reduction |
| Premature deaths from port PM2.5 | Estimated 2–5/year | 1–5 lives saved/year |
| Cardiovascular & respiratory hospitalizations | Estimated 8–20/year | 5–19 avoided/year |
| Childhood asthma ED visits | Estimated 12–30/year | 8–29 avoided/year |
| **Monetized public health benefit (EPA VSL)** | **$8M+/year** | **$5–$10M saved/year** |

**Methodology Note**

Premature death estimates use EPA's concentration-response function for PM2.5 (Krewski et al. 2009, ACS CPS-II) and EPA Value of Statistical Life ($11.8M, 2024-adjusted). Hospitalization and ED visit rates scaled from Minnesota and Wisconsin health department surveillance data and ICCT emissions screening. Ranges reflect uncertainty in dispersion modeling and exposure assumptions. All estimates are conservative — they exclude SOx and secondary PM2.5 formation, which would increase totals. Duluth-Superior's smaller scale means wider relative uncertainty in estimates; site-specific dispersion modeling would narrow these ranges significantly.

## The Great Lakes Dimension

Duluth-Superior presents a distinct health impact profile compared to the larger coastal port complexes. Three factors make it strategically important despite its smaller absolute scale:

**Extended berth times.** Bulk cargo operations — loading iron ore, coal, and grain — require significantly longer berth periods than container port turnarounds. Each vessel may run auxiliary engines for 24–72 hours during loading, generating cumulative emissions that exceed what vessel count alone would suggest.

**Compact impact zone.** Unlike New York/NJ or Houston, where port emissions disperse across multi-million-person metro areas, Duluth-Superior's emissions concentrate in a

metropolitan area of 115,000 people. The per-capita exposure is higher relative to the emissions volume, and the health burden falls on a smaller community with fewer economic resources to absorb it.

**Great Lakes water quality intersection.** Vessel emissions at Duluth-Superior don't just affect air quality — PM2.5 and nitrogen deposition contribute to Lake Superior water quality degradation. The Great Lakes-St. Lawrence Seaway system's inclusion in the North American Emission Control Area (ECA) in 2013 reduced fuel sulfur content for vessels, but at-berth auxiliary engine emissions remain uncontrolled.[2]

## The Regulatory Gap

California's CARB At-Berth Regulation has been in effect since 2014 and was strengthened in 2020. In October 2023, the EPA authorized California's regulation under the Clean Air Act, which legally enables other states to adopt the identical standard. **Neither Minnesota nor Wisconsin has adopted at-berth vessel controls.**

The Minnesota Pollution Control Agency (MN PCA) has a relatively progressive track record on air quality regulation compared to many other states. The cross-state jurisdiction — with the port straddling the Minnesota-Wisconsin border — creates both complexity and opportunity: parallel regulatory action in both states would be needed for comprehensive coverage, but a single state moving first could create momentum for the other.

**Pathways to Action**

Several pathways exist for reducing at-berth emissions at the Duluth-Superior port complex:

- **Minnesota PCA rulemaking**: MN PCA could adopt California's at-berth standard under EPA authorization, covering the Minnesota side of the port
- **Wisconsin DNR parallel action**: Coordinated regulatory action with Wisconsin would ensure comprehensive port coverage
- **Great Lakes EJ TCGM grant funding**: The Minneapolis Foundation administers a $40 million Great Lakes Environmental Justice Thriving Communities Grantmaking Program (EPA Region 5). Tier 1 grants up to $150,000 fund monitoring, research, and community mapping — a Duluth-Superior health impact assessment could be structured as a Tier 1 research project. Applications are rolling through fall 2026.
- **Carbon credit incentives**: Voluntary carbon market frameworks currently under development could provide revenue to fund capture deployment
- **Tribal government engagement**: Federally recognized tribal nations in the region are eligible for dedicated TCGM funding and may have independent interest in Great Lakes air and water quality protection

## What Comes Next

This assessment is a screening-level analysis using publicly available data. A full site-specific assessment for the Duluth-Superior port complex — with higher-resolution dispersion modeling, localized health data, and census-tract-level environmental justice analysis — is available through our research services or could be developed as a grant-funded research partnership.

Port Health Watch is also developing:

- **Air Quality Health Units (AQHUs)**: The first tradable health benefit asset class for port pollution reduction, under development for submission to Verra's SD VISta program. Learn more →
- **Carbon credit methodology**: A Verra VCS methodology for at-berth maritime carbon capture, targeting July 2026 submission. Learn more →

**The Opportunity**

At-berth emissions capture at the Port of Duluth-Superior could save 1–5 lives per year, prevent hospitalizations and emergency room visits, and deliver $5–$10 million annually in monetizable health benefits — using technology that is commercially deployed and independently verified today. As the largest Great Lakes port, Duluth-Superior can serve as a proof-of-concept for at-berth emissions control across the entire Great Lakes-St. Lawrence Seaway system.

1. U.S. Census ACS 5-year estimates; Duluth Seaway Port Authority; ICCT, "Nationwide port emissions screening for berthed vessels" (September 2024). ↩
2. EPA, "National Port Strategy Assessment: Reducing Air Pollution and Greenhouse Gases at U.S. Ports"; IMO North American Emission Control Area regulations; Great Lakes Maritime Research Institute. ↩

This assessment was produced by Port Health Watch, a research initiative of Civil Ledger Lab, operated by EcoAsset Lab LLC. For site-specific assessments with higher-resolution modeling, contact research@porthealthwatch.org.