Lung illnesses more likely near Logan Airport

Study doesn't find higher rates of heart disease, hearing loss

JESSICA RINALDI/GLOBE STAFF

Winthrop, a town under a flight path to Logan Airport, is one of 17 communities cited in a Health Department report.

By David Abel and Zachary T. Sampson | GLOBE STAFF | GLOBE CORRESPONDENT MAY 29, 2014

Children who live in neighborhoods bordering Logan International Airport are as much as four times more likely to wheeze, experience shortness of breath, and exhibit other signs of undiagnosed asthma compared with children who live farther away, according to a long-awaited state report released Wednesday night.

The study, commissioned by the Legislature 14 years ago and only now finished, also found that adults who have lived near the airport for three or more years — in parts of East Boston, South Boston, Chelsea, and Winthrop — are nearly twice as likely to experience chronic obstructive pulmonary disease than those living in communities with less exposure to air pollution from planes taking off and landing.

But the $1.8 million study by the state Department of Public Health, which was delayed after going years without funding and after five revisions to its complicated statistical models, found that those living close to the airport had no higher rates of heart disease or hearing loss.

"The chief takeaways are that we do see some respiratory effects associated with living in the areas of highest impact, but Logan itself represents a smaller contribution to the overall urban air pollution picture than expected," said Suzanne K. Condon, director of the health department's Bureau of Environmental Health, who oversaw the study.

The authors said that the findings on asthma and lung disease are "statistically significant" — meaning they are unlikely to be due to chance — and that they took into account the emissions from greater vehicle traffic in the congested areas near the airport and socioeconomic factors such as smoking rates and poverty, which are known to contribute to the rates of respiratory illnesses.

Subject: FYI--Article from Inside EPA

Daily News

Academic Study Draws Attention To Growing A[illegible] Air Toxics Emissions

Posted: October 19, 2015

A new study by the New Jersey Institute of Technology (NJIT) shows significant and growing emissions of air pollution -- including air toxics -- from airports across the country, drawing attention to a problem that has so far received less scrutiny from regulators than stationary sources, road vehicles or shipping.

In a new "infographic" published online recently by NJIT's Masters In Civil Engineering Online degree program, the Institute illustrates the extent of the pollution problem caused by airport emissions. Pollutants emitted by airports include lead, nitrogen oxides, particulate matter, sulfur oxide and volatile organic compounds (VOCs), some of which are classified as air toxics by EPA.

NJIT says "people living, working, or simply within nine square miles of airports are exposed to air pollution that is 10 times higher than areas outside this zone," while noting that the number of U.S. airports has grown from around 15,000 in 1980 to over 19,000 in 2013.

The Institute lists individual airports as examples of serious polluters. "Van Nuys airport in Van Nuys, CA is estimated to generate 1.4 tons of lead emissions every year. Another top air polluter is Seattle Airport in Seattle, WA where carbon monoxide levels exceed the federal guidelines. Logan Airport in Boston, MA is also a guilty party with VOC emissions reaching the 667,432 [kilogram] mark annually.

"At the Cincinnati/Northern Kentucky International Airport, air pollution is so bad every terminal services employee subjected to tests registered ACGIH carbon monoxide levels in excess of the threshold limit of 25 ppm." ACGIH is the American Conference Of Governmental Industrial Hygienists, a body that sets occupational health standards.

The Institute suggests solutions to the airport pollution problem that include airlines purchasing newer, more efficient aircraft, and airports taking steps to reduce congestion. It also advocates that regulators reduce the sulfur content of aviation fuel for large, commercial aircraft. Such fuel now contains between 400 parts per million (ppm) and 800 ppm sulfur, with wide variation, the institute says.

The Federal Aviation Administration is already pursuing measures to improve air traffic control and reduce congestion on the ground at airports, which would reduce idling and emissions.

Airport Emissions

EPA is further studying lead emissions from general aviation airports that host aircraft that use leaded aviation fuel (avgas), but has so far denied environmentalists' petitions to push the agency to remove lead from avgas. Environmentalists have failed with past attempts to force a federal district court-ordered deadline for developing an avgas "endangerment finding." Such a finding of endangerment to human health or welfare would trigger a Clean Air Act mandate for EPA to regulate leaded avgas.

While the avgas investigation is focused on lead emissions, researchers have also identified a problem with ultrafine particulate matter (UFP) emitted by aircraft. UFP is usually defined as particles 100 nanometers or less in diameter, compared to larger fine particulate matter (PM2.5) or even larger coarse particles (PM10). EPA currently regulates PM2.5 and PM10 through its national ambient air quality standards, but does not have any rules specific to UFP.

At the May 5 annual Health Effects Institute conference in Philadelphia, researcher Neelakshi Hudda of Tufts University outlined the findings of recent studies, including her 2014 study on UFP downwind of Los Angeles International Airport and a 2015 study by *Keuken et al.* on Schipol airport in the Netherlands.

Hudda said the studies show a strikingly high concentration of UFP at air monitors underneath the flightpath of aircraft approaching the airport for landing, with high readings up to 20 kilometers (12.4 miles) from the airport.

The International Civil Aviation Administration (ICAO) is working on developing PM standards for aircraft, with initial work focused on development test procedures for measuring emissions. ICAO is expected to issue PM standards in February 2019, and may issue some form of transitional limits before then, EPA officials say.

Mike Samulski, of EPA's Office of Transportation and Air Quality, told a May 5 meeting of EPA's Clean Air Act Advisory Committee's Mobile Sources Technical Review panel that EPA is gathering PM data from aircraft engines to help with the ICAO effort.

"All the focus" on PM emissions from aircraft is on what is emitted during aircraft takeoff and landings at airports, Simulski said in response to a question from a panel member. A PM inventory of airports shows that they are

Air Pollution Found to Pose Greater Danger to Health than Earlier Thought

by **Kathleen O'Neil**
September 23, 2005

Experts may be significantly underestimating air pollution's role in causing early death, according to a team of American and Canadian researchers, who studied two decades' worth of data on residents of the Los Angeles metro area.

When the epidemiologists examined links between particle pollution and mortality within more than 260 Los Angeles neighborhoods, they found that pollution's chronic health effects are two to three times greater than earlier believed. The study appears in the November issue of Epidemiology but was published early on the journal's Web site.

Among participants, for each increase of 10 micrograms per cubic meter (g/m3) of fine particles in the neighborhood's air, the risk of death from any cause rose by 11 to 17 percent, according to Michael Jerrett, Ph.D., associate professor of preventive medicine at the Keck School of Medicine of the University of Southern California and the paper's lead author. Fine particle levels can differ by about 20 g/m3 from the cleanest parts of Los Angeles to the most polluted.

"By looking at the effects of pollution within communities, not only did we observe pollution's influence on overall mortality, but we saw specific links between particulate matter and death from ischemic heart disease, such as heart attack, as well as lung cancers," Jerrett says. Ischemic heart disease mortality risks rose by 25 to 39 percent for the 10 g/m3increase in air pollution.

Earlier studies took one or two pollution measures from several cities and compared health effects among cities. This study digs more deeply, taking pollution measures at 23 sites within Los Angeles to more accurately reflect air pollution exposure where residents live and work.

Researchers examined data from 22,906 residents of Los Angeles, Riverside, San Bernardino and Ventura counties in the American Cancer Society's Cancer Prevention Study II since 1982. They determined air pollution exposure in 267 different zip codes where participants lived. The vast number of participants allowed scientists to control for dozens of factors that influence health outcome, such as smoking, diet and education. Finally, they compiled causes of death for the 5,856 participants who died by 2000.

When considering air pollution, the epidemiologists specifically looked at levels of particulate matter, a mixture of airborne microscopic solids and liquid droplets. That includes acids (such as nitrates), organic chemicals, metals, dust and allergens.

Small particles less than 2.5 micrometers in diameter pose the greatest problems to health because they can penetrate deep into the lungs and sometimes even enter the bloodstream. In this

study, the researchers tracked this particulate matter, called PM2.5 for short, across the neighborhoods of Los Angeles. It is often found in smoke, vehicle exhaust, industrial emissions and haze, driven by the burning of fossil fuels. Scientists also tracked ozone pollution, but found no link between ozone levels and mortality.

Increased deaths from heart disease jibe with the scientists' earlier research showing links between air pollution and atherosclerosis, a thickening of artery walls that may lead to heart attack and stroke. They believe particulate matter may promote inflammatory processes, including atherosclerosis, in key tissues. "We have convincing evidence that those causes of death that we might expect from inflammation, ischemic heart disease and lung disorders, are elevated in areas of higher pollution levels," he says.

Researchers also saw more than a twofold increased risk of death from diabetes, although numbers of diabetes-related deaths were smaller than those from heart disease, making findings less reliable. "People who are diabetic may be more susceptible to day-to-day fluctuations in air pollution," Jerrett says. "They may experience a state of greater inflammation—related to insulin resistance—that makes their lungs more receptive to receiving harmful particles."

Jerrett notes that findings might have been affected by participants who moved during the study or who changed their lifestyle since 1982. Another limitation is that scientists could only use participants' zip codes, rather than their home addresses, to determine their home neighborhood.

Researchers will conduct a similar study in New York City to try to duplicate findings. They hope to determine whether Los Angeles' tailpipe-emission-driven pollution poses a greater danger than that in the eastern United States, where power plants and factories contribute more heavily to pollution. They also plan to better understand pollution's effects on diabetes, and will use more specific measures to assess pollution within neighborhoods.

Because of the large number of participants in the American Cancer Society's study (more than a million people in 150 cities), policymakers in the past have relied heavily on findings from the study to set the nation's air-quality standards.

"These findings should give us some pause to think about what we need to do as a society," Jerrett says. "Restrictions on tailpipe emissions have gotten tighter, but there are more trucks and cars on the roads and people are driving farther. This study may cause us to reflect on how we use our cars, what cars we drive and whether we can do anything to make tailpipe emissions from all vehicles less harmful to health."

The Health Effects Institute and the National Institute of Environmental Health Sciences supported the research.

Michael Jerrett, Richard T. Burnett, Renjun Ma, C. Arden Pope III, Daniel Krewski, K. Bruce Newbold, George Thurston, Yuanli Shi, Norm Finkelstein, Eugenia E. Calle and Micheal J. Thun, "Spatial Analysis of Air Pollution and Mortality in Los Angeles," Epidemiology. Vol. 16, No. 6 (published early on Epi Fast-Track, www.epidem.com.

Comment 5: Commentor questioned how pollutant levels at Sea-Tac contrast with pollutants emissions in other portions of the region on a per acre basis.

Response: As would be expected, the acreage containing Sea-Tac Airport emits a greater level of air pollution than the average acre within King County for specific pollutants. Generally, Airport lands (encompassing 2,500 acres) produce greater levels of nitrogen oxides (NOx) for each airport acre than do all sources for each of King County's 1.4 million acres. However, aircraft emissions of Volatile Organic Compounds (VOC) and Carbon Monoxide (CO) for each Airport acre are nearly the same as compared to all sources for each King County acre.

Nitrogen Oxide (NOx): Aircraft activity at Sea-Tac produces approximately 0.5 tons NOx for each Airport acre (2,500 acres). All sources (aircraft, motor vehicles, fuel tanks, etc.) produce about 0.2 tons NOx for each acre within the Master Plan Update EIS study area (15,000 acres). Comparatively, all sources within King County (mobile, non-road mobile, point and stationary sources) produce 0.1 tons NOx for each King County acre.

Volatile Organic Compound (VOC): Aircraft produce approximately 0.1 tons per year VOC for each Airport acre. All sources produce just over 0.1 tons VOC per year for each acre within the EIS study area. The airport and airport area per acre level is the same as the King County level of about 0.1 tons VOC per acre.

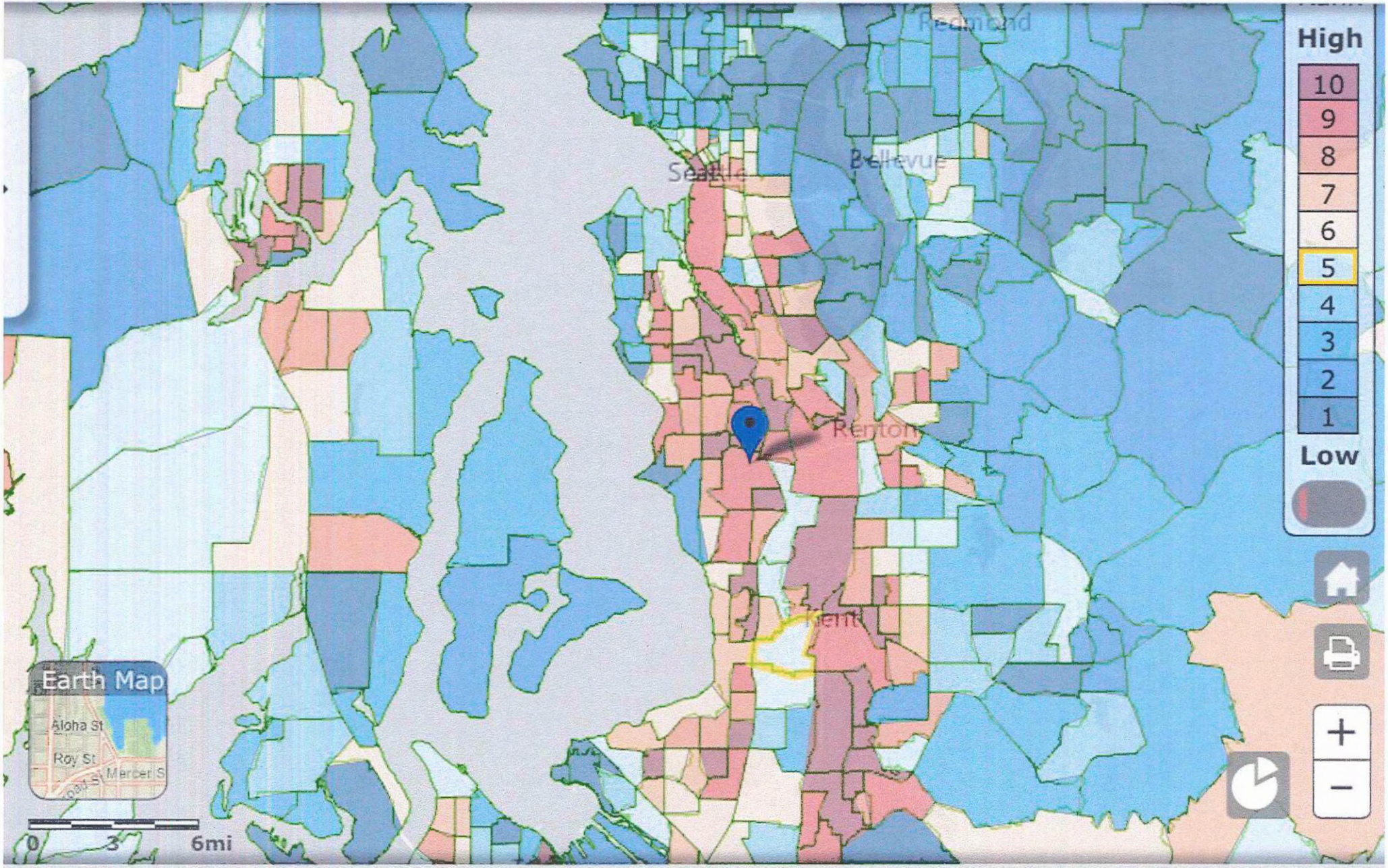
Carbon Monoxide (CO): Aircraft produce about 0.5 tons CO per year for each Airport acre. All sources in the study area produce 1.5 tons CO per year for each acre. All sources within King County produce 0.4 tons CO per year for each acre in King County.

Comment 6: Commentor questioned if the airport should be treated like a point source instead of as mobile sources?

Response: Sea-Tac Airport facilities consist of a complex mix of stationary, mobile and non-road mobile sources. Stationary or point sources are typically limited in size to a single facility in comparison to the 2,500 acres at Sea-Tac consisting of numerous individual facilities. Emissions from aircraft and motor vehicles are consistently treated as mobile sources under the Clean Air Act. Additionally, although the Port of Seattle owns the land, many of the structures on-airport are owned and maintained by the tenants using the Airport. These tenants have certain responsibilities and liabilities associated with their operation independent from the Port of Seattle. These facilities are regulated by the Puget Sound Air Pollution Control Agency as stationary sources. As a result, air pollution modeling for airports typically uses point, area, and line sources to characterize the types of sources and/or facilities.

Comment 7: Commentor expressed concerns with the role and results of the SIP.

Response: Ms. Des Marias correctly notes that "the goal of the SIP is to chart air pollution and improvements over time to eventually reach attainment of the standards to protect public health and better the environment." The SIP "inventories" pollutant levels by a variety of sources within the Region including airports. Once all the pollutant sources are inventoried, then the SIP focuses on measures to reduce pollutant levels in order to meet pollutant reduction goals for the Region. The SIP inventories do not mean that activity within the Region cannot grow, nor do they establish pollutant 'budgets' for a particular source that cannot be exceeded. For example, the SIP accounts for growth in aircraft activity at Sea-Tac. Because motor vehicles are expected to remain the largest



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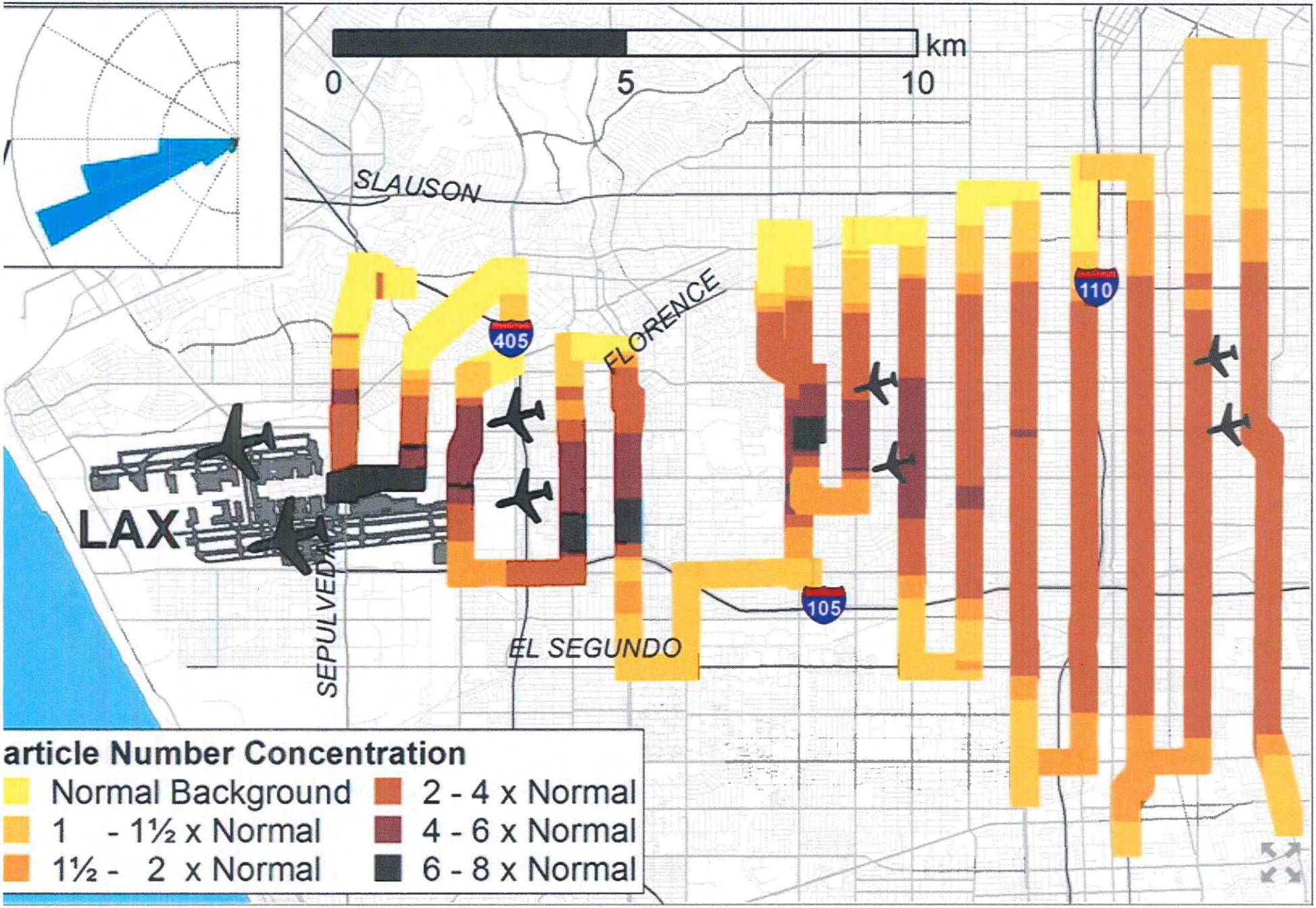
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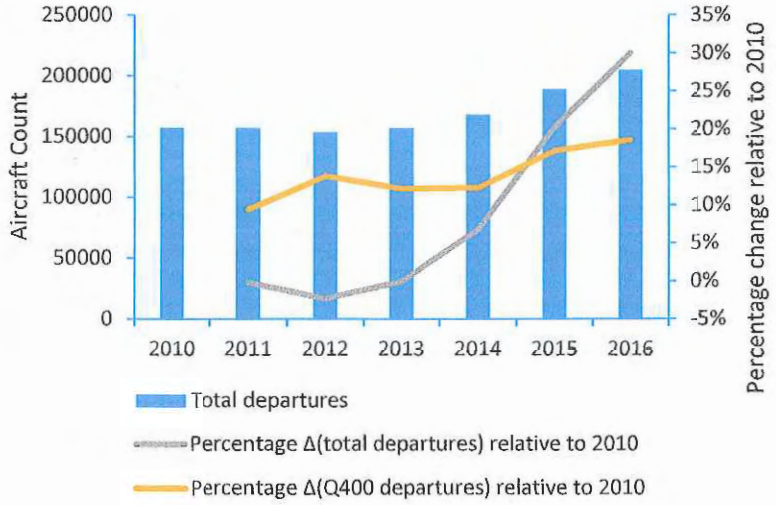
Figure D.1: Change in the number of departures at SEA from 2010-2016



Response 2: In accordance with the Clean Air Act (CAA), the EPA developed the National Ambient Air Quality Standards (NAAQS) for six common air pollutants. These criteria air pollutants are carbon monoxide (CO), nitrogen dioxide (NO2), ozone (O3), particulate matter (PM), sulfur dioxide (SO2), and lead (Pb). The EPA determined that these criteria air pollutants may harm human health and the environment, and cause property damage. The EPA regulates these pollutants to permissible levels through human health-based (primary standards) and environmental-based (secondary standards) criteria.
EPA sets, reviews, and revises standards for air pollutants and how they are measured. Air pollutants are measured within a geography area, called an air basin.

The FAA evaluated the air quality impacts of the Preferred Alternative in accordance with the CAA. The implementation of the Preferred Alternative will not result in more aircraft being turned on westerly headings in north-flow. Furthermore, while there is expected to be a shift in where these turboprops fly, since the No Action and Preferred Alternatives are located within the same region tested for air quality standards, the implementation of the Preferred Alternative would not change the amount of aircraft emissions in this air quality region. Therefore, the FAA determined that there would be no air quality impacts as a result of the implementation of the Preferred Alternative.

EPA was provided the opportunity to review FAA's air quality analysis under Section 306 of the CAA but did not note any issues or inadequacies with the air quality analysis.

Response 3: The FAA recognizes that there have been few studies on the subject. In one study looking at low flying propeller overflights[8], it was found that such overflights are not expected to result in building damage.

Response 4: There are a few studies conducted to evaluate the relationship between airports and property values and these studies have focused primarily on the noise effects.

[8] Building Vibrations Induced by Noise from Rotorcraft and Propeller Aircraft Flyovers, NASA Technical Memorandum 104170, June 1992

Comment 715

Lauren Zimmerman

Page 2

Aviation noise concentration: I would rephrase as ""Increase in aviation noise"" as this plan will make aviation noise more frequent. It's sad to see communities that predate the airport changing due to the expansion of the airport and the lack of consideration given to these areas. 3

Air quality: I believe that there are insufficient trees to protect against airplane fumes and ultra-fine particles. 2

Form URL:
https://www.faa.gov/nextgen/communityengagement/SEA/community_comments/

Response to Comment 715

EJSCREEN Report (Version 2016)

Tract: 53033027300, WASHINGTON, EPA Region 10

Approximate Population: 6,431

Input Area (sq. miles): 1.37

98168 in CENSUS TRACT

Selected Variables	Value	State Avg.	%ile in State	EPA Region Avg.	%ile in EPA Region	USA Avg.	%ile in USA
Environmental Indicators							
Particulate Matter (PM 2.5 in µg/m³)	8.57	7.42	90	7.53	80	9.32	31
Ozone (ppb)	30.8	35.2	15	37.9	8	47.4	3
NATA* Diesel PM (µg/m³)	2.07	1.39	84	1.05	90-95th	0.937	90-95th
NATA* Cancer Risk (lifetime risk per million)	60	40	93	39	90-95th	40	95-100th
NATA* Respiratory Hazard Index	7.2	2.8	97	2.8	95-100th	1.8	95-100th
Traffic Proximity and Volume (daily traffic count/distance to road)	100	440	51	380	52	590	51
Lead Paint Indicator (% Pre-1960 Housing)	0.49	0.24	82	0.23	84	0.3	74
Superfund Proximity (site count/km distance)	0.15	0.2	65	0.14	77	0.13	79
RMP Proximity (facility count/km distance)	0.46	0.4	75	0.39	75	0.43	74
Hazardous Waste Proximity+ (facility count/km distance)	0.13	0.091	83	0.086	85	0.11	77
Water Discharger Proximity (facility count/km distance)	0.32	0.19	85	0.23	82	0.31	75
Demographic Indicators							
Demographic Index	60%	29%	92	29%	94	36%	81
Minority Population	64%	29%	91	26%	94	37%	76
Low Income Population	55%	30%	87	33%	85	35%	80
Linguistically Isolated Population	27%	4%	97	3%	98	5%	96
Population With Less Than High School Education	29%	10%	93	10%	94	14%	87
Population Under 5 years of age	12%	6%	90	6%	90	6%	90
Population over 64 years of age	9%	13%	32	13%	31	14%	31

* The National-Scale Air Toxics Assessment (NATA) is EPA's ongoing, comprehensive evaluation of air toxics in the United States. EPA developed the NATA to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that NATA provides broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. More information on the NATA analysis can be found at: https://www.epa.gov/national-air-toxics-assessment.

+ The hazardous waste environmental indicator and the corresponding EJ index will appear as N/A if there are no hazardous waste facilities within 50 km of a selected location.

For additional information, see: www.epa.gov/environmentaljustice

Ultrafine Particles Near Airports

Short-Term Effects Of Airport-Associated Ultrafine Particle Exposure On Lung Function And Inflammation

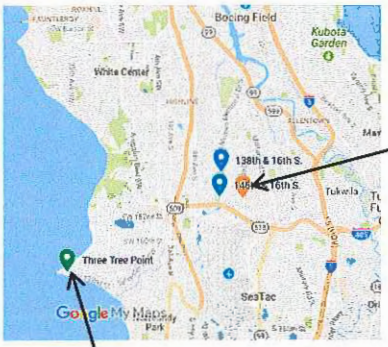
R. Habre[1], S. P. Eckel[1], S. Fruin[1], T. Enebish[1], E. Rappaport[1], F. Gilliland[1]

[1]University of Southern California, Los Angeles, CA

- Randomized crossover study of 21 non-smoking adults with mild to moderate asthma
- 2-hr scripted, mild walking activity both inside and outside of the high LAX UFP impact zone (avg. difference ~30,000 /cc)
- Mean particle size at LAX impact zone was 29 nm
- Observed an increase in inflammatory blood markers and a reduction in lung function
- **"Preliminary data suggest a relationship between airport-related UFP exposures and adverse acute lung effects in asthmatics"**

This abstract is funded by: The Southern California Environmental Health Sciences Center (grant # P30ES007048) funded by the National Institute of Environmental Health Sciences and the Hastings Foundation

UFP size distribution, aircraft impacted area vs. background



146th & 24th

Three Tree Point

Particle distribution parked North of runways & background, 17-Nov-17