Date: February 15, 2017

To: The Environmental and Natural Resources Committee

From: Miki Barnes, President of *Oregon Aviation Watch* Miki Barnes

Topic: Testimony in support of the passage of SB 115 – the prohibition of the use of leaded aviation fuel as of January 1, 2022

I would like to express my gratitude to Senator Dembrow and the members of this committee for holding this hearing. In addition I would like to extend my sincere appreciation to Senator Chuck Riley for sponsoring SB 115 and Representative Mitch Greelick for sponsoring a companion bill in the house.

Oregon Aviation Watch (OAW) is a 501(c)(3) non-profit organization whose mission is to enhance and protect the quality of life for Oregon residents by eliminating the adverse impacts of aviation activity. We are thankful that the legislature has agreed to address this issue through SB 115 by prohibiting leaded aviation fuel as of January 1, 2022. However, due to the serious dangers posed by lead exposure and poisoning, *Oregon Aviation Watch* urges you to establish the ban sooner. By 2022, the Hillsboro Airport alone will release another 4-5 tons of lead into the air. Other airports across the state will also contribute to this highly toxic environmental and public health risk.

Background Information

General Aviation Activity - Primary Source of Airborne Lead Emissions

The EPA National Emissions Inventory (NEI) database tracks various toxic pollutants throughout the U.S. A search of the 2011 NEI table on lead emissions in Oregon yielded 512 sources, over 80% of which (417) were airports.[1] Due to serious health risks associated with lead, this pollutant was phased out of automotive fuel between 1973 and 1996 and banned as a paint additive by 1978. Notwithstanding the known dangers associated with this heavy metal, the general aviation industry persists in using leaded fuel. Per EPA estimates, of the 950 tons released nationwide in 2008, more than half were from piston-engine aircraft.[2] By contrast, commercial aircraft use unleaded jet fuel. For this reason general aviation airports often, but not always, release far more lead into the environment than commercial passenger airports.

As a result, residents, including children and pregnant women, living within the vicinity of Oregon's more than 450 general aviation airports are likely breathing air containing lead, especially in light of the EPA finding that, "Lead concentrations in air increase with proximity to airports where piston-engine aircraft operate."[3] Reliable studies revealed that children living in close proximity to an airport had higher blood lead levels. After completing a study of airports in six North Carolina Counties, Duke University researchers concluded that,

> ...living within 1000 m [2/3 mile] of an airport where aviation gasoline is used may have a significant effect on blood lead levels in children. Our results further suggest that the impacts of aviation gasoline are highest among those children living closest to the airport.[4]

Impacts of Lead on Human Health and the Ecosystem

Lead is a pernicious neurotoxin and probable carcinogen. An extensive body of literature now links elevated blood lead levels, even in very low amounts, with Attention Deficit Hyperactivity Disorder (ADHD), a disorder that can result in devastating effects on children, their families and society. The symptoms of ADHD include extreme hyperactivity, impulsivity, inattentiveness and distractibility. ADHD often co-occurs with conduct and oppositional defiant disorders.

The Centers for Disease Control (CDC) has warned that "No safe blood lead level in children has been identified. Even low levels of lead in blood have been shown to affect IQ, ability to pay attention, and academic achievement. And effects of lead exposure cannot be corrected."[5]

As explained by the EPA,

> Once taken into the body, lead distributes throughout the body in the blood and is accumulated in the bones. Depending on the level of exposure, lead can adversely affect the nervous system, kidney function, immune system, reproductive and developmental systems and the cardiovascular system. Lead exposure also affects the oxygen carrying capacity of the blood. The lead effects most commonly encountered in current populations are neurological effects in children and cardiovascular effects (e.g., high blood pressure and heart disease) in adults. Infants and young children are especially sensitive to even low levels of lead, which may contribute to behavioral problems, learning deficits and lowered IQ.[6]

The EPA also warns about the deleterious effect of lead on ecosystems:

> Lead is persistent in the environment and can be added to soils and sediments through deposition from sources of lead air pollution…Elevated lead in the environment can result in decreased growth and reproductive rates in plants and animals, and neurological effects in vertebrates. [7]

As explained by the Agency for Toxic Substances and Disease Registry (ATSDR), "Once lead falls onto the soil, it sticks strongly to soil particles and remains in the upper layer of soil…Lead may remain in soil particles or sediment in water for many years."[8]

Aviation emissions contribute to the toxic build-up in air, soil and water. According to the EPA, "Lead emissions, especially those at altitude, undergo dispersion and eventually deposit to surfaces, and lead deposited to soil and water can remain available for uptake by plants, animals and humans for long periods of time."[9]

Despite these serious impacts, little has been done to test for lead in the vicinity of the largest facility source of lead in the state, the Hillsboro Airport.

Per a June 2016 Washington County Public Health Department report,

> In Washington County, population lead poisoning statistics are not comprehensive and many at risk children are not being tested. Of the 45,000 children under the age of six in Washington County, approximately 3% (on average 1260 children) are tested for elevated blood lead levels per year.[10]

This same report states that "Environmental sampling data (air, soil, and water) for the Hillsboro Airport is limited"[11] and went on to suggest that "More data on the presence (or absence) of lead contamination in the soils in and around the Hillsboro Airport would allow for a more comprehensive exposure assessment."[12]

Hillsboro Airport – Largest Source of Lead Emissions in Oregon

The Port of Portland owned and operated Hillsboro Airport is the largest general aviation airport in Oregon. It is primarily a flight training facility which routinely logs over 200,000 operations per year. As a result of the extensive use of HIO, it has become the largest facility source of lead pollution in Oregon with estimated emissions of 0.7 tons per year (tpy) in 2007.[13] Out of nearly 20,000 airports nationwide, HIO ranks in the top one percent, 21st in the nation in lead emissions.[14] Federal Aviation Administration (FAA) forecasts projected that HIO lead emissions will climb to 0.8 tpy in 2016 and 0.9 tpy by 2021[15], however, the construction of a third runway at this airport has nearly doubled HIO's capacity, thus lead and other toxic emissions may increase well beyond the Port estimates.

HIO came into existence as a grassy airstrip in 1928. Forty years later, the Port of Portland assumed ownership, yet in the nearly half century it has operated this facility it has never measured lead in the soil or air in the vicinity of this airport. Neither the Port nor DEQ has ever actually measured lead levels at HIO or any other airport in Washington County. The emissions reported by these agencies are based solely on estimates. During its 88 year history, an Environmental Impact Statement (EIS) has never been done at this airport.

Aviation Lead Emissions Higher Than Estimates Reflect

The evidence to date suggests that HIO lead emissions may be higher than current estimates reflect.

- There is a significant discrepancy in the time the Port factored in for the Landing and Take-Off (LTO) mode of flight. The Port estimated 10 minutes whereas the EPA factors in 16 minutes. The Port offered no explanation for why it chose a shorter LTO phase.
- Neither the Port nor DEQ factored in pre-flight engine run-ups in their estimates even though the EPA has described run-ups as "the most important contributor to peak air Pb [lead] concentrations" at and in the vicinity of an airport.
- DEQ did not factor cruise phase lead emissions into their Portland Air Toxics Solutions (PATS) study model. According to the EPA, based on 2008 estimates, an additional 5.3 tons of lead was released in Oregon when aircraft were flying above 3,000 feet. In light of the significant amount of flight activity that occurs in Washington County, there is a high likelihood that much of the cruise phase lead emissions are impacting Washington County residents.

Lead Emissions during the Landing and Take-off Cycle (LTO)

The EPA determines lead emissions for individual airports by estimating the time that aircraft spend in various modes during the landing and take-off (LTO) cycle. This phase of flight includes taxi/idle-out, takeoff, climb-out, approach and taxi/idle-in but not the cruise phase. Consideration is also given to whether the aircraft has one or two engines, the concentration of lead in the fuel, and the retention of lead in the engine and oil.[16]

In their Environmental Assessment on the proposed third runway at HIO, the Port estimated emission levels of 0.7 tpy in 2007 based on "10.0 total minutes of aircraft taxi/idle time..."[17] Port documentation on this topic provided no explanation as to why other LTO modes such as take-off, climb-out, and approach were not considered. Nor did the agency differentiate between taxi-idle-in and taxi-idle out. By contrast, the EPA factors in 16 minutes for the LTO cycle.[18] These significant discrepancies suggest that the Port may have underestimated actual emission levels by shaving 6 minutes off the LTO cycle.

Lead Emissions from Run-Ups Not Included in Emission Estimates

Detailed data obtained from modeling and monitoring lead emissions at and in the vicinity of the Santa Monica Airport, a general aviation facility that typically logs half as many operations as HIO, was published by the EPA in February of 2010,

Included in the report was a comment from the director of a flight school,

> Dr. Richard Pat Anderson, the Director of the Flight Research Center at Embry-Riddle Aeronautical University in Daytona, Florida who reported that their experienced pilots conduct run-up checks for a total of 1 minute and their pilots in training for 2 minutes...[19]

The study concluded that during both the summer and winter months, ground run-up pre-flight engine checks were "the most important contributor to peak air Pb [lead] concentrations."[20] An EPA memo dated November 2010 also emphasized the high level of lead emissions associated with run-up operations,

> The location of the predicted maximum lead concentration(s) at airports is downwind of the area(s) where pilots conduct the preflight run-up checks and take-off. [21]

However, despite the availability of this information, the Port CDM lead study failed to include run-up emissions. *Oregon Aviation Watch* raised this concern in testimony submitted on the proposal to construct a third runway at HIO. In response the Port stated,

> The commentator is correct that the emissions modeling did not specifically include aircraft engine run-ups. The FAA requires the use of EDMS to evaluate aircraft/airport emissions, and this model is not enabled to calculate run-up emissions. Research is currently underway to develop ways to capture engine run-ups in emission models; however, an industry-accepted standard approach to such modeling has not yet been adopted.[22]

It is worth noting that the EPA was well aware of the shortcomings of the FAA modeling system for estimating lead,

> EDMS has a limited number of piston engine aircraft in its aircraft data and is currently not set up to calculate metal emissions and thus, it is not a readily available tool for determining airport lead emissions related to aircraft operations.[23]

Neither Port or DEQ Factored in Cruise Phase Emissions

The landing and take-off cycle does not include lead emissions released during the cruise phase. In the words of the EPA,

> For inventory purposes, lead emitted outside the LTO [landing and take-off] cycle occurs during aircraft cruise mode and portions of the climb-out and approach modes above the mixing height (typically 3,000 ft.). This part of an aircraft operation emits lead at various altitudes as well as close to and away from airports.[24]

In the case of HIO, nearly 2/3 of the 212,543 operations in 2011 were local touch and go training maneuvers[25] and as such remained under 2,000 feet, well below the mixing height.

Per EPA estimates based on 2008 operational counts, an additional 5.3 tons of lead were released over Oregon during the cruise phase[26] which occurs when aircraft fly above 2,000 feet. Due to the location of multiple airports within close proximity to HIO, in conjunction with the intensive flight training activity throughout the area, there is a high likelihood that much of this additional tonnage was, and is continuing to be, released over Washington County homes, neighborhoods, schools, day care centers, assisted living facilities, recreational areas, water sources, and prime farmland.

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Attachment: Please include hard copy version of slide presentation by Miki Barnes on behalf of *Oregon Aviation Watch* dated 4/15/15 in the record. This is a 17 page document of the slides shown to the Transportation and Economic Development Senate Committee in support of Senate Joint Memorial 1 that was under consideration during the 2015 session.

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[1] To review the 2011 EPA National Emissions Inventory on various pollutants go to the EPA NEI available on-line at https://www.epa.gov/air-emissions-inventories/2011-national-emissions-inventory-nei-data. From there scroll down to the Google Fusion and Maps table and click on the specific pollutant. When the data appears click on the blue tab to filter by state, county, facility type or other preferred option..

[2] Lead ISA Final Report with Errata Sheet. 2013 Final Report: Integrated Science Assessment for Lead. U.S. Environmental Protection Agency. (June 2013). EPA/600/R-10/075F. Pg. lxxviii. Available online at https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=255721#Download.

[3] Advance Notice of Proposed Rulemaking on Lead Emissions from Piston-Engine Aircraft Using Leaded Aviation Gasoline: Regulatory Announcement. U.S. Environmental Protection Agency (EPA.). (April 2010). Available online at https://www3.epa.gov/otaq/regs/nonroad/aviation/420f10013.pdf. .

[4] Miranda, M.L., Anthopolos, R., Hastings D. A geospatial analysis of the effects of aviation gasoline on childhood blood lead levels. Children's Environmental Health Initiative, Nicholas School of the Environment. Duke University. (July 2011). Available on-line at http://ehp.niehs.nih.gov/1003231/.

[5] Update on Blood Lead Levels in Children. Lead: What Do Parents Need to Know to Protect Their Children? Centers for Disease Control. Available on-line at http://www.cdc.gov/nceh/lead/acclpp/blood_lead_levels.htm. Accessed on 5/22/16.

[6] What are the Effects of Lead on Human Health. Basic Information About Lead Air Pollution. EPA website. Available on-line at https://www.epa.gov/lead-air-pollution/basic-information-about-lead-air-pollution#how

[7] What are the Effects of Lead on Human Health. Basic Information About Lead Air Pollution. EPA website. Available on-line at https://www.epa.gov/lead-air-pollution/basic-information-about-lead-air-pollution#how.

[8] 1.2 What Happens to Lead When it Enters the Environment? Public Health Statement for Lead. ATSDR. Cas # 7439-92-1. (August 2007). Available on-line at http://www.atsdr.cdc.gov/phs/phs.asp?id=92&tid=22.

[9] Calculating Piston-Engine Aircraft Airport Inventories for Lead for the 2008 National Emissions Inventory. EPA-420-B-10-044. (December 2010). Pg. 17. Available on-line at https://www.epa.gov/otaq/regs/nonroad/aviation/420b10044.pdf.

[10] Baumann, Christina and Davis, Matthew. Lead Emissions for the Hillsboro Airport and Public Health: An Overview of the Issue and Options for Further Characterization of Risks. Washington County Public Health Department. (June 2016). Pg. 7.

[11] Ibid. Pg. 1.

[12] Ibid. Pg. 10.

[13] Hillsboro Airport Parallel Runway 12L/30R. Draft Environmental Assessment. Volume 2 Appendices. Prepared for Port of Portland by CH2MHILL. (October 2009). Pg. C3 1-2.

[14] EPA Memorandum from Marion Hoyer and Meredith Pedde to the Lead NAAQS Docket EPA-HQOAR-2006-0735. (11/8/10). Pg. 2-3. Available on-line at https://www3.epa.gov/otaq/regs/nonroad/aviation/memo-selc-airport-mon-stdy.pdf.

[15] Hillsboro Airport Parallel Runway 12L/30R. Draft Supplemental Environmental Assessment. Appendix E – Air Quality Technical Memo. Prepared for Port of Portland by Barrilleaux, J. and Dowlin R. (3/15/13). Pg. 9-11.

[16] Lead Emissions from the Use of Leaded Aviation Gasoline in the United States - Technical Support Document. (EPA20-R-08-020). U.S. Environmental Protection Agency. Assessment and Standards Division Office of Transportation and Air Quality. (October 2008). Pg. 3-4. Available at http://nepis.epa.gov/Exe/ZyPDF.cgi/P1004MXJ.PDF?Dockey=P1004MXJ.PDF.

[17] Hillsboro Airport Parallel Runway 12L/30R. Draft Environmental Assessment. Volume 2 Appendices. Prepared for Port of Portland by CH2MHILL. (October 2009). Pg. C3 1-2.

[18] Calculating Piston-Engine Aircraft Airport Inventories for Lead for the 2008 National Emissions Inventory. EPA-420-B-10-044. (December 2010). Pg. 17. Available on-line athttp://www.epa.gov/otaq/regs/nonroad/aviation/420b10044.pdf.

[19] Ibid. Pg. 68.

[20] Ibid. Pg.. 71.

[21] Hoyer M . and Pedde, M. Selection of Airports for the Airport Monitoring Study: Memorandum. EPA, NAAQS Docket EPA-HQ-OAR-2006-0735. 11/18/10. Pg. 7.

[22] Hillsboro Airport Parallel Runway 12L/30R. Final Supplemental Environmental Assessment. Volume 2 (Appendices G and I.) Prepared by Port of Portland. (February 2014). Pg. G.9-51.

[23] Calculating Piston-Engine Aircraft Airport Inventories for Lead for the 2008 National Emissions Inventory. EPA-420-B-10-044. (December 2010). Pg. 11.http://www.epa.gov/otaq/regs/nonroad/aviation/420b10044.pdf.

[24] Calculating Piston-Engine Aircraft Airport Inventories for Lead for the 2008 National Emissions Inventory. EPA-420-B-10-044. (December 2010). Pg. 17. Available at http://www.epa.gov/otaq/regs/nonroad/aviation/420b10044.pdf.

[25] Hillsboro Airport Terminal Area Forecast (TAF). Detail Report. Federal Aviation Administration (FAA). (January 2013).

[26] Calculating Piston-Engine Aircraft Airport Inventories for Lead for the 2008 National Emissions Inventory. EPA-420-B-10-044. (December 2010). Pg. 19-20. Available on-line at http://www.epa.gov/otaq/regs/nonroad/aviation/420b10044.pdf.