

Arsenic and Lead in Angle Lake – Key Facts

Arsenic determined

- Arsenic and lead scientifically identified in lake sediments and attributed to former ASARCO smelter plume¹
- Mean Concentration 208.2+/- 28.2 mgAs/kg dry wt.¹
- Maximum dissolved (not particulate) in bottom water 87.5 ug/l As¹. The EPA standard for human health protection (water + organism consumption) is 0.018ug/l or (organism consumption only) 0.14 ug/l. The drinking water MCL is 10 ug/l, but the goal is zero.
- These levels are in surficial sediments, as well near surface (0-10 cm depth).

Lead determined

- Core profiles indicate lead approaching 500 mg/kg Pb¹
- Another study – average lead sediment 434 mgPb/kg²

(1) Gawel et al. (2014), *Arsenic and lead distribution and mobility in lake sediments in the South-central Puget Sound Watershed: The long-term impact of a metal smelter in Ruston, Washington, USA*. Science of the Total Environment 472 (2014) 530-537, Elsevier

(2) Mathieu, C., Friese, M. *PBT Chemical Trends in Washington State determined from age-dated sediment cores: 2011 Sampling Results*. Report 12-03-045. Environmental Assessment Program, Washington State Department of Ecology, Olympia, Washington

Critical Statutes and Regulations

- Model Toxics Control Act (MTCA) Cleanup Regulation Chapter 173-340 WAC. The link below also contains three Focus Sheets, as well as the MTCA Statute (Chapter 70.105D RCW, amended 2013) and the Uniform Environmental Covenants Act Statute (Chapter 64.70 RCW, adopted 2007)
<https://fortress.wa.gov/ecy/publications/documents/9406.pdf>
- RCW 43.21 C State Environmental Policy Act
- RCW 70.94 Washington Clean Air Act
- RCW 70.95 Solid Waste Management, Reduction and Recycling
- RCW 70.105 Hazardous Waste Management
- RCW 90.48 Water Pollution Control
- RCW 90.58 Shoreline Mangement Act of 1971
- Chapter 296-848 WAC Inorganic Arsenic Rule, Department of Labor and Industries
- MTCA exempts Ecology [not city] from process requirements of certain state laws noted above. However, Ecology must meet substantive requirements. It also exempts Ecology from laws authorizing local permits or approvals for cleanups done by Ecology (RCW 70.1105D.090)

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- **Tacoma Smelter Plume – Interim Action Plan Washington Department of Ecology June 2012 (especially chapters 8 and 9). WDOE Publication 12-09-086**
<https://fortress.wa.gov/ecy/publications/documents/1209086.pdf>
 1. Chapter 8 states: Ecology requires reporting for any properties with a single sample of arsenic over 20 ppm [20 mg/kg] or lead over 250 ppm [250 mg/kg].
 2. Entire City of SeaTac lies within Moderate Impact Zone (As 20-100 ppm)
 3. Angle Lake sediment levels exceed the High Impact Zone criteria (As > 100 ppm), originally created for soils directly around the ASARCO stack and mill site!!
 4. So far, soils (not sediments) from the plume have not failed the EPA RCRA Toxicity Characteristic Leaching Procedure test (TCLP) and are therefore not designated as state or federally designated dangerous or hazardous waste. The state is handling these soils as “contaminated” as defined in WAC 173-350-100. However, most scientists recognize this test as limited and not necessarily indicative of the actual risk to human health, as it only considers leaching. If soils fail this test, they are designated as a federally-designated hazardous waste and state dangerous waste under WAC 173-303-070(3) and must be handled accordingly. TCLP testing is not normally thought of as being conducted on sediments.
 5. The entire focus of this plan was for yard soils, not freshwaters or freshwater sediments.

Typically, MATCA would require soils to be cleaned up to a maximum of 20 ppm arsenic or 250 ppm lead, as applied to the Interim Action Plan. The lake sediments are presently ten times this level for arsenic, and about 2 times this level for lead.

- **Sediment Management Standards WAC 173-204**
<https://www.epa.gov/sites/production/files/2014-12/documents/wa-chapter173-204.pdf>
 1. The freshwater cleanup objective for Arsenic in sediments is 14 mg/kg dry wt. and the cleanup screening level is 120 mg/kg dry wt.
 2. The freshwater cleanup objective for lead is 360 mg/kg dry wt. and >1300 mg/kg dry wt. for screening level
 3. These are levels to protect sensitive benthic communities. They DO NOT equate to protection of human health. They DO NOT address bioaccumulation or consumption/ingestion issues.
 4. These criteria suggest that lake sediments are toxic to certain benthic communities and would typically require some type of remedial action or clean-up

Additional Considerations

- **A human health risk assessment is required as per WAC 173-204-550 (6) g: “The current and potential significant threats to human health posed by sediment**

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contamination shall be evaluated under WAC 173-204-561 and (h) Any other information required by the department”.

1. General requirements are noted in WAC 173-204-560; see also 562 through 564.
2. Guidance is provided in the Sediment Cleanup User’s Manual II (SCUM II) to properly ascertain the exposure and risks these contaminated sediments pose, and to develop appropriate clean-up criteria.
 - a. <https://fortress.wa.gov/ecy/publications/documents/1209057.pdf> The associated multistep calculation spread sheet can be accessed here:
 - b. <https://ecology.wa.gov/Spills-Cleanup/Contamination-cleanup/Sediment-cleanups>
3. The sediment work for off-shore ASARCO was conducted for the marine environment and is not directly applicable.
4. This assessment requires highly specialized, experienced risk assessment consultants, preferably familiar with the state and EPA sediment programs and the agency “players” in addition to all the regulatory risk protocols. It is not at the level of the typical engineering consulting firm the city employs.
 - It is likely that before any risk work is completed, additional testing data may be required to ascertain the location and extent of contamination as well as reasonable exposure scenarios. Highly specialized protocols for ultra-trace sampling are recommended, and analysis should be conducted following Puget Sound Protocols and/or Ecology/EPA protocols (e.g. SW 846 current edition), with testing performed at an laboratory with the state certifications for the specific tests (a UW laboratory may not hold the proper credentials). Matrices could involve sediment, pore/bottom waters and tissue samples from fish or other organisms.
 - Exceedance of the Federal Clean Water Act Standards in the bottom water sample as noted above (maximum over 600 times above consumption level) strongly suggests that bottom fish caught in the lake should not be consumed.
 - The city should carefully evaluate 1.) Contacting the agencies and 2.) Entering a volunteer clean-up program. An uninformed decision here could cost into five or six figures. It is possible the city might become entangled in a “full-employment act” for agency personnel and consultants in an extended site clean-up taking years.
 - Alternatively, the city faces significant liability and legal exposure if it does nothing or fails to report. There is also the moral obligation to ascertain risk and protect citizens.
 - There may be ASARCO settlement money to clean the site. There was originally over 96 million dollars set aside for the yard clean-up program. This requires agency involvement under a volunteer program that has not dealt with lake sediments.
 - Contacting the designated agency personnel from Ecology and/or EPA region 10 should only be done after an action plan is formulated for the reasons above. They can answer a lot of questions, but once the lake is put on their radar screen, it is usually impossible to take it off. Technically, the reporting requirement is for yard soils – no one was thinking

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of lake sediments. Also, the program envisioned private property owners, not a government/city.

- The yard program is directly applicable to surrounding home yards, and possibly the park soils. Again, there is the issue of a government entity vs. private property owner for the park. Disturbance of the upland soils vs. sediments make it impossible to generalize expected yard concentrations. Testing is required per the yard program.
- Yard program notes: If you are within the home soil testing boundary in King County, please fill out a sampling access form and email it to Public Health-Seattle & King County at dirtalert@kingcounty.gov. Questions? Call Denis Sharify at 206-477-DIRT.

Potential Contacts

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