Fact Sheet

Background Levels of Metals in Soils for Cleanups

State of Oregon
Department of Environmental Quality

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DEQ is a leader in restoring, maintaining and enhancing the quality of Oregon's air, land and water.

Background

To help improve assessment and eventual cleanup of metals-contaminated sites in Oregon, the Oregon Department of Environmental Quality Cleanup Program has prepared a data table specifying regional default background concentrations of various metals in Oregon soils.

DEQ compiled a statewide database for naturally occurring metals in soil and calculated summary statistics for 16 of these metals, including lead, arsenic and mercury. It also calculated background metals concentrations, including the 95 percent upper prediction limit, using methods consistent with U.S. Environmental Protection Agency policy and guidance for 10 separate regions in Oregon (see Figure 1). These data and the statistical values derived from them will replace previous background metals concentrations in use by the DEQ Cleanup Program.

Why the new background data is important

DEQ analyzed and compiled the background metals data to:

- Better distinguish the sources of metals contamination on cleanup sites
- Reduce the burden of sampling and analytical costs for sites with metals contamination
- Refine and improve previous guidance on background metals concentrations
- Enable better comparisons of site data to background concentrations for naturally occurring contaminants

How DEQ gathered the data

DEQ compiled roughly 230,000 data points representing about 5,100 individual sampling locations statewide. For the 16 metals statistically analyzed, it calculated data minimums, maximums, means, percentiles, tolerance limits and prediction limits to characterize typical metals concentrations in soils within each individual region. These data came from a compilation of 10 individual databases from state (Department of Geology and Mineral Industries, DEQ), federal (U.S. Geological Survey, U.S. Department of Agriculture, Natural Resources Conservation Service), and academic (Portland State University) sources generated during geochemical, soil and mining exploration investigations and several environmental cleanup sites. DEQ's 2013 Development of Oregon Background Metals Concentrations in Soil Technical Report, which summarizes how the background values were developed, is available on the Cleanup Program webpage at http://www.oregon.gov/deq/Hazards-and-Cleanup/env-cleanup/Pages/Cleanup-Guidance-Docs.aspx.

Updated values may now be used

These updated metals background values may now be applied on project-specific decision making for cleanup work in Oregon. The values in Table 1 of this fact sheet replace previous statewide background values contained in a 2002 DEQ memorandum subsequently incorporated into Appendix B of DEQ's Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment and into Table 1 of DEQ's Human Health Risk Assessment Guidance.

Applicability

DEQ has established background soil concentrations for 16 metals (antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, silver, thallium, vanadium and zinc) in 10 regions across the state. These data can be used to:

- Determine whether the metals are present in site soil at concentrations exceeding estimates of background
- Identify whether or not these metals should be retained as chemicals of potential concern or chemicals of potential ecological concern in the DEQ cleanup process

Use of regional default background concentrations

The regional default background concentrations for metals in soils presented in Table 1 represent the 95 percent upper prediction limit for 16 metals in 10 regions of Oregon. The numbers can be used by comparing the maximum detected concentration from a site database with the default background concentration for the appropriate region. If the maximum detected concentration is less than the default value, then that metal is not present in site soil above background levels and that metal is not a chemical of potential concern or potential ecological concern.

DEQ may develop additional guidance describing alternate methods to evaluate background samples such as statistical comparative

Last Updated: 1/25/18
By: Tiffany Johnson

screening techniques, hypothesis testing or application of geochemical evaluation techniques, in the future.

Alternate sources of background values

DEQ recognizes that at some sites it may be appropriate to use background values other than the regional default background metals concentrations. Any of the following options may be used to define natural background concentrations for metals at cleanup sites:

1) Site-specific background evaluations (i.e., a background evaluation done on un-impacted areas of similar soil type at or in the immediate vicinity of the subject site)
2) Site-specific background evaluations previously completed in the site's vicinity
3) DEQ regional default background concentrations

Transboundary soil transport

As shown in Figure 1 and Table 1, background levels for metals can vary from one region to the next. DEQ project managers need to carefully evaluate site-specific requirements when selecting a cleanup remedy including a "clean" soil cap by specifying background concentrations for the region where the facility is located in the Record of Decision.

DEQ Materials Management makes determinations regarding soil that qualifies as "clean fill" for other circumstances. For more information about the definition of clean fill, see http://www.oregon.gov/deq/Filtered%20Library/IMDcleanfill.pdf.

Disclaimer

This document provides information and technical assistance to the public and DEQ employees about DEQ's Cleanup Program. This information should be interpreted and used in a manner fully consistent with the state's environmental cleanup laws and implementing rules. This document does not constitute rulemaking by the Oregon Environmental Quality Commission and may not be relied on to create a right or benefit, substantive or procedural, enforceable at law or in equity, by any person, including DEQ employees. DEQ may take action at variance with this guidance.

For more information please contact:

Contact Tiffany Johnson, DEQ Cleanup Program Coordinator, Portland, 503-229-6258, or call toll- free in Oregon at 800-452-4011, ext. 6258.

Alternative formats

Documents can be provided upon request in an alternate format for individuals with disabilities or in a language other than English for people with limited English skills. To request a document in another format or language, call DEQ in Portland at 503-229-5696, or toll-free in Oregon at 1-800-452-4011, ext. 5696; or email deqinfo@deq.state.or.us.

Figure 1. Regional Boundaries for Default Background Metals Concentrations in Soil

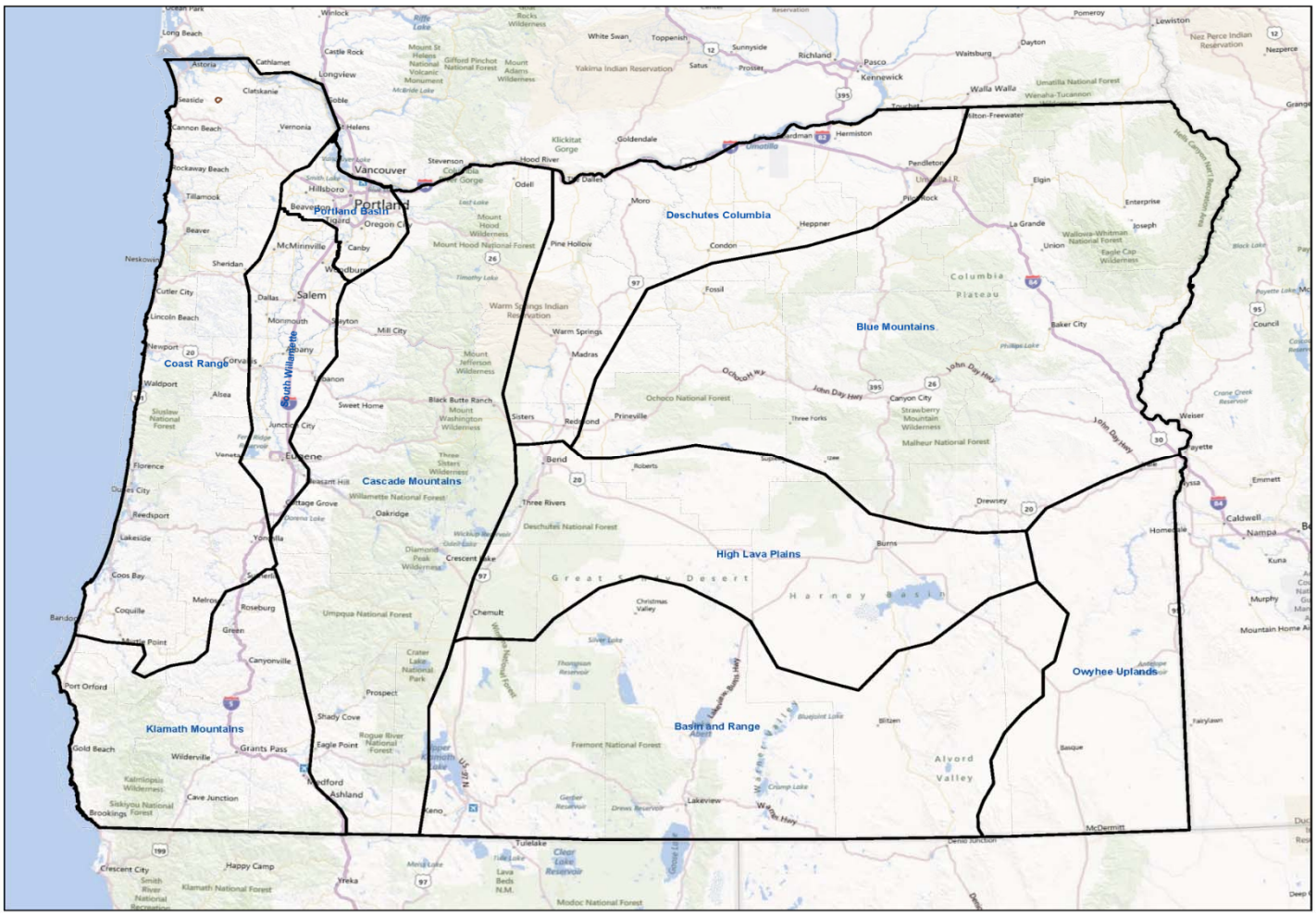

Table 1. Regional Default Background Concentrations for Metals in Soil

Metal	Basin and Range	Blue Mountains	Cascade Range	Coast Range	Deschutes - Columbia Plateau	High Lava Plains	Klamath Mountains	Owyhee Uplands	South Willamette Valley	Portland Basin
Antimony	0.86 (a)	N/A (c)	0.67 (a)	0.55 (a)	1.3 (a)	0.35 (a)	0.59 (a)	N/A (d)	0.39 (a)	0.56 (b)
Arsenic	12 (a)	14 (a)	19 (a)	12 (b)	6.8 (b)	7.2 (a)	12 (a)	17 (a)	18 (b)	8.8 (b)
Barium	790 (b)	950 (b)	630 (b)	840 (b)	700 (b)	790 (b)	630 (b)	970 (b)	730 (b)	790 (b)
Beryllium	2.4 (a)	2.6 (a)	2.1 (a)	2.8 (a)	2.6 (a)	2.6 (a)	1.4 (a)	2.0 (b)	2.6 (a)	2.0 (b)
Cadmium	0.81 (a)	0.69 (a)	0.54 (a)	0.54 (a)	0.40 (a)	0.78 (a)	0.52 (a)	N/A (c)	1.6 (a)	0.63 (a)
Chromium	100 (b)	190 (b)	200 (b)	240 (b)	170 (b)	140 (b)	890 (b)	120 (b)	100 (b)	76 (b)
Copper	110 (b)	120 (b)	73 (b)	100 (a)	29 (b)	62 (b)	110 (b)	50 (b)	140 (b)	34 (b)
Lead	29 (a)	21 (a)	34 (a)	34 (a)	18 (b)	21 (b)	36 (a)	30 (a)	28 (a)	79 (b)
Manganese	1600 (b)	1800 (b)	2100 (b)	2100 (b)	1300 (b)	1500 (b)	3000 (b)	1200 (b)	2900 (b)	1800 (b)
Mercury	0.28 (a)	1.4 (a)	0.24 (a)	0.11 (a)	0.040 (a)	0.060 (a)	0.17 (a)	0.75 (a)	0.070 (a)	0.23 (b)
Nickel	66 (b)	92 (b)	110 (a)	160 (b)	78 (b)	75 (b)	630 (b)	53 (b)	50 (b)	47 (b)
Selenium	0.41 (a)	0.93 (a)	0.52 (a)	1.5 (a)	0.46 (a)	0.54 (a)	0.80 (a)	0.49 (a)	0.68 (a)	0.71 (a)
Silver	0.42 (a)	0.51 (a)	0.17 (a)	0.41 (a)	0.82 (a)	0.68 (a)	0.16 (a)	2.2 (a)	0.33 (a)	0.82 (a)
Thallium	0.22 (a)	N/A (c)	2.8 (a)	5.4 (a)	4.6 (a)	0.21 (a)	0.31 (a)	N/A (d)	5.7 (a)	5.2 (a)
Vanadium	270 (b)	400 (b)	280 (b)	260 (b)	300 (b)	220 (b)	290 (b)	190 (b)	370 (b)	180 (b)
Zinc	130 (b)	160 (b)	170 (b)	140 (b)	130 (b)	140 (b)	140 (b)	120 (b)	200 (b)	180 (b)

Notes:
All concentrations in mg/kg
Data generated with ProUCL, Version 4.1.00
N/A = Not available
UPL = Upper prediction limit
(a) = 95% Kaplan-Meier UPL (t) (b) = 95% UPL
(c) = Not Enough Samples
(d) = No Data