

## Meeting minutes

Feb. 18, 2015 ATSAC meeting



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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.*

### Introduction

The third meeting of the 2014-2015 Air Toxics Science Advisory Committee was held in Conf Room EQC-A, 10<sup>th</sup> floor, HQ, 811 SW Sixth Ave., Portland, on Feb. 18, 2015, from 9 a.m. to noon.

Committee members in attendance: Max Hueftle, Bruce Hope, Bill Lambert, Kent Norville and Dean Atkinson.

David Farrer was absent. Kim Anderson resigned from the committee in early February 2015.

### Committee Administrative Items

The ATSAC chair pointed out that a quorum was present (i.e., five of six members are present). Kim Anderson resigned from the ATSAC on Feb. 6, 2015 via call and email to Sue MacMillan. The ATSAC is in the process of filling Dr. Anderson's position with an alternate member, and hopefully the ATSAC will be back at a full membership of seven soon.

DEQ and the ATSAC have opened up the option for interested parties to participate by phone, if prescribed rules of conduct are followed. DEQ will make call-in numbers for interested parties who want to participate by phone available before next meeting.

The ATSAC read out loud the text that now appears on all comment cards, about the limits and goals of the ATSAC, and a strong recommendation to the audience to keep questions and comments within that context. Each audience member who fills out a card will have approximately three minutes to talk, and will be chosen on a first-come-first-serve basis. Audience members who are present in person will be allowed to speak first, then any interested parties on the phone. The ATSAC chair encouraged audience members to sign in, and fill out comment cards. If ATSAC concludes business early, the additional time will be used for audience questions.

### Presentation on 2011 Emissions Inventory results for Oregon

Chris Swab, DEQ senior data manager, presented a Power Point presentation on the 2011 Emissions Inventory results.

The tons-per-year amounts of chemicals emitted are presented in a summary table as a descending list. The ATSAC requested that Swab compare the results of the 1999 Emissions Inventory, on which the previous ATSAC based most of its decisions, with the current 2011 results, to identify whether any new chemicals pop up, or disappear. It was suggested that in the midst of 2011 the U.S. was in the Great Recession, so facilities, etc., may not have been emitting as much chemical-impacted air as usual.

Chris Swab asked the Committee which emissions inventory data they wanted him to consider -- 2005, 2008, 2011?

The ATSAC recommended using 1999 data, because it was what the ATSAC started with. The ATSAC would like to know which chemicals have emerged in the intervening 13 years, or may be emitted in larger amounts sufficient to change their relative ranking.

The emissions inventory is based on actual emissions. The Toxics Release Inventory, also known as the TRI, provides information on permitted releases. Chris cautioned the ATSAC on their use of TRI data because information reported to the TRI tends to overestimate actual emissions.

## **Portland Air Toxics Solutions Project Presentation Overview**

Sarah Armitage, senior air toxics specialist, presented a Portland Air Toxics Solutions also known as PATS, Overview via Power Point slides. Typical undocumented sources were discussed, with documented sources being made up of things like background concentrations of chemicals in air along with transport from other areas. The undocumented sources are small, but must be considered. Undocumented activities include commercial activities not identified with specific codes/categories; small boilers, paints and solvents used for random purposes; peripheral emissions from permitted operations which may not be documented. Undocumented sources probably do not include biogenic emissions.

## **Discussion of toxicity data for chromium (hexavalent), cobalt and lead**

### **Hexavalent chromium (Cr6): Max Hueftle and Dean Atkinson**

Industrial sources have not contributed that much Cr6 lately. Sources like electroplating are well-controlled. Composite mesh pad systems are being used that are nearly 100 percent efficient. Automotive coatings are well-controlled and have been re-formulated to prevent or eliminate Cr loss. Mr. Hueftle stated that industrial sources were being controlled really well, from the perspective of the Lane Regional Air Protection Agency.

The autobody industry, collectively, has the potential to be a large source of chromium. However, in response to recently-issued federal regulations, auto body finishes have been reformulated to remove the target metals, including cadmium, chromium, manganese, nickel, and lead, so some of their emissions have declined. The primary source of chromium currently identified in the PATS study is related to internal combustion of fuels – jives with what Sarah and Chris said.

Originally, at time of the 2005 ATSAC review, DEQ analyzed total chromium particulate samples and applied a theoretical speciation formula to come up with the proportion of total chromium that was made up of Cr6. Since 2005, DEQ has been conducting ambient monitoring for chromium species. Cr6 is carcinogenic; trivalent chromium, or Cr3, is an oxidized form of Cr6, and is not carcinogenic.

Currently, DEQ monitors for Cr species. Preserving Cr6 so that it doesn't oxidize to the Cr3 form is critical. Cr6 air samples must be kept on ice to prevent oxidation. Based on DEQ information, it doesn't appear that much Cr6 is present in air. Anthony Barnack



stated that DEQ hasn't seen much chromium via their air monitoring. LRAPA stopped monitoring for metals because no exceedances of benchmarks were occurring.

There are two main uncertainties with chromium, and both are related to speciation: 1) Speciation between Cr6 and Cr3, and 2) our current Air Benchmark Concentration (also referred to as an ABC, or benchmark) is focused on Cr6. Was the chromium Ambient Benchmark Concentration originally meant to address Cr6 or total Cr? This is another level of complexity that needs to be considered in regard to review of the Cr6 benchmark.

Current air monitoring results don't indicate that Cr6 is a problem; none are even close to the current ABC for chromium. Note that the ABC for Cr6 is conservative.

Typically, when total Cr is assessed, it's assumed that the carcinogenicity of Cr6 is included. The ATSAC's original effort was aimed at identifying a benchmark for Cr6. Maybe the ATSAC should consider a benchmark for Cr6 and a separate benchmark for Cr3?

The Cr6 studies upon which the standing Ambient Benchmark Concentration (also referred to as ABC or benchmark) is based were conducted within an experimental atmosphere containing primarily Cr6; however this point is not explicitly reported. The committee is of the opinion that Cr6 is the species of relevance to adverse health effects, therefore it decided to retain the ABC of 0.00008 micrograms per cubic meter (ug/m3) for Cr6, which equals 80 picograms per cubic meter when converted. This benchmark concentration should not be applied to total Cr.

At this time, no new carcinogenic potency info is available to for the ATSAC to review. Therefore, the 1990s data, upon which the retained ABC is based, represents the best-available data.

Committee vote: Retain ABC for Cr6 of 0.00008 micrograms per cubic meter (ug/m3) or 80 picograms per cubic meter (pg/m3). Unanimous agreement.

### **Cobalt: Bruce Hope and Kent Atkinson**

In 2005, there wasn't much information on cobalt, so at that time ATSAC went with the the Agency for Toxic Substances Disease Registry (also referred to as ATSDR) value of 0.1 micrograms per cubic meter (ug/m3) for the cobalt ABC. Cobalt is similar to iron and nickel in regard to physical properties. Cobalt is chemically active, pulling in other compounds. Cobalt is a part of Vitamin B12. It occurs naturally in the environment, and is present in many different media including windblown dust, runoff into water, mining activities, combustion of coal and metals processing. Cobalt is an essential micro-mineral. Studies (1990s) done on industrial workers show that their tungsten carbide tools abrade as used more and more, release metal particulates, including cobalt.

Formerly, the protective level for cobalt exposure was based on particulate exposure; related cobalt toxicity studies were based on exposure of occupational workers to cobalt. In more-recent studies, animals were exposed to atomized sprays of cobalt sulfate or cobalt chloride, over a lifetime. These studies demonstrated the carcinogenic properties of cobalt. Higher concentrations affect respiratory systems.

EPA has not weighed in on cobalt toxicity in the Integrated Risk Information System (IRIS), but has via the Provisional Peer-Reviewed Toxicity Values (PPRTVs). The alternative value that is available as a PPRTV, rather than a toxicity factor from IRIS, is the most-current EPA value because the process to incorporate new information using IRIS is slow.

Cobalt sulfate, soluble, non-particulate – different type of effect than that associated with exposure via cobalt particulates, which is what earlier studies were based on; these also were confounded by other metals present with particulates (the ABC of 0.1 ug/m<sup>3</sup> is based on related studies).

More recently, researchers have used studies with animals exposed for a lifetime to atomized sprays of soluble cobalt sulfate, creating, in effect, an atmosphere of cobalt sulfate, which is an artificial set-up in terms of real-world exposures. These are the studies which demonstrated the carcinogenicity of cobalt.

But in real life, soluble cobalt sulfate in the atmosphere cannot physically cause lifetime exposure due to rapid environmental breakdown of this compound, i.e., the physical parameters of cobalt sulfate won't allow it to be present in air for long. These animal studies demonstrated the carcinogenicity of cobalt; soluble non-particulate cobalt sulfate was shown to cause carcinogenicity. Protective levels related to these studies are 0.1 to 0.2 nanograms per cubic meter (ng/m<sup>3</sup>) cobalt, while ambient concentrations of cobalt are typically between 1 ng/m<sup>3</sup> and 80 ng/m<sup>3</sup>.

So in reality, you'd probably be comparing an ABC based on soluble cobalt sulfate to monitored concentrations of particulate cobalt. Also, ambient concentrations of ABC for cobalt are very close to an ABC based on carcinogenicity.

EPA is now also looking at toxicity of cobalt particulates. Toxicity endpoint for particulates has decreased to 0.006 micrograms per cubic meter (ug/m<sup>3</sup>), via EPA using same study that ATSDR used to identify a protective value of 0.1 ug/m<sup>3</sup> for cobalt (2004). EPA first adjusted for continuous exposure, then applied an Uncertainty Factor (UF) of 300 (2008). Earlier ATSDR didn't add these things. Ambient concentrations of cobalt per ATSDR were 0.2 to 3 micrograms per cubic meter (1978-1993), so the more-stringent value of 0.006 micrograms per cubic meter is encompassed within this range, making cobalt a background issue, for all practical purposes.

Cobalt in particulate form is confounded by other metals that sorb to particulates to other metals, so you end up trying to control those, rather than the cobalt itself.

Chris Swab: EPA didn't include metals in their fugitive dust samples. Particulate Matter 2.5 (commonly referred to as PM 2.5) is part of this – represents re-entrained road dust, some construction. So it's inhalable, based on the small size of the particulates. Could originate from the action of car wheels on road surfaces.

LRAPA estimates that about 10 percent of road dust is made up of PM 2.5.

The ATSAC needs to define environmentally relevant form of cobalt, and the form most relevant to population exposure. It seems like particulate cobalt is the most relevant form,



in terms of human exposure. Committee agreed that particulate cobalt is the focus of the discussion.

Cobalt is emitted at 0.3 tons/year in Oregon, based on the most current emissions inventory; this is believed to come from industrial sources. Current cobalt ABC is 0.1 ug/m<sup>3</sup>. The ATSAC could consider EPA's new value of 0.006 ug/m<sup>3</sup>, if the committee agrees with use of UFs, etc. The concentration of 0.006 ug/m<sup>3</sup> is two orders of magnitude more stringent than 0.1 ug/m<sup>3</sup>. But at 0.006 ug/m<sup>3</sup> (same as 6 nanograms per cubic meter), the concentration is well within background ranges.

Back to previous discussions: If we're considering toxicity data from a single study, but which have been revised based on a later, added protocol -- all other things being equal, then we choose higher number, which in this case is 0.1 micrograms per cubic meter (ug/m<sup>3</sup>).

To support this further, if we take the cobalt ABC down to 0.006 ug/m<sup>3</sup>, then cobalt emissions would disappear in a fog of background concentrations. If we stick with 0.1 ug/m<sup>3</sup> as the ABC, then we avoid a greater number of false-positives.

The point of our ABCs, in part, is to trigger actions by DEQ management. At an ABC set at 0.1 ug/m<sup>3</sup>, we still provide protection for the public, and it's actually usable for screening. When you're looking at mine milling processes, you're going to have high concentrations anyway, so 0.1 ug/m<sup>3</sup> would make more sense to use as an ABC.

Committee vote: Retain 0.1 micrograms per cubic meter (ug/m<sup>3</sup>) value for cobalt ABC. Unanimous agreement.

**Lead: Dean Atkinson and Bill Lambert.**

Eleven tons per year of lead is emitted statewide; of course this number does not take into account small area and regional differences. Lead is a very visible chemical of interest, with concerns centering around the Hillsboro Airport. In 2011, approximately 0.6 tons of lead were emitted from aviation activities. With an expansion of the airport, lead emissions could go as high as 0.9 tons/year.

The current ABC concentration for lead of 0.15 micrograms per cubic meter (ug/m<sup>3</sup>) matches the federal National Ambient Air Quality Standard (commonly referred to as NAAQS) value. A concentration of 1.5 ug/m<sup>3</sup> was chosen as the lead ABC, because that's the EPA level that was in place in 2005 (which was a level originally promulgated by EPA in 1978), while an EPA criteria review was being conducted. In 2008, EPA adopted the value of 0.15 ug/m<sup>3</sup> lead for the NAAQS. The December 2014 EPA rulemaking retained the same NAAQS standard for lead.

Lead is present in total suspended particulate form, regardless of size fraction. For the purposes of the NAAQS, concentrations are calculated as rolling three-month average values, over a three-year period.

Clean Air Act directive: Protect public health with adequate margin of safety.



The Clean Air Act directs that NAAQS be set at a level with an adequate margin of safety to protect the most sensitive groups of the population. In the case of lead, the relevant sensitive population group is children under five years of age, including fetuses.

Exposure to lead *in utero* and during the early years of life causes impairment of neural development and decreased mental functional capacity. In later years, associations with impaired academic performance and Attention Deficit Hyperactive Disorder (ADHD) have been reported – and these effects persist into adulthood. Impaired neurodevelopment and functioning is the most sensitive endpoint, and these effects have been demonstrated in multiple studies, so there is a high confidence in a causal relationship.

Children's hand-to-mouth behavior significantly increases their exposure to lead; this route of exposure is not as large in older children and teenagers, so we're mostly worried children who are about 5 years old and younger. The CDC lead reference level (new term in past three years replacing action level) is a blood lead level of 5 micrograms lead per deciliter of blood (ug/dL). The current reference blood lead level of 5 ug/dL replaces the former action level of 10 micrograms of lead per deciliter of blood (ug/dL). Recent epidemiological studies show detrimental effects below this reference level, at 3 ug/dL.

Lead use has been reduced significantly in products, paints and building materials, and has not been used in motor vehicle gasoline since the 1970s, with subsequent related lowering of lead levels detected in the blood of infants and children. Hypertension and strokes in adults also have been reduced. In particular, the removal of tetraethyl lead as an anti-knock component in gasoline played a large role in lowering blood lead levels.

Evidence for carcinogenicity of lead is limited. Even so, the cancer risk-based level for chronic exposure to lead is higher than the toxicity-based level of lead associated with adverse neurological outcomes in children.

NAAQS for lead is set to reduce exposure to and protect children who are exposed to lead in air. Total suspended particulates, also referred to as TSP, are important when dealing with lead, because in mass fractions, we see that lead is present in the total suspended particulate; the lead associated with PM 2.5 and PM 10 fractions are usually well below TSP standards. TSP is also relevant because of the hand-to-mouth transfer in young children.

Expect to see the deposition of lead particles in upper and mid-respiratory tract, and removal by the mucociliary escalator to the pharynx where the particles trapped in mucous are swallowed. Therefore, the primary route of entry into a child's body is through the GI tract.

Malnutrition can be related to lead exposure, because the valence of lead is +2 and the same as calcium. Therefore, active transport mechanisms in the epithelium of the small intestine selectively absorb lead just as they do for calcium. A similar physiologic state exists in pregnant women, who more actively absorb calcium and therefore lead from their GI tracts. Also, the metabolism of pregnancy mobilizes calcium from maternal bone stores, making available previously sequestered lead, which can cross the placenta and expose the fetus.

The EPA focused their modeling effort on the air concentration-to-blood ratio (in other words, micrograms of lead per deciliter of blood, or ug/dL) in developing its analysis for rulemaking. Ideally, EPA would set air-related exposure concentrations for no IQ loss in the population. However, neuro-developmental impacts to children are predicted at all levels of population exposure. Therefore the air concentration would have to be zero to prevent any loss of IQ points in the population. At 0.15 micrograms per cubic meter (ug/m<sup>3</sup>), the level of the current NAAQS, EPA models estimate a mean loss of one to two IQ points in the subset of children in the upper tail of the distribution exposed at the NAAQS of 0.15 ug/m<sup>3</sup>. In rulemaking, the EPA Administrator accepted this level of estimated harm.

In its modeling, the EPA relied upon the critical epidemiologic studies by Bellinger, Canfield, Lanpher, and Tellez-Rojo, who demonstrated quantifiable effects below 5 ug/dL. These studies show losses of 1.5 to 2.5 IQ points per ug/dL blood lead for children in the range of 0.5 to 9 ug/dL. As a point of comparison, current National Health and Nutrition Examination Survey (NHANES) data indicate that the concentration of 5 ug/dL blood lead represents the 97.5 percentile for US children ages one to five years old.

The air concentration of 0.15 ug/m<sup>3</sup> selected in 2008 is at the lower end of the World Health Organization Air Quality Guideline range for lead; in 2008, the ATSAC established a more stringent ABC of 0.15 ug/m<sup>3</sup>. Bill and Dean recommend retaining this ABC, but would also consider setting a lower ABC if defensible.

California's LeadSpread model considered particulate phase-to-blood level-to-IQ points and estimated a 1 to 3 IQ point decrease at the level of the federal NAAQS; similarly, a loss of one to three IQ points is associated with the most-exposed populations in upper tail of population distribution. The model took lead in all media into account. 50<sup>th</sup>, 90<sup>th</sup>, and 99<sup>th</sup> percentile blood level information was assessed.

In remote areas, an air lead concentration of 1 ng/m<sup>3</sup> is present; specifically in Arctic (pristine) remote-region study. Therefore, 0.15 ug/m<sup>3</sup> (a value equal to 150 nanograms per cubic meter) is 150 times the remote-region background. A lead concentration of 40 nanograms per cubic meter was documented in 1995 for U.S. ambient air/anthropogenic background.

Oregon air data indicates that lead levels in air, as estimated, are well below the ABC of 150 ug/m<sup>3</sup>. Questions for the committee to consider: Would setting ABC lower than this, then, serve any useful purpose? What's the benefit? Also, lead in indoor exposure settings (smoking, paint dust) is a lot higher than outdoors.

The 2014 emissions inventory will now include point sources with actual lead emissions of 0.5 tons/year or greater; this is a lower (more stringent) requirement than the 5 tons/year potential-to-emit threshold established for previous emissions inventory years. Our ambient monitoring data is quite low.

Question is: How do we justify lowering the ABC, in a way that makes it legally defensible, if required? ATSAC resources can't really do the drilldown on other studies to justify a more-stringent standard for lead. Identifying a threshold other than zero will always leave a portion of the population unprotected (i.e., by one to three IQ points). Note that the lead levels monitored in air are much lower than the benchmark for lead.



Nature itself produces some lead, so we'll never get to zero with lead anyway. An ABC of 0.15 ug/m<sup>3</sup> would thus help us identify hot spots, i.e., real trouble spots. Really, we would need an ABC of zero to protect against all lead exposure in air, which would be almost impossible, because some of the lead present in air comes from natural processes.

The reality is, it would cost a lot of money to get the concentration of lead in air to zero, and it simply might not be possible technically.

ATSAC member feels we should retain 0.15 ug/m<sup>3</sup> as the ABC for lead, as this level represents the best available scientific and technical evidence, although we do have a trade-off in terms of lowered IQ points. This is an acknowledged compromise position. Alignment with the federal National Ambient Air Quality Standard, or NAAQS, for lead makes sense, based on the ATSAC's limited resources to conduct independent research analysis and modelling.

If the ATSAC was to arbitrarily divide our ABC for lead by two or five or some other number to add an additional safety factor, it would be impossible to provide a legally defensible reason why the ATSAC chose to do this, and in fact the time it would take to go through that justification process would take funds away from regulatory efforts that are actually protecting people.

Neither Bruce Hope nor Bill Lambert was able to locate more recent high quality epidemiologic studies that would change their interpretation of the adequacy of the EPA analysis and rulemaking. However, should any new peer-reviewed information become available, then the ATSAC would use it to re-evaluate our ABC at that time.

Committee vote: Retain current ABC of 0.15 ug/m<sup>3</sup> for lead, in alignment with the federal NAAQS. Unanimous agreement.

Response to audience question about rounding: The ATSAC acknowledges that ABCs set for other air toxics are rounded to the nearest tenth of a microgram. However, because the ATSAC is precisely following the NAAQS in its recommendation for the ABC for lead, no rounding will be employed. Additionally, given the fact that there is no observed threshold for adverse effects from lead, the ATSAC does not want to increase the current ABC value for lead by rounding up the value from 0.15 to 0.2.

### **Topics for the next meeting:**

Dean Atkinson and David Farrer: Cadmium.

Kent Norville and Bill Lambert: Manganese.

Bruce Hope and Max Hueftle: Nickel and nickel compounds.

Dr. Norville can't make next ATSAC meeting in March.

Triage of ALL air toxics to the smaller group that ATSAC will assess.

A second presentation by Chris Swab will help. Can certify ranking prior to next meeting

Maybe have Norville do his screening, if he can?



Sue MacMillan: Must complete my screening look at ABCs, then get together with Chris Swab and Bill Lambert to provide a reduced list.

Dr. Norville: Reduce via emissions inventory table first, then I could do my ranking. The ATSAC also asked MacMillan to identify those chemicals for which no toxicity information is available.

**Comments and questions from audience Jim Lubischer, retired physician –**

There are two lead scenarios that I am concerned with:

What is the blood threshold level is for Pb, since the ATSAC has identified an ABC of 0.15 ug/m<sup>3</sup>?

IRIS in 2004 said that there was no threshold in air for Pb; i.e., effects can occur at any level of lead. The EPA administrator then makes a judgement call. CASAC recommendation made in 2005 was to protect 99.5 percent of the kids, with an acknowledged IQ loss of one to two points. Lubischer disagrees with that judgment. Since there's no threshold, Lubischer thinks that a lower (more stringent) ABC is justifiable. A child inhaling throughout lifetime without health effects is what's supposed to be considered.

If you choose 0.15 ug/m<sup>3</sup> as the ABC for Pb, which allows a loss of one to three IQ points, then you can't call it a benchmark, because it's not protective.

**John Krallman** – neighborhood association person; attorney; professor –  
Wants diesel looked at as soon as possible.

**Miki Barnes**— concerned citizen.

Barnes stated that a lot of the focus in the committee's lead discussion today was on lowered IQ. But lead exposure causes dementia, too, as well as cardiovascular disease and ADHD. All of these conditions have enormous economic consequences and anguish. Lowered IQ in a state where we've got the lowest high school graduation rate in the country is very significant. Hillsboro Airport is majorly responsible. There is much more significant exposure in smaller areas than state-wide. Averaging across the state damps down the people who are exposed to higher levels in smaller areas. There's also an environmental justice issue with Hillsboro, and with airports in general. For example, there are huge race issues related to exposure that causes lowered IQ, ADHD, etc.

Also, Ms. Barnes said that when she accesses the emissions inventory on-line, and looks up PM 2.5, she is concerned that Intel wants to double their emissions of PM 2.5. She wanted to know why these prefab plants like Intel are not listed in the National Emissions Inventory (NEI)?

Swab asked Barnes whether her question is about why Intel wants to increase their emissions from (?) 10 to 25 tons per year...?

Barnes wanted to know why she can't find prefab plants listed in the NEI, if they're such a huge emitter of PM 2.5? She asked if she could get in touch with Mr. Swab to understand how to better use the NEI.

Chris Swab said yes.

At this point, the ATSAC chair advised Barnes and Swab that they needed to deal with this topic more off-line.



**Mr. Weigant – concerned citizen.**

He stated that he is familiar with the topics that ATSAC is discussing. In terms of economic impact, need to realize there's a cost to repairing a situation. For example, cleaning up lead found in old paint – large costs. Smaller costs: point sources. He suggested that DEQ should require a 10-cents-per-gallon air quality improvement fee, and increase the fee by 10 cents each year, and this could subsidize alternative fuels. Could solve many AQ with lead by pinpointing relevant point sources. He stated that he understands that the ATSAC wants to focus on scientific information, but politics needs to be considered with this issue. He also brought up concerns about pollution caused by aviation fuel. Wants to know if ATSAC will consider these other things, will they lower ABC as a result?

The ATSAC chair responded by saying that the committee has been clear about the fact that concerns about smaller geographic areas have not been ignored.