Klamath Settlement Process

Secretarial Determination

Questions and Answers
Klamath Reservoir Sediment Chemistry Data

August 12, 2010

1. Why was this data collected?

Interior Secretary Ken Salazar ordered additional chemical analysis of the sediments behind the Klamath River dams in order to fully assess any potential effects to human health and the environment if bottom sediments move downstream if the four dams (Iron Gate, JC Boyle, Copco 1 and Copco 2) are removed. In addition, these data will be used to evaluate the potential impacts to human health and the environment of the exposed sediments that would become part of the terrestrial landscape if the reservoirs are drained.

2. Are there any human health concerns associated with the sediments analyzed?

A preliminary review of the sampling results indicates human health is not at risk due to contact with the sediment. Further analysis will be undertaken to ensure there is a full understanding of how dam removal might affect humans if some of the sediments move downstream and some of them remain.

3. What about risks associated with consuming fish from these lakes?

There is no data at this point to suggest elevated risk from fish consumption due to the compounds identified in this preliminary analysis. Recent warnings that were posted about algal toxins in Copco 1 and Iron Gate reservoirs are a separate matter and the public is advised to follow current guidance in those postings. It is likely that the Klamath Settlement Environmental Impact Statement/Environmental Impact Report (EIS/EIR) will address any potential issues over the safety of consuming fish as data analysis continues.

4. What was sampled? What did you find?

Bottom sediments were sampled from JC Boyle, Copco 1, and Iron Gate Reservoirs and from the Klamath River Estuary (sampling was not conducted at Copco 2 because very little sediment is found there). The sediment samples were analyzed for a broad suite of chemicals. The preliminary analysis of the data shows a low-level presence of chemicals in the sediment behind the dams, including PCBs, trace metals, and dioxins. This finding is consistent with previous reports.

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5. Were the levels of chemicals detected a concern?

Based on an initial screening of the sediment data results, these levels indicate no current public health concerns from direct exposure to reservoir sediments. Some chemicals are present at levels above one or more protective screening levels for sediment disposal or above available United States and western United States background values. Sediment quality guidelines have not been established for all analyzed compounds (e.g., PBDEs).

6. How many samples were taken? Where and at what depths?

Samples were taken from 39 locations in the most recent study for the Secretarial Determination. Samples from about 26 locations in three reservoirs (including 22 borings and 4 grab samples) were taken during a preliminary study in 2006. This number of samples is considered adequate for a screening level analysis for the Secretarial Determination.

See attached maps (or visit KlamathRestoratin.gov) for sample locations within each reservoir for the Secretarial Determination study; sample depths are provided in the Inventory table. Depending on the depth of the sediment, samples were either taken as composites of the entire core length (< 5 ft), or as composites from individual 5-ft deep segments.

7. What compounds were tested for in the sediments?

A comprehensive suite of chemical classes were analyzed, including nutrients and organic carbon, metals, current-use pesticides, legacy chlorinated insecticides, organic solvents and hydrocarbons, PCBs, brominated flame retardants (known as PBDEs), and dioxins and furans. Additionally, samples were collected to support bioassessment tests; however, those data are still in review and are not being released at this time.

8. What compounds have been detected in the sediments?

A preliminary review of the data indicates that sediment samples from JC Boyle, Copco I and Iron Gate reservoirs contain low levels of commonly occurring chemicals, confirming the previous 2006 findings of a commissioned report.

- Several metals, naturally occurring elements that are found in all ecosystems, were detected; mercury was not detected.
- Few current-use pesticides were detected in any samples. Those detected included the organophosphate insecticide chlorpyrifos and the pyrethroid insecticide permethrin. Some of the legacy chlorinated insecticides, such as dieldrin, lindane, DDT, and their breakdown products were detected; of these legacy pesticides, methoxychlor was detected most frequently.

- PCBs[1] were detected in all reservoirs but no arochlors were detected. Certain specific PCB compounds (congeners) were detected, in differing amounts depending on the location. Dioxins and furans[2] were detected in all locations sampled. See additional questions for more information.
- Pentachlorophenol, a semivolatile compound used as a wood preservative was found in one sample in JC Boyle reservoir.
- Polybrominated diphenyl ethers (PBDEs)[3] were detected in the reservoirs and estuary.

9. What about the Klamath estuary sampling?

Several compounds were detected including methoxychlor, which is an organochlorine insecticide also found elsewhere in this study, low levels of PCBs, PBDEs, and dioxins, and some organic hydrocarbons indicative of fuels or solvents. The estuary samples were very different from those obtained from the reservoirs in that they had very low amounts of fine-grained sediment and organic carbon, which are the fractions of sediment most likely to carry these chemicals.

10. What are the sources of these chemicals?

The chemicals detected in the sediments reflect both naturally occurring chemicals (e.g., some metals found in the local geology) as well as those likely coming from both human activities within the watershed and aerial deposition.

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1 PCBs, or polychlorinated biphenyls, are a group of chlorinated aromatic hydrocarbons used in transformer fluids, lubricants, some paints and coating materials, plasticizers and inks. Aroclors® are specific technical mixtures of PCBs made by Monsanto between the 1930s and 1970's. Additional information is available at: http://www.epa.gov/epawaste/hazard/tsd/pcbs/index.htm

2 The term "dioxin" is commonly used to refer to a specific family of chlorinated organic chemicals that share a similar chemical structure. Examples of dioxins include polychlorinated-dibenzo-dioxins (PCDDs), and polychlorinated-dibenzo-furans (PCDFs). PCDDs and PCDFs are not commercial chemical products, but are unintentional byproducts of most forms of combustion, including natural events (e.g., forest fires) and several industrial chemical processes (e.g., wood treatment facilities) burning of plastics, and historic pesticide use. While dioxins are considered to be ubiquitous in the environment, levels have been declining since the early 1970's as a result of a number of federal and state regulations and clean-up actions. Additional information is available at the following web site; with answers to Frequently Asked Questions available by clicking on the "Recent Updates" link in the box on the right: http://cfpub.epa.gov/ncea/CFM/nceaQFind.cfm?keyword=Dioxin

3 PBDEs are a group of brominated aromatic hydrocarbons used as flame retardants in building materials, electronics, furnishings, motor vehicles, plastics, polyurethane foams, and textiles. Their chemical structure is like PCB, with bromine instead of chlorine. Some of these compounds are banned in California. Additional information is available at: http://www.epa.gov/oppt/pbde/

11. How will this sediment chemistry information be used?

A multi-agency team of federal and state experts is assembling existing sediment chemistry data to evaluate potential exposures and associated risks related to human and ecosystem exposures. These analyses will be part of the Klamath Settlement EIS/EIR.

12. Can you break down the sampling results in a little more detail and describe what they mean?

PCBs – The total concentrations for PCBs **(*see footnote #1 for a description of PCBs*)** detected in the sediments sampled ranged from 0.5 parts per billion (ppb) in the estuary to 13 ppb in JC Boyle, Copco I and Iron Gate reservoirs. The total reported PCB values were the sum of the detected PCB congeners (molecules differing only by where the chlorine atoms are attached) detected in the sediments; none of the individual congener concentrations exceeded 1 ppb. No Aroclors were detected. Total PCB values were below common screening levels for sediment disposition. Potential future exposures to PCB congeners in detected bottom sediments, and any related human health risks, will be evaluated as part of the Klamath Settlement EIS/EIR.

Dioxins and furans – Dioxin and furan **(*see footnote #2 for a description of dioxins and furans)*** data generally are summarized by computing a "toxicity equivalent quotient" (TEQ) from the "toxicity equivalent factors" (TEFs) for individual compound concentrations. The most toxic dioxin compound, 2,3,7,8 tetrachloro-dibenzo-dioxin (TCDD), is assigned a value of 1 and other compounds' toxicity values are scaled relative to TCDD. Due to different mechanisms of toxicity, TEQ values are computed differently for humans and mammals, fish, and avian wildlife.

Dioxins and furans levels (expressed as TEQ values in parts per trillion (pptr) or picograms per gram, pg/g) in reservoir bottom sediments were calculated for human/mammal toxicity and found to be around 6.5 pptr in JC Boyle Reservoir, 8 pptr in Copco 1 Reservoir, and 3 pptr in Iron Gate Reservoir. The levels in JC Boyle and Copco 1 reservoirs are slightly above what might be considered background levels (see discussion of background levels below), whereas the dioxin TEQ in Iron Gate Reservoir is in the range of background levels. TEQ values calculated for fish and avian species are somewhat lower, based on lower toxicity of dioxin to those types of species. For purposes of illustration, for the western U.S. generally, and for the nation, background levels of dioxins and furans in bottom sediments typically range from 2 to 5 pptr TEQ as determined in four studies. Background samples in these studies were taken at locations thought to be unaffected by any known specific dioxin source. Two of these studies were national in scope and two were focused on west coast water bodies (Puget Sound and San Francisco Bay). These studies found similar "background" concentrations of dioxin in sediments. The national surveys identified background as being 3.9 pptr (Canada) and 5.3 pptr TEQ (U.S.). The regional survey conducted in Puget Sound identified 4 pptr TEQ as background in non-urban embayments. The San Francisco Bay regional study identified 2-5 pptr TEQ as background in areas selected to be unaffected by known dioxin sources.

PDBEs – PBDEs ***(see footnote #3 for a description on PBDEs)*** were detected at concentrations ranging from about 500 to 6700 pptr (0.5-6.7 ppb), with the highest concentrations found in JC Boyle Reservoir. No applicable screening levels for PBDEs in sediments have been developed. These levels are similar to those found elsewhere in the Pacific Northwest.

13. Q: How will DOI continue to keep the public informed as new information becomes available?
The Interior Department will continually provide updates at KlamathRestoration.gov. In addition, federal team members will also hold periodic meetings in or near the Klamath Basin that are open to the public. At these meetings, the team will provide updates on all aspects of the Secretarial Determination process, including the development of any new information regarding sediment.

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