Technical Briefing Sheet

U.S. Environmental Protection Agency, Region 10 December 2004

Sediment Sampling Approach and Rationale, Upper Columbia River

During April and May 2005, field crews employed by the U.S. Environmental Protection Agency (EPA) will be collecting sediment samples from the Upper Columbia River site in northeast Washington. This *Technical Briefing Sheet* provides information about why EPA is collecting these sediment samples, and presents information on the sampling approach to be used. This sediment sampling work is being conducted as part of an EPA-lead Remedial Investigation and Feasibility Study (RI/FS) of hazardous waste contamination in the Upper Columbia River. EPA is providing this *Technical Briefing Sheet* to help answer questions that you might have regarding the upcoming sampling.

Background

Several investigations and studies over the past 20 years have identified the presence of heavy metals and organic contaminants in the sediments of the Upper Columbia River and within Lake Roosevelt (the reservoir behind Grand Coulee Dam). A 2001 EPA investigation of the upper 70 miles of the Upper Columbia River and Lake Roosevelt confirmed that widespread contamination was present in lake and river sediments at levels that posed a potential threat to people and animals that might contact the sediment. These findings led EPA to recommend that additional investigation was needed to evaluate the nature and extent of the problem, assess risk to people and animals, and determine possible cleanup actions. This *Technical Briefing Sheet* describes the initial phase of sediment sampling activities that will be conducted as part of the RI/FS. The sediment investigation will be conducted within an approximately 150-mile reach of the Upper Columbia River, from the U.S.–Canadian border (River Mile 744) to the Grand Coulee Dam (River Mile 597).

Recent EPA actions

During the last several months, EPA has:

- Reviewed data and findings from past studies and investigations, and used this information to develop a preliminary understanding of site conditions and contaminant distribution within the lake, river, and local tributaries
- Identified data and information that are needed to gain a better understand of existing levels of contamination in river and lake sediments
- Identified information gaps that must be addressed to better understand the location, character, and long-term fate of contaminants in sediment, as well as the current threat to people, plants, and animals that may contact these sediments
- Developed a sampling design and approach that will provide several different kinds of sediment samples from throughout the Upper Columbia River study area
- Identified specific contaminants that will be analyzed as part of the current phase of investigation
- Prepared a draft *Phase I Sediment Sampling Approach and Rationale* report that describes the proposed 2005 sediment sampling activities, and the technical justification to support the sampling activities described therein

Potential sources of contamination

Sediments within the Upper Columbia River contain known environmental contaminants that have been derived from both point sources (specific, identifiable locations) and non-point sources (those that cannot be traced to a specific location). Historical sampling and analysis have confirmed the presence of metals, dioxins/furans, and polychlorinated biphenyls (PCBs) in Upper Columbia River sediments at concentrations that might pose a threat to people, plants, or animals who contact them. A major point source for metals is the Teck Cominco industrial/metallurgical complex in Trail, British Columbia. The primary source of historical loading of dioxins and furans to the Upper Columbia River was the Celgar pulp mill in Castlegar, British Columbia. Specific PCB point sources are unknown. PCBs have been found in fish tissue and in a limited number of historical sediment samples.

Kinds of contaminated sediment

Within the Upper Columbia River, two general types of contaminated sediment are recognized: coarser grained (sand-sized) particulates and finer

grained (silt/clay-sized) particulates. Where present, the contaminated black, sand-sized sediment typically includes particulate slag (a byproduct of smelting operations). Contaminated fine-grained sediment can include silt/clay-sized particles of slag material or naturally occurring silt, clay, and organic material that becomes contaminated by metals or other contaminants, which preferentially bind to these particles.

Distribution of contaminated sediment

Sediment containing coarse-grained slag shows elevated concentrations of metals including arsenic, copper, and zinc. In general, the larger particulates are present in the upper reaches of the Columbia River and of Lake Roosevelt. Mercury, cadmium, and lead are found at higher concentrations in the finer-grained sediments that are present in the middle and lower reaches of Lake Roosevelt. Dioxins, furans, and PCBs (where detected) also have been found in association with the finer-grained bottom sediments.

Given the general findings from previous sediment studies, the highest levels of metals contamination are present in the upper reaches of the Columbia River above Kettle Falls. However, the detailed distribution of sediment contamination, both laterally (across the river/reservoir channel) and vertically (below the surface of the sediment bed), has not been determined.

Transport of contaminated sediment

For the most part, the contaminated sediments are transported in water, although some might be transported by the wind as dust. Coarse-grained, slag-impacted sediment primarily moves along the bottom of the river, carried downstream by the river current. Fine-grained contaminants (suspended in water) and dissolved contaminants (in solution) flow with the water. As the river flows downstream, it encounters progressively slower and deeper water in Lake Roosevelt. Downstream from Marcus Flats (River Mile 703) it appears that there is little potential for downstream transport of the sand-sized slag-impacted sediment under current reservoir operational conditions. Furthermore, in the middle and lower reaches of the reservoir, the current becomes slow enough to allow the fine-grained silt and clay-sized particulates to settle.

How can people, animals, and plants be exposed to contamination?

People might be exposed to contaminated sediment by:

- Directly contacting it at beaches, in the river, and in the reservoir (recreational and tribal users)
- Inhaling dust from exposed sediment during wind storms at reservoir drawdown.
- Eating fish, shellfish, plants, or wildlife that have accumulated contaminants (recreational and Tribal users)

Invertebrates, fish, and wildlife also might directly contact contaminated sediments. Fish and other aquatic organisms might eat or absorb contaminants, and those contaminants might accumulate and concentrate in their tissues. Certain contaminants also might accumulate in plants. Wildlife such as birds, mammals, fish, amphibians, and reptiles that eat fish, invertebrates, or plants that contain contaminants might be exposed through this pathway.

How did EPA develop the design and approach for the Phase I sediment program?

EPA has developed a systematic approach (a data quality objectives process) to identify specific data needs to be addressed by a Remedial Investigation. This process was used to develop the specific types of data to be collected, as well as the approach and design of the Phase I sediment sampling program. EPA considered the specific data needs identified in the data quality objectives process, the unique site characteristics, and collective input and comments received from the Colville Tribe, the Spokane Tribe, the U.S. Department of the Interior, and the Washington Department of Ecology.

What kinds of sediment samples will be collected, and where?

In the April/May 2005 Phase I investigation, 325 sediment samples will be collected from throughout the Upper Columbia River. Most will be collected from the upper 6 to 12 inches of the sediment layer. A small number of samples will be collected from deeper portions of the sediment layer.

The sample locations are shown in Figure 1. Many of the samples will be collected along transect lines that correspond to discrete River Miles. The proposed Phase I sampling locations are currently being

evaluated for potential conflicts with historical or cultural resources. Some sample locations might be relocated as a result of this evaluation.

The following types of sediment samples will be collected during the Phase I sampling program:

Baseline sediment samples (132). Baseline sediment samples will be used to better define the current distribution of contaminants over the length and width of the river. Baseline samples in the upper portion of the study area (above River Mile 720) will be collected along transect lines spaced at 1-mile intervals. Below River Mile 720, baseline samples will be collected along transects spaced at 3-mile intervals. Previous studies have found metals concentrations to be higher and more variable in the upper portion of the Upper Columbia River, where visible slag-impacted sediment is more evident. These observations favored the development of a more tightly spaced sample interval for this upper reach. Along each transect, a minimum of three samples will be collected: an upper river bank sample from each side of the river and a sample from near the center of the original (pre-dam) river channel.

Focus-area sediment samples (122). Six Focus Areas have been established to assess current and future conditions within selected reaches of the river/reservoir system (see Figure 1). The Focus Areas will include an increased density of sediment samples within a 5- to 6-mile segment of the river/reservoir. The greater sampling density provides a better means to examine spatial and vertical changes in contaminant concentrations. In addition, the Focus-area samples will provide a baseline for evaluating changes that might result from any cleanup actions. Given the large size of the Upper Columbia River, the Focus-areas create smaller sub-areas that can be used to represent anticipated sediment conditions within broader, adjoining sections of the river/reservoir system.

Beach sediment samples (48). Sediment samples will be collected from designated recreational areas (campgrounds, boat ramp areas, etc.) or other high-use beaches located throughout the entire Upper Columbia River. Beach sediment data will be used to assess potential risk to beach users.

Tributary sediment samples (11). Tributary sediment samples will be collected near the mouths of six major tributaries. These tributaries include (from upstream to downstream): Big Sheep Creek, Onion Creek, the Kettle River, the Colville River, the Spokane River, and the Sanpoil River. The data will be used to better understand how these tributaries affect Upper Columbia River sediment.

Sediment core samples (11). Sediment core samples will be collected from designated sites throughout the Upper Columbia River. Core samples will be used to assess vertical variations in contaminant concentrations within the sediment and to establish the apparent thickness of the contaminated sediment layer. This information assists in understanding the potential for future movement and redistribution of contaminants.

Bioassay sediment samples (50). These samples will be used to establish the relationship between contaminant concentrations and toxicity to sediment organisms. Bioassay samples will be collected from areas that are several feet below the water line at the time of sampling.

Reference-area sediment samples. Sediment samples from outside of the Upper Columbia River study area will be collected for comparison to the Upper Columbia River samples. The specific locations where reference samples will be collected have not been identified yet.

What kinds of contaminant data analyses are needed?

The data quality objectives process identified the types of laboratory analyses needed for the three groups of sediment samples. Sediment samples will be collected and analyzed for total metals, PCBs, and dioxins/furans. In addition, sediment bioassays and grain-size analyses will be performed on samples from a number of locations. Other supplemental analytes (such as total organic carbon, ammonia, acid volatile sulfide/selectively extracted metals [AVS/SEM], and total sulfides) also will be included to provide a better indication of other possible factors that might affect sediment chemistry and toxicity.

To learn more

EPA is providing a variety of ways for people to learn more about the Upper Columbia River RI/FS project and get involved.

- **Visit our website.** EPA has developed a website for the Upper Columbia River project. Visit:

www.epa.gov/r10earth/, click on *index A-Z*, click on *U* for *Upper Columbia River*.

- **Join our mailing list.** Fact sheets and briefing sheets regarding the project will be sent to parties on our mailing list. To be added to or removed from the list, contact Deborah Neal at 800- 424-4372 or neal.deborah@epa.gov.
- **Read project fact sheets.** EPA has prepared fact sheets to describe the project and its goals. They are sent out by regular mail and are available on the EPA website. We will continue to publish fact sheets as milestones are reached and there is news to report.
- **Talk with EPA project staff.** EPA project managers and community involvement coordinators are available to talk with you to discuss the investigation and answer questions. If possible, one of us will attend community or club meetings to provide updates. See contact information below.
- **Visit an information repository.** EPA has established eight information repositories for the Upper Columbia River project. These are places where you can read project documents. Be sure to call ahead for business hours.
  - *Northport*: Northport Town Hall, 315 Summit Street, 509-732-4450
  - *Colville*: Colville Public Library, 195 South Oak Street, 509-684-6620
  - *Inchelium*: Inchelium Tribal Resource Center, 12 Community Loop, 509-634-2791
  - *Grand Coulee*: Grand Coulee Library, 225 Federal Street, 509-633-0972
  - *Wellpinit*: Spokane Tribe Department of Natural Resources, 6290 B Ford-Wellpinit Road, 509-258-9042
  - *Davenport:* Davenport Library, 411 Morgan Street, 509-725-4355
  - *Spokane:* Spokane Library, 906 W. Main, 509-444-5334
  - *Nespelem:* Office of Environmental Trust, Colville Confederated Tribes, 1 Colville, 509-634-2425
- **Read articles in local papers.** EPA will share significant project news and milestones with local, Tribal, and community newspapers and newsletters via press releases, fact sheets, and briefing sheets. Some publications are already covering EPA's Upper Columbia River activities on a regular basis.

Contacts

If you have questions, concerns, or suggestions on this project, please call or email us.

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TTY users, call 800-877-8339. If you need materials in languages other than English, please call Deborah Neal.

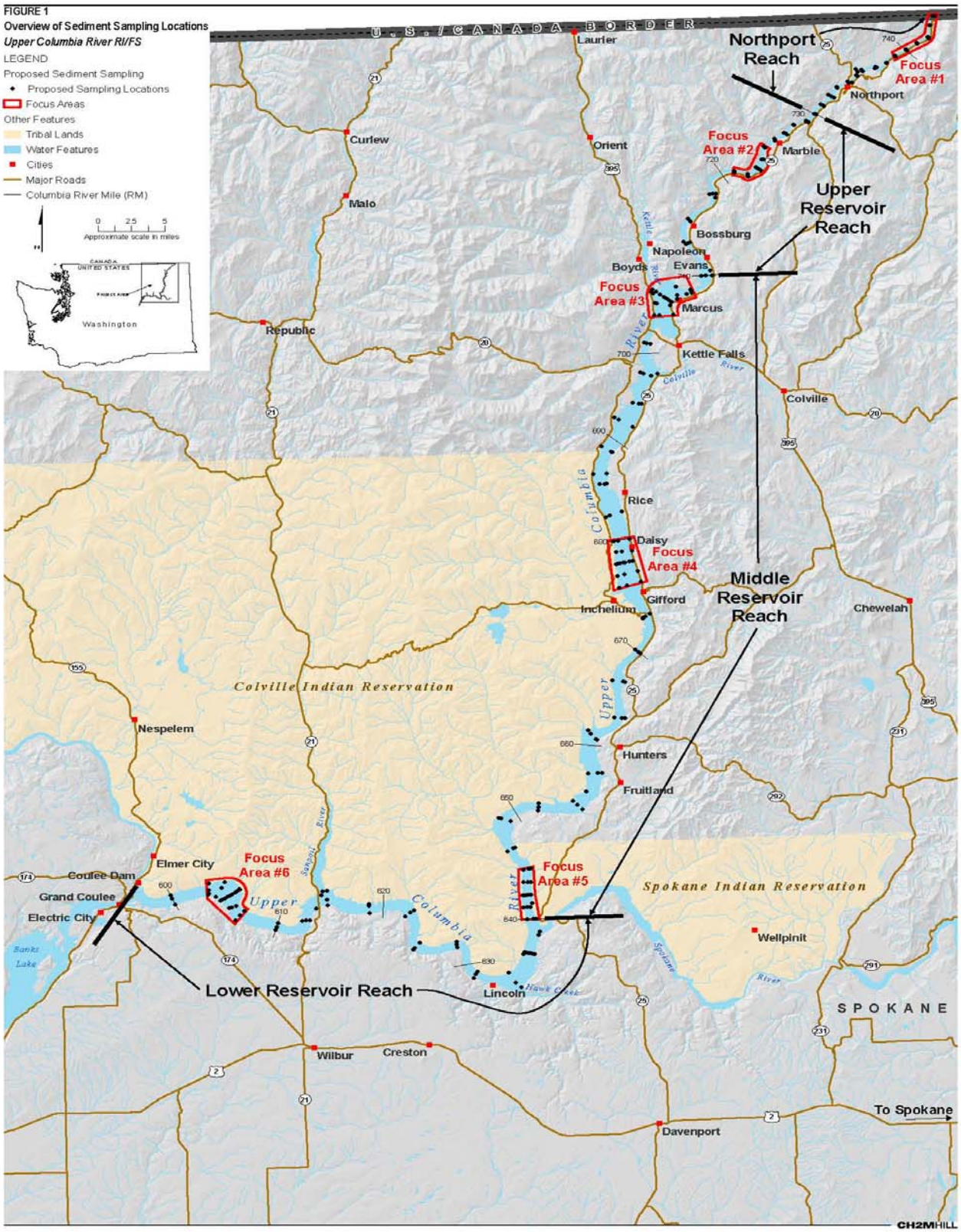
FIGURE 1
Overview of Sediment Sampling Locations
Upper Columbia River RI/FS
LEGEND
Proposed Sediment Sampling
Proposed Sampling Locations
Focus Areas
Other Features
Tribal Lands
Water Features
Cities
Major Roads
Columbia River Mile (RM)
Approximate scale in miles
Washington
U.S./CANADA BORDER
Laurier
Northport Reach
Focus Area #1
Northport
Focus Area #2
Marble
Upper Reservoir Reach
Curlew
Orient
Malo
Bossburg
Napoleon
Boyds
Evans
Focus Area #3
Marcus
Republic
Kettle Falls
Colville
Rice
Daisy
Focus Area #4
Middle Reservoir Reach
Inchelium
Gifford
Chewelah
Colville Indian Reservation
Nespelem
Hunters
Fruitland
Elmer City
Focus Area #6
Coulee Dam
Grand Coulee
Electric City
Focus Area #5
Spokane Indian Reservation
Wellpinit
Lower Reservoir Reach
Lincoln
SPOKANE
Wilbur
Creston
To Spokane
Davenport
CH2MHILL