

PORTLAND HARBOR SUPERFUND SITE
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

*Comprehensive Round 2
Site Characterization Summary
& Data Gaps Analysis Report*



EXECUTIVE SUMMARY
FEBRUARY 2007

GENERAL OVERVIEW

Identified as a cleanup priority by the U.S. Environmental Protection Agency (EPA) in December 2000, the Portland Harbor Superfund Site is a complex project. The Lower Willamette River extends from the confluence with the Columbia River to Willamette Falls (about 26 miles) in Oregon City. The cleanup investigation is focused on a nine mile stretch of the Lower Willamette River, referred to by EPA as the Study Area, which is roughly between Sauvie Island and Swan Island – north of downtown Portland.

The Lower Willamette Group (LWG) – some of the parties identified by EPA as potentially having responsibility for investigation and cleanup at the Site – is performing a Remedial Investigation and Feasibility Study (RI/FS). The Remedial Investigation (RI) determines the nature and extent of sediment and surface water contamination, characterizes physical conditions that may affect movement of contaminants, and assesses the potential risks the contamination poses to human and ecological health. The Feasibility Study (FS) will identify appropriate cleanup strategies and methods. The results of the RI/FS will be used by EPA to identify specific areas of the Site that will require cleanup.

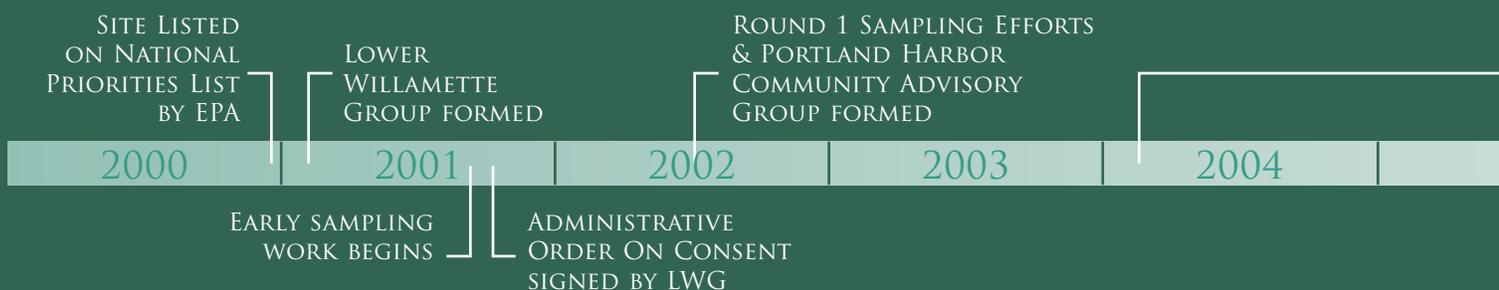
The LWG initiated scientific investigations to support the in-water RI/FS in 2000 under the supervision of EPA and in cooperation with its partners (other federal natural resource trustee agencies, the Oregon Department of Environmental Quality (DEQ) and six Tribal governments). Upland cleanup and source

control efforts are ongoing under the direction of DEQ. After completion of the in-water Study, EPA will establish the final site boundaries and cleanup methods in a document called a Record of Decision (ROD).

The LWG and EPA agreed to a three-staged approach to the in-water Study: Round 1 (most of the physical and biological field studies); Round 2 (most of the field and laboratory chemical studies); and Round 3 (final studies to fill remaining data gaps). A substantial amount of data from Rounds 1 and 2 are compiled and evaluated in the Comprehensive Round 2 Site Characterization Summary and Data Gaps Analysis Report (Round 2 Report) to identify data and analyses needed to complete the in-water Study (i.e., Round 3). Once Round 3 is completed the Remedial Investigation and Feasibility Study will be written.

The LWG just completed the Round 2 Report, which identified the following data gaps: additional analysis or sampling of sediments, surface water, stormwater, benthic (sediment-dwelling) organisms, lamprey and sturgeon. Of these data needs, the LWG has already initiated sampling plans for a Round 3A data collection effort. The remaining data needs will be collected in Round 3B later in 2007.

Once the LWG completes the RI/FS, EPA will issue the site ROD. The post-ROD detailed design phase for cleanup activities in specific sediment areas will likely include additional in-water data collection.



APPROACH

The Round 2 Report is the result of a significant commitment of time and resources by the LWG, EPA and EPA's partners. All of the parties involved have placed a high priority on using a cooperative and iterative process to identify, discuss and solve emerging issues. Additionally, throughout the field sampling collection and analysis process, the LWG has consistently worked with EPA and its partners to provide information to many sectors of the community, such as the Portland Harbor Community Advisory Group (PHCAG), business, educational institutions and the media.

PURPOSE

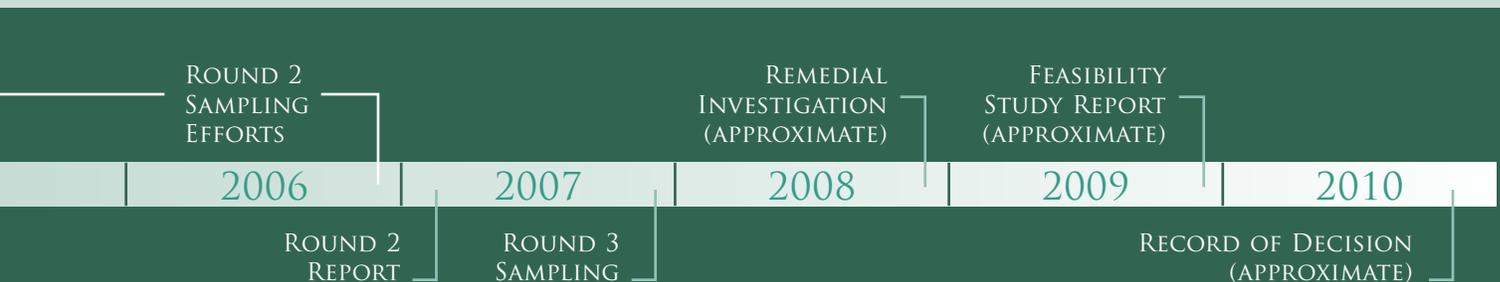
The Round 2 Report evaluates the physical, chemical and biological information collected so far in order to focus the Round 3 data collection effort and, to the extent practicable, determine the final data needs for the RI/FS. The Report includes the following:

- Review of the investigative activities, including major sample collection phases and goals
- Description of the upland and in-water physical characteristics of the Site
- Identification of potential historical and current contaminant sources and the ways in which chemicals move into and around the Study Area
- Identification and mapping of the nature and distribution of chemical concentrations in sediments, water, fish and benthic organisms
- Initial evaluation of how chemicals move through the physical system and into fish, wildlife and people

- Documentation of the results of the Round 2 human health and ecological risk assessments
- Identification of initial preliminary remediation (cleanup) goals and initial identification of areas in the river where chemicals may be of potential concern to human or environmental health.
- Presentation of a revised conceptual site model which shows the relationships among known sources, chemicals, and the fish, wildlife or people who might come into contact with those chemicals.
- Identification of data needed to complete the RI/FS

LWG SAMPLE COLLECTION & ANALYSIS THROUGH 2006

- 2,000 individual fish and invertebrate samples
- 1,800 subsurface sediment chemistry samples (from about 660 coring locations)
- 1,650 surface sediment chemistry samples
- 800 sediment trend analysis sample points
- 500 sediment profile images
- 225 transition zone water samples from 108 stations at nine sites
- 130 surface water samples from 25 point and transect stations
- Four major annual bathymetry surveys (river bottom mapping) of 16 miles of the Lower Willamette River
- Three wildlife habitat surveys



PHYSICAL SETTING

Over the past 150 years the Portland Harbor area of the Lower Willamette River has experienced significant physical changes, including areas that have been redirected, straightened, filled or deepened by dredging. Most of the riverbank has been filled, stabilized and/or engineered for industrial or port operations with riprap, bulkheads and over-water piers and docks. There is a federally maintained navigation channel throughout the Study Area which has been dredged – historically – to a level of minus 40 feet.

The river flow varies dramatically with the seasons, with low late-summer dry-season levels and high rainy season and spring snow melt levels. Periodic flow reversals within Portland Harbor also occur due to tidal effects.

The Willamette River flows into both the Columbia River and Multnomah Channel. Under certain conditions more than half the river flows into Multnomah Channel. The width and depth of the river affect the flow velocities and determine in part where sediment is eroded and deposited.
Conceptual Site Model

In order to focus sampling and other investigations, a conceptual site model for the Study Area was developed by LWG and is periodically updated. The model describes the current understanding of potential chemical sources, pathways and receptors in the Study Area and evaluates the relative importance of different pathways for both historical and current potential sources.

POTENTIAL SOURCES/PATHWAYS

The evaluation of potential sources included reviewing available upland information and assessing the likelihood that chemicals associated with facility operations may have migrated or been released directly to the river. Additionally, potential sources outside the Study Area from other reaches of the Lower Willamette River were identified (e.g., upstream). Potential source and pathway information will be updated in the final RI report.

The evaluation of potential sources concludes:

- There were numerous historical sources that contributed contamination to the river via all pathways (surface water/sediment transport, groundwater, stormwater and process wastewater discharge, overland flow, bank erosion, overwater activities/spills and atmospheric deposition)
- Most historical sources are no longer active or have been significantly diminished
- Upstream surface water, sediment resuspension and deposition, and stormwater from within and upstream of the Study Area remain the most likely significant pathways.

DISTRIBUTION OF CHEMICALS

The LWG analyzed samples for more than 540 chemicals of interest. Taken as a whole, these data show that chemical concentrations in sediment tend to be fairly uniform across the Study Area except in near shore and off-channel areas that are generally associated with known or suspected historical or current sources, where concentrations tend to be higher. In general, sediment collected from areas outside the Study Area shows lower concentrations of indicator chemicals than sediment collected within the Study Area (except for arsenic and mercury, which exhibit high concentrations throughout the Willamette River basin).

CHEMICALS FOUND IN STUDY AREA SEDIMENTS

ARSENIC: A natural occurring metal that exists throughout the entire Willamette River, it also has been used to preserve wood or as pesticide

MERCURY: A metal that has several forms and exists throughout the entire Willamette River

POLYCHLORINATED BIPHENYLS (PCBS): A mixture of individual chemicals that were used in electrical equipment and other industrial uses; no longer in use but still in the environment

DDT (dichlorodiphenyltrichloroethane), DDE (dichlorodiphenyldichloroethylene) and DDD (dichlorodiphenyldichloroethane): Pesticides no longer in use but still in the environment

POLYCYCLIC AROMATIC HYDROCARBONS (PAHS): A group of more than 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage or other organic substances

PETROLEUM: Oil, gasoline, diesel, etc.

PHthalates: Substances added to plastics to increase their flexibility

DIOXINS: Chemicals formed during chlorine treatment of pulp and paper and other industrial processes

FURANS: Chemicals produced when wood is distilled and other industrial processes

RISK ASSESSMENT

The primary goal of the federal Superfund cleanup program for the Portland Harbor Superfund Site is to reduce risks to human and environmental health from historical and current sources of contamination found at the Site. As the focus is to reduce unacceptable risks to human and environmental health, the cleanup will not necessarily eliminate all risks. A preliminary look at what might potentially be causing risks to human and environmental health is contained in the Round 2 Report.

Human Health Risk Assessment

The Round 2 Human Health Risk Assessment (HHRA) evaluated potential risks to humans resulting from exposure to chemicals through direct contact with beach sediment, in-water sediment, surface water and groundwater seeps, and through fish and shellfish consumption. Because the results are preliminary, they are not intended for developing final cleanup standards or identifying areas in need of cleanup. Final cleanup standards will be determined before EPA prepares its ROD.

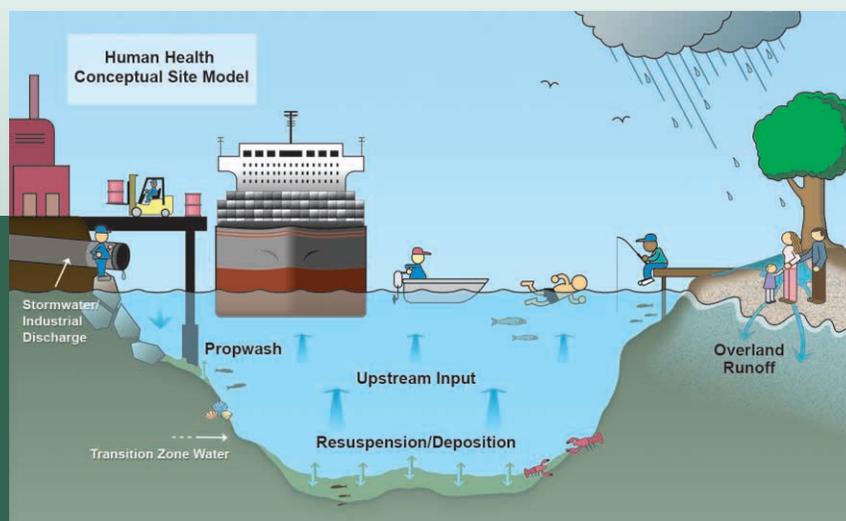
The Round 2 HHRA evaluated the following exposure scenarios:

- **DOCKSIDE WORKER** — direct exposure to beach sediment;
- **IN-WATER WORKER** — direct exposure to in-water sediment;
- **ADULT AND CHILD RECREATIONAL BEACH USER** — direct exposure to beach sediment and surface water (for swimming scenarios);

- **TRANSIENT** — direct exposure to beach sediment, surface water (for bathing and drinking water scenarios) and groundwater seeps;
- **NATIVE AMERICAN FISHER** — direct exposure to beach sediment or in-water sediment and fish consumption; and
- **NON-TRIBAL FISHER** — direct exposure to beach sediment or in-water sediment, fish consumption and shellfish consumption.

The key conclusions of the Round 2 HHRA are:

- Potential risks from consumption of fish or shellfish are higher than any of the other exposure scenarios;
- Depending on the assumptions used, potential risks from consumption of fish or shellfish may exceed EPA target ranges for cancer and noncancer risks;
- Depending on the assumptions used, potential risks from consumption of upstream (Willamette Falls) fish also may exceed the EPA target risk ranges;
- PCBs result in the highest potential cancer and noncancer risks from fish consumption; and
- Potential risks from direct exposure to beach sediment, in-water sediment, surface water and groundwater seeps are generally within EPA acceptable risk ranges except in two areas of in-water sediments (one area located about a mile north of the St. Johns Bridge and another area just north of the Rail Road Bridge).



Ecological Risk Assessment

The Round 2 Ecological Risk Assessment presents an evaluation of potential risks to ecological receptors (e.g. fish, wildlife, aquatic plants, etc.) within the Study Area. The Round 2 ecological risk analysis was intended to identify potential data gaps remaining for the RI/FS and was not intended to develop final cleanup levels or identify areas in need of remediation. Final acceptable risk standards will be determined before EPA prepares its Record of Decision.

Summary of Ecological Risk Assessment Findings

- A high percentage of sediment sampling stations were classified as nontoxic to sediment dwelling organisms
- Potential risks to fish are mostly from PCBs
- Potential risks to wildlife are mostly from PCBs, dioxins, mercury and DDTs.
- There were no potential unacceptable risks identified for amphibians, reptiles and aquatic plants.

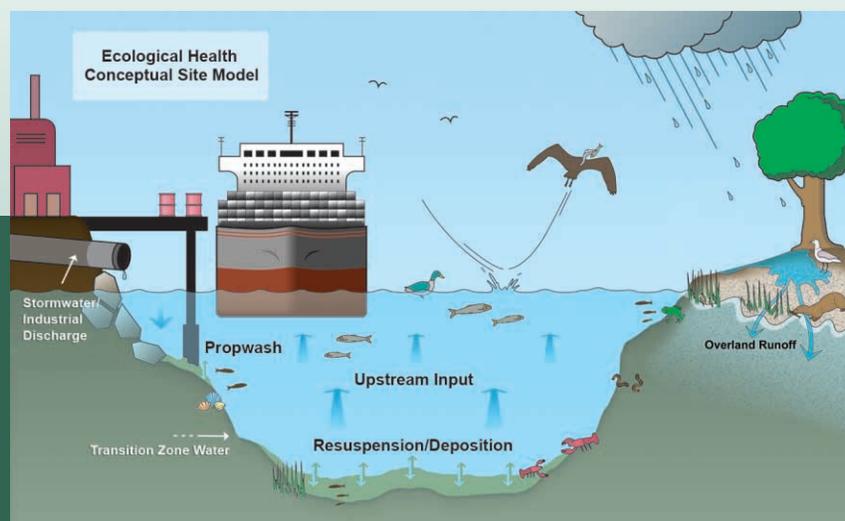
Most of the data needed to complete a baseline ecological risk assessment have already been collected. The remaining data needs have been identified and the sampling efforts are either underway or achievable through the Round 3 sampling program.

INITIAL AREAS OF POTENTIAL CONCERN

Initial Areas of Potential Concern are physical locations within the Study Area where chemicals in sediment may represent unacceptable risk to human or ecological health. The areas presented in the Round 2 Report specifically for the purpose of identifying the data needs for Round 3. Some of these initial areas could become final Areas of Potential Concern in the Remedial Investigation report (including the baseline risk assessments), and used to evaluate a variety of cleanup methods in the Feasibility Study. Some of cleanup methods include: dredging, capping or natural attenuation (allowing nature to help reduce the risks over time). The final cleanup locations and methodologies will then be determined by EPA in the ROD.

Summary of Round 2 Report Findings

- 29 initial areas of potential concern identified (28 specific sites and the entire Study Area for the risks from fish consumption associated with PCBs)
- Areas range from under 0.2 acres to 40 acres
- Five are less than one acre
- 10 are between one and 10 acres
- 13 are between 10 and 40 acres
- The more receptors/scenarios that drove the risk, the higher the concentrations of initial chemicals of concern in sediments at that area
- PCBs are the most wide-spread chemical causing the identification of initial areas of potential concern, and PCB risks are present throughout the Study Area.



DATA GAPS

As a result of data collection and analysis through Round 2, the LWG identified the following data needed to complete the RI/FS:

- Sediment traps (tests to evaluate sediment movement and transport)
- Surface sediments (the first foot of sediment)
- Subsurface sediments (deeper sediments)
- Surface water (the water in the river)
- Stormwater (water entering the river during storm events)
- Lamprey and sturgeon tissue (chemical analysis of fish tissue from these species found in Study area)
- Lamprey and benthic toxicity (tests to determine if sediments from study area are toxic to lamprey, clams and worms which tend to live and feed in the sediment)

Of these data needs, sediment trap, surface sediment, subsurface sediment, surface water, stormwater, lamprey and sturgeon tissue, and lamprey toxicity data are already being addressed through Round 3A data collection activities. This data will mostly be used to confirm the initial conclusions of the Round 2 Report and to prepare the RI report. Additional sediment data needs have also identified for Round 3B .

CONCLUSIONS

- The Round 2 Report presents a comprehensive overview of the work done over the past five years at the Portland Harbor Superfund Site.
- A majority of the sampling and analysis for the study has been completed but some data gaps remain and will be filled through the Round 3 sampling effort.
- The primary potential risks to human and ecological health are likely to be from PCBs.
- Levels of initial chemicals of concern in sediment tend to be fairly uniform across the Study Area except in nearshore and off-channel areas that are generally associated with known or suspected historical or current sources, where concentrations tend to be higher.

NEXT STEPS

The next step in the RI/FS process is to complete the gathering and analysis of data. The Round 3 data gathering and analysis effort will lead to a completed Remedial Investigation report. The subsequent Feasibility Study report will then examine the best options for cleanup actions that will successfully and adequately reduce unacceptable risks to human or environmental health. For those contaminated areas of the river that have not been resolved by Early Action cleanups, EPA will issue a Record of Decision (ROD) selecting final cleanup remedies after the RI/FS is completed.

FOR MORE INFORMATION, CONTACT:

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