

Lower Duwamish Waterway Superfund Site

November 2007

Two Important Reports Completed for the Lower Duwamish Waterway Superfund Site

The Environmental Protection Agency (EPA) and Washington Department of Ecology (Ecology) have approved two important reports about the risks from sediment contamination in the Lower Duwamish Waterway. One report is the **Human Health Risk Assessment (HHRA)**, which estimates the risk to people living, working and playing along the waterway, and eating fish and shellfish found there. The other report is the **Ecological Risk Assessment (ERA)**, which estimates the risks to animals that live in and along the waterway.

The two reports look at how people and animals might be exposed to Duwamish chemical contaminants and what health risks they might face. This fact sheet provides a summary of information in these reports. EPA and Ecology will use these reports to help determine which contaminants and which parts of the Duwamish Waterway need to be cleaned up. You can find these documents at the information repositories listed on the back of this fact sheet.

The reports also provide information that the Washington State Department of Health can use when advising people how to protect their health while EPA and Ecology continue studies of Lower Duwamish Waterway contamination. See the Department of Health recommendations for reducing your exposure to contaminated sediments (mud), fish, and shellfish.

What does the Human Health Risk Assessment tell us?

There are many chemical contaminants in Duwamish sediments, fish, and shellfish. Most of the health risk comes from four contaminants: PCBs, arsenic, dioxins, and PAHs. (See page 5 for more information.) Of these, the highest risk is from exposure to PCBs (polychlorinated biphenyls).

People may be exposed to contaminants in the waterway in various ways, such as eating fish and shellfish, getting waterway sediments on their skin, and accidentally getting sediments in their mouth. The risks from eating Duwamish fish and shellfish are much higher than risks from the other exposures. An insert to this factsheet provides Washington Department of Health recommendations about how you can reduce your risk from contaminated sediments, fish, and shellfish.

Eating Duwamish fish and shellfish is a health risk:

For people who eat Duwamish fish and shellfish three times a week, the risk of cancer and non-cancer health effects is about ten times higher than EPA's "acceptable risk range." Eating less than the estimated three meals a week reduces risk.

PCBs are responsible for most of the risk from eating Duwamish fish, compared to other contaminants in fish. Arsenic and PAHs are responsible for most of the risk

from eating Duwamish clams. Dioxins are found in sediments and are assumed to pose a risk in fish and shellfish, based on studies in other areas that show how dioxins accumulate in seafood.

Duwamish resident fish are more contaminated than salmon:

Salmon that return to the Duwamish Waterway spend most of their lives in the ocean, where they accumulate PCBs and other contaminants in their bodies. Other Duwamish fish, such as English sole, spend most of their lives in the waterway. These "resident" fish accumulate more contaminants from the Duwamish than salmon do. For this reason, the human health risk assessment estimated risk from eating resident fish, not salmon.

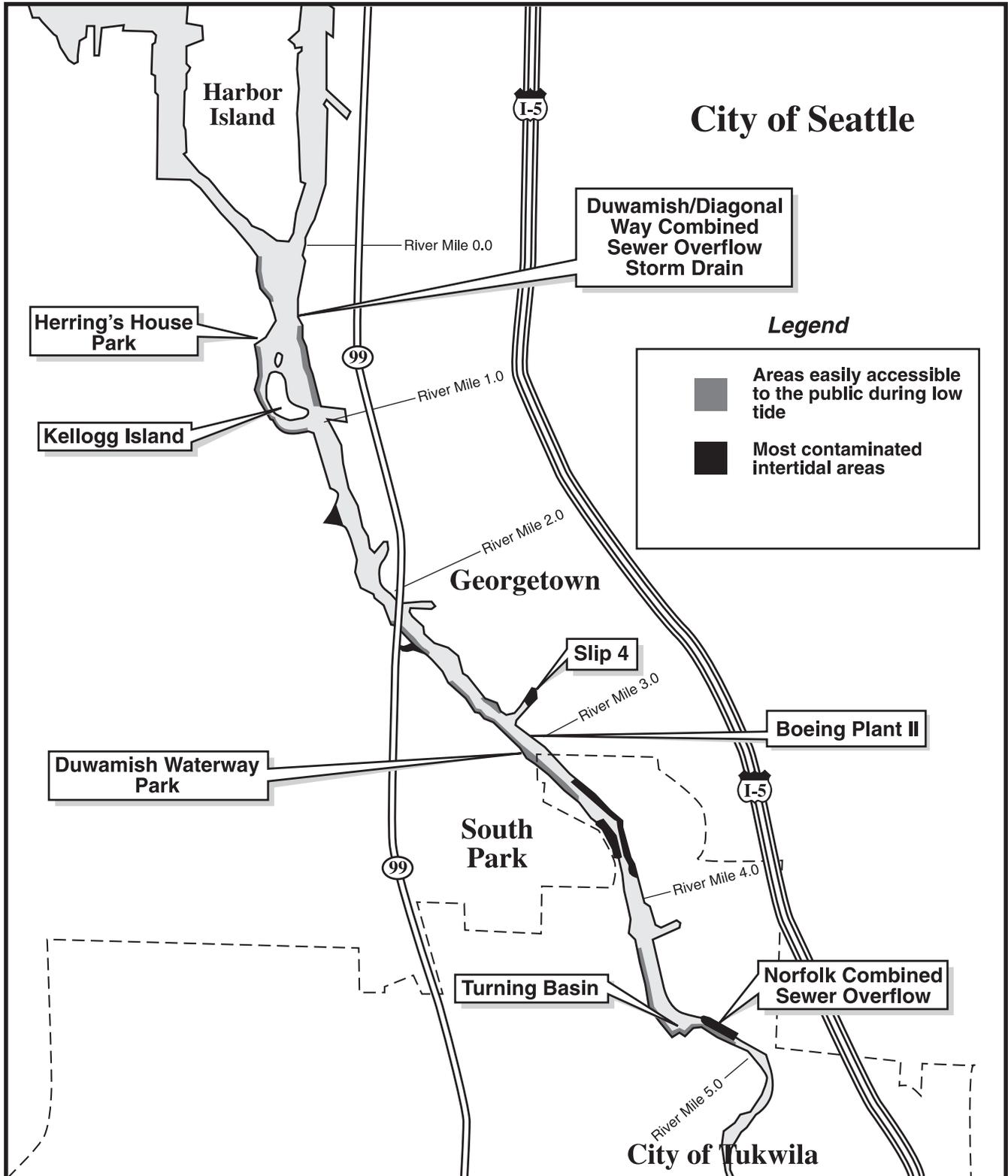
Risks from Duwamish mud depend on activities and areas:

The human health risk assessment evaluated sediments in the waterway that people can readily contact — sediments that are under water at high tides but accessible at lower tides.

People may come into contact with these "intertidal" sediments because they are in areas where they have easy access from the shoreline, such as next to homes in the South Park neighborhood and at Duwamish Waterway Park. Sediments in more accessible areas near homes and parks are generally less contaminated than those in industrial areas.

The risk assessment estimated the risks to young children who frequently play in easily accessible sediments (for example, every other day during the summer) and found that the risks are relatively low but are above “threshold” levels of concern for EPA and

Ecology. EPA and Ecology will consider whether cleanup or other actions are needed to reduce people’s risk. Risks are lower for older children and adults (for example, dog walkers), and for children playing in the mud less frequently.



Other intertidal areas are located near industrial properties. Some of these areas have high levels of contamination. As with fish and shellfish, the contaminants responsible for most of the risks due to contact with sediments are PCBs, PAHs, arsenic, and dioxins. Most of the industrial areas are more difficult for the public to reach by land, but they can be reached by boat. The risk assessment showed low risk to people who have little skin contact with sediment, but higher risks for people who might frequently dig for clams. Risks are higher for people who dig clams in industrial areas than in easily accessible areas. EPA and Ecology recommend that people minimize their use of the most contaminated areas.

Tribal fishers who use nets may be exposed to contaminants picked up on fishing nets that touch the bottom or banks in contaminated areas of the Duwamish. Tribal fishers may be exposed through skin contact with the mud on their nets and through unknowingly swallowing small amounts when their hands touch their mouths (when eating, for example). Risks for net fishing are similar to those for children playing at the beach.

Some industrial areas and nearby sediments are going to be cleaned up over the next few years. EPA and Ecology will use the results of the risk assessments to help determine what additional areas need to be cleaned up. For now, you can reduce your risks from contaminated sediments by following Washington Department of Health recommendations (see insert).

What does the Ecological Risk Assessment tell us?

The Ecological Risk Assessment evaluated risks to mammals, birds, fish and organisms that live in the Duwamish sediments (intertidal sediments and sediments that are always under water). The risk assessment compared levels of contaminants in the tissues of these animals, the sediments, or their food to levels of ecological concern based on scientific studies.

The Ecological Risk Assessment found that the contaminant that poses the greatest risk to mammals is PCBs. River otters in the Duwamish may be exposed to enough PCBs in their food to reduce the growth or survival of their offspring.

In addition, sediment in about one quarter of the Lower Duwamish Waterway contains many contaminants at levels higher than State of Washington standards. The standards are designed to protect worms, clams and other organisms that live in the sand or mud. These creatures are eaten by fish and other animals, so harm to them affects the whole ecosystem.

Comparing the results of the Human Health Risk Assessment and the Ecological Risk Assessment, EPA and Ecology believe that cleaning up the Duwamish to protect those at greatest risk – people, river otters, and organisms that live in the sediment – will protect the waterway’s fish and birds, too.

How was the Human Health Risk Assessment developed?

EPA and Ecology looked at ways people might be exposed to Duwamish contamination and focused on the following groups:

- Tribal members regularly fishing in the Lower Duwamish Waterway
- People regularly clamming in the Lower Duwamish Waterway
- People eating large amounts of fish and shellfish, with a particular focus on tribal children, adult tribal members, Asians, and Pacific Islanders
- Children playing frequently in the Lower Duwamish mud
- People who walk below the high tide line or who walk their dogs there

For each group or “scenario”, scientists estimated how much of each contaminant a person might be exposed to (the *dose*). Scientific information relating chemicals to health effects (*toxicity information*) was combined with the *dose* to estimate the *risk* that peoples’ health might be affected. The risks for individual contaminants were added together to show the total risk from exposure to contamination in the Lower Duwamish Waterway.

Methods used to calculate risk are designed to over-estimate an ‘average’ person’s risk. This way, cleanup and other actions to reduce risk will also protect ‘sensitive’ groups of people (like children, the elderly, and pregnant women) and other groups with unique characteristics (such as tribal members, who are likely to eat more fish and shellfish).

How do EPA and Ecology use risk estimates in cleanups?

The human health risk assessment estimates the probability that a person will get cancer as a result of exposure to site contaminants. This probability is described in terms of one in a thousand, one in a million, and similar estimates.

One in a thousand is a level of risk that is too high — reducing the risk is almost always appropriate. Risk can be reduced through reducing contaminant levels or limiting human exposure to the contaminants. Some examples of risk reduction are cleanup actions, physical barriers, legal controls on land use, education, or a combination of these.

One in one million is a “threshold” level of risk below which agencies generally do not require such action.

Between these risk levels is the “acceptable risk range.” Whether agency action is needed for risks in this range depends on many factors, including how confident agency scientists and decisionmakers are in the risk estimates, and how the contaminant levels compare to background concentrations.

When contaminated areas of a site pose risks that warrant action, the cleanup levels (contaminant levels to be reached after cleanup) and other responses should

reduce risk to a level selected from within this range. It must also take into consideration Ecology's risk threshold of one in one hundred thousand (which falls in the middle of EPA's range).

EPA and Ecology use a similar approach to estimating the potential for non-cancer health effects and selecting cleanup goals. Cleanup goals may also be developed to reduce ecological risk and comply with environmental standards.

Was the local community involved in telling scientists where and how people actually come in contact with contaminants along the Lower Duwamish Waterway?

Yes. The Duwamish River Cleanup Coalition (DRCC) participated in a bank-to-bank survey of the waterway, pointing out where people play, walk, boat, or otherwise have access to the river and its sediments. DRCC and representatives of Native American tribes who use the waterway worked with scientists to help develop 'scenarios'. These scenarios describe how people could come in contact with contamination.

DRCC is the community advisory group for the site. Neither the tribes nor DRCC necessarily endorse the conclusions of the risk assessments. Please see the back of this fact sheet for more information about the DRCC.

Who wrote the reports?

The Lower Duwamish Waterway Group wrote the human health risk assessment and the ecological risk assessment reports with oversight from EPA and Ecology. These risk assessments are part of the larger Remedial Investigation.

The Lower Duwamish Waterway Group consists of the City of Seattle, King County, the Port of Seattle, and the Boeing Company. The group is studying the Lower Duwamish site under an agreement with EPA and Ecology.

What happens next?

EPA and Ecology are reviewing the draft Remedial Investigation report. The community advisory group, the Muckleshoot and Suquamish Tribes, and other government agencies also are reviewing the report. The report describes the results of six years of testing in the waterway.

With oversight from EPA and Ecology, the Lower Duwamish Waterway Group will then evaluate sediment cleanup alternatives in a report called a feasibility study. Based on the remedial investigation and feasibility study, EPA and Ecology will develop a proposed cleanup plan for the Duwamish.

Cleanup of the waterway sediments will be coordinated with cleanup and pollution control efforts on properties near the waterway. Sediments in some areas have already been cleaned up, and more will be cleaned up in the next several years. EPA and Ecology's proposed cleanup plan will address remaining sediment contamination in the waterway.

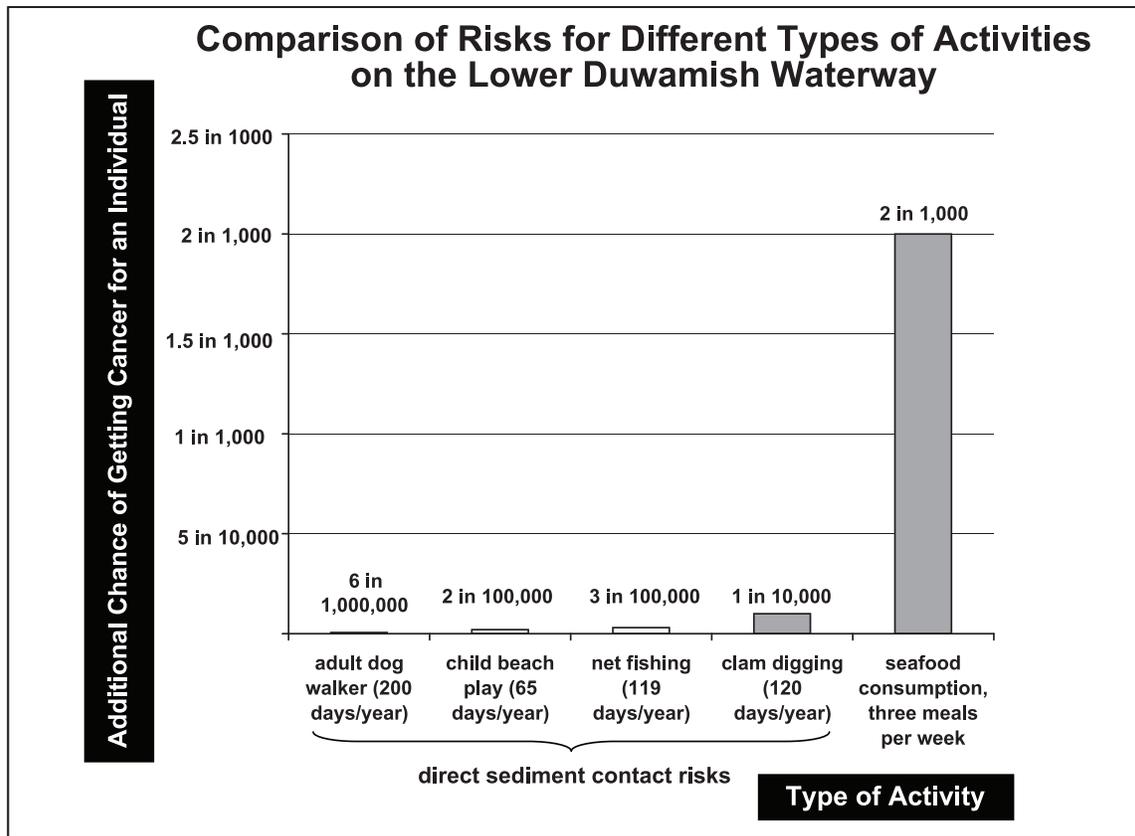
How will EPA and Ecology involve the public in cleanup decisions?

EPA and Ecology will request formal public comments on the proposed cleanup plan. Until then, EPA and Ecology will continue to meet with the public informally to provide updates, answer questions, and listen to community concerns.

Background

The Lower Duwamish Waterway has served as Seattle's major industrial corridor since it was created by widening and straightening the Lower Duwamish River in the early 1900s. Activities on the waterway have included boat manufacturing and repair, marina operations, airplane parts manufacturing, cement manufacturing, metals fabrication and marine transport operations, as well as many others. In addition, approximately two hundred outfalls discharge into the waterway. These include outfalls for storm water, combined sewer overflows, and emergency overflows.

The U.S. Environmental Protection Agency (EPA) added the Lower Duwamish Waterway site to the Superfund list on September 13, 2001. This is EPA's list of the nation's most contaminated hazardous waste sites that are targeted for investigation and cleanup. The Washington State Department of Ecology (Ecology) added the site to the Washington State Hazardous Sites List on February 26, 2002.



What Are the Most Harmful Contaminants in the Lower Duwamish Waterway?

There are many chemical contaminants in Duwamish sediments, fish, and shellfish. Most of the health risk comes from the four discussed below.

Polychlorinated biphenyls (PCBs) are manmade chemicals that were banned in the late 1970s. They stay in the environment for a long time and can build up in fish and shellfish. Children exposed to PCBs may develop learning and behavior problems later in life. PCBs are known to impact the immune system and may cause cancer in people who have been exposed over a long time. PCBs are found in sediments throughout the Lower Duwamish Waterway and are generally highest near industrial areas.

Arsenic is naturally present at low levels in Puget Sound area rock and soil. Industrial activities have spread additional arsenic over much of the Puget Sound region. Long-term exposure to toxic forms of arsenic may cause skin, bladder, and other cancers.

- Levels of inorganic arsenic (the most toxic form of arsenic) in most Duwamish fish and shellfish are similar to those in other parts of Puget Sound. However, clams from the Duwamish Waterway had much higher levels of inorganic arsenic than found elsewhere in Puget Sound.
- In easily accessible areas of the waterway, levels of arsenic in sediment are generally similar to arsenic levels in Seattle soils.
- In the more difficult to access areas of the Lower Duwamish Waterway, some of the sediments contain arsenic levels higher than Seattle soils.

Polycyclic aromatic hydrocarbons (PAHs) are formed during the burning of substances such as coal, oil, gas, wood, garbage and tobacco and during the charbroiling of meat. Long periods of breathing, eating, or having skin contact with high levels of some of the PAHs may increase a person's risk of cancer. PAHs are present in sediments throughout the Lower Duwamish Waterway and are generally highest near industrial areas.

Dioxins and furans (dioxins) are by-products of burning (either in natural or industrial settings), chemical manufacturing and metal processing. Dioxins last a long time in the environment and, like PCBs, can build up in fish and fatty foods. Specific toxic effects related to dioxins include: reproductive problems, problems in fetal development or in early childhood, immune system damage, and cancer. Dioxins are commonly found in urban and industrial soils and sediments. In some areas in the Duwamish, dioxin concentrations in the sediment are elevated above typical urban concentrations.

Where Can I Learn More? How Can I Get Involved?

The best way for people to get involved with the cleanup is to join the local citizens' advisory group called the Duwamish River Cleanup Coalition. A Superfund community advisory group is made up of members of the community and is designed to serve

as the focal point for the exchange of information among the local community and EPA, the state regulatory and other pertinent federal agencies involved in cleanup of the Superfund site.

Duwamish River Cleanup Coalition

5410 First Avenue NE
Seattle, WA 98105
(206) 954-0218
info@duwamishcleanup.org
www.duwamishcleanup.org

Information Repositories:

South Park Public Library
8604 Eighth Ave. S.
Seattle, WA 98108
206-615-1688

EPA Records Center
1200 6th Avenue
Seattle, Washington 98101
206-553-4494

Environmental Protection Agency:

Renee Dagseth, Community Involvement Coordinator 206-553-1889 or dagseth.renee@epa.gov.

Visit EPA's website at:

<http://yosemite.epa.gov/r10/cleanup.nsf/sites/lduwamish>

Washington State Department of Ecology :

Justine Asohmbom: 425-649-7135 or juas461@ecy.wa.gov

Visit Ecology's website at:

http://www.ecy.wa.gov/programs/tcp/sites/lower_duwamish/lower_duwamish_hp.html

The Lower Duwamish Waterway Group's web site: www.ldwg.org contains all final reports the group has prepared to date, along with other information.



U. S. Environmental Protection Agency
1200 Sixth Avenue, Suite 900, ETPA-081
Seattle, Washington 98101-3140

Pre-Sorted Standard
Postage and Fees Paid
U.S. EPA
Permit No. G-35
Seattle, WA

Lower Duwamish Waterway
Seattle, WA
November 2007



Alternative formats are available. For reasonable accommodation, please call Renée Dagseth at 206-553-1889. TTY users, please call the Federal Relay Service at 800-877-8339.