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LWG
LOWER WILLAMETTE GROUP

FISH TISSUE SAMPLING SOP

ROUND 1A
PORTLAND HARBOR RI/FS

August 28, 2002

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1.0 INTRODUCTION

Collection, handling and processing procedures for fish species for the Human Health Risk Assessment (HHRA), and Ecological Risk Assessment (ERA) for the Portland Harbor Superfund Site (Site) were previously described in the Round 1A Field Sampling Plan (FSP) (SEA et al. 2002a), the Round 1 FSP (SEA et al. 2002b), and standard operating procedures prepared by Windward (2002) and Ellis Environmental Associates (2002). This standard operating procedures manual (SOP) modifies and clarifies the procedures previously presented. The procedures described in this SOP are in accordance with U.S. Environmental Protection Agency (EPA) guidance (EPA 2000).

1.1 COLLECTION

Fish collection methods that will be used include boat electrofishing, beach seining, purse seining, and trotlines. These methods are described in the Round 1A FSP. In addition, backpack electro fishing, baited setlines, hook and line, standard crayfish traps, and benthic grab samplers may be used to target specific species.

It is anticipated that electro fishing and seining techniques deployed in the mark and recapture study of sub-yearling Chinook salmon will result in the collection of additional fish species. Target fish species that are incidentally collected through the electro fishing and seining techniques will be used for chemical analyses. If target fish species are not collected through the electro fishing or seining techniques, techniques focused on individual species will be used in an attempt to collect the target fish species.

The overall fish collection process is shown in Figure 1 and described below.

1.2 FISH PROCESSING AND IDENTIFICATION

As fish are collected with decontaminated dip nets following boat electrofishing, individual fish will be placed in decontaminated large coolers.[1] Fish will be handled with nitrile gloves (which are changed between stations), identified by species, measured for length, and weighed in the field with a spring-loaded hand held scale (fish that are retained for tissue analyses will also be weighed in the field processing laboratory on a digital balance) Non-target fish species or target species that do not meet size range requirements will be returned immediately to the water. Species identification will be conducted only by experienced personnel knowledgeable of the taxonomy of species in the lower Willamette. Taxonomic keys, appropriate for the waters being sampled, will be consulted to confirm species identification Fish are

[1] Section 2 2 of this SOP describes the cleaning and decontamination procedures to be used for the field and field laboratory fish sampling and processing equipment.

collected on the fish collection boat, placed in a decontaminated container. Once the target size and mass is achieved, the fish are moved to the processing boat where a team of field scientists will perform a physical examination of each fish following each step as described in the Fish Health Examination Sheet (Figure 2). Fish that are identified as target species, will be quickly examined for collection-related major defects or lacerations, clubbed on the head with a wooden club wrapped in aluminum foil (dull side out) and will be placed in decontaminated polyethylene holding bins within the boat. When clubbing the fish, care will be taken not to damage the fish skin. Subsequently, the bins with collected fish will be transferred to a second boat where a team of field scientists will perform a physical examination of each fish following each step as described in the Fish Health Examination Sheet (Figure 2).

The aluminum foil wrapping the wooden club will be changed between each fish. Holding coolers and bins, gloves, and dip nets will be decontaminated as described in Section 2.2 between each sample location.

1.3 HUMAN HEALTH RISK ASSESSMENT

Fish caught for HHRA will be carefully wrapped in aluminum foil with shiny side away from fish and placed inside the appropriate size plastic bag. A label will be generated for each fish, which will be placed inside a resealable plastic bag, which in turn, will be inserted inside the bag that contains the fish. The label will indicate whether the fish is designated for a whole body or fillet sample. The bag will then be sealed or tied with a plastic tie depending on fish size; a custody seal will be attached and immediately placed inside a cooler with wet ice (4°C). Fish will be transported to the LWG field lab set up at Atofina, and stored at 4°C until processing. All fish should be weighed and filleted within 24 hours of fish collection. Once fish have been weighed, and if the fish is designated for filleting, filleted, they will be stored at -20°C for at least one day before shipping. This will ensure that whole body fish and fillets will be completely frozen before shipping.

Sample compositing will only be done after field data are reviewed by scientists at Kennedy/Jenks Consultants and their instructions given on specific compositing for each fish species. Procedures to select compositing schemes are described in the Round 1A Compositing SOP.

1.4 ECOLOGICAL RISK ASSESSMENT

Fish caught for ERA will be transferred to the second boat, as described above, and will be physically examined, measured for length (in millimeters) and weight (in grams), wrapped in aluminum foil with the shiny side away from the fish, and placed inside the appropriate size plastic bag. A label will be generated for each fish, which will be placed inside a resealable plastic bag, which in turn, will be inserted inside the

bag that contains the fish. Individually wrapped fish from a given sampling station will be grouped in one plastic bag according to a table indicating number of fish per species per sampling station (Table 3). The bag will then be sealed or tied with a plastic tie depending on fish size; a custody seal will be attached and immediately placed inside a cooler with wet ice (4°C). Fish will be transported to LWG field lab and stored at 4°C until processing. All fish should be inspected within 24 hours of fish collection. Once fish have been inspected they will be stored at -20°C for at least one day before shipping. This will ensure that whole body fish will be completely frozen before shipping. If an alternate lab is used for fish processing, an addendum to this SOP will be prepared.

Sample compositing will only be done after field data are reviewed by scientists at Windward Environmental and their instructions given on specific compositing for each fish species. Procedures to select compositing schemes are described in the Round 1A Compositing SOP.

A photocopy of the field notebook will be given to LWG fish processing team and all information on lab processing will be entered in the lab notebook.

1.4.1 Ecological Target Species

The following target species will be collected for the ERA:

- Crayfish (may also be used as a target species for the HHRA at specific locations)
- Juvenile Chinook
- Lamprey ammocoetes
- Large scale sucker
- Peamouth
- Sculpin
- Smallmouth bass
- Northern pikeminnow
- Benthic invertebrates

1.4.2 Human Health Target Species

The following target species will be collected for the HHRA:

- Bullhead
- Black crappie
- Smallmouth bass

- Common carp

In addition to the above target species, the following species will be collected as alternative species:

- Walleye for bullhead
- Largescale sucker for carp

Boat electro fishing will be the primary collection method for walleye, whereas bullhead will be collected using trotlines. Due to the schedule of the mark and recapture of sub-yearling Chinook salmon, boat electro fishing will be conducted before the trotlines are used. Therefore, it will not be known whether an alternative species for bullhead is needed at the time when walleye could be collected. As a result, walleye will be collected during the boat electro fishing, prepared, and frozen until bullhead have also been collected, at which time a decision will be made whether to use bullhead or walleye as the target species for chemical analyses based on the number of fish collected for each species. EPA will be consulted in making the decision to use bullhead or walleye as the target fish species.

Largescale sucker and carp will both be collected by boat electrofishing. If a sufficient number of carp are collected during the first day of electrofishing, in sample areas designated for the HHRA species, then largescale sucker will not be collected. If fewer than 10 carp are collected at each location after the first two days, then largescale sucker will also be collected. If both species are collected, carp and largescale sucker will be prepared and frozen until the end of sample collection, at which time a decision will be made whether to use carp or largescale sucker as the target species for chemical analyses based on the number of fish collected for each species If largescale sucker are collected, EPA will be consulted in making the decision to use largescale sucker or carp as the target fish species.

The target locations, numbers, and sizes for each fish species are provided in the Table 1. If the target species within the indicated size range cannot be collected in sufficient quantity following five days of electrofishing in areas designated for the HHRA species, an alternative species or size range may be used for the tissue analyses. Alternate size ranges are also provided in Table 1. EPA will be notified before selecting an alternative species or sizes.

1.5 INSPECTION

Fish that have met the target species and target size will be removed from the polyethylene bins and rinsed with river water to remove any foreign material from the external surface. Small fish may be stunned when placed in a decontaminated bucket with ice.

Once stunned, fish will be placed on an aluminum foil (shiny side away from fish) covered polyethylene tray for inspection and measurement. Aluminum foil will be replaced between each fish to minimize cross-contamination. If at any point in the inspection process the aluminum foil is compromised, by a rip or tear, it will be traded out for a fresh sheet. Fish will be inspected carefully to ensure that their skin and fins have not been damaged by the sampling equipment. Damaged fish or fish with skin lacerations will be discarded to prevent loss of contaminants in fish tissue or cross-contamination of other fish during handling and processing. Field scientists will perform a physical examination of each fish following each step as described in the Fish Health Examination Sheet (Figure 2).

1.6 FIELD MEASUREMENTS

The length and, if the specimen falls within the target size, the weight of all fish caught will be measured in the field. All fish retained will also be reweighed in the LWG field lab (see Section 2.3).

After inspection, fish will be weighed with a hand-held scale in the field. Three handheld scales, Two Pesola™ scales of 60g (0.5g) and 1000g (10g), and a Chatillon™ scale of 6kg (50g) will be used to obtain the most accurate measurement depending on fish size. Subsequently, fish will be placed down on a decontaminated measuring board and measured (total length and fork length) in millimeters (mm). The total body length is defined as the length from the anterior-most part of the fish to the tip of the longest caudal fin ray (when the lobes of the caudal fin are compressed dorsoventrally) (Anderson and Gutreuter 1983).

1.7 SAMPLE IDENTIFICATION

A unique code will be assigned to each sample as part of the data record. This code will indicate the project phase, sampling location, sample matrix, sample compositing, level of replication/duplication, and matrix specific sample information (i.e., organism and tissue type for tissue samples).

Project Phase	Sampling Location	Sample Matrix	Organism/Tissue	Composite, Replication, Duplication
LWG*aa*	*rrxxx*	*bb*	*SSti*	*CRD*

Project Phase – All samples for LWG will be prefixed with "LWG". The following two characters will indicate the Phase or Round of sampling under which the sample was collected. For example, the Round 1 samples will start with "LWG01".

Sampling Location – (also called Station Name) Sampling locations will consist of three parts The first two characters, "rr", indicate the river mile (rounded down to

the nearest whole mile) of the location. The next character will be either "B" for beach locations or "R" for on-water river locations. All sampling locations within each river mile will be numbered sequentially from 001 to 999, represented by the final three characters. It is recognized that tissue sampling is often conducted along a transect or trawl track and thus the location is not a single point. For the transects that are not contained entirely within one river mile, the river mile of the midpoints will be used in the name of those line sampling locations.

The exception to this sampling location naming convention will be for sampling of whole segments of river for fish tissue. In those cases, the six character sampling location name will be "FZ", for Fishing Zone, followed by two digits for the lower river mile and another two digits for the upper river mile. For example, a sampling area for fish tissue from river mile 3 to river mile 6 would be named FZ0306. Note that "Fishing Zones" can be designated for collection of any organisms, not exclusively vertebrate fishes.

Sample Matrix – The matrix component is a two-character code that defines the type of material sampled. The following codes will be used to indicate the various matrices being sampled.

- TS = tissue

Organism Tissue – For tissue samples, this four-character section of the sample code will represent, with the first two characters, the organism that will be collected and, with the last two characters, the specific tissue that will be tested. For example, "CRWB" represents a crayfish (CR) whole body (WB) tissue sample. The following codes will be used to indicate the various species being sampled in Round 1:

- BC = Black crappie
- BB = Brown bullhead
- YB = Yellow Bullhead
- BN = Benthic invertebrates
- CR = Crayfish
- CP = Carp
- LA = Lamprey amoecetes
- LS = Largescale sucker
- NP = Northern pikeminnow
- PM = Peamouth
- SC = Subyearling Chinook salmon

- SP = Sculpin
- SB = Smallmouth bass
- WE = Walleye
- WB = Whole body
- F = Fillet (only for use in the field)
- FL = Fillet with skin
- FS = Fillet skinless

Composite, Replication, Duplication – The last three characters in the sample code are used to indicate the level of compositing, replication, and/or duplication represented by the sample. The first character will either be an "S" for a single sample or a "C" to indicate that the sample is some type of composite (e.g., spatial or across organisms). The second character will range from 0 (for a unique sample with no replication) to a maximum of "9" (to indicate which replicate a sample is in a series of replicates). The last character is used to indicate whether or not a sample represents a split or duplicate analysis. Use of a "0" indicates no duplication; a "1" or a "2" indicates which duplicate in the series a sample represents.

Because the compositing scheme will be determined after the collection activities, these characters will not be completed on the sample identification label in the field. These characters will be completed following the handling and processing of the individual fish at LWG field lab.

1.8 SAMPLE PACKAGING

In the field, each fish will be wrapped individually in heavy-duty aluminum foil (shiny side out) and placed individually in a watertight resealable plastic bag. A label will be generated for each fish, which will be placed inside a resealable plastic bag, which in turn, will be inserted inside the bag that contains the fish. The bag will then be resealed or tied with a plastic tie depending on fish size and immediately placed inside a cooler with wet ice. For the ERA, fish collected will be grouped in plastic bags according to the sampling station. Each bag will contain individually wrapped fish with their respective labels.

1.9 FIELD DOCUMENTATION

Documentation for fish collection consists of information that must be provided in the field: (1) on the Sample Identification Label; (2) in the Field Notebook; (3) on the Chain-of-Custody Form

1.9.1 Sample Identification Label

A waterproof Sample Identification Label (Figure 4) will be completed in indelible ink for each individual fish, which will be placed inside a resealable plastic bag, which in turn, will be inserted inside the bag that contains the fish. The bag will then be resealed or tied with a plastic tie depending on fish size and immediately placed inside a cooler with wet ice or in the freezer. This label will include the following information: the project number, station ID, sampling date and time, species name, sample ID, sample type (whole body or fillet), and the initials of the person(s) collecting the sample. If a fish sample identification label is lost during handling or transport, the field coordinator will write a statement detailing how the sample was collected, stored, and transferred to the laboratory. The statement will include all pertinent information, such as entries in field notebooks regarding the sample, whether the sample was in the sample collector's physical possession or in a locked compartment until shipped to the laboratory, stored at the correct temperature until receipt by the laboratory, etc.

1.9.2 Field Notebook

The field notebook should be a bound, waterproof field logbook with consecutively numbered pages and should be completed using indelible ink. No erasures should be made; all corrections should consist of a single line-out deletion, followed by the sampler's initials and the date. The sampler should initial and date each page of the field logbook. The sampler should sign and date the last page at the end of each day, and a (z-ing out) line should be drawn through the remainder of the page.

A field notebook will have entries for each sampling location as follows.

- Date and time
- Sampling crew names
- Weather conditions
- Description of activity or method
- Station location ID
- Location using Global Positioning System
- Water depth of capture (meters/feet)
- Time of beginning and end of activity
- Number of times activity was performed (effort)
- Number of fish caught and released
- Species name
- Sample type (i.e., HHRA or ERA)
- Sample identification number as on label of each fish

- Total fish length (in mm)
- Total fish weight (to the nearest 0.1 g)
- Fish physical examination comments
- Other comments (e.g., evidence of hatchery markings)

The cruise leader will check these notes against the COC prior to final packing of the coolers. In addition, the field notebook will be used to document any unusual activities or problems encountered in the field that would be useful for the Field Coordinator and Project Manager to be aware of when data quality is being evaluated. It will also include a record of any photographs taken in the field. Other items that should be included in the field notebook are: Name of person making entries and other field personnel and their duties, including the times that they are present; Level of personal protection being used; Onsite visitors, if any, including the times that they are present; The name, agency, and telephone number of any field contacts; Notation of the system used to determine the station location information; The type of vessel used (e.g., size, power, type of engine) (for aquatic sampling only); Cross-references of numbers for duplicate samples; Variations, if any, from specified sampling protocols and reasons for deviation; Details pertaining to unusual events which might have occurred during sample collection (e.g., possible sources of sample contamination, equipment failure, unusual appearance of sample integrity, control of vertical descent of the sampling equipment; etc.)

1.9.3 Sample Processing Form

The sample processing form will contain similar information as in the lab notebook but of an easy format to be read for data entry in a computer.

1.9.4 Chain-of Custody Form

A chain-of-custody (COC) form will be completed in indelible ink and included with each sample shipment. The COC forms will be enclosed in resealable plastic bags and taped to the inside lid of the cooler. The information on this form will be used to track all samples from field collection to receipt at the subcontract laboratory. COC forms will be completed in triplicate; the person responsible for sample collection will retain one copy, and the other two copies will accompany the shipment to the laboratory. The COC forms must be signed by the recipient and the individual relinquishing the samples at each point that the custody of the samples is transferred, for example, between the field personnel and the laboratory, or among different departments of the laboratory. Upon receipt of coolers, the laboratory is required to log in samples and note non-conformances. Temperature exceedances will be reported to the chemistry QA manager and field cruise leader immediately. Sample processing and analysis will not proceed until permission from chemistry QA manager or field cruise leader is given.

2.0 HANDLING AND PROCESSING

Handling and processing include those procedures up through the point at which the sample is frozen. The overall fish handling and processing procedures are presented in Figures 1 and 3 and described below.

Personnel performing the fish processing will be experienced fisheries biologists. Care will be taken during the processing to avoid contaminating samples.

Field coolers will be delivered directly from the field by automobile or sampling boat to the field lab. Field coolers will be inspected by field lab personnel upon receipt at the processing laboratory. The date and time that the samples are received at the field lab will be recorded in the laboratory notebook. If fish are collected at night, field personnel will be responsible for storing collected fish, which have been properly labeled and wrapped, in the refrigerator (4°C). If insufficient storage capacity exists in the refrigerators, then samples will be stored on ice prior to laboratory processing. Refrigerator(s) will be locked and signed.

Individual fish will be carefully unwrapped and placed on a surface covered with clean aluminum foil, shiny side away from the fish. Aluminum foil will be replaced between each fish. Each fish will be vigilantly inspected following steps on the Fish Health Examination Sheet (Figure 2), to ensure that they have not been compromised in any way (i.e., not properly preserved during shipment, damaged during capture). Anomalies will be specifically noted in the lab notebook. Any specimen deemed unsuitable for further processing and analysis should be discarded and identified on the sample processing record (Table 2). The laboratory manager shall immediately inform SEA field manager of the unsuitable sample.

2.1 LABORATORY PROCESSING EQUIPMENT

Laboratory equipment used to process fish will be dedicated to fish processing and will be decontaminated before use. PTFE cutting boards or boards covered with clean, heavy-duty aluminum foil, high quality stainless steel knives, and stainless steel utensils will be used for processing fish. Separate sets of cutting boards and knives will be used for scaling or skinning fish and for filleting fish. PTFE cutting boards, knives, and other utensils will be decontaminated at the end of each day according to the decontamination procedures described below.

2.2 DECONTAMINATION PROCEDURES

Field sampling equipment that cannot practically be put through a full decontamination process (e.g., one that involves acid and solvent rinses) will be decontaminated as follows:

- Wash with brush and Alconox™ or other phosphate-free detergent
- Rinse with site water

The field equipment that will be cleaned in this way includes coolers, buckets, dip nets, fish measuring boards, holding bins, and the heavy-duty nitrile gloves (StanSolv A-10CR 519) worn by the field crew when sampling. This decontamination step will be conducted at the start and end of each sampling day and between each station or sampling area.

In the LWG field laboratory, fish and tissue processing equipment in direct contact with samples will be decontaminated in the following manner prior to use every day:

- Rinse with potable water
- Wash with brush and Alconox™ or other phosphate-free detergent
- Double rinse with deionized water
- Rinse with 0.1 N nitric acid
- Rinse with 99.8% methanol
- Rinse with deionized water

Cutting boards, knives, and other utensils will also be decontaminated between each fish. Aluminum foil will be replaced between each fish.

Gloves will be worn whenever handling fish. Gloves will be talc- or dust-free, nitrile, and of noncontaminating materials. Hands are considered "dirty" whenever a fish is touched. To prevent cross-contamination, after handling a fish, gloves will be replaced prior to contacting any other surface.

Prior to use, decontaminated equipment will be wrapped in clean aluminum foil with the shiny side facing out.

2.3 SAMPLE MEASUREMENTS

LWG field scientists wearing disposable powder-free nitrile gloves will remove fish from 4°C refrigerator within 24 hours of fish collection and unwrap fish from field bag. Information on label will be entered into lab notebook. A general physical inspection will be done according to the Fish Health Examination Sheet (Figure 2). Any specimen deemed unsuitable for further processing and analysis should be discarded and identified on the sample processing record (Table 2). The laboratory

manager shall immediately inform SEA field manager of the unsuitable sample. A wet weight will be determined for each fish in the processing laboratory Samples will be weighed on top-loading, digital balances that are properly calibrated and of adequate accuracy and precision. The calibration of the balance will be checked at the beginning of every day. Calibration will be with certified NIST weights and recorded in the laboratory notebook. Fish will be weighed directly on an aluminum foil-lined balance tray. To prevent cross contamination between individual fish, the foil lining will be replaced after each weighing and between fillet weighings of filleted tissue samples. All weights will be recorded to the nearest 0.1g on the sample processing record.

2.4 SCALING OR SKINNING

Only the side of the fish that will be filleted with the skin-on with belly flap will need to be scaled. The side to be filleted and skinned will not be scaled first. To prevent contamination, separate sets of decontaminated utensils and cutting boards will be used for skinning or scaling fish and for filleting fish. Fish with scales will be scaled and any adhering slime removed by rinsing with distilled water prior to filleting. Scaling will be done in a separate area surrounded by a 4mm thick transparent plastic wall attached to the ceiling and floor of the lab. After scaling each fish, a quick decontamination will be done by spraying a 2% Alconox™ solution on the walls and floor and wiped with paper towels making sure that all scales have been removed from the area. Fish without scales (i.e., yellow or brown bullhead) will be skinned with decontaminated stainless steel pliers prior to filleting. Whole body ERA and HHRA fish will not be scaled or skinned.

A fish will be scaled by laying it flat on a clean PTFE cutting board or on a cutting board that has been covered with heavy duty aluminum foil, shiny side away from the fish, and removing the scales and adhering slime by scraping from the tail to the head using the non-blade edge of a clean stainless steel knife, or stainless steel spoon. Cross-contamination will be controlled by rinsing the cutting board and knife with contaminant-free distilled water between individual fish. If an aluminum-foil-covered cutting board is used, the foil will be changed between fish. The skin will be removed from fish without scales by loosening the skin just behind the gills and pulling it off between knife blade and thumb or with stainless steel pliers.

Once the scales and slime have been scraped off or the skin removed, the outside of the fish will be washed with contaminant-free distilled water. The fish will then be placed on a second clean (aluminum foil-lined) cutting board for filleting

2.5 FILLETING

Filleting will be conducted by or under the supervision of an experienced fisheries biologist. Gloves will be talc- or dust-free, and of noncontaminating materials. Prior to filleting, hands will be washed with Ivory soap and rinsed thoroughly in tap water, followed by distilled water (USEPA 1991). Fish will be filleted on PTFE cutting boards that are cleaned properly between fish or on cutting boards covered with heavy-duty aluminum foil that is changed between fish (Puget Sound Water Quality Authority 1996). Care will be taken to avoid contaminating fillet tissues with material released from inadvertent puncture of internal organs. If the fillet tissue becomes contaminated by materials released from the inadvertent puncture of the internal organs during resection, the fillet tissue may be eliminated as a sample or, alternatively, the fillet tissue may be rinsed in contaminant-free, deionized distilled water and blotted dry. The fisheries biologist will decide which procedure is appropriate. Regardless of the procedure selected, a notation will be made in the sample processing record and documented on the corrective action form (Table 4).

Clean, high-quality stainless steel utensils will be used to remove one or both fillets from each fish, as necessary. The general procedure recommended for filleting fish, after scaling or skinning the fish, is as follows (USEPA 1991):

- A shallow cut will be made through the skin on either side of the dorsal fin from the top of the head to the base of the tail.
- A cut will be made the entire length of the gill cover through the skin and flesh to the bone dorsally from the rib cage. A very careful and shallow cut will follow the opercle down to the belly area of the fillet, being extremely careful not to puncture the gut cavity and especially internal organs.
- A shallow cut will be made along the belly from the base of the pectoral fin to the tail. A single cut will then be made from behind the gill cover to the anus and then a cut will be made on both sides of the anal fin. While making the cuts, extreme care will be taken not to cut into the gut cavity as this could contaminate fillet tissues.
- The fillet will be removed.

The belly flap will be included in one fillet from each fish. Any dark muscle tissue in the vicinity of the lateral line will not be separated from the light muscle tissue that constitutes the rest of the muscle tissue mass. Large bones still present in the tissue after filleting will be removed carefully (USEPA 1991). Smaller bones present in tissue that are difficult to remove will not be removed. If bones are not removed from tissue, that will be noted in the comments column of the sample processing form. Both fillets will be removed from a fish. One fillet, which contains the belly flap, will be used for organic and most inorganic analyses. The other fillet, which will be

skinned and does not contain the belly flap, will be used for the mercury analysis. Fillets will be weighed individually and the weight recorded to the nearest gram on the sample processing record.

Fillets will be placed in heavy-duty aluminum foil, shiny side away from the fish, placed inside a resealable plastic bag and new label added. A custody seal will be placed on each sample bag and be wrapped with clear tape at least once over, this will ensure no tampering with samples. All samples will be stored at -20°C prior to shipping. The freezer should be locked and signed. Once samples are completely frozen, the compositing scheme will be selected and the samples will be shipped to Axys for tissue homogenization.

2.6 LABORATORY DOCUMENTATION

Documentation for fish handling consists of information that must be provided in the laboratory: (1) on the Sample Identification Label, (2) in the Lab Notebook, (3) on the Sample processing form, and (4) on the Chain-of-Custody Form.

2.6.1 Sample Identification Label

Because fish that are filleted will have two samples following processing, new sample identification labels will be prepared for fillet samples. As was done in the field, a waterproof Sample Identification Label (Figure 4) will be completed in indelible ink for each individual fish, which will be placed inside a resealable plastic bag, which in turn, will be inserted inside the bag that contains the fish. The bag will then be resealed or tied with a plastic tie depending on fish size and immediately placed inside a cooler with wet ice or in the freezer. Information from the original sample identification label that was completed in the field should be transferred to the new labels completed in the laboratory. The labels will include the following information: the project number, station ID, sampling date and time, species name, sample ID, the initials of the person(s) collecting the sample, sample type (fillet with skin or fillet without skin), and the initials of the person processing the sample. The composite number will be added to the sample identification label after the compositing scheme is identified. If a fish sample identification label is lost during shipment, the field and laboratory coordinators will write a statement detailing how the sample was collected, stored, processed, and transferred to the laboratory. The statement will include all pertinent information, such as entries in field notebooks regarding the sample, whether the sample was in the sample collector's physical possession or in a locked compartment until shipped to the laboratory, stored at the correct temperature until receipt by the laboratory, etc.

Sample identification labels will not be completed in the laboratory for whole body samples. The original sample identification labels completed in the field will be used for whole body samples.

2.6.2 Lab Notebook

The laboratory notebook should be a bound, waterproof logbook with consecutively numbered pages and should be completed using indelible ink. No erasures should be made; all corrections should consist of a single line-out deletion, followed by the processor's initials and the date. The processor should initial and date each page of the laboratory notebook. The processor should sign and date the last page at the end of each day, and a (z-ing out) line should be drawn through the remainder of the page.

A laboratory notebook will have entries for each sample as follows.

- Date and time
- Sampling processing team names
- Description of activity or method
- Time of beginning and end of activity
- Transfer of information from fish sample label
- Sample identification number as on label of each fish
- Species name
- Total fish length (in mm)
- Total fish weight (to the nearest 0.1 g)
- Fish physical examination comments
- Description of fish handling for filleting
- Weight of fillet with skin and of fillet without skin

2.6.3 Sample Processing Form

The sample processing form will contain similar information as in the lab notebook but of an easy format to be read for data entry in a computer.

2.6.4 Chain-of Custody Form

The COC form completed in the field will be signed upon receipt at FES, as described previously. Prior to shipping to Axys for homogenization, a new COC form will be completed in indelible ink and included with each sample shipment. The COC forms will be enclosed in resealable plastic bags and taped to the inside lid of the cooler. The information on this form will be used to track all samples from field collection to receipt at the subcontract laboratory. COC forms will be completed in triplicate; the person responsible for sample processing will retain one copy, and the other two copies will accompany the shipment to the laboratory. The COC forms must be

signed by the recipient and the individual relinquishing the samples at each point that the custody of the samples is transferred, for example, between the LWG field laboratory personnel and the Axys laboratory, or among different departments of the laboratory. Upon receipt of coolers, the laboratory is required to log in samples and note non-conformances. Temperature exceedances will be reported to the chemistry QA manager immediately. Sample processing and analysis will not proceed until permission from chemistry QA manager is given.

2.6.5 Storage Temperature Quality Control

Each storage freezer or refrigeration unit will be monitored daily to insure temperature compliance. Each unit will have a separate log form containing date, time, and temperature information.

2.7 SHIPPING SAMPLES

Samples will be placed in medium sized coolers (24"x14"x15"); the coolers final weight should not exceed 50lbs for health and safety issues. Coolers will be prepared in the following manner: line the coolers bottom with crushed dry ice, place a layer of wrapped and bagged fish tissue samples in the cooler and add another layer of dry ice. Build upon that theme until the top layer (this should be dry ice). Note that somewhere in this cooler needs to be a temperature blank. Produce a new COC for this cooler and the samples within. Place the COC in a Ziploc and tape to the inside of the lid of the new cooler. Close the lid and seal with 3 COC cooler seals, one on each side that opens. Strapping or packing tape will be used to seal around the cooler seal and twice around girth and once around length. Placards will be attached to the cooler that state "Environmental Samples Of No Commercial Value:" "Keep Frozen", "This Side Up", "Handle With Care". In addition, on the outside of the cooler will be a contact name placard "In case of emergency or shipping delays please contact Ian Stupakoff at 360-419-0809 or Janet Cloutier at 360-705-3534 immediately. Copies of all field logs, lab logs, old COCs and cooler receipt forms and other paperwork will be sent to Janet Cloutier, the SEA chemistry QA manager for placing in the final data package.

Shipping with FEDEX is the preferred method to Axys laboratory in Sydney BC, and returning samples to CAS in Kelso, WA. The coolers will be delivered to the local FEDEX and processed with international shipping papers. These contain a FEDEX weigh bill and a Commercial Invoice. The FEDEX weighbill will act as an extension of the COC. The persons shipping will retain a copy of the weight bill and email (a pdf) or fax a copy of the weight bill and tracking number to the SEA chemistry QA manager upon shipping. The original may be shipped up later for incorporation in the final data package. Samples will be shipped in the middle of the week to ensure that weekend delays are avoided.

It is critical that the samples be shipped and received frozen ($\leq 0°C$). Samples will be packed and shipped on dry ice. This will ensure that samples will arrive below -20°C. If a cooler arrives > 0°C but $\leq 4°C$, it will be assumed that hold time will start from the time it was packaged. All labs are to notify the chemistry QA manager upon receipt of such non-conforming samples immediately. Upon notification, the chemistry QA manager will notify the field QA manager and the CERCLA coordinator. Finally, if a cooler arrives > 4°C, the same notification process will ensue. The CERCLA project coordinator will consult with the EPA QA manager prior to making a decision about analyzing such samples.

3.0 REFERENCES

Buck, J. 2002. USFWS. Personal communication, e-mail to Matt Luxon, Windward Environmental, Tables showing tissue chemical concentrations, length and weight data from Columbia River sampling.

Ellis Environmental Services. 2002. Laboratory Processing SOP for Field Sampling Plan Round 1A Portland Harbor RI/FS, Draft. Prepared for Lower Willamette Group, Portland OR.

Ellis, Robert. 2002. Phone conversation with Matt Luxon 6/13/2002

Fishbase. 2002. www.fishbase.org accessed 6/12/2002

North, John A.; Burner, Lisa C.; Cunningham, Bonnie S.; Farr, Ruth A.; Friesen, Thomas A.; Harrington, Jennifer C.; Takata, Howard K.; Ward, David L. 2002. Relationships Between Bank Treatment/Nearshore Development And Anadromous/Resident Fish In The Lower Willamette River. Annual Progress Report May 2000-June 2001. City of Portland , Prepared for City of Portland, Bureau of Environmental Services, Endangered Species Act Program by Oregon Department of Fish and Wildlife, Clackamas, OR.

Puget Sound Water Quality Authority. 1996. Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound. Olympia, WA: Puget Sound Water Quality Authority(Puget Sound Estuary Program).

Striplin Environmental Associates, Inc.; Windward Environmental LLC; Anchor Environmental, L. L. C., and Kennedy/Jenks Consultants. 2002a. Field Sampling Plan Round 1A Portland Harbor RI/FS, Draft. Prepared for Lower Willamette Group, Portland OR.

Striplin Environmental Associates, Inc. 2002b. Round 1 Field Sampling Plan Portland Harbor RI/FS. , Prepared for The Lower Willamette Group, Portland, OR.

Texas Water Commission. 1990. Texas Tissue Sampling Guidelines. Texas Water Commission, Austin, TX.

U.S. EPA. (Environmental Protection Agency). 1991. Environmental Monitoring and Assessment Program (EMAP) Near Coastal Program Laboratory Methods for Filleting and Compositing Fish for Organic and Inorganic Contaminant Analyses. Draft. Office of Research and Development, Environmental Research Laboratory, Narragansett, RI.

U.S. EPA. (Environmental Protection Agency). 2000. Guidance for assessing chemical contaminant data for use in fish advisories, Volume 1 - Fish sampling and analysis. Third Edition. EPA 823-B-00-007. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

Windward Environmental. 2002. Laboratory Processing SOP for Field Sampling Plan Round 1A Portland Harbor RI/FS, Draft. Prepared for Lower Willamette Group, Portland OR.

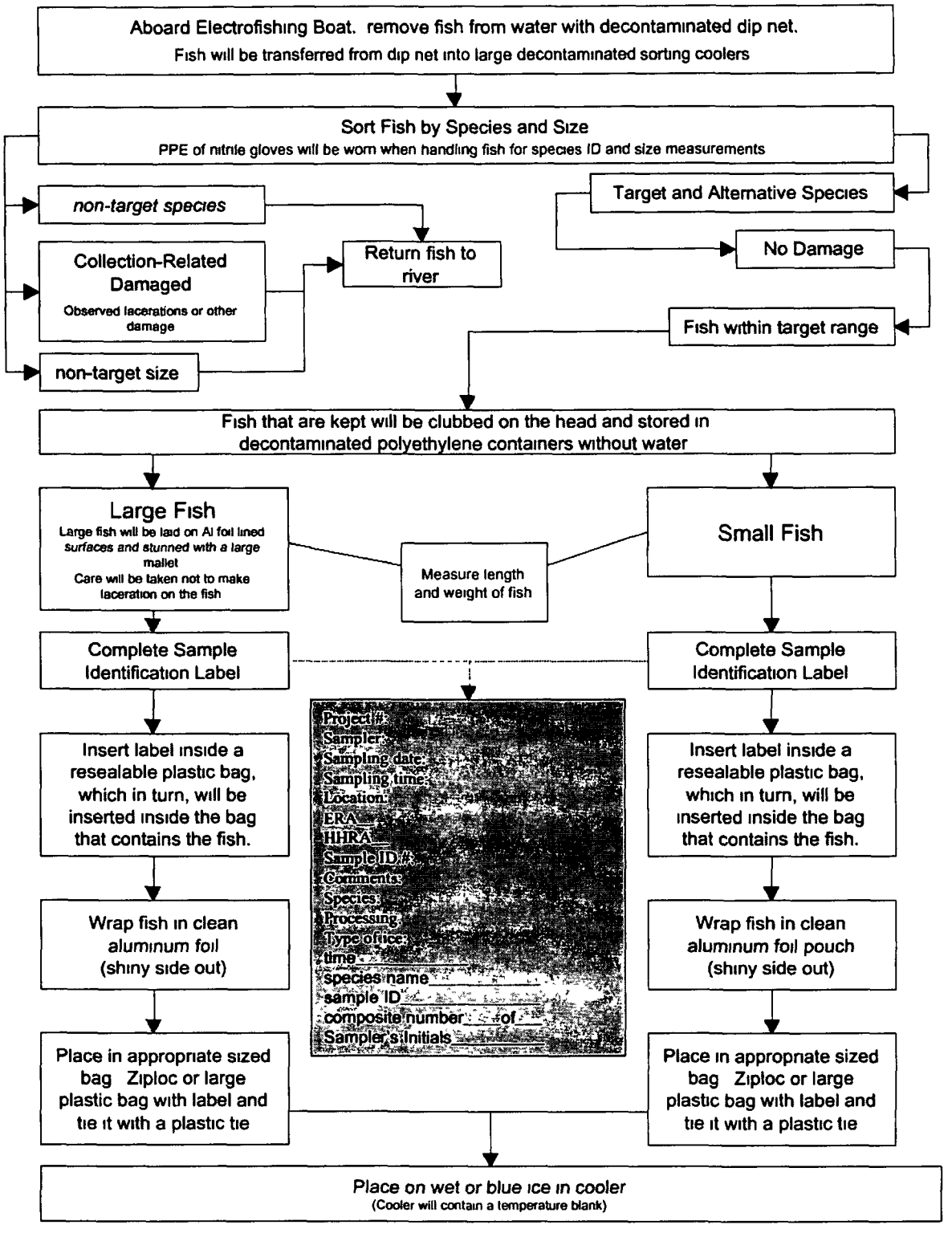

Figure 1. Field Fish Collection, Handling and Processing

FISH HEALTH EXAMINATION SHEET DATE ___/___/___ STATION ID# _____ FISH ID# _____

Blood _____(mL) Plasma/Serum _____ Cryovial 1 _____ Cryovial 2

SPECIES _____ Weight _____(g) Length _____(mm)

EXTERNAL EXAMINATION: ***(check all that apply)***

EYES:	Left		Right	
☐normal	☐OTHER *specify* _____		☐normal	☐OTHER *specify* _____
☐exopthalmic	_____		☐exopthalmic	_____
☐hemorrhagic	_____		☐hemorrhagic	_____
☐opaque	_____		☐opaque	_____
☐missing	_____		☐missing	_____
☐emboli	_____		☐emboli	_____
# in fixative ___ # of Photos ___			# in fixative ___ # of Photos ___	

HEAD:	**BODY SURFACE:**	OTHER *specify* (include location)
☐normal	☐normal	_____
☐tumors	☐tumors	_____
☐lesions	☐lesions	_____
☐parasite	☐parasite	
☐OTHER	☐OTHER	# in fixative ___ # of Photos___

OPERCLES: ☐OTHER *specify* _____

☐normal

☐slight shortening _____

☐severe shortening _____

in fixative ___ # of Photos ___

GILLS:	Left		Right	
☐normal	☐OTHER *specify* _____		☐normal	☐OTHER *specify* _____
☐frayed	_____		☐frayed	_____
☐clubbed	_____		☐clubbed	_____
☐marginate	_____		☐marginate	_____
☐pale	_____		☐pale	_____
# in fixative ___ # of Photos ___			# in fixative ___ # of Photos ___	

PSEUDOBRANCHS: ☐OTHER *specify* _____

☐normal

☐swollen _____

☐lithic _____

☐hemorrhagic # in fixative___ # of Photos___ _____

FINS:		☐OTHER (*specify, identify affected fins)*
☐normal	☐frayed	_____
☐mild erosion	☐hemorrhagic	_____
☐severe erosion	☐emboli	_____
		_____
# in fixative___ # of Photos___		

Figure 2. Fish Health Examination Sheet

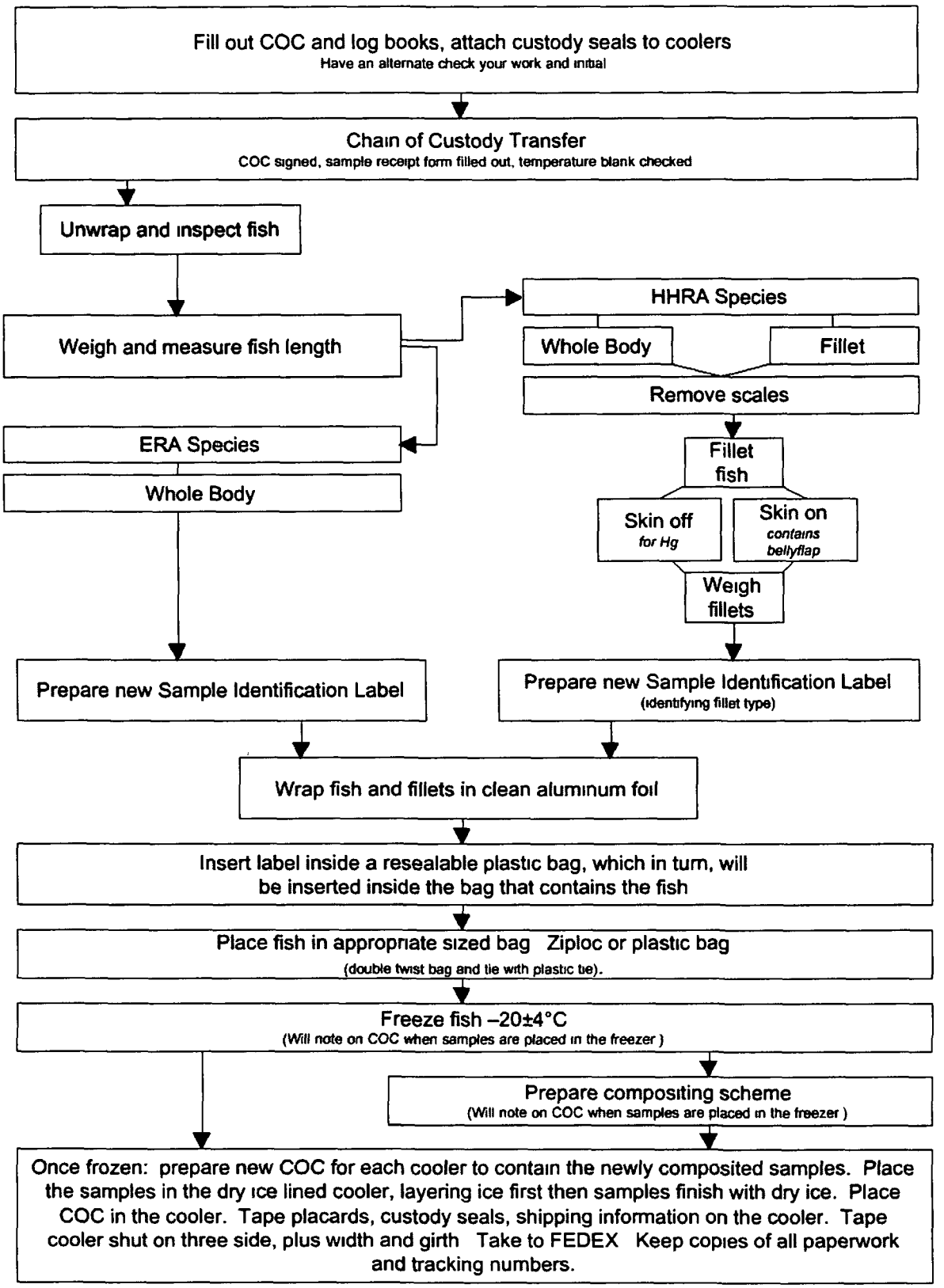

Figure 3. Laboratory Fish Handling and Processing

Striplin Environmental Associates 222 Kenyon St. NW Olympia, WA 98502 telephone (360) 705-3534	
Project #:	Sampler:
Sampling date:	Sampling time:
Location:	☐ ERA ☐ HHRA
Sample ID #	
Comments:	
Species:	Processing:
Type of ice.	☐ Whole body
☐ Wet Ice ☐ Dry Ice ☐ ☐	☐ Fillet

Figure 4. Label for Fish Samples

Table 1 Fish Collection for the Human Health Risk Assessment at the Willamette River.

Sample Location	Species	Primary Collection Method	Sample Type	Number of Composites	Number of Individual Fish per Composite	Total Number of Individual Fish	Optimal Size Range mm (in)	Alternate Size Range mm (in)
RM 2 5-3,5	Smallmouth Bass*	Boat electrofishing	Fillet	1	5	5	266-355 (10 5-14)	225-300 (9-12)
		Boat electrofishing	Whole Body	1	5	5	266-355 (10 5-14)	225-300 (9-12)
RM 3 5-4 5	Smallmouth Bass*	Boat electrofishing	Whole Body	3	5	15	266-355 (10.5-14)	225-300 (9-12)
RM 4 5-5 5	Smallmouth Bass*	Boat electrofishing	Fillet	1	5	5	266-355 (10 5-14)	225-300 (9-12)
		Boat electrofishing	Whole Body	1	5	5	266-355 (10 5-14)	225-300 (9-12)
RM 5 5-6 5	Smallmouth Bass*	Boat electrofishing	Fillet	1	5	5	266-355 (10 5-14)	225-300 (9-12)
		Boat electrofishing	Whole Body	1	5	5	266-355 (10 5-14)	225-300 (9-12)
RM 6 5-7 5	Smallmouth Bass*	Boat electrofishing	Whole Body	3	5	15	266-355 (10 5-14)	225-300 (9-12)
RM 7 5-8 5	Smallmouth Bass*	Boat electrofishing	Fillet	1	5	5	266-355 (10.5-14)	225-300 (9-12)
		Boat electrofishing	Whole Body	1	5	5	266-355 (10.5-14)	225-300 (9-12)
RM 8 5-9,5	Smallmouth Bass*	Boat electrofishing	Fillet	1	5	5	266-355 (10 5-14)	225-300 (9-12)
		Boat electrofishing	Whole Body	1	5	5	266-355 (10 5-14)	225-300 (9-12)
RM 8-9 (Swan Is Lagoon)	Smallmouth Bass*	Boat electrofishing	Whole Body	3	5	15	266-355 (10 5-14)	225-300 (9-12)
RM 3-6	Black Crappie	Boat electrofishing	Fillet	3	5	15	225-300 (9-12)	200-266 (7 9-10 5)
		Boat electrofishing	Whole Body	3	5	15	225-300 (9-12)	200-266 (7 9-10 5)
	Carp	Boat electrofishing	Fillet	3	5	15	508-677 (20-26 5)	508-677 (20-26 5)
		Boat electrofishing	Whole Body	3	5	15	508-677 (20-26 5)	508-677 (20-26.5)
	Bullhead	Trotline	Fillet	3	5	15	225-300 (9-12)	225-300 (9-12)
		Trotline	Whole Body	3	5	15	225-300 (9-12)	225-300 (9-12)
	Walleye**	Boat electrofishing	Fillet	3	5	15	412.5-550 (16-21 5)	343-457 (13 5-18)
		Boat electrofishing	Whole Body	3	5	15	412 5-550 (16-21.5)	343-457 (13 5-18)
	Largescale Sucker**	Boat electrofishing	Fillet	3	5	15	375-500 (15-20)	375-500 (15-20)
		Boat electrofishing	Whole Body	3	5	15	375-500 (15-20)	375-500 (15-20)
RM 6-9	Black Crappie	Boat electrofishing	Fillet	3	5	15	225-300 (9-12)	200-266 (7 9-10 5)
		Boat electrofishing	Whole Body	3	5	15	225-300 (9-12)	200-266 (7 9-10 5)
	Carp	Boat electrofishing	Fillet	3	5	15	508-677 (20-26 5)	508-677 (20-26 5)
		Boat electrofishing	Whole Body	3	5	15	508-677 (20-26 5)	508-677 (20-26.5)
	Bullhead	Trotline	Fillet	3	5	15	225-300 (9-12)	225-300 (9-12)
		Trotline	Whole Body	3	5	15	225-300 (9-12)	225-300 (9-12)
	Walleye**	Boat electrofishing	Fillet	3	5	15	412.5-550 (16-21 5)	343-457 (13 5-18)

Table 1 Fish Collection for the Human Health Risk Assessment at the Willamette River

Sample Location	Species	Primary Collection Method	Sample Type	Number of Composites	Number of Individual Fish per Composite	Total Number of Individual Fish	Optimal Size Range mm (in)	Alternate Size Range mm (in)
		Boat electrofishing	Whole Body	3	5	15	412.5-550 (16-21 5)	343-457 (13 5-18)
	Largescale Sucker**	Boat electrofishing	Fillet	3	5	15	375-500 (15-20)	375-500 (15-20)
		Boat electrofishing	Whole Body	3	5	15	375-500 (15-20)	375-500 (15-20)
RM 22	Smallmouth Bass	Backpack electrofishing or beach seining	Whole Body	3	5	15	266-355 (10 5-14)	225-300 (9-12)
	Black Crappie	Backpack electrofishing or beach seining	Whole Body	3	5	15	225-300 (9-12)	200-266 (7 9-10 5)
	Carp	Beach seining	Whole Body	3	5	15	508-677 (20-26 5)	508-677 (20-26 5)
	Bullhead	Trotline	Whole Body	3	5	15	225-300 (9-12)	225-300 (9-12)
	Walleye**	Backpack electrofishing or beach seining	Whole Body	3	5	15	412 5-550 (16-21 5)	343-457 (13 5-18)
	Largescale Sucker**	Beach seining	Whole Body	3	5	15	375-500 (15-20)	375-500 (15-20)
RM 24	Smallmouth Bass	Backpack electrofishing or beach seining	Whole Body	3	5	15	266-355 (10 5-14)	225-300 (9-12)
	Black Crappie	Backpack electrofishing or beach seining	Whole Body	3	5	15	225-300 (9-12)	200-266 (7 9-10 5)
	Carp	Beach seining	Whole Body	3	5	15	508-677 (20-26 5)	508-677 (20-26 5)
	Bullhead	Trotline	Whole Body	3	5	15	225-300 (9-12)	225-300 (9-12)
	Walleye**	Backpack electrofishing or beach seining	Whole Body	3	5	15	412 5-550 (16-21 5)	343-457 (13 5-18)
	Largescale Sucker**	Beach seining	Whole Body	3	5	15	375-500 (15-20)	375-500 (15-20)
RM 25	Smallmouth Bass	Backpack electrofishing or beach seining	Whole Body	3	5	15	266-355 (10 5-14)	225-300 (9-12)
	Black Crappie	Backpack electrofishing or beach seining	Whole Body	3	5	15	225-300 (9-12)	200-266 (7 9-10 5)
	Carp	Beach seining	Whole Body	3	5	15	508-677 (20-26.5)	508-677 (20-26 5)
	Bullhead	Trotline	Whole Body	3	5	15	225-300 (9-12)	225-300 (9-12)
	Walleye**	Backpack electrofishing or beach seining	Whole Body	3	5	15	412 5-550 (16-21 5)	343-457 (13 5-18)
	Largescale Sucker**	Beach seining	Whole Body	3	5	15	375-500 (15-20)	375-500 (15-20)
	Total			133		665		

* Smallmouth bass will also be used as target species for the Ecological Risk Assessment

** Alternate target species (walleye for bullhead and largescale sucker for carp) Alternate target species will only be collected in the reference areas (RM 19-26) if selected as target species following collection in ISA

Table 2. Sample Processing Form.

Sample Processing Form

Processor Name & Date	Sample ID	Whole Body Wt (g)	Total Length (mm)	Fork Length (mm)	Sample Type check one			If Fillet	Fillet Wt. (g)	Comments
					Whole Body (WB)	Fillet skin on (FL)	Fillet skin off (FN)	*New* Sample ID		

Table 3 Target for Size, Number, and Mass of Representative Species for Ecological Risk Assessment Sampling.

Representative Species	Minimum Mass Needed (g)	Target Size - minimum length (mm)	Target Weight of individuals (g)[b]	Number of individuals needed for composite per station	Number of stations	Reference stations	Total number of fish per species
Benthic Invertebrates[a]	150	na	150	na	-	-	-
Crayfish	300	100	20	8	21	3	192
Lamprey ammocoetes	150	70	1	150	22	3	3750
Largescale sucker	150	300	450	5	5	3	40
Peamouth	150	200	150	5	5	3	40
Subyearling Chinook salmon	100	90	7 5	14	-	-	-
Sculpin	150	90	9	17	22	3	425
Smallmouth bass	150	250	175	5	see Table 1	see Table 1	see Table 1
Northern pikeminnow	150	250	150	5	5	3	40
Total Number of fish							4487
Total Number of fish without lamprey amoecetes							737

[a] biota retained on 0 5 mm mesh sieve

[b] The length-weight relationships for lamprey, largescale sucker, peamouth, sculpin, smallmouth bass, and northern pikeminnow are based on predicted weights from length-weight relationships published for similar species in Fishbase (www fishbase org) and confirmed with Bob Ellis (Ellis, Personal communication 2002) Subyearling Chinnok data are from Ellis (Ellis, Personal communication 2002) Crayfish data are from samples taken in the Columbia River (Buck personnal communication (2002) Juvenile Chinook salmon yearlings data are from North (2002)
na - not applicable

Table 4. Fish Processing Corrective Action Form

Fish Processing Corrective Action Form

Date _____ SampleID _____

Processor Name _____ Project Manager _____

Details of Problem / Recommended Corrective Action

Corrective Action Taken

Processor _____ Project Manager _____
Date _____ Date _____

STRIPLIN Environmental Associates
222 Kenyon Street NW
Olympia, WA 98502
360/ 705-3534 Fax 705-3669

September 3, 2002

Wallace Reid
US Environmental Protection Agency, Region 10
1200 Sixth Ave, M/S ECL-115
Seattle, WA 98101

Re: Transmittal of Fish Tissue SOP Hardcopy
Portland Harbor Superfund Site
USEPA Docket No: CERCLA-10-2001-0240

Dear Mr. Reid:

Enclosed please find hardcopies of the Fish Tissue Sampling Standard Operating Procedure document This document was inadvertently left out of the mailing sent to you last Friday that contained the homogenization and compositing SOPs. We apologize for the inconvenience

If you have any questions, please give me a call at (206) 705-3534.

Sincerely,

Gene Revelas
Striplin Environmental Associates

cc: Chip Humphrey, EPA
Eric Blischke, ODEQ
Rick Kepler, ODF&W
Helen Hillman, NOAA
Ted Bueger, U.S. Fish & Wildlife
Brian Cunninghame, Confederated Tribes of the Warm Springs Reservation of Oregon
Lynn Hatcher, Confederated Tribes and Bands of the Yakama Nation
Kathleen Feehan, Confederated Tribes of the Grand Ronde Community of Oregon
Tom Downey, Confederated Tribes of the Siletz Indians
Audie Huber, Confederated Tribes of the Umatilla Indian Reservation
Rick Eichstaedt, Nez Perce Tribe
Julie Carter, CRITFC
Trey Harbert, Port of Portland (LWG)
Robert Wyatt, Northwest Natural (LWG)
Libby Smith, Anchor Environmental, LWG Library