APPENDIX A. FIELD COLLECTION LOGBOOKS AND CHAIN-OF-CUSTODY FORMS

10.17.06 T.Do

0815 Arrive at Strom Park Boat ramp.
Weather: partly cloudy, clearing,
50's warming to low 60's later.
Crew: Thai Do (Windward Env. LLC)
Matt Lixon (Windward Env. LLC)

0830 Set up: launch canoe, review backpack electroshocking equipment
We decided that before we begin, we will make sure the settings are correct and will perform some trial runs right off the boat launch area. The default settings are not appropriate so we will reset them.
Backpack electroshocker is set to duralpake:

Setting 1
3 pulses/sec
125 V 25% duty cycle

Setting 2
30 pulses
125 V 25% duty cycle

0845 Depart boat launch and headed just upstream to look for suitable beach area with habitat: depositional areas with a nice flow/current.

10.17.06 T.Do

0900 Unsuccessful upstream of boat launch so we will head downstream and will shock any areas that seem suitable.

1345 We canoed downstream about two miles and were unsuccessful at every location we tried. We returned to the boat launch at Strom Park to take a lunch break.

1415 Depart Strom Park boat launch. Headed to Cedar Creek area, an area advised by Stan van de Wetering (Silcfz), a high ammocoete yield area.

1430 Arrive at Cedar Creek area. We decided to work here for the rest of the day.

1620 This area was successful. We collected 50 acceptable sized (~5-9 cm) ammocoetes. We collected a jar of site water for the lab to test for hardness. The in-situ temperature was measured at 12.9° C. The area

10.17.06 T. Do

we caught these ammocoetes had a mile steady, but slow, current. Substrate was fine sands with a silty layer, sparsely vegetated, and leaf litter. The water temp was measured about 3" from the surface, and may be slightly cooler at the bottom where the sediment:water interface is. That portion of the river was about knee high.

TD 1625 Depart Cedar Creek area; headed to Northwestern Aquatic Sciences to drop off ammocoetes and water sample.

TD 1645 Arrive at NAS. Off load samples.

1655 Sign off samples to NAS.

1700 Depart NAS. End of field day.

T. DO
10.17.06

10.18.06 T. Do

0800 Arrived at N.A.S to pick up coolers and gel ice packs for continued ammocoete collection on the Siletz River.
Crew: Thai Do (Windward)
Matt Luxon (Windward)
Weather: overcast, 50°s, v. light showers, (infrequent)

0830 Arrive at Cedar Creek area. Set up equipment.

0900 Begin sampling/electroshocking.
Water temp: 12.6°C.

1200 Lunch break

1230 Resume sampling/electroshocking

1430 End of sampling because we have to drop off ammocoetes at NAS, and still have to drive in to Corvallis, OR to return the rental canoe by 1700. Loaded samples and gear. Each cooler contains ~50 ammocoetes. Site sediment (fine sands w/silt) is placed inside (~2-3 inches) with site water before we release the captured ammocoetes into the coolers. The inside lids have frozen gel ice packs affixed

10.18.06 T.Do

to them to keep the water temp. cool during transport to NAS.

1500 Arrived at N.A.S. to drop off ammocoetes.

1510 Sign-off samples - ~250 ammocoetes.

1530 Depart N.A.S. Head to Peak Sports in Corvallis to return rental canoe.

1700 Arrive in Corvallis. Return canoe.

1715 Depart for Portland. End of field day.

T.DO
10.18.06

10.23.06 T.Do

0800 Arrived at N.A.S. to pick up coolers and ice gel packs for continued ammocoete collection on Siletz River for toxicity testing.

Crew: Thai Do (Windward)
Jenny Buening (Windward)

Weather: Fog clearing to sunny, 40°-50°F to mid to high 50°s F later

0830 Arrive at Cedar Creek area along Siletz River. Health and Safety briefing for Jenny.

0835 Begin setting up equipment.

0845 Screw clamp for anode ring is missing. Unable to sample without it. Called Windward to find out if it was left behind at field gear room → no.

0915 Attempt to jerry-rig anode ring with wire and eye screw... will search for missing piece near parking area.

0930 Unable to locate. Return to Newport to find hardware to jerry rig shocker equipment.

10.23.06 J.D.

0945 Called Smith-Root (shocker rental place) and asked if they could Fed-Ex ~~and~~ 10.23.06 an overnight package for the screw clamp. They said someone is actually coming to Newport today so they can drop off the replacement part with us later today.

1000 Purchased hardware for temporary fix of anode ring.

1015 Gary Buhler (NAS) found the part in NAS parking lot.

1020 We head back to sampling site

1100 Arrived back at Cedar Creek area.

1130 Lunch break

1145 Set up and begin sampling.
In situ water temperature = 12.1°C.
Water level appears a little higher, probably from recent rain last week.

10.23.06 J.D.

1615 End of sampling. Load up vehicle with samples

1630 Headed to N.A.S. to drop off samples

1700 Arrived at N.A.S.

1710 Sign-off samples ~200 ammocoetes.

10.23.06 J.D.

1730 Depart N.A.S. End of field days

2010 Called Joe Goulet in response to voicemail message asking for an update. Left him a message with the tally (~200) collected for today.

2100 Received spare anode ring & clamp from Smith-Root representative.

J.D. 10.23.06

10.24.06 T.Do

0800 Arrived at N.A.S. to pick up coolers and ice gel packs for continued ammocoete collection on the Siletz River. Prepped coolers w/ ice packs.
Crew: Thai Do (Windward)
Jenny Buening (Windward)
Weather: rain showers to partly sunny; 40°s F. to low-mid 50°s F.

0845 Arrive at Cedar Creek area along the Siletz River; set up sampling equipment/gear.

0910 Begin sampling/electroshocking.
Water temp: 11.8°C.

1315 Lunch break

1345 Resume sampling/electroshocking.

1700 End of sampling. All 300 ammocoetes collected.

1715 Depart to N.A.S. to drop off samples.

1745 Arrive at N.A.S. Offload samples.

1750 Sign off ammocoetes to N.A.S.
6 coolers ~ 300 ammocoetes.

1815 Depart N.A.S.; demobilize to Portland (stopover before

10.24.06 T.Do

returning to Seattle.

2100 Arrive in Portland. End of field day.

TDo 10.24.06

2230 Called Joe Goulet (EPA) to give him today's tally. Will return shocker equipt. to Smith-Root Inc en route to Seattle (in Vancouver) tomorrow.

T.DO 10.24.06

CHAIN-OF-CUSTODY/TEST REQUEST FORM

№ 2409

Project/Client Name: LWG RA Lamprey ammocoete
Project Number:
Contact Name: Helle Andersen
Sampled By: TDO, M Luxton

Ship to: N.A.S.
Attn: Gary Buhler
Shipping Date: 10.17.06
Shipper:
Airbill Number: —
Form filled out by: T.DO
Turnaround requested:

Sample Collection Date (m/d/y)	Time	Sample Identification	Volume of Sample / # of Containers	Matrix	Test(s) Requested (check test(s) required): tox.*	Hardness						Comments / Instructions [Jar tag number(s)]
10.17.06	1655	Siletz R. (Cedar Ck.)	58	ammocoetes	X							
10.17.06	1655	Siletz R. (Cedar Ck)	~~[illegible]~~ 1	water		X						water temp: 12.9°C in situ
		Total Number of Containers		Purchase Order / Statement of Work #								

1) Released by:	1) Rec'd by:	2) Released by:	2) Rec'd by:
Print name: THAI DO	Gary Buhler	Print name:	
Signature:	Company: NAS	Signature:	Company:
Company: WINDWARD		Company:	
Date/Time: 10.17.06/1655	Date/Time: 10.17.06/1655	Date/Time:	Date/Time:

* Distribution: White copies accompany shipment; yellow retained by consignor.

To be completed by Laboratory upon sample receipt:

Date of receipt::	Laboratory W.O. #:
Condition upon receipt:	Time of receipt:
Cooler temperature:	Received by:

Wind Ward environmental LLC
200 West Mercer Street
Suite 401
Seattle, WA 98119
Tel: (206) 378-1364
Fax: (206) 217-9343

CHAIN-OF-CUSTODY/TEST REQUEST FORM

№ 2407

Project/Client Name: LWG EPA - lamprey ammocoete (toxicity)
Project Number:
Contact Name: Helle Andersen
Sampled By: T Do, M Luxon

Ship to: N.A.S.
Attn: Gary Buhler
Shipper: hand del'd
Form filled out by: T.Do

Shipping Date: 10.18.06
Airbill Number:
Turnaround requested:

Sample Collection Date (m/d/y)	Time	Sample Identification	Volume of Sample / # of Containers	Matrix	Test(s) Requested (check test(s) required): TOX.							Comments / Instructions [Jar tag number(s)]
10.18.06	15:00	Siletz R. (Cedar creek)	5 buckets ~25D ammocoetes	ammocoete	5							5 coolers, ~25D ammocoetes
		Total Number of Containers		Purchase Order / Statement of Work #								

1) Released by:	1) Rec'd by:	2) Released by:	2) Rec'd by:
Print name: THAI DO	Gary Buhler	Print name:	
Signature:	Company: N.A.S.	Signature:	Company:
Company: WINDWARD ENV LLC		Company:	
Date/Time: 10.18.06/15:10	Date/Time: 10.18.06/15:10	Date/Time:	Date/Time:

* Distribution: White copies accompany shipment; yellow retained by consignor.

WindWard environmental LLC
200 West Mercer Street
Suite 401
Seattle, WA 98119
Tel: (206) 378-1364
Fax: (206) 217-9343

To be completed by Laboratory upon sample receipt:

Date of receipt::	Laboratory W.O. #:
Condition upon receipt:	Time of receipt:
Cooler temperature:	Received by:

1 of

CHAIN-OF-CUSTODY/TEST REQUEST FORM

№ 2408

Project/Client Name: LWG ERA-Lamprey ammocoete (toxicity)
Project Number: 06.28.04.45
Contact Name: Helle Andersen
Sampled By: TDO J Buening

Ship to: N.A.S.
Attn: Gary Buhler
Shipper: hand del'd.
Form filled out by: T.DO

Shipping Date:
Airbill Number:
Turnaround requested:

Sample Collection Date (m/d/y)	Time	Sample Identification	Volume of Sample / # of Containers	Matrix	Test(s) Requested (check test(s) required): tox. test							Comments / Instructions [Jar tag number(s)]
10.23.06	1700	LW3-Siletz River (Cedar Ck.)	4 coolers ~200 ct.	ammocoetes	✓							in situ temp 12.1°C.
		Total Number of Containers		Purchase Order / Statement of Work #								

1) Released by:	1) Rec'd by:	2) Released by:	2) Rec'd by:
Print name: THAI DO	Gary Buhler	Print name:	
Signature:	Company: N.A.S.	Signature:	Company:
Company: WINDWARD ENV LLC		Company:	
Date/Time: 10.23.06 / 1710	Date/Time: 10.23.06 / 1710	Date/Time:	Date/Time:

* Distribution: White copies accompany shipment; yellow retained by consignor.

Wind Ward environmental LLC

200 West Mercer Street
Suite 401
Seattle, WA 98119
Tel: (206) 378-1364
Fax: (206) 217-9343

To be completed by Laboratory upon sample receipt:

Date of receipt:	Laboratory W.O. #:
Condition upon receipt:	Time of receipt:
Cooler temperature:	Received by:

CHAIN-OF-CUSTODY/TEST REQUEST FORM

№ 2411

Project/Client Name: LWG ERA - lamprey ammocoete (toxicity)
Project Number: 06.28.04.45
Contact Name: Helle Andersen
Sampled By: TDo JBuening

Ship to: NAS.
Attn: Gary Buhler
Shipper: hand del'd
Form filled out by: T. Do

Shipping Date:
Airbill Number:
Turnaround requested:

Sample Collection Date (m/d/y)	Time	Sample Identification	Volume of Sample / # of Containers	Matrix	Test(s) Requested (check test(s) required): tox. test							Comments / Instructions [Jar tag number(s)]
10.24.06	1750	LW3 - Siletz River (Cedar Creek area)	6 coolers ~300 ct.	ammocoetes	X							in situ temp. 11.8°C
		Total Number of Containers		Purchase Order / Statement of Work #								

1) Released by: THAI DO	1) Rec'd by: Gary Buhler	2) Released by:	2) Rec'd by:
Print name: THAI DO		Print name:	
Signature:	Company: N.A.S.	Signature:	Company:
Company: WINDWARD ENV LLC		Company:	
Date/Time: 10.24.06/1750	Date/Time: 10.24.06/1750	Date/Time:	Date/Time:

* Distribution: White copies accompany shipment; yellow retained by consignor.

To be completed by Laboratory upon sample receipt:

Date of receipt::	Laboratory W.O. #:
Condition upon receipt:	Time of receipt:
Cooler temperature:	Received by:

Wind Ward environmental LLC
200 West Mercer Street
Suite 401
Seattle, WA 98119
Tel: (206) 378-1364
Fax: (206) 217-9343

APPENDIX B. TOXICITY TESTING REPORT

TOXICITY TEST REPORT

TEST IDENTIFICATION

Test Nos.: 686-31 through 37

Title: Lamprey (*Lampetra* sp.) ammocoete acute, static renewal range-finding toxicity testing with lamprey ammocoetes (*Lampetra* sp.) in support of the Portland Harbor remedial investigation (RI).

Protocol No.: NAS-686-Lamprey-rf, October 11, 2006 draft.

Study Objectives: The study objectives for the laboratory were to: 1) establish proper methods for holding the ammocoetes in the laboratory, including feeding and temperature regimens; 2) establish the proper exposure system, including size of exposure chambers, flow rate, and feeding regimen; and 3) perform range-finding toxicity tests with the following six chemicals: copper, aniline, pentachlorophenol, naphthalene, diazinon, and lindane. After the study was initiated, naphthalene was dropped from the range-finding testing and testing at two higher temperatures was added.

STUDY MANAGEMENT

Study Sponsor: Windward Environmental, Inc., 200 West Mercer Street, Suite 401, Seattle, WA 98119.

Sponsor's Study Monitor: Ms. Helle Andersen

Testing Laboratory: Northwestern Aquatic Sciences, P.O. Box 1437, Newport, OR 97365.

Test Location: Newport Laboratory.

Laboratory's Study Personnel: Richard S. Caldwell, Ph.D., G.A. Buhler, B.S., Proj. Man./Study Dir.; L.K. Nemeth, B.A., M.B.A., Acting Lab Director and QA Officer; G.J. Irissarri, B.S., Aq. Toxicol.; G. Hutchinson, B.S., Tech.

Study Schedule: The study began on September 28, 2006 with preparations to receive and hold lamprey in the laboratory. The study schedule required holding the lamprey for two to three weeks after receipt in order to determine whether lamprey ammocoetes could be held successfully in the laboratory. After two to three weeks of holding, four chemicals (aniline, copper, pentachlorophenol, and lindane) were tested on 11-9-06 in 96-hr static renewal tests. Diazinon was tested on 11-16-06. Naphthalene was dropped from the range-finding phase of the study due to the difficulty of keeping it in solution. After the chemical testing started, two more tests were requested to assess the ability of lamprey to acclimate to and survive in water-only tests at higher temperatures (17°C and 22°C). The temperature testing was conducted with remaining lamprey ammocoetes following the successful completion of chemical testing. On 11-21-06, at the end of all chemical testing, remaining organisms were fed, then ammocoetes were separated into different temperature-controlled rooms to acclimate to temperatures for the 96-hr temperature tests which were initiated on 12-1-06 (17°C) and 12-8-06 (22°C). The final test ended on 12-12-06.

Disposition of Study Records: All specimens, raw data, reports and other study records are stored according to Good Laboratory Practice regulations at Northwestern Aquatic Sciences, 3814 Yaquina Bay Rd., Newport, OR 97365.

Good Laboratory Practices: The test was conducted following the principles of Good Laboratory Practices (GLP) as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR Part 792).

Statement of Quality Assurance: The test data were reviewed by the Quality Assurance Unit to assure that the study was performed in accordance with the protocol and standard operating procedures. This report is an accurate reflection of the raw data.

TEST MATERIAL

Description: Chemicals tested included aniline (Fisher Scientific Lot #062904; purity: 99.9% assay), copper as copper sulfate (Argent Lot No. 0195; purity: minimum 99%), pentachlorophenol (Eastman Organic Chemicals), lindane (Aldrich batch # 07325DD; purity: 97%), and diazinon (Chem Service Lot # 362-71A; purity: 98.2%).

Preparation of Working Stock Solution and Test Concentrations: Stock solutions of aniline, pentachlorophenol, lindane, and diazinon, and were prepared by weighing or, in the case of aniline, measuring volumetrically, enough of the chemical to exceed either the saturation levels in water or an amount to exceed the estimated aqueous toxicity concentrations, and adding the chemicals to from 1L to 4L of NAS tap water in clean, acetone-rinsed brown glass bottles fitted with Teflon® caps. Bottles were capped and the contents slowly stirred on a magnetic stirrer at room temperature for ca. 20 hours. Target aqueous concentrations for each

chemical were: lindane, 8.0 mg/L; pentachlorophenol, 40 mg/mL; diazinon, 40 mg/L; and aniline, 1000 mg/L. The copper stock solution was a 1 mg/mL stock prepared on 10-27-05.

DILUTION WATER

Source: Dechlorinated municipal tap water from the City of Newport.
Dates of Preparation: A tank of dilution water was prepared prior to receipt of lampreys in the laboratory, topped off daily as needed, and constantly aerated. Water was removed for testing, or for aerated temperature acclimation prior to testing, on 11-9-06, 11-16-06, 11-30-06 and 12-7-06.
Water Quality: Ranges for parameters were: conductivity 110-130 µmhos/cm and alkalinity 30-40 mg/L as $CaCO_3$. In all batches of dilution water hardness was 51 mg/L as $CaCO_3$, and pH was 7.2. All total chlorine measurements were <0.02 mg/L.
Pretreatment: Dechlorinated, aerated ≥24 hr.

TEST ORGANISMS

Species: Lamprey, *Lampetra* sp.
Age: ammocoetes
Size: An initial representative subsample of six lampreys was measured after lab receipt of all animals. Pretest lamprey ammocoetes ranged from 28 to 84 mm in length and 0.04 to 0.78 g in weight. At the end of each test, lengths and weights were measured on all control animals and the overall means were calculated: average length, 67 ± 11 mm; average weight, 0.45 ± 0.20 g.
Source: Cedar Creek, Siletz River, Oregon. Organisms were collected by Windward staff and delivered to the laboratory.
Acclimation: Lamprey ammocoetes were received on 10-17-06, 10-18-06, 10-23-06, and 10-24-06. In situ water temperatures recorded on chain-of-custodies were 12.9°C, 12.1 °C, and 11.8°C. Average water quality parameters measured in the receiving water at the laboratory were: Temperature, 12.0 ± 1.3°C (range 10.6 – 13.6); dissolved oxygen, 8.8 ± 0.6 mg/L (range 8.2 - 9.6); pH, 6.0 ± 0.6 (range 5.3 – 6.8); conductivity, 96 ± 39 µmhos/cm (range 62 – 150); hardness, 31 ± 11 mg/L as $CaCO_3$ (range 26 – 51); and alkalinity, 38 ± 35 mg/L as $CaCO_3$ (range 20 – 90).

Animals were placed in 10-gallon tanks under flow-through conditions (~35 mL/minute, or ~ 2 volume changes per day, with one additional daily siphon and replacement of 2/3 volume of each tank). Approximately 50 lampreys were placed in each tank. Tanks contained 2-3 inches of sediment (Sandtastic Play Sand, Waupaca Materials) covered with 26L of test water and supplied with aeration. Normal behavior for lamprey ammocoetes is to immediately bury in sediment and remain there. If any are observed swimming around and not burying, that indicates some sort of stress. A total of six lampreys were found dead on the sediment surface within the first few days after receipt of animals, probably from being damaged during field sampling. Four lampreys from the 10/18/06 batch died and two from the 10/24/06 batch died. None of these animals were able to bury in the sediment. All other lampreys buried into the sediment and were not observed swimming in the water column.

Since lampreys were to be held short-term (a few weeks), they were not fed during this time. Water quality conditions for the three weeks prior to initiating the first tests (686-31 through –34) averaged: Temperature, 12.3 ± 0.5°C; dissolved oxygen, 10.9 ± 0.6 mg/L; pH, 7.6 ± 0.4; conductivity, 129 ± 5 µmhos/cm; hardness, 48 ± 4 mg/L as $CaCO_3$; and alkalinity, 44 ± 9 mg/L as $CaCO_3$. Further acclimation data for individual tests is summarized in Appendix II. Approximately four weeks after animal receipt, remaining lampreys were fed a yeast slurry (2 g yeast in 400 mL tap water blended for ~ 1 minute). The flow was turned off and 50 mL of slurry was fed to each tank. Flow was resumed after 24 hours. Lampreys were then further acclimated to remaining test temperatures.

TEST PROCEDURES AND CONDITIONS

Test Chambers: The test chambers were 2.5-gallon glass aquaria, containing 2.8L of test solution each, and were covered with plastic lids.

Test Concentrations: Four test concentrations and a control were used for each test. Test concentrations were determined by 96-hr exposures of a single lamprey to each of a wide range of three to six concentrations for each chemical. Nominal concentrations used for range-finding testing of each chemical were:

Aniline: 1000, 100, 10, 1.0 and 0 mg/L
Copper: 1.0, 0.1, 0.01, 0.001, and 0 mg/L
Pentachlorophenol: 4.0, 0.4, 0.004, and 0 mg/L
Lindane: 8.0, 0.8, 0.08, 0.008, and 0 mg/L
Diazinon: 40, 4.0, 0.4, 0.04, and 0 mg/L

Replicates/Treatment: 1 for chemical tests; 4 for temperature tests
Organisms/Treatment: 5 for chemical tests; 20 for temperature tests
Loading: 0.38 to 1.05 g/L
Aeration: Yes
Feeding: None
Water Volume Changes: For all testing, solutions were renewed at 48 hours with fresh solution. For chemical tests, new stock solutions were started mixing 24 hours prior to renewal.
Effects Criteria: The effect criteria used in the lamprey range-finding toxicity test was mortality, defined as a lack of visible respiratory movement and absence of response to tactile stimulation.
Target Water Quality Conditions: Temperature, 12 ± 1°C for chemical tests and 12, 17, or 22 ± 1°C for temperature tests; dissolved oxygen, ≥ 6.0 mg/L.
Photoperiod: 16:8 hr, L:D.
Light Intensity: Light intensity for the tests ranged from 49.5 to 73.0 foot-candles. Measurements are recorded on each test bench sheet.

DATA ANALYSIS METHODS

Percent survival was calculated for each concentration from the raw data. For temperature tests the means were obtained for each treatment. The software employed for these calculations was Microsoft Excel 2000.

CHEMICAL ANALYSES

For the chemical exposure tests, a sample of test solution was taken directly from each test aquaria at 0-, 48- (both old and new solutions) and 96-hours. Samples were stored at 4°C in the dark prior to shipment to Columbia Analytical Services. Shipment of samples was generally accomplished the next work day after sampling.

PROTOCOL DEVIATIONS

Lamprey ammocoetes were not fed during the first month of holding on the recommendation of William Swink, M.S., Research Fishery Biologist with the USGS at Hammond Bay Biological Station. Mr. Swink has extensive experience working with sea lamprey, including culture of larval lampreys; effects of density on growth of larvae; and survival, growth, and feeding of newly metamorphosed lampreys. After chemical testing was completed and holding was to continue past the initial planned time, remaining lampreys were fed a yeast slurry based on the methods used by the USGS at Hammond Bay Biological Station.

Dilution water hardness was 51 mg/L as $CaCO_3$ in all batches of test water used. This is slightly above the water hardness listed in the QAPP (<50 mg/L). Collection site water hardness ranged from 20 – 51 mg/L.

TEST RESULTS

Water quality conditions measured in test aquaria during the 96-hr toxicity tests are summarized in Appendix II. The temperature specification (12, 17, or 22 ± 1 °C) was met during the study for each temperature regime. Dissolved oxygen remained near saturation throughout the test (range 8.0 – 11.2 mg/L). The pH was within the range of 6.8 to 7.6, and conductivity measurements were within the range of 110 to 160 µmhos/cm. Hardness remained at 51 mg/L as $CaCO_3$ in all tests and alkalinity ranged from 30 to 40 mg/L as $CaCO_3$ in all tests except aniline (40 to 460 mg/L as $CaCO_3$).

The daily tabulations of the numbers of surviving lamprey ammocoetes in each treatment and treatment replicate are shown in Tables 1-7. Although not required for test acceptability in these research range-finding tests, the 96-hr control survival was 100% for all tests in the study, meeting the standard acute test acceptability criterion of 90%.

Table 1. Survival of lamprey ammocoetes, exposed for 96 hours to aniline.

Nominal Conc. (mg/L)	Replicate	Number of Lamprey Surviving 0-hr	24-hr	48-hr	72-hr	96-hr	Percent Survival
1,000	1	5	5	2	2	0	0.0
100	1	5	5	5	5	5	100.0
10	1	5	5	5	5	5	100.0
1.0	1	5	5	5	5	5	100.0
0 (control)	1	5	5	5	5	5	100.0

Table 2. Survival of lamprey ammocoetes, exposed for 96 hours to copper.

Nominal Conc. (mg/L)	Replicate	Number of Lamprey Surviving 0-hr	24-hr	48-hr	72-hr	96-hr	Percent Survival
1.0	1	5	0	0	0	0	0.0
0.1	1	5	5	5	5	2	40.0
0.01	1	5	5	5	5	5	100.0
0.001	1	5	5	5	5	5	100.0
0 (control)	1	5	5	5	5	5	100.0

Table 3. Survival of lamprey ammocoetes, exposed for 96 hours to pentachlorophenol.

Nominal Conc. (mg/L)	Replicate	Number of Lamprey Surviving 0-hr	24-hr	48-hr	72-hr	96-hr	Percent Survival
4.0	1	5	0	0	0	0	0.0
0.4	1	5	0	0	0	0	0.0
0.04	1	5	5	5	5	5	100.0
0.004	1	5	5	5	5	5	100.0
0 (control)	1	5	5	5	5	5	100.0

Table 4. Survival of lamprey ammocoetes, exposed for 96 hours to lindane.

Nominal Conc. (mg/L)	Replicate	Number of Lamprey Surviving 0-hr	24-hr	48-hr	72-hr	96-hr	Percent Survival
8.0	1	5	0	0	0	0	0.0
0.8	1	5	5	5	5	5	100.0
0.08	1	5	5	5	5	5	100.0
0.008	1	5	5	5	5	5	100.0
0 (control)	1	5	5	5	5	5	100.0

Table 5. Survival of lamprey ammocoetes, exposed for 96 hours to diazinon.

Nominal Conc. (mg/L)	Replicate	Number of Lamprey Surviving 0-hr	24-hr	48-hr	72-hr	96-hr	Percent Survival
40	1	5	5	0	0	0	0.0
4.0	1	5	5	5	5	5	100.0
0.4	1	5	5	5	5	5	100.0
0.04	1	5	5	5	5	5	100.0
0 (control)	1	5	5	5	5	5	100.0

Table 6. Survival of lamprey ammocoetes, exposed for 96 hours to 17°C.

Temperature (°C)	Replicate	Number of Lamprey Surviving 0-hr	24-hr	48-hr	72-hr	96-hr	96-hr % Survival Replicate	Mean
17	1	5	5	5	5	5	100.0	
	2	5	5	5	5	5	100.0	
	3	5	5	5	5	5	100.0	
	4	5	5	5	5	5	100.0	100.0
12 (control)	1	5	5	5	5	5	100.0	
	2	5	5	5	5	5	100.0	
	3	5	5	5	5	5	100.0	
	4	5	5	5	5	5	100.0	100.0

Table 7. Survival of lamprey ammocoetes, exposed for 96 hours to 22°C.

Temperature (°C)	Replicate	Number of Lamprey Surviving 0-hr	24-hr	48-hr	72-hr	96-hr	96-hr % Survival Replicate	Mean
22	1	5	5	5	5	5	100.0	
	2	5	5	5	5	4	80.0	
	3	5	5	5	5	5	100.0	
	4	5	5	5	5	5	100.0	95.0
12 (control)	1	5	5	5	5	5	100.0	
	2	5	5	5	5	5	100.0	
	3	5	5	5	5	5	100.0	
	4	5	5	5	5	5	100.0	100.0

STUDY APPROVAL

Guy Bothler 3/21/07
Project Manager/Study Director Date

Julie R. Fine 3-21-07
Quality Assurance Unit Date

Linda K. Nemeth 3/21/07
Acting Laboratory Director Date

APPENDIX I

PROTOCOL

TEST PROTOCOL

LAMPREY (*LAMPETRA* sp.) RANGE-FINDING TOXICITY TEST

1. INTRODUCTION

1.1 Purpose of Study: The purpose of this test is to perform range finding testing to determine the concentrations of specific chemicals that should be used for definitive testing to determine acute toxicity. The test employs lamprey (*Lampetra* sp.) ammocoetes. This testing is research based rather than for regulatory purposes and changes to procedures may occur as the study develops.

1.2 Summary of Method: Juvenile lampreys (ammocoetes) are exposed for 96 hours to a wide range of concentrations of several specific chemicals in order to find the concentrations that should be used for further testing to determine acute toxicity levels. The range-finding tests will be static-renewal. The test chambers are covered glass containers, each holding a volume of solution large enough to prevent loading from exceeding 1.1 g/L. For this range finding one replicate test chamber with five ammocoetes is employed at each of three or more test concentrations. A dilution water control is also run for each test, and a solvent control is also run if a solvent is required for a specific chemical. If there is a surplus of animals available, two replicates per concentration with five animals per replicate may be employed. Mortality is the effect criterion.

2. STUDY MANAGEMENT

2.1 Sponsor's Name and Address:
Windward Environmental LLC
200 West Mercer Street, Suite 401
Seattle, WA 98119

2.2 Sponsor's Study Monitor:
Ms. Helle Andersen

2.3 Name of Testing Laboratory:
Northwestern Aquatic Sciences
3814 Yaquina Bay Road P.O. Box 1437
Newport, OR 97365

2.4 Test Location: Newport Laboratory

2.5 Laboratory's Personnel to be Assigned to the Study:
Study Director: Gary Buhler
Quality Assurance Officer: Linda K. Nemeth
Aquatic Toxicologist: Gerald Irissarri
Aquatic Toxicologist: Michele Redmond

2.6 Proposed Study Schedule: Range finding tests should begin within two to three weeks of ammocoetes collection. Part of the study is to determine whether lamprey ammocoetes can be held in the laboratory prior to testing.

2.7 Good Laboratory Practices: The test is conducted following the principles of Good Laboratory Practices (GLP) as defined in the EPA/TSCA Good Laboratory Practice regulations effective December 29, 1983 (40 CFR Part 792).

3. TEST MATERIAL

For this study, six chemicals are to be tested if there are sufficient animals and chemicals can be obtained and put into solutions successfully. Copper, naphthalene, pentachlorophenol, lindane, diazinon, and aniline are the chemicals to be tested. These chemicals were selected to represent a range of toxic mode of actions. The chemicals will be purchased by NAS. If the number of ammocoetes is limited then chemicals will be tested in the order listed above. The nominal concentrations prepared for each chemical by the laboratory will be confirmed by chemicals analyses. Water samples will be collected from the control and each test concentration at test initiation and termination in bottles supplied by Columbia Analytical Services. Samples will be shipped via overnight carrier to CAS within 24 hours of collection.

4. DILUTION WATER

Dilution water is dechlorinated municipal water from the City of Newport.

5. TEST ORGANISMS

5.1 Species: Lamprey, *Lampetra* sp.

5.2 Source: Lamprey will be collected from the Siletz River by Windward Environmental and transported to NAS.

5.3. Age: ammocoetes (juveniles)

5.4 Acclimation and Pretest Observation: After receipt of fish at the laboratory, they will be sorted into holding tanks supplied with ~4-6 cm of fine sand, flowing water (dilution water), and aeration. The flow rate will depend on the number and size of the ammocoetes received. Animals will be held for two – three weeks prior to testing. During holding, ammocoetes will be fed yeast and, if necessary, a larval fish food weekly or at a frequency that appears to be appropriate based on observations of laboratory staff. After two weeks of holding, ammocoetes should appear disease-free and unstressed, with fewer than 5% of the organisms dying during the 24 to 48 hours prior to testing. To determine the loading rate and test chamber size, the wet weigh of approximately 10 ammocoetes will be measured before test initiation.

Care must be used to ensure that fish are not subjected to unusual handling or environmental stress either before or during the testing period. Ammocoetes should burrow into the substrate. Fish should be handled only the minimum necessary using suitable dip nets and should not be subjected to more than a 3°C temperature change during any 12-hour period. The dissolved oxygen level must be maintained at a level of 6.0 mg/L or greater. During holding, loading of fish in aquaria should not exceed 10 g/L, and holding water should be replaced at a minimum rate of 2 tank volumes per day. Fish are shielded from any unusual visual stress and treated with a photoperiod of 16 hours light and 8 hours darkness. A daily log of feeding, behavioral observations, mortality, and water quality should be maintained.

6. DESCRIPTION OF TEST SYSTEM

6.1 Test Chambers and Environmental Control: Test chambers are glass containers capable of holding a volume large enough to prevent loading from exceeding 1.1 g/L. Test chambers should be covered. Test chambers are maintained at constant temperature by partial immersion in a temperature-controlled water bath or by holding in a constant temperature room. The system is maintained in a photoperiod-controlled room or enclosure. Aeration is not required unless dissolved oxygen concentration falls below 6.0 mg/L. Aeration rate should not exceed 100 bubbles/minute. If aeration in required, all containers are aerated by slow bubbling of oil-free compressed air through 1 ml disposable pipets.

6.2 Cleaning: All laboratory glassware, including test chambers, is cleaned as described in EPA-821-R-02-012. New glassware and test systems are soaked 15 minutes in tap water and scrubbed with detergent (or cleaned in automatic dishwasher); rinsed twice with tap water; carefully rinsed once with fresh, dilute (10%, V:V) hydrochloric or nitric acid to remove scale, metals, and bases; rinsed twice with deionized water; rinsed once with acetone to remove organic compounds (using a fume hood or canopy); and rinsed three times with deionized water. Test systems and chambers are rinsed again with dilution water just before use.

7. EXPERIMENTAL DESIGN AND TEST PROCEDURES

7.1 Experimental Design: The test involves exposure of lamprey ammocoetes to a series of three to five test concentrations and a dilution water control. Exposures are for 96 hours. Each treatment consists of one test chamber each containing five fish. Total randomization is used for the placement of containers in the temperature-controlled room. Test organisms are impartially distributed to the test chambers by adding one to two animals to each chamber and repeating the process until each contains 5 organisms.

7.2 Effect Criterion: The effect criterion used in the lamprey bioassay is mortality, defined as a lack of visible respiratory movement and absence of response to tactile stimulation.

7.3 Test Conditions: The test temperature employed is 12 ± 1°C. The photoperiod is 16 hours of light and 8 hours of darkness. Illumination is supplied by ambient laboratory lighting. The dissolved oxygen concentration in each test container must be greater than 6.0 mg/L throughout the test. Test containers are gently aerated if required to maintain the oxygen level. If aeration is employed, all containers are treated equally. In the 96-hr test, the test solutions are renewed at 48 hours at a minimum (more if needed for purposes of specific chemicals in solutions). Loading must not exceed 1.1 g/L.

7.4 Preparation of Test Solutions: Each chemical stock solution is prepared by manual mixing with dilution water to prepare a series of test concentrations. The test dilutions are brought to the test temperature by partial immersion of the test containers in a water bath and, if necessary, are gently aerated until the dissolved oxygen concentration is 6.0 mg/L or greater. A solvent may be required to get some of the chemicals into solution.

7.5 Beginning the Test: The test is begun by adding the organisms to the equilibrated test containers as previously described.

7.6 Feeding: Animals are fed weekly during holding. If deemed necessary, animals will be fed prior to the 48-hour renewal.

7.7 Test Duration, Type and Frequency of Observations, and Methods:
The test duration of the range finding toxicity test is 96-hours. The type and frequency of observations to be made during the test are summarized as follows:

Type of Observation	Times of Observation
Biological Data	
Survival (in each test container)	Daily
Physical and Chemical Data	
Temperature and dissolved oxygen	Daily
pH	Beginning, at renewal, end
Hardness and alkalinity	Beginning and end
Sample for chemical measurement (each concentration and control)	Beginning and end

During the test, dead organisms are removed at least every 24 hours. Dissolved oxygen is measured in each stock test solution using a polarographic oxygen probe calibrated according to the manufacturer's recommendations. The pH is also measured in each stock test solution using a pH probe and a properly calibrated meter with scale divisions of 0.1 pH units. Temperature is measured with a calibrated mercury thermometer or telethermometer. Conductivity is measured with a conductivity meter. Hardness and alkalinity are measured using Hach test kits.

7.8 Test Acceptability Criterion: In a range finding test with only five animals in the control, the standard acute control survival criterion of 90% is not realistic. If one animal dies randomly, the test would not meet the criterion. Test acceptability will at the discretion of the study director.

8. DATA ANALYSIS

The data generated from the range finding test will be used to estimate the concentrations to be used in later definitive test. Percent survival is calculated for each treatment replicate, and, if there is more than one replicate per concentration, the means are obtained for each treatment level. An LC50 is calculated using Probit, Spearman-Karber, or Trimmed Spearman-Karber method.

9. REPORTING

The final report of the test results must include all of the following standard information at a minimum: name and identification of the test; the investigator and laboratory; information on the test material; information on the dilution water; detailed information about the test organisms; a description of the experimental design and test chambers and other test conditions including water quality; definition of the effect criteria and other observations; responses, if any, in the control treatment; tabulation and statistical analysis of measured responses; a description of the statistical methods used; any unusual information about the test or deviations from procedures.

10. STUDY DESIGN ALTERATION

Amendments made to the protocol must be approved by the sponsor and study director and should include a description of the change, the reason for the change; the date the change took effect, and the dated signatures of the study director and sponsor. Any deviations in the protocol must be described and recorded in the study raw data.

11. REFERENCE TOXICANT

Reference toxicant testing is not practical or required with range finding testing for research purposes.

12. REFERENCED GUIDELINES

ASTM. 1996. Standard guide for conducting acute toxicity tests on test materials with fishes, macroinvertebrates, and amphibians. E729-96. American Society for Testing and materials, Philadelphia, PA.

EPA. 2002. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms (Fifth Edition). EPA-821-R-02-012. Office of Water, US Environmental Protection Agency, Washington, D.C.

13. APPROVALS

_____ for Windward Environmental
Name Date

_____ for Northwestern Aquatic Sciences
Name Date

APPENDIX II

RAW DATA

TEST DESCRIPTION, MONITORING, AND RESULTS BENCHSHEETS – HOLDING DATA

ANIMAL RECEIPT/HOLDING: FRESHWATER

SPECIES: *Lampetra* ~~*tridentata* (Pacific Lamprey)~~ SP- GAB 11-8-06

DATE	TEMP (°C)	pH	DO (mg/L)	COND (µmhos/cm)	HARD (mg/L)	ALK (mg/L)	Source	No. of Animals	Water* Change	Feeding	Disposition	Comments	Init.
10-17-06	13.6	5.3	8.2	62	26	20	Silety River (Cedar Cr)	~58	yes -		Rec' data	~33 Animals put in each of tanks #1 & #2	WB
10-17-06	—	—	—	—	26	—	Silety River water	—	—	—			WB
10-18-06	12.3	7.4	10.7	135	43	50	Silety River (Cedar Cr)	~58	yes	—		Tank #1 WQ Holding	sf
10-18-06	12.4	6.0	9.6	95	26	20	" "	≈255			Rec' data	TANKS #3, 4, 5	GH
10-19-06	12.5	7.1	10.8	133	51	60	" "	~313	yes	—	1d tank #4 2d tank #9	tank #1 Holding WQ	sf
10-20-06	12.7	7.5	10.6	120	51	30	" "	"	yes	—		tank #5 Holding WQ	GH
10-21-06	12.5	7.5	11.1	130	43	30	" "	"	yes	—		tank #8 Holding WQ	GH
10-22-06	12.2	7.1	10.9	125	51	60	" "	"	"	—		Tk #2 WQ	sf
10-23-06	12.6	6.9	10.8	120	51	30	" "	"	"	—	Removed 1 dead Tk #3 sf	Tk #6 WQ NH3 taken	sf
10-23-06	11.5	6.8	8.4	75	26	20	Silety River (Cedar Cr)	~~200~~ pcf ~~TANKS #12, 13~~	"	—	Rec' data	~50 in TANKS 10, 11, 12, 13	WB
10-24-06	12.3	7.4	10.8	130	51	50	" "	≈500	"	—		Tank #12 WQ	sf
10-24-06	10.6	6.0	8.8	150	51	90	" "	~782	"	—	Rec' data	~45 in tanks 1, 14, 15, 16, 17, 18, 19	GH
10-25-06	12.4	6.9	10.8	130	43	30	" "	"	"	—	1d tank 14	tank #14 NH3 taken Holding WQ	GH
10-26-06	12.6	7.4	10.6	130	43	50	" "	"	"	—		tank #2 NH3 taken Holding WQ	GH
10-27-06	12.4	7.0	~~10.~~ 11.2 (GH 10-27-06)	130	43	50	" "	"	"	—	1d tank 18	tank #17 NH3 taken Holding WQ	GH
10-28-06	12.4	7.1	10.8	130	43	40	" "	"	"	—		TANK #3 NH3 TAKEN	[illegible]
10-29-06	12.9	8.1	10.8	135	51	50	" "	"	"	—		tank #11 NH3 taken	GH
10-30-06	12.7	8.0	10.4	130	43	50	" "	"	"	—		Tank #5 NH3 Taken	GH
10-31-06	12.8	7.8	10.2	130	43	40	" "	"	"	—		Tk #19 NH3 taken	[illegible]
11-1-06	12.6	7.9	10.3	135	43	40	" "	"	"	—	≈30 Animals used for T	Tk #14	WB

* Held in Flowthrough tanks

ANIMAL RECEIPT/HOLDING: FRESHWATER

SPECIES: *Lampetra* ~~*tridentata* (Pacific Lamprey)~~ SP. CMB 11-8-06

DATE	TEMP (°C)	pH	DO (mg/L)	COND (µmhos/cm)	HARD (mg/L)	ALK (mg/L)	Source	No. of Animals	Water Change	Feeding	Disposition	Comments	Init.
11-2-06	12.1	8.2	10.3	~~330~~ 130 GM	51	50	Siletz River (Cedar Creek)	~750	yes	—		TANK #6 NH3 TAKEN	CB
11-3-06	11.8	7.9	10.8	130	51	40	"	"	"	—		Tank #9 NH3 taken	GH
11-4-06	11.2	8.0	11.6	130	51	40	"	"	"	—		tank #13 NH3 taken	GH
11-5-06	11.6	7.9	11.2	135	51	50	"	~700	"	—		tank #16 NH3 taken	GH
11-6-06	13.2	7.9	13.0	119	51	30	"	"	"	—		Tank #1 NH3 Taken	LPS/GH
11-7-06	11.9	7.7	11.4	130	51	50	"	"	"	—		tank #11 NH3 taken	GH
11-8-06	11.5	8.0	11.2	125	51	50	"	"	"	—		TANK #17 NH3 Taken	CB
11-9-06	11.8	8.0	11.3	125	51	40	"	"	"	—	used ~100 animals for testing	TANK #4 NH3-N Taken	CB
11-10-06	11.7	7.9	11.2	115	43	50	"	~650	"	—		TANK #16 NH3 Taken	GH/LP
11-11-06	11.2	7.7	11.1	120	51	40	"	"	"	—		TANK #1 NH3 Taken	CB
11-12-06	11.3	7.8	11.0	130	51	40	"	"	"	—		TANK #13 NH3 TAKEN	GH
11-13-06	11.4	7.6	11.0	130	51	40	"	"	"	—		Tank #15 NH3 taken	GH
* 11-14-06	11.6	7.5	10.9	125	51	40	"	"	"	—		Tank #14 NH3 taken	GH
11-15-06	11.8	7.6	10.9	132	51	40	"	"	"	—		Tank #12 NH3-N taken	LPS
11-16-06	11.4	7.4	11.4	130	43	50	"	"	"	—		Tank #18 NH3-N taken	GH
11-17-06	11.6	7.6	11.3	117	51	40	"	"	"	—		Tank #1 NH3 taken	LPS/GH
11-18-06	11.8	7.4	11.2	120	51	40	"	"	"	—		TANK #14	CB
11-20-06	11.9	7.3	11.4	110	51	40	"	"	"	—		TANK #13	CB
11-21-06	—	—	—	—	—	—	"	"	Flow turned off	yes all tanks fed		2g dry yeast	GD
11-22-06	11.4	7.2	11.2	125	51	50	"	"				Tank #15 NH3 taken	LPS

ANIMAL RECEIPT/HOLDING: FRESHWATER—temperature acclimation study
SPECIES: *Lampetra* sp.

12°C

DATE	TEMP (°C)	pH	DO (mg/L)	COND (µmhos/cm)	HARD (mg/L)	ALK (mg/L)	Source	No. of Animals	Water Change	Feeding	Disposition	Comments	Init.
11-24-06	11.6	7.4	11.6	120	51	40	Siletz River		yes			TANK #14 NH_3-N 5 TANKS	GAB
11-25-06	12.0	7.6	11.3	135	60	50	" "		YES			TANK # 19 NH_3-N TAKEN	GJL
11-26-06	11.9	7.6	11.2	140	60	50	" "		"			TANK # 18 NH_3-N TAKEN	GJL
11-27-06	11.6	7.3	11.2	140	51	30	" "		"			TANK #12 NH_3-N TAKEN	GH
11-28-06	11.6	7.5	11.2	150	60	50	" "		"			Tank # 19 NH_3-N Taken	GJL
11-29-06	11.3	7.4	11.2	140	51	50	" "		"			Tank #14 NH_3-N Taken	GJL
11-30-06	11.7	7.5	11.0	135	60	40	" "		"			TANK # 18 NH_3-N TAKEN	GJL
12-1-06	11.8	7.4	11.4	130	60	40	" "		"			TK # 12 NH_3-N Taken	GD
12-2-06	11.9	7.3	11.2	130	51	40	" "		"			TK # 18 NH_3-N Taken	[illegible]
12-3-06	11.8	7.0	10.4	145	51	30	" "		"			TANK # 14	GH
12-4-06	11.4	7.3	10.6	140	60	40	" "		"			TANK # 14 NH_3-N TAKEN	GJL
12-5-06	12.0	6.9	11.2	140	51	40	" "		"			TANK #12 NH_3-N Taken	GNS
12-6-06	12.2	7.3	10.7	125	60	40	" "		"			TANK #12 NH_3-N TAKEN	GAB
12-7-06	12.0	7.4	10.9	135	60	40	" "		"			TANK #13 NH_3-N - TAKEN	GJL
12-8-06	12.2	7.4	11.0	120	51	40	" "					TANK # 14 NH_3-N TAKEN	GJL

ANIMAL RECEIPT/HOLDING: FRESHWATER—temperature acclimation study

SPECIES: *Lampetra* sp.

(to 17°C)

DATE	TEMP (°C)	pH	DO (mg/L)	COND (µmhos/cm)	HARD (mg/L)	ALK (mg/L)	Source	No. of Animals	Water Change	Feeding	Disposition	Comments	Init.
11-24-06	12.2	7.2	11.4	125	51	40	Safety Rock		yes			TANK #1 NH3-N TAKEN 1 4 TANKS	GAS
11-25-06	13.5	7.3	10.7	135	60	50	" "		yes			TANK #15 NH3-N TAKEN	GSL
11-26-06	14.6	7.5	10.2	140	60	40	" "		"			TANK #17 NH3-N TAKEN	GSL
11-27-06	15.5	7.3	9.8	145	60	40	" "		"			Tank #1 NH3-N Taken	GH
11-28-06	16.8	7.8	9.6	140	60	50	" "		"			Tank #16 NH3-N Taken	GH
11-29-06	16.8	7.7	9.4	140	51	50	" "		"			Tank #17 NH3-N Taken	GH
11-30-06	17.0	7.5	9.3	140	60	40	" "		"			TANK #15 NH3-N TAKEN	GSL
12-1-06	16.3	7.4	9.4	140	60	40	" "		"			Tank #16 NH3-N Taken	GJ

ANIMAL RECEIPT/HOLDING: FRESHWATER—temperature acclimation study

SPECIES: *Lampetra* sp.

22°C

DATE	TEMP (°C)	pH	DO (mg/L)	COND (µmhos/cm)	HARD (mg/L)	ALK (mg/L)	Source	No. of Animals	Water Change	Feeding	Disposition	Comments	Init.
12-1-06	16.9	7.3	8.8	145	51	30	Sky Run center	-150	"			up to 22°C 1°C/day	[illegible]
12-2-06	17.9	7.3	8.9	140	51	30	"	"	"			NH_3-N TAKEN TK#15	[illegible]
12-3-06	18.5	7.2	8.8	160	51	30	"	"	"			Tank #15	GJI
12-4-06	19.3	7.2	9.0	155	51	40	"	"	"			TANK #1 NH_3-N TAKEN	GJI
12-5-06	20.4	7.3	8.7	170	51	40	"	"	"			TANK #15 NH_3-N TAKEN	[illegible]
12-6-06	21.6	7.5	8.5	155	51	50	"	"	"			TK#17 NH_3-N TAKEN	[illegible]
12-7-06	21.1	7.4	8.8	150	51	50	"	"	"			TANK #15 NH_3-N TAKEN	GJI
12-8-06	21.9	7.5	8.8	150	51	40	"	"				TANK #1 NH_3-N TAKEN	GJI

Tank #1 lampreys
(first Batch)

	L (cm)	W (g)
1.	8.4 (cm)	0.78 g
2.	8.1 (cm)	0.78 g
3.	5.1 (cm)	0.17
4.	4.5 (cm)	0.15
5.	3.0 (cm)	0.06
6.	2.8 (cm)	0.04

wrote wrong units
GH 2-15-07

10-23-06
GH

Initial representative subsample upon lab receipt

TEST DESCRIPTION, MONITORING, AND RESULTS BENCHSHEETS – CHEMICAL TESTS

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686-31 Client Windward Investigator

STUDY MANAGEMENT:

Client: Windward Environmental, 200 West Mercer Street, Suite 401, Seattle, WA 98119
Client's Study Monitor: Ms. Helle Anderson
Testing Laboratory: Northwestern Aquatic Sciences
Test Location: Newport Laboratory
Laboratory's Study Personnel:
Project Manager/Study Director: G.A. Buhler
QA Officer: L.K. Nemeth 1. G.J. IRISSARRI
2. R.S. Caldwell 3.
4. 5.
Study Schedule:
Test Beginning: 11-9-06 1820 Test Ending: 11-13-06 1720

TEST MATERIAL:

Description: Aniline Fisher Scientific Lot # 062904 (purity: 99.9% assay)
NAS Sample No.:
Date of Preparation:
:

DILUTION WATER:

Description: City of Newport tap water
Date of Preparation/Collection: 11-9-06*
Water Quality: Cond. (µmhos/cm) 110 pH 7.2
Hardness (mg/L as $CaCO_3$) 51 Alkalinity (mg/L as $CaCO_3$) 40
Total Chlorine (mg/L, DL 0.02 mg/L) <0.02
Treatments: Dechlorinated, aerated ≥ 24 hours

* Tank of dilution water was prepared before lampreys were received in the lab, topped off daily when needed, and constantly aerated. Dilution water needed for test was removed on 11-9-06.

TEST ORGANISMS:

Species: *Lampetra* sp. Age/Size: 9 ammocoetes
Source: Siletz River, Oregon—Cedar Creek area
Acclimation Data:

Date	Temp. (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	Total Ammonia-N (mg/L)	Comments (including tank #)
10-26-06	12.6	7.4	10.6	130	43	50	0.00	#2
10-27-06	12.4	7.0	11.2	130	43	50	0.00	#17
10-28-06	12.4	7.1	10.8	130	~~51~~ 43	40	0.00	#3
10-29-06	12.9	8.1	10.8	135	~~51~~ 43 51	50	0.01	#4
10-30-06	12.7	8.0	10.4	130	43	50	0.01	#5
10-31-06	12.8	7.8	10.2	130	43	40	0.01	#19
11-1-06	12.6	7.9	10.3	135	43	40	0.00	#14
11-2-06	12.1	8.2	10.3	130	51	50	0.00	#6
11-3-06	11.8	7.9	10.8	130	51	40	0.00	#9
11-4-06	11.2	8.0	11.6	130	51	40	0.00	#13
11-5-06	11.6	7.9	11.2	135	51	50	0.00	#16
11-6-06	13.2	7.9	13.0	120	51	30	0.00	#1
11-7-06	11.9	7.7	11.4	130	51	50	0.01	#11
11-8-06	11.5	8.0	11.2	125	51	50	0.01	#17
11-9-06	11.8	8.0	11.3	125	51	40	0.00	#4
Mean	12.2	7.8	11.0	130	48	45	0.00	
S.D.	0.6	0.4	0.7	0.4	4	6	0.00	
(N)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	

[redacted]

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686-~~X~~ 31 ① CWB 11-16-06 Client Windward Investigator

TEST PROCEDURES AND CONDITIONS:

Test Concentrations (10% series recommended): 1,000, 100, 10, 1.0 and 0 mg/L (control). All concentrations are nominal.
Test Chambers (description): 2.5 gallon glass aquaria covered with plastic wrap and plastic lids
Test Volume (mL): 2.8 L Replicates/treatment: 1
Organisms/treatment: 5 (5/repl) Temperature (°C) 12 ± 1
Test water changes: one, at 48 hours Aeration during test: Yes
Feeding: None. Test Duration: 96 hr
Photoperiod (L/D): 16/8 Light intensity (ft.c.): 65-4 11-10-06 GAB
Beaker Placement: Stratified randomization

Randomization chart: Location: Room 1

Ø	100	1000	1.0	10	

STOCK SOLUTION PREPARATION:

GB 11-11-06
GB 11-9-06

TEST SOLUTION PREPARATION:

3.7 mL of aniline stock is diluted to 3,700 mL; this is the 1,000 mg/L concentration.
370 mL of this is then diluted to 3,700 mL; this is the 100 mg/L concentration.
This process is repeated for the 10 and 1.0 mg/L concentration.

After all solutions are mixed, 500 mL is removed for chemistry samples.

LOADING (g/L):
(weigh and measure length of controls at end of test)

11/13/06

Length (mm)	Weight (g)
72	0.49
67	0.38
71	0.47
79	0.63
83	0.75
$\bar{x}$ 74	0.54
SD 6	0.15
(N) (5)	(5)

0.54 g/Fish x 5 fish ÷ 2.8L = 0.96 g/L

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686-131 Client OUB 11-16-06 Windward Investigator

WATER QUALITY DATA SHEET

DAY 0 (11/9/06) DS/GJ

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors	Comments
1,000	12.8	7.6	10.5	120	51	440	5	All fish quiescent
100	12.8	7.4	10.4				5	
10	12.9	7.4	10.4				5	
1.0	12.8	7.2	10.5				5	
Control	12.8	7.2	10.4	110	51	40	5	

NOTES: Sample new solutions at each concentration and ship to CAS.

DAY 1 (11/10/06) DS

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors	Comments
1,000	12.4	7.4	10.3				5	All fish quiescent
100	12.4	7.4	10.2				5	
10	12.3	7.4	10.4				5	
1.0	12.4	7.3	10.3				5	
Control	12.3	7.2	10.2				5	

DAY 2 (11/11/06) DS

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors	Comments
1,000	12.6	7.5	10.4	125	51	460	2(30)	All surviving fish quiescent
100	12.5	7.4	10.6				5	
10	12.4	7.4	10.6				5	
1.0	12.5	7.3	10.6				5	
Control	12.4	7.3	10.6	120	51	40	5	

NOTES: Sample new and old solutions at each concentration and ship to CAS.

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686-~~1~~ 31 GB 11-16-06 Client Windward Investigator

WATER QUALITY DATA SHEET

DAY 3 (11 /12 /06) GSL/[illegible]

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors	Comments
1,000	12.8	7.6	10.4				2	Quiescent
100	12.8	7.5	10.2				5	
10	12.6	7.4	9.9				5	
1.0	12.8	7.5	10.1				5	
Control	12.9	7.5	10.2				5	

DAY 4 (11 /13 /06) GB

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors	Comments
1,000	12.5	7.5	10.2	125	51	440	0(20)	
100	12.6	7.3	10.1				5	GB ~~[illegible]~~, light lt scolored Flaccid
10	12.3	7.3	10.3				5	normal
1.0	12.5	7.2	10.2				5	↓
Control	12.4	7.2	10.2	120	51	40	5	↓

NOTES: Sample old solutions at each concentration and ship to CAS. Weigh and measure lengths on control animals.

WQ:

						1000	Ø
$\bar{X}$	12.6	7.4	10.3	120	51	447	40
SD	0.2	0.1	0.2	5	0	12	0
(N)	(25)	(25)	(25)	(6)	(6)	(3)	(3)

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686-31 GB 11-16-06 Client Windward Investigator

WATER SAMPLING RECORD

NAS Sample #	Description Day	Conc. (mg/L)	Date	Time	Initials	Comments
07906	Day 0	1,000	11-9-06	1545	GB	500mL
07916	Day 0	100				
07926	Day 0	10				
07936	Day 0	1.0				800mL
07946	Day 0	control				1,000mL
08256	Day 2-old	1,000	11-11-06	1645	GB	1,000 mL
08266	Day 2-old	100				
08276	Day 2-old	10				
08286	Day 2-old	1.0				
08296	Day 2-old	control				
08306	Day 2-new	1,000	11-11-06	1610	GB	520mL
08316	Day 2-new	100				
08326	Day 2-new	10				
08336	Day 2-new	1.0				800mL
08346	Day 2-new	control				1,000mL
08506	Day 4	1,000	11-13-06	1720	GB	1000mL
08516	Day 4	100				
08526	Day 4	10				
08536	Day 4	1.0				
08546	Day 4	control				

Copper

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686-~~2~~ 32 ① GB, 11-26-06 Client Windward Investigator

STUDY MANAGEMENT:

Client: Windward Environmental, 200 West Mercer Street, Suite 401, Seattle, WA 98119
Client's Study Monitor: Ms. Helle Anderson
Testing Laboratory: Northwestern Aquatic Sciences
Test Location: Newport Laboratory
Laboratory's Study Personnel:
Project Manager/Study Director: G.A. Buhler GAB
QA Officer: L.K. Nemeth 1. G.J. IRISSARRI GJI
2. R.S. Caldwell 3.
4. 5.
Study Schedule:
Test Beginning: 11-9-06 1700 Test Ending: 1620

TEST MATERIAL:

Description: Copper as $CuSO_4 \bullet 5H_2O$, Argent Lot No. 0195. 1mg/mL stock prepared 10-27-05.
NAS Sample No.: 1 Purity 99% minimum
Date of Preparation:
:

DILUTION WATER:

Description: City of Newport tap water
Date of Preparation/Collection: 11-9-06*
Water Quality: Cond. (µmhos/cm) 110 pH 7.2
Hardness (mg/L as $CaCO_3$) 51 Alkalinity (mg/L as $CaCO_3$) 40
Total Chlorine (mg/L, DL 0.02 mg/L) <0.02
Treatments: Dechlorinated, aerated ≥ 24 hours
* Tank of dilution water was prepared before lampreys were received in the lab, topped off daily when needed, and constantly aerated. Dilution water needed for test was removed on 11-9-06.

TEST ORGANISMS:

Species: *Lampetra* sp. Age/Size: ammocoetes
Source: Siletz River, Oregon—Cedar Creek area
Acclimation Data:

Date	Temp. (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	Total Ammonia-N (mg/L)	Comments (including tank #)
10-26-06	12.6	7.4	10.6	130	43	50		#2
10-27-06	12.4	7.0	11.2	130	43	50		#17
10-28-06	12.4	7.1	10.8	130	43	40		#3
10-29-06	12.9	8.1	10.8	135	51	50		#11
10-30-06	12.7	8.0	10.4	130	43	50		#5
10-31-06	12.8	7.8	10.2	130	43	40		#19
11-1-06	12.6	7.9	10.3	135	43	40		#14
11-2-06	12.1	8.2	10.3	130	51	50		#6
11-3-06	11.8	7.9	10.8	130	51	40		#9
11-4-06	11.2	8.0	11.6	130	51	40		#13
11-5-06	11.6	7.9	11.2	135	51	50		#16
11-6-06	13.2	7.9	13.0	120	51	30		#1
11-7-06	11.9	7.7	11.4	130	51	50		#11
11-8-06	11.5	8.0	11.2	125	51	50		#17
11-9-06	11.8	8.0	11.3	125	51	40		#4
Mean	12.2	7.8	11.0	130	48	45		
S.D.	0.6	0.4	0.7	0.4	4	6		
(N)	(15)	(15)	(15)	(15)	(15)	(15)		

LAMPREY SURVIVAL RANGE-FINDING TEST

32 DCB 11/6/06

Test No. 686-2 Client Windward Investigator

TEST PROCEDURES AND CONDITIONS:

Test Concentrations (10% series recommended): 1.0, 0.1, 0.01, 0.001 and 0 mg/L (control)
Test Chambers (description): 2.5 gallon glass aquaria covered with plastic wrap and plastic lids
Test Volume (mL): 2.8 L Replicates/treatment: 1
Organisms/treatment: 5 (5/repl) Temperature (°C) 12 ± 1
Test water changes: one, at 48 hours Aeration during test: Yes
Feeding: None. Test Duration: 96 hr
Photoperiod (L/D): 16/8 Light intensity (ft.c.): 64.5 11-10-06 GB
Beaker Placement: Stratified randomization

Randomization chart: Location: Room 1

0.001	1.0	Ø	0.01	0.1	

STOCK SOLUTION PREPARATION:

TEST SOLUTION PREPARATION:

3.7 mL of 1mg/mL copper stock is diluted to 3,700 mL; this is the 1.0 mg/L concentration.
370 mL of this is then diluted to 3,700 mL; this is the 0.1 mg/L concentration.
This process is repeated for the 0.01 and 0.001 mg/L concentration.

GB 11-9-06
GB 11-9-06

After all solutions are mixed, 500 mL is removed for chemistry samples.

LOADING (g/L):
(weigh and measure length of controls at end of test)

11/13/06

Length (mm)	Weight (g)
55	0.25
51	0.19
50	0.19
56	0.24
58	0.42
$\bar{X}$ 54	0.26
SD 3	0.09
(N) (5)	(5)

0.26g/fish x 5 fish ÷ 2.8L = 0.46g/L

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686-2 32 ① GAB 11-16-06 Client Windward Investigator

WATER QUALITY DATA SHEET

DAY 0 (11/9/06) GAB/GJ

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors	Comments
1.0	12.2	6.9	10.8	110	51	40	5	
0.1	12.1	7.1	10.8				5	
0.01	12.2	7.1	10.7				5	
0.001	12.1	7.1	10.8				5	
Control	12.3	7.1	10.6	116	51	40	5	

NOTES: Sample new solutions at each concentration and ship to CAS.

DAY 1 (11/10/06) GAB

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors	Comments
1.0	12.2	7.2	10.6				0(50)	
0.1	12.3	7.2	10.4				5	
0.01	12.3	7.2	10.2				5	
0.001	12.4	7.2	10.5				5	
Control	12.6	7.2	10.3				5	

DAY 2 (11/11/06) GAB

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors	Comments
1.0	12.2	7.3	10.7	120	51	40	0	
0.1	12.3	7.3	10.6				5	All fish quiescent
0.01	12.3	7.3	10.6				5	
0.001	12.3	7.3	10.6				5	
Control	12.6	7.3	10.4	115	51	40	5	

NOTES: Sample new and old solutions at each concentration and ship to CAS.

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686-~~2~~ 32 ① 11-16-06 VB Client Windward Investigator

WATER QUALITY DATA SHEET

DAY 3 (11 / 12 / 06) 6S2 /TSC

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors	Comments
1.0	12.7	7.5	10.4				—	
0.1	12.7	7.6	10.3				5	3 quiescent
0.01	12.8	7.6	10.5				5	
0.001	12.6	7.6	10.4				5	
Control	12.8	7.6	10.4				5	

DAY 4 (11 / 13 / 06) VB

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors	Comments
1.0	12.1	7.3	10.5	115	51	40	0	
0.1	12.1	7.3	10.3				2 (3D)	quiescent, slight discolored
0.01	12.1	7.2	10.4				5	normal
0.001	12.1	7.2	10.3				5	↓
Control	12.1	7.2	10.2	110	51	40	5	↓

NOTES: Sample old solutions at each concentration and ship to CAS. Weigh and measure lengths on control animals.

WQ:						
$\bar{X}$	12.3	7.3	10.5	113	51	40
SD	0.2	0.2	0.2	4	0	0
(N)	(25)	(25)	(25)	(6)	(6)	(6)

LAMPREY SURVIVAL RANGE-FINDING TEST

Copper

Test No. 686-2 32 GB 11-16-06 Client Windward Investigator

WATER SAMPLING RECORD

NAS Sample #	Description Day	Conc. (mg/L)	Date	Time	Initials	Comments
0775G	Day 0	1.0	11-9-06	1400	GAB	500mL
0776G	Day 0	0.1				
0777G	Day 0	0.01				
0778G	Day 0	0.001				
0779G	Day 0	control				
0795G	Day 2-old	1.0	11-11-06	~~1545~~ 1620	GAB	500 ~~1,000~~ ml
0796G	Day 2-old	0.1				
0797G	Day 2-old	0.01				
0798G	Day 2-old	0.001				
0799G	Day 2-old	control				
0800G	Day 2-new	1.0	11-11-06	1545	GAB	500 mL
0801G	Day 2-new	0.1				
0802G	Day 2-new	0.01				
0803G	Day 2-new	0.001				
0804G	Day 2-new	control				
0835G	Day 4	1.0	11-13-06	1620	GAB	500 ~~1000~~ mL GAB 11-13-06
0836G	Day 4	0.1				
0837G	Day 4	0.01				
0838G	Day 4	0.001				
0839G	Day 4	control				

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686-3 (33 @ 0.03 w/ 16 ...) Client Windward Investigator

STUDY MANAGEMENT:

Client: Windward Environmental, 200 West Mercer Street, Suite 401, Seattle, WA 98119
Client's Study Monitor: Ms. Helle Anderson
Testing Laboratory: Northwestern Aquatic Sciences
Test Location: Newport Laboratory
Laboratory's Study Personnel:
Project Manager/Study Director: G.A. Buhler GAB
QA Officer: L.K. Nemeth 1. G.J. IRISSARRI GJI
2. R.S. Caldwell RSC 3.
4. 5.
Study Schedule:
Test Beginning: 11-9-06 1745 Test Ending: 11-13-06 1645

TEST MATERIAL:

Description: Pentachlorophenol (PCP) Eastman Organic Chemicals
NAS Sample No.:
Date of Preparation:
:

DILUTION WATER:

Description: City of Newport tap water
Date of Preparation/Collection: 11-9-06*
Water Quality: Cond. (µmhos/cm) 110 pH 7.2
Hardness (mg/L as $CaCO_3$) 51 Alkalinity (mg/L as $CaCO_3$) 40
Total Chlorine (mg/L, DL 0.02 mg/L) <0.02
Treatments: Dechlorinated, aerated ≥ 24 hours
*Tank of dilution water was prepared before lampreys were received in lab, topped off daily when needed, and constantly aerated. Dilution water needed for test was removed on 11-9-06.

TEST ORGANISMS:

Species: *Lampetra* sp. Age/Size: ammocoetes
Source: Siletz River, Oregon—Cedar Creek area
Acclimation Data: See holding data

Date	Temp. (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	Total Ammonia-N (mg/L)	Comments (including tank #)
Mean								
S.D.								
(N)								

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686-33 Client Windward Investigator

TEST PROCEDURES AND CONDITIONS:

Test Concentrations (10% series recommended): 4.0, 0.4, 0.04, 0.004 and 0 mg/L (control). All concentrations are nominal.
Test Chambers (description): 2.5 gallon glass aquaria covered with plastic wrap and plastic lids
Test Volume (mL): 2.8 L Replicates/treatment: 1
Organisms/treatment: 5 (5/repl) Temperature (°C) 12 ± 1
Test water changes: one, at 48 hours Aeration during test: Yes
Feeding: None.
Photoperiod (L/D): 16/8 Light intensity (ft.c.): 68.9 11-10-06 VB
Beaker Placement: Stratified randomization

Randomization chart: Location: Room 1

0.4	0.004	Ø	0.04	4.0	

STOCK SOLUTION PREPARATION:

TEST SOLUTION PREPARATION:

370 mL of 40 mg/mL PCP stock is diluted to 3,700 mL; this is the 4.0 mg/L concentration.
370 mL of this is then diluted to 3,700 mL; this is the 0.4 mg/L concentration.
This process is repeated for the 0.04 and 0.004 mg/L concentration.

After all solutions are mixed, 500 mL is removed for chemistry samples.

LOADING (g/L):
(weigh and measure length of controls at end of test)

Length (mm)	Weight (g)
55	0.25
51	0.18
50	0.15
49	0.17
82	0.66
$\bar{X}$ 57	0.28
SD 14	0.21
(N) (5)	(5)

0.28 g/fish × 5 fish ÷ 2.8 L = ~~0.38~~ 0.5 g/L

GW CALCULATION ERROR 2-19-07

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686-33 Client Windward Investigator

WATER QUALITY DATA SHEET

DAY 0 (11/9/06) CMS/GSL

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors	Comments
4.0	12.2	7.2	10.4	115	51	40	5	All fish quiescent
0.4	12.2	7.1	10.4				5	
0.04	12.2	7.1	10.2				5	
0.004	12.2	7.1	10.4				5	
Control	12.3	7.1	10.4	110	51	40	5	

NOTES: Sample new solutions at each concentration and ship to CAS.

DAY 1 (11/10/06) AB

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors	Comments
4.0	12.2	7.4	10.2				0(50)	
0.4	12.2	7.3	10.4				0(50)	
0.04	12.2	7.3	10.4				5	
0.004	12.2	7.2	10.2				5	
Control	12.2	7.2	10.3				5	

DAY 2 (11/11/06) AB

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors	Comments
4.0	12.2	7.5	10.5	125	51	40	0	
0.4	12.2	7.4	10.5				0	
0.04	12.2	7.3	10.4				5	
0.004	12.3	7.3	10.4				5	
Control	12.3	7.3	10.5	120	51	40	5	

NOTES: Sample new and old solutions at each concentration and ship to CAS.

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686-~~3~~ 33 ① 11-16-06 Client Windward Investigator [redacted]

WATER QUALITY DATA SHEET

DAY 3 (11/12/06) GSL/TSL/

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors	Comments
4.0	12.7	7.6	10.3				-0	
0.4	12.7	7.6	10.4				-0	
0.04	12.7	7.6	10.2				5	
0.004	12.8	7.6	10.3				5	
Control	12.8	7.5	10.2				5	

DAY 4 (11/13/06) CAS

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors	Comments
4.0	12.1	7.3	10.6	115 ~~51~~	51 ~~40~~	40	0	
0.4	12.1	7.3	10.6		CAS 11-13-06		0	
0.04	12.1	7.3	10.5				5	normal
0.004	12.1	7.2	10.4		CAS 11-13-06		5	↓
Control	12.1	7.2	10.4	115 ~~51~~	~~40~~ 51	40	5	↓

NOTES: Sample old solutions at each concentration and ship to CAS. Weigh and measure lengths on control animals.

WQ						
$\bar{X}$	12.3	7.3	10.4	117	51	40
SD	0.2	0.2	0.1	5	0	0
(N)	(25)	(25)	(25)	(6)	(6)	(6)

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686-~~3~~ 33 OGB, 1-26-06 Client Windward Investigator

WATER SAMPLING RECORD

NAS Sample #	Description Day	Conc. (mg/L)	Date	Time	Initials	Comments
0780G	Day 0	4.0	11-9-06	1415	GAB	500mL
0781G	Day 0	0.4				
0782G	Day 0	0.04				
0783G	Day 0	0.004				800mL
0784G	Day 0	control				1,000mL
0805G	Day 2-old	4.0	11-11-06	1625	GAB	1,000mL
0806G	Day 2-old	0.4				
0807G	Day 2-old	0.04				
0808G	Day 2-old	0.004				
0809G	Day 2-old	control				
0810G	Day 2-new	4.0	11-11-06	1555	GAB	500mL
0811G	Day 2-new	0.4				
08112G	Day 2-new	0.04				
08113G	Day 2-new	0.004				800mL
08114G	Day 2-new	control				1000mL
0840G	Day 4	4.0	11-13-06	1650	GAB	1000mL
0841G	Day 4	0.4				
0842G	Day 4	0.04				
0843G	Day 4	0.004				
0844G	Day 4	control				

Lindane

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686-A 34 Client Windward Investigator

STUDY MANAGEMENT:

Client: Windward Environmental, 200 West Mercer Street, Suite 401, Seattle, WA 98119

Client's Study Monitor: Ms. Helle Anderson

Testing Laboratory: Northwestern Aquatic Sciences

Test Location: Newport Laboratory

Laboratory's Study Personnel:

Project Manager/Study Director: G.A. Buhler GB

QA Officer: L.K. Nemeth 1. G.J. IRISSARRI GJI

2. R.S. Caldwell RSC 3.

4. 5.

Study Schedule:

Test Beginning: 11-9-06 1800 Test Ending: 11-13-06 1710

TEST MATERIAL:

Description: Lindane Aldrich batch # 07325DD (purity: 97%)

NAS Sample No.:

Date of Preparation:

:

DILUTION WATER:

Description: City of Newport tap water

Date of Preparation/Collection: 11-9-06 *

Water Quality: Cond. (µmhos/cm) 110 pH 7.2

Hardness (mg/L as $CaCO_3$) 51 Alkalinity (mg/L as $CaCO_3$) 40

Total Chlorine (mg/L, DL 0.02 mg/L) <.002

Treatments: Dechlorinated, aerated ≥ 24 hours

*Tank of dilution water was prepared before lampreys were received in lab, topped off daily when needed, and constantly aerated. Dilution water needed for test was removed on 11-9-06.

TEST ORGANISMS:

Species: *Lampetra* sp. Age/Size: ammocoetes

Source: Siletz River, Oregon—Cedar Creek area

Acclimation Data: see holding data

Date	Temp. (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	Total Ammonia-N (mg/L)	Comments (including tank #)
Mean								
S.D.								
(N)								

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686-~~A~~ 34 GAB 11-16-06 Client Windward Investigator

TEST PROCEDURES AND CONDITIONS:

Test Concentrations (10% series recommended): 8.0, 0.8, 0.08, 0.008 and 0 mg/L (control) All concentrations are nominal.
Test Chambers (description): 2.5 gallon glass aquaria covered with plastic wrap and plastic lids
Test Volume (mL): 2.8 L Replicates/treatment: 1
Organisms/treatment: 5 (5/repl) Temperature (°C) 12 ± 1
Test water changes: one, at 48 hours Aeration during test: Yes
Feeding: None. Test Duration: 96 hr
Photoperiod (L/D): 16/8 Light intensity (ft.c.): 53.4 11-10-06 GAB
Beaker Placement: Stratified randomization

Randomization chart: Location: Room 1

8.0	∅	0.8	0.08	0.008	

STOCK SOLUTION PREPARATION:

TEST SOLUTION PREPARATION:

GAB 11-9-06 GAB 11-11-06

Stock lindane solution is the 8.0 mg/L test concentration.
370 mL of 8 mg/L lindane is then diluted to 3,700 mL this is the 0.8 mg/L concentration.
This process is repeated for the 0.08 and 0.008 mg/L concentration.

After all solutions are mixed, 500 mL is removed for chemistry samples.

LOADING (g/L):
(weigh and measure length of controls at end of test)

RSC 11/13/06

Length (mm)	Weight (g)
59	0.27
58	0.27
68	0.37
70	0.43
88	0.79

0.43 g/fish × 5 fish ÷ 2.8L = 0.77

$\bar{X}$	69	0.43
SD	12	0.21
(N)	(5)	(5)

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686-A34 11-16-06 Client Windward Investigator

WATER QUALITY DATA SHEET

DAY 0 (11/9/06) MB/GJ

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors	Comments
8.0	12.2	7.3	10.4	115	51	40	5	ALL Fish quiescent
0.8	12.2	7.3	10.2				5	
0.08	12.3	7.2	10.2				5	
0.008	12.1	7.2	10.4				5	
Control	12.2	7.2	10.2	115	51	40	5	

NOTES: Sample new solutions at each concentration and ship to CAS.

DAY 1 (11/10/06) MB

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors	Comments
8.0	12.1	7.5	10.1				0(50)	
0.8	12.1	7.4	10.2				5	ALL Fish quiescent
0.08	12.2	7.3	10.5				5	
0.008	12.2	7.3	10.2				5	
Control	12.1	7.3	10.4				5	

DAY 2 (11/11/06) MB

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors	Comments
8.0	12.2	7.5	10.4	120	51	40	0	
0.8	12.2	7.4	10.5				5	ALL Fish quiescent
0.08	12.2	7.4	10.4				5	
0.008	12.1	7.4	10.8				5	
Control	12.2	7.3	10.6	120	51	40	5	

NOTES: Sample new and old solutions at each concentration and ship to CAS.

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686-434 Client Windward Investigator

WATER QUALITY DATA SHEET

DAY 3 (11 / 12 / 06) 632 /JB

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors	Comments
8.0	12.7	7.6	10.4				0	
0.8	12.6	7.6	10.2				5	all quiescent
0.08	12.8	7.6	10.3				5	
0.008	12.8	7.5	10.3				5	
Control	12.6	7.5	10.4				5	

DAY 4 (11 /13 /06) KB

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors	Comments
8.0	12.1	7.4	10.3	115	51	40	0	
0.8	12.2	7.3	10.2				5	twitching kinking of body, shedding mucus
0.08	12.2	7.3	10.4				5	2 normal, 3 erratic
0.008	12.3	7.3	10.3				5	normal
Control	12.1	7.2	10.2	115	51	40	5	↓

NOTES: Sample old solutions at each concentration and ship to CAS. Weigh and measure lengths on control animals.

$\bar{X}$	12.3	7.4	10.3	117	51	40
SD	0.2	0.1	0.2	3	0	0
(N)	(25)	(25)	(25)	(6)	(6)	(6)

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686-~~4~~34 Client Windward Investigator

WATER SAMPLING RECORD

NAS Sample #	Description Day	Conc. (mg/L)	Date	Time	Initials	Comments
0785G	Day 0	8.0	11-9-06	1440	GAB	500 mL
0786G	Day 0	0.8				
0787G	Day 0	0.08				
0788G	Day 0	0.008				800 mL
0789G	Day 0	control				1,000 mL
0815G	Day 2-old	8.0	11-11-06	1635	GAB	1,000 mL
0816G	Day 2-old	0.8				
0817G	Day 2-old	0.08				
0818G	Day 2-old	0.008				
0819G	Day 2-old	control				
0820G	Day 2-new	8.0	11-11-06	1600	GAB	500 mL
0821G	Day 2-new	0.8				
0822G	Day 2-new	0.08				
0823G	Day 2-new	0.008				800 mL
0824G	Day 2-new	control				1,000 mL
0845G	Day 4	8.0	11-13-06	1710	GAB	1000 mL
0846G	Day 4	0.8				
0847G	Day 4	0.08				
0848G	Day 4	0.008				
0849G	Day 4	control				

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686-35 Client Windward Investigator

STUDY MANAGEMENT:

Client: Windward Environmental, 200 West Mercer Street, Suite 401, Seattle, WA 98119
Client's Study Monitor: Ms. Helle Andersen
Testing Laboratory: Northwestern Aquatic Sciences
Test Location: Newport Laboratory
Laboratory's Study Personnel:
Project Manager/Study Director: G.A. Buhler GAB
QA Officer: L.K. Nemeth 1.
2. 3.
4. 5.
Study Schedule:
Test Beginning: 11-16-06 1445 Test Ending: 11-20-06 1500

TEST MATERIAL:

Description: Diazinon Chem Service * Lot #362-71A (purity 98.2%)
NAS Sample No.:
Date of Preparation:
:

DILUTION WATER:

Description: City of Newport tap water
Date of Preparation/Collection: 11-16-06 *
Water Quality: Cond. (µmhos/cm) 110 pH 7.2
Hardness (mg/L as $CaCO_3$) 51 Alkalinity (mg/L as $CaCO_3$) 30
Total Chlorine (mg/L, DL 0.02 mg/L) –
Treatments: Dechlorinated, aerated ≥ 24 hours

* Tank of dilution water was prepared before lampreys were received in the lab, topped off daily when needed, and constantly aerated. Dilution water needed for test was removed on 11-16-06.

TEST ORGANISMS:

Species: *Lampetra* sp. Age/Size: ammocoetes
Source: Siletz River, Oregon—Cedar Creek area
Acclimation Data: See holding data

Date	Temp. (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	Total Ammonia-N (mg/L)	Comments (including tank #)
Mean								
S.D.								
(N)								

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686- 35 Client Windward Investigator

TEST PROCEDURES AND CONDITIONS:

Test Concentrations (10% series recommended): 40, 4.0, 0.4, 0.04 and 0 mg/L (control) All concentrations are nominal.
Test Chambers (description): 2.5 gallon glass aquaria covered with plastic wrap and plastic lids
Test Volume (mL): 2.8 L Replicates/treatment: 1
Organisms/treatment: 5 (5/repl) Temperature (°C) 12 ± 1
Test water changes: one, at 48 hours Aeration during test: Yes
Feeding: None. Test Duration: 96 hr
Photoperiod (L/D): 16/8 Light intensity (ft.c.): 64
Beaker Placement: Stratified randomization

Randomization chart: Location: Room 1

0.04	40	Ø	0.4	4.0	

STOCK SOLUTION PREPARATION:

TEST SOLUTION PREPARATION:

1-18-06 TS

Stock diazinon solution is the 40 mg/L test concentration.
370 mL of 40 mg/L diazinon is then diluted to 3,700 mL this is the 4.0 mg/L concentration.
This process is repeated for the 0.4 and 0.04 mg/L concentration.

1-18-06 M

After all solutions are mixed, 500 mL is removed for chemistry samples.

LOADING (g/L):
(weigh and measure length of controls at end of test)

Length (mm)	Weight (g)
70	0.41
90	0.90
70	0.38
74	0.53
68	0.40
$\bar{X}$ 74	0.52
SD 9	0.22
(N) 15	15

0.52g/fish x 5 fish ÷ 2.8L = 0.93g/L

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686-35 Client Windward Investigator

WATER QUALITY DATA SHEET

DAY 0 (11 / 16 / 06) LAB

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors	Comments
40	12.2	7.3	10.6	115	51	30	5	Tetanous for 2/hr, often quiescent
4.0	12.1	7.3	10.6				5	Normal
0.4	12.2	7.3	10.5				5	↓
0.04	12.1	7.3	10.7				5	↓
Control	12.1	7.3	10.6	115	51	30	5	↓

NOTES: Sample new solutions at each concentration and ship to CAS.

DAY 1 (11 / 17 / 06) B

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors	Comments
40	11.8	7.1	10.6				5	quiescent
4.0	11.8	7.1	10.5				5	Twitching
0.4	11.7	7.1	10.5				5	normal
0.04	11.8	7.1	10.4				5	↓
Control	11.8	7.1	10.5				5	↓

DAY 2 (11 / 18 / 06) B

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors	Comments
40	11.9	7.3	10.4	120	51	30	0(50)	
4.0	12.0	7.3	10.3				5	Tetanous & erratic
0.4	11.9	7.2	10.5				5	↓
0.04	11.7	7.2	10.6				5	↓
Control	11.8	7.2	10.6	125	51	30	5	Normal

NOTES: Sample new and old solutions at each concentration and ship to CAS.

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686-35 Client Windward Investigator

WATER QUALITY DATA SHEET

DAY 3 (11/19/06)

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors	Comments
40	11.8	7.3	10.6				0	
4.0	11.7	7.3	10.4				5	Twitching & erratic
0.4	11.8	7.3	10.3				5	↓
0.04	11.8	7.3	10.3				5	↓
Control	11.9	7.3	10.2				5	normal

DAY 4 (11/20/06)

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors	Comments
40	11.9	7.3	10.5	120	51	30	0	
4.0	11.8	7.3	10.6				5	twitching & erratic
0.4	11.8	7.3	10.5				5	↓
0.04	11.9	7.3	10.3				5	↓
Control	12.0	7.3	10.4	120	51	40	5	normal

NOTES: Sample old solutions at each concentration and ship to CAS. Weigh and measure lengths on control animals.

INQ: $\bar{X}$	11.9	7.2	10.5	119	51	32
SD	0.1	0.1	0.1	4	0	4
(N)	(25)	(25)	(25)	(6)	(6)	(6)

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686- 35 Client Windward Investigator

WATER SAMPLING RECORD

NAS Sample #	Description Day	Conc. (mg/L)	Date	Time	Initials	Comments
08556	Day 0	40	11-16-00	1325	GAB	520mL
08566	Day 0	4.0				
08576	Day 0	0.4				
08586	Day 0	0.04				860mL
08596	Day 0	control				1000mL
08606	Day 2-old	40	11-18-00	1330	KB	1000mL
08616	Day 2-old	4.0				
08626	Day 2-old	0.4				
08636	Day 2-old	0.04				
08646	Day 2-old	control				
08656	Day 2-new	40		1320		520mL
08666	Day 2-new	4.0				
08676	Day 2-new	0.4				
08686	Day 2-new	0.04				860mL
08696	Day 2-new	control				1000mL
08706	Day 4	40	11-20-00	1510	KB	1000mL
08716	Day 4	4.0				
08726	Day 4	0.4				
08736	Day 4	0.04				
08746	Day 4	control				

TEST DESCRIPTION, MONITORING, AND RESULTS BENCHSHEETS – TEMPERATURE TESTS

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686-36 Client Windward Investigator

STUDY MANAGEMENT:

Client: Windward Environmental, 200 West Mercer Street, Suite 401, Seattle, WA 98119
Client's Study Monitor: Ms. Helle Andersen
Testing Laboratory: Northwestern Aquatic Sciences
Test Location: Newport Laboratory
Laboratory's Study Personnel:
Project Manager/Study Director: G.A. Buhler GAB
QA Officer: L.K. Nemeth 1. G.J. IRISSARRI GJI
2. Greg Hutchinson GH 3.
4. 5.
Study Schedule:
Test Beginning: 12-1-06 1500 Test Ending: 12-5-06 1440

TEST MATERIAL:

Description:
NAS Sample No.:
Date of Preparation:
:

DILUTION WATER:

Description: City of Newport tap water
Date of Preparation/Collection: 12-30-06
Water Quality: Cond. (µmhos/cm) 130 pH 7.2
Hardness (mg/L as $CaCO_3$) 51 Alkalinity (mg/L as $CaCO_3$) 30
Total Chlorine (mg/L, DL 0.02 mg/L) <0.02
Treatments: Dechlorinated, aerated ≥ 24 hours

TEST ORGANISMS:

Species: *Lampetra* sp. Age/Size: ammocoetes
Source: Siletz River, Oregon—Cedar Creek area
Acclimation Data: 17°C see holding data

Date	Temp. (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	Total Ammonia-N (mg/L)	Comments (including tank #)
Mean								
S.D.								
(N)								

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686- 36 Client Windward Investigator

Acclimation Data: 12°C See initial data

Date	Temp. (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	Total Ammonia-N (mg/L)	Comments (including tank #)
Mean								
S.D.								
(N)								

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686- 36 Client Windward Investigator

TEST PROCEDURES AND CONDITIONS:

Test Concentrations (10% series recommended): 0 (control).
Test Chambers (description): 2.5 gallon glass aquaria covered with plastic wrap and plastic lids
Test Volume (mL): 2.8 L Replicates/treatment: 1
Organisms/treatment: 4 (5/repl) Temperature (°C) 12 ± 1 and 17 ± 1
Test water changes: one, at 48 hours Aeration during test: Yes
Feeding: None. Test Duration: 96 hr
Photoperiod (L/D): 16/8
Beaker Placement: Stratified randomization

Randomization chart: 17°C Location: Room 3 Light intensity (ft.c.): 73.0 12-1-06

B	A	D	C

Randomization chart: 12°C Location: Room 4 Light intensity (ft.c.): 55.6 12-1-06

A	D	C	B

TEST SOLUTION PREPARATION:

2.8 liters of dilution water per tank. CB 12-1-06

LOADING (g/L):
(weigh and measure length a replicate at end of test)

17°C

Length (mm)	Weight (g)
80	0.72
71	0.46
65	0.44
72	0.55
82	0.78
$\bar{x}$ 74	0.59
SD 7	0.15
(N) (5)	(5)

0.59 g/fish x 5 fish ÷ 2.8L = 1.05 g/L

12°C

Length (mm)	Weight (g)
98	1.00
72	0.66
60	0.36
64	0.42
46	0.33
$\bar{x}$ 66	0.55
SD 15	0.28
(N) (5)	(5)

0.55 g/fish x 5 fish ÷ 2.8L = 0.98 g/L

NOTES:

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686- 36 Client Windward Investigator

WATER QUALITY DATA SHEET

DAY 0 (12/1/06) WM

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors A	B	C	D	Comments
17°C	16.5	7.3	9.7	125	51	30	5	5	5	5	Slightly more active than 12°C fish
12°C	12.6	7.3	11.0	120	51	30	5	5	5	5	

DAY 1 (12/2/06) WB

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors A	B	C	D	Comments
17°C	17.0	7.2	9.0	135			5	5	5	5	Slightly more active than 12°C fish
12°C	12.2	7.4	11.2	120			5	5	5	5	

DAY 2 (12/3/06) YBH

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors A	B	C	D	Comments
17°C	16.5	6.8	9.1	140	51	30	5	5	5	5	≈ 3/4 H_2O Δ
12°C	12.1	6.9	10.2	125	51	30	5	5	5	5	≈ 3/4 H_2O Δ

DAY 3 (12/4/06) WB/GJ

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors A	B	C	D	Comments
17°C	17.3	7.4	8.8	130			5	5	5	5	Slightly more active than 12°C fish
12°C	12.2	7.4	10.4	120			5	5	5	5	

DAY 4 (12/5/06) WM

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors A	B	C	D	Comments
17°C	17.0	7.0	9.0	140	51	30	5	5	5	5	
12°C	12.5	6.9	10.6	130	51	30	5	5	5	5	

	17	12	17	12	17	12	17	12		
$\bar{X}$	16.9	12.3	7.1	7.2	9.1	10.7	134	123	51	30
SD	0.4	0.2	0.2	0.3	0.3	0.4	7	4	0	0
(N)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(6)	(6)

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686-37 Client Windward Investigator

STUDY MANAGEMENT:

Client: Windward Environmental, 200 West Mercer Street, Suite 401, Seattle, WA 98119
Client's Study Monitor: Ms. Helle Andersen
Testing Laboratory: Northwestern Aquatic Sciences
Test Location: Newport Laboratory
Laboratory's Study Personnel:
Project Manager/Study Director: G.A. Buhler GAB
QA Officer: L.K. Nemeth 1. G.J. IRISSARRI GJI
2. Greg Hutchinson GH 3.
4. 5.
Study Schedule:
Test Beginning: 12-8-06 1430 Test Ending: 12-12-06 1540

TEST MATERIAL:

Description:
NAS Sample No.:
Date of Preparation:
:

DILUTION WATER:

Description: City of Newport tap water
Date of Preparation/Collection: 12-7-06
Water Quality: Cond. (µmhos/cm) 120 pH 7.2
Hardness (mg/L as $CaCO_3$) 51 Alkalinity (mg/L as $CaCO_3$) 30
Total Chlorine (mg/L, DL 0.02 mg/L) <0.02
Treatments: Dechlorinated, aerated ≥ 24 hours

TEST ORGANISMS:

Species: *Lampetra* sp. Age/Size: ammocetes
Source: Siletz River, Oregon—Cedar Creek area
Acclimation Data: 22°C see holding data

Date	Temp. (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	Total Ammonia-N (mg/L)	Comments (including tank #)
Mean								
S.D.								
(N)								

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686- 37 Client Windward Investigator

Acclimation Data: 12°C see holding data

Date	Temp. (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	Total Ammonia-N (mg/L)	Comments (including tank #)
Mean								
S.D.								
(N)								

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686- 37 Client Windward Investigator

TEST PROCEDURES AND CONDITIONS:

Test Concentrations (10% series recommended): 0 (control).
Test Chambers (description): 2.5 gallon glass aquaria covered with plastic wrap and plastic lids
Test Volume (mL): 2.8 L Replicates/treatment: 1
Organisms/treatment: 4 (5/repl) Temperature (°C) 12 ± 1 and 22 ± 1
Test water changes: one, at 48 hours Aeration during test: Yes
Feeding: None. Test Duration: 96 hr
Photoperiod (L/D): 16/8
Beaker Placement: Stratified randomization

Randomization chart: 22°C Location: Room #1 Light intensity (ft.c.): 68.2 12-8-06 JMS

B	D	A	C

Randomization chart: 12°C Location: Room #4 Light intensity (ft.c.): 49.5 12-8-06 JMS

D	B	A	C

TEST SOLUTION PREPARATION:

2.8 liters of dilution water per tank. OB 12-8-06 OD 12-7-06

LOADING (g/L):
(weigh and measure length of replicate at end of test)

22°C

Length (mm)	Weight (g)
70	0.56
58	0.32
55	0.31
68	0.48
70	0.51
X 64	0.44
SD 7	0.11
(N) (5)	(5)

0.44g/Fish x 5 Fish ÷ 2.8L = 0.79 g/L

12°C

Length (mm)	Weight (g)
65	0.41
62	0.30
80	0.66
70	0.48
71	0.55
X 70	0.48
SD 7	0.14
(N) (5)	(5)

0.48g/Fish x 5 Fish ÷ 2.8L = 0.86 g/L

NOTES:

LAMPREY SURVIVAL RANGE-FINDING TEST

Test No. 686-37 Client Windward Investigator

WATER QUALITY DATA SHEET

DAY 0 (12/8/06) MS

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors A	B	C	D	Comments
22°C	21.8	7.3	8.3	140	51	30	5	5	5	5	
12°C	11.9	7.4	10.6	115	51	30	5	5	5	5	

DAY 1 (12/9/06) 6S3/6H

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors A	B	C	D	Comments
22°C	23.0	6.9	8.2	140			5	5	5	5	
12°C	12.3	7.0	10.1	120			5	5	5	5	

DAY 2 (12/10/06) MS

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors A	B	C	D	Comments
22°C	22.6	7.3	8.0	140	51	40	5	5	5	5	
12°C	12.6	7.1	10.2	110	51	30	5	5	5	5	

DAY 3 (12/11/06) MS/6S3

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors A	B	C	D	Comments
22°C	21.8	7.2	8.2	160			5	5	5	5	
12°C	12.1	7.0	10.9	130			5	5	5	5	

DAY 4 (12/12/06) MS

Conc. (mg/L)	Temp (°C)	pH	DO (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	Alkalinity (mg/L)	# Survivors A	B	C	D	Comments
22°C	22.2	7.2	8.3	150	51	40	5	4(1)	5	5	
12°C	12.2	7.0	10.8	125	51	40	5	5	5	5	

	22	12	22	12	22	12	22	12	22	12	22	12
$\bar{X}$	22.3	12.2	22.2	10.9	8.3	10.5	146	120	51	51	37	33
SD	0.5	0.3	0.2	0.4	0.3	0.4	9	8	0	0	6	6
(N)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(3)	(3)	(3)	(3)

CALCULATED ERROR 2-9-07 6S7.1 0.2 (5)

AMMONIA BENCHSHEETS AND ANALYSIS

Total Ammonia-N in Water: Computation Worksheet
Salicylate Method (SOP #5492)

Result

	Sample description	Dilution factor	OD_{655}	NH_3-N (mg/L)
	Blank	----	----	----
	1.0 mg/L NH_3-N Std.	----	0.117	1.00
	3.0 mg/L NH_3-N Std.	----	0.348	3.00
	6.0 mg/L NH_3-N Std.	----	0.652	6.00
	10.0 mg/L NH_3-N Std.	----	1.150	10.00
	3.0 mg/L spike	----	0.358	3.15
	3.0 mg/L spike dupl.	----	0.329	2.90
1.	10-25-06 Tank #14	1	0.004	ND
2.	10-26-06 Tank #2	1	0.000	ND
3.	10-27-06 Tank #17	1	0.003	ND
4.	10-28-06 Tank #3	1	0.003	ND
5.	10-29-06 Tank #11	1	0.009	ND
6.	10-30-06 Tank #5	1	0.008	ND
7.	10-31-06 Tank #19	1	0.010	ND
8.	11-1-06 Tank #14	1	0.002	ND
9.	11-2-06 Tank #6	1	0.001	ND
10.	11-3-06 Tank #9	1	0.000	ND
11.	11-4-06 Tank #13	1	0.002	ND
12.	11-5-06 Tank #16	1	0.001	ND
13.	11-6-06 Tank #1	1	0.004	ND
14.	11-7-06 Tank #11	1	0.008	ND
15.	11-8-06 Tank #17	1	0.006	ND
16.	11-9-06 Tank #4	1	0.004	ND
17.	11-10-06 Tank #16	1	0.002	ND
18.	11/11/2006	1	0.011	ND
19.	11-12-06 Tank #13	1	0.002	ND
20.	11-13-06 Tank #14	1	0.001	ND
21.				
22.				
23.				
24.				
25.				
26.				
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28.				
29.				
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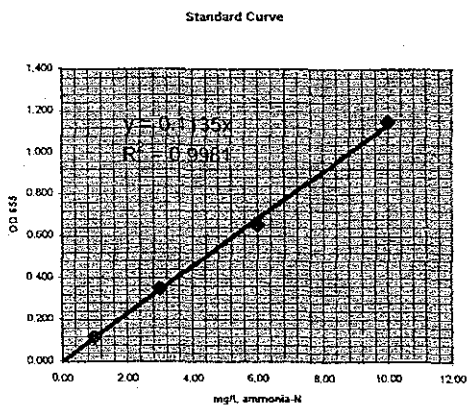
35.				
36.				



Reporting limit (mg/L) =	0.1
Recovery (%) =	100.8
Precision (RPD) =	8.44
Sample volume (ml):	0.50
Dilution factor	1

Sample Set Description:

Test No.: 686 Lamprey holding
Test Day: 10-25-06 to 11-13-06
Species: Lamprey

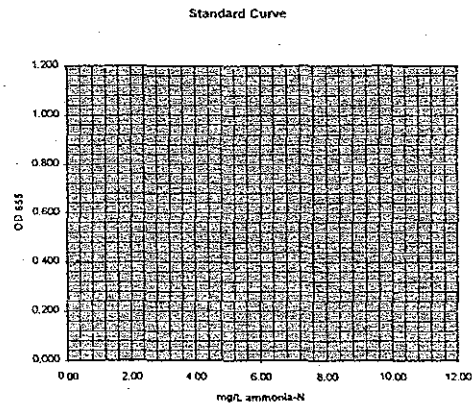
Overlying water

Analyst:	RSC
Date analysed:	11/30/2006

Total Ammonia-N in Water: Computation Worksheet
Salicylate Method (SOP #5492)

Result

	Sample description	Dilution factor	OD655	NH_3-N (mg/L)
	Blank	-----	----	----
	1.0 mg/L NH_3-N Std.	-----	.117	1.00
	3.0 mg/L NH_3-N Std.	-----	.348	3.00
	6.0 mg/L NH_3-N Std.	-----	.652	6.00
	10.0 mg/L NH_3-N Std.	-----	1.15	10.00
	3.0 mg/L spike	-----	.358	
	3.0 mg/L spike dupl.	-----	.329	
1.	10-25-06 Tank #14	1	.004	
2.	10-26-06 Tank #2	1	.000	
3.	10-27-06 Tank #17	1	.003	
4.	10-28-06 Tank #3	1	.003	
5.	10-29-06 Tank #11	1	.004	
6.	10-30-06 Tank #5	1	.008	
7.	10-31-06 Tank #19	1	.010	
8.	11-1-06 Tank #14	1	.002	
9.	11-2-06 Tank #6	1	.001	
10.	11-3-06 Tank #9	1	.000	
11.	11-4-06 Tank #13	1	.002	
12.	11-5-06 Tank #16	1	.001	
13.	11-6-06 Tank #1	1	.004	
14.	11-7-06 Tank #11	1	.008	
15.	11-8-06 Tank #17	1	.006	
16.	11-9-06 Tank #4	1	.004	
17.	11-10-06 Tank #16	1	.002	
18.	11/11/2006	1	.011	
19.	11-12-06 Tank #13	1	.002	
20.	11-13-06 Tank #14	1	.001	
21.				
22.				
23.				
24.				
25.				
26.				
27.				
28.				
29.				
30.				
31.				
32.				
33.				
34.				
35.				
36.				



Reporting limit (mg/L) = 0.1

Recovery (%) = #VALUE!
Precision (RPD) = #VALUE!

Sample volume (ml): 0.50
Dilution factor 1

Sample Set Description:
Test No.: 686 Lamprey holding
Test Day: 10-25-06 to 11-13-06
Species: Lamprey

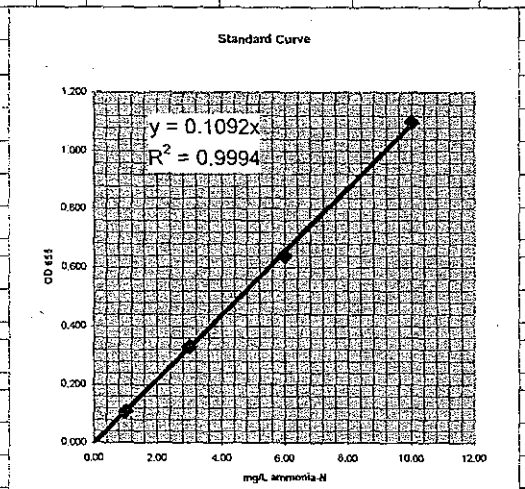
Overlying water

Analyst: RSC
Date analysed: 11/30/2006

Total Ammonia-N in Water: Computation Worksheet
Salicylate Method (SOP #5492)

Result

	Sample description	Dilution factor	OD_{655}	NH_3-N (mg/L)
	Blank	-----	-----	-----
	1.0 mg/L NH_3-N Std.	-----	0.107	1.00
	3.0 mg/L NH_3-N Std.	-----	0.330	3.00
	6.0 mg/L NH_3-N Std.	-----	0.640	6.00
	10.0 mg/L NH_3-N Std.	-----	1.100	10.00
	3.0 mg/L spike	-----	0.325	2.98
	3.0 mg/L spike dupl.	-----	0.320	2.93
	5.0 mg/L 2nd source	-----	0.485	4.44
1.	11-14-06 Tank #14	1	0.003	ND
2.	11-15-06 Tank #12	1	0.004	ND
3.	11-16-06 Tank #18	1	0.000	ND
4.	11-17-06 Tank #1	1	0.005	ND
5.	11-18-06 Tank #14	1	0.000	ND
6.	11-20-06 Tank #13	1	0.000	ND
7.	11-22-06 Tank #15	1	0.010	ND
8.	11-24-06 Tank #14	1	0.010	ND
9.	11-25-06 Tank #19	1	0.013	0.12
10.	11-26-06 Tank #18	1	0.005	ND
11.	11-27-06 Tank #12	1	0.012	0.11
12.	11-28-06 Tank #10	1	0.039	0.36
13.	11-29-06 Tank #14	1	0.029	0.27
14.	11-30-06 Tank #18	1	0.021	0.19
15.	12-1-06 Tank #12	1	0.009	ND
16.	12-2-06 Tank #18	1	0.036	0.33
17.	12-3-06 Tank #10	1	0.040	0.37
18.	12-4-06 Tank #14	1	0.021	0.19
19.	12-5-06 Tank #12	1	0.030	0.27
20.	12-6-06 Tank #12	1	0.019	0.17
21.	12-7-06 Tank #13	1	0.022	0.20
22.	12-8-06 Tank #14	1	0.030	0.27
23.				
24.				
25.				
26.				
27.				
28.				
29.				
30.				
31.				
32.				
33.				
34.				
35.				
36.				



Reporting limit (mg/L) =	0.1
Recovery (%) =	98.5
Precision (RPD) =	1.55
2nd source (%) =	88.8
Sample volume (ml):	0.50
Dilution factor	1

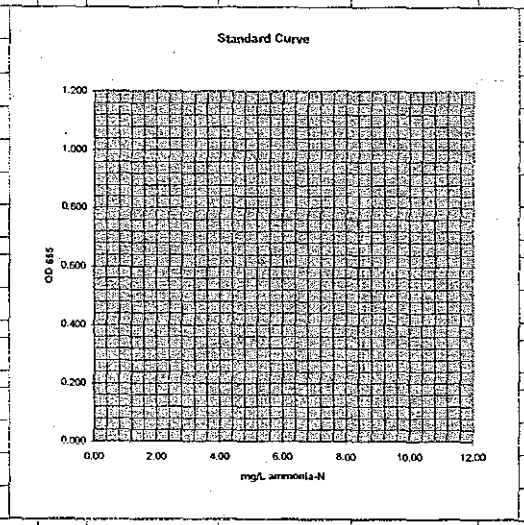
Sample Set Description:

Test No.:	686 Lamprey holding 12°
Test Day:	11-14-06 to 12-8-06
Species:	Lamprey
Overlying water	
Analyst:	GJI
Date analysed:	12/29/06

Total Ammonia-N in Water: Computation Worksheet
Salicylate Method (SOP #5492)

Result

	Sample description	Dilution factor	OD655	NH_3-N (mg/L)
	Blank	-----	-----	-----
	1.0 mg/L NH_3-N Std.	-----	0.107	1.00
	3.0 mg/L NH_3-N Std.	-----	0.330	3.00
	6.0 mg/L NH_3-N Std.	-----	0.640	6.00
	10.0 mg/L NH_3-N Std.	-----	1.100	10.00
	3.0 mg/L spike	-----	0.325	
	3.0 mg/L spike dupl.	-----	0.320	
	5.0 mg/L 2nd source	-----	0.485	
1.	11-14-06 Tank #14	1	0.003	
2.	11-15-06 Tank #12	1	0.004	
3.	11-16-06 Tank #18	1	0.000	
4.	11-17-06 Tank #1	1	0.005	
5.	11-18-06 Tank #14	1	0.000	
6.	11-20-06 Tank #13	1	0.000	
7.	11-22-06 Tank #15	1	0.010	
8.	11-24-06 Tank #14	1	0.010	
9.	11-25-06 Tank #19	1	0.013	
10.	11-26-06 Tank #18	1	0.005	
11.	11-27-06 Tank #12	1	0.012	
12.	11-28-06 Tank #10	1	0.039	
13.	11-29-06 Tank #14	1	0.029	
14.	11-30-06 Tank #18	1	0.021	
15.	12-1-06 Tank #12	1	0.009	
16.	12-2-06 Tank #18	1	0.036	
17.	12-3-06 Tank #10	1	0.040	
18.	12-4-06 Tank #14	1	0.021	
19.	12-5-06 Tank #12	1	0.030	
20.	12-6-06 Tank #12	1	0.019	
21.	12-7-06 Tank #13	1	0.022	
22.	12-8-06 Tank #14	1	0.030	
23.				
24.				
25.				
26.				
27.				
28.				
29.				
30.				
31.				
32.				
33.				
34.				
35.				
36.				



Reporting limit (mg/L) =	0.1
Recovery (%) =	#VALUE!
Precision (RPD) =	#VALUE!
2nd source (%) =	#VALUE!
Sample volume (ml):	0.50
Dilution factor	1

Sample Set Description:

Test No.: 686 Lamprey holding 12°
Test Day: 11-14-06 to 12-8-06
Species: Lamprey

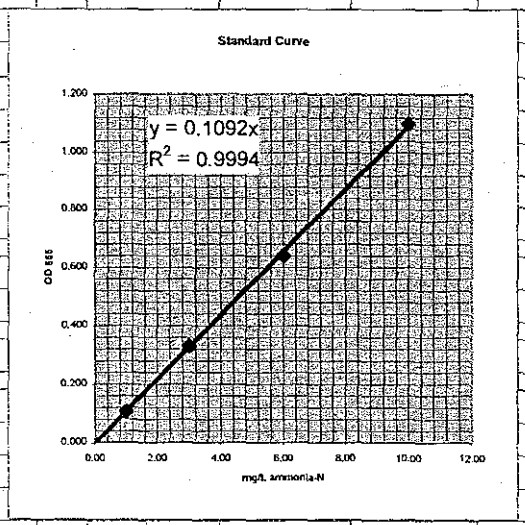
Overlying water

Analyst: 651
Date analysed: 12-29-06

Total Ammonia-N in Water: Computation Worksheet
Salicylate Method (SOP #5492)

Result

	Sample description	Dilution factor	OD_{655}	NH_3-N (mg/L)
	Blank	-----	-----	-----
	1.0 mg/L NH_3-N Std.	-----	0.107	1.00
	3.0 mg/L NH_3-N Std.	-----	0.330	3.00
	6.0 mg/L NH_3-N Std.	-----	0.640	6.00
	10.0 mg/L NH_3-N Std.	-----	1.100	10.00
	3.0 mg/L spike	-----	0.325	2.98
	3.0 mg/L spike dupl.	-----	0.320	2.93
	5.0 mg/L 2nd source	-----	0.485	4.44
1.	11-24-06 Tank #1	1	0.000	ND
2.	11-25-06 Tank #15	1	0.008	ND
3.	11-26-06 Tank #17	1	0.000	ND
4.	11-27-06 Tank #1	1	0.002	ND
5.	11-28-06 Tank #16	1	0.003	ND
6.	11-29-06 Tank #17	1	0.009	ND
7.	11-30-06 Tank #15	1	0.008	ND
8.	12-1-06 Tank #16	1	0.000	ND



Reporting limit (mg/L) =	0.1
Recovery (%) =	98.5
Precision (RPD) =	1.55
2nd source (%) =	88.8
Sample volume (ml):	0.50
Dilution factor	1

Sample Set Description:

Test No.: 686 Lamprey holding 17°
Test Day: 11-24-06 to 12-1-06
Species: Lamprey

Overlying water

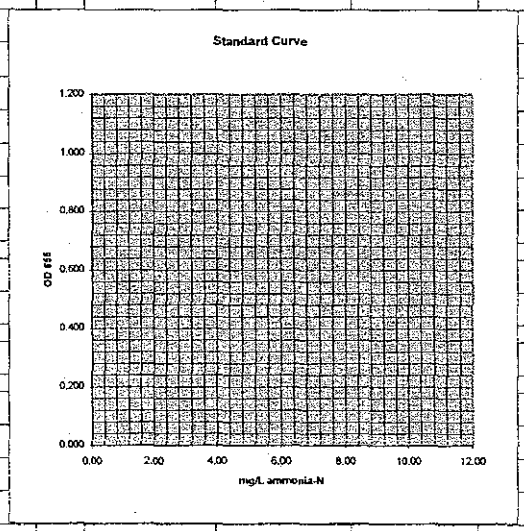
Analyst: GJI
Date analysed: 12/29/06

Total Ammonia-N in Water: Computation Worksheet

Salicylate Method (SOP #5492)

Result

	Sample description	Dilution factor	OD655	NH3-N (mg/L)
	Blank	-----	-----	-----
	1.0 mg/L NH3-N Std.	-----	0.107	1.00
	3.0 mg/L NH3-N Std.	-----	0.330	3.00
	6.0 mg/L NH3-N Std.	-----	0.640	6.00
	10.0 mg/L NH3-N Std.	-----	1.100	10.00
	3.0 mg/L spike	-----	0.325	
	3.0 mg/L spike dupl.	-----	0.320	
	5.0 mg/L 2nd source	-----	0.485	
1.	11-24-06 Tank #1	1	0.000	
2.	11-25-06 Tank #15	1	0.008	
3.	11-26-06 Tank #17	1	0.000	
4.	11-27-06 Tank #1	1	0.002	
5.	11-28-06 Tank #16	1	0.003	
6.	11-29-06 Tank #17	1	0.009	
7.	11-30-06 Tank #15	1	0.008	
8.	12-1-06 Tank #16	1	0.000	



Reporting limit (mg/L) =	0.1
Recovery (%) =	#VALUE!
Precision (RPD) =	#VALUE!
2nd source (%) =	#VALUE!
Sample volume (ml):	0.50
Dilution factor	1

Sample Set Description:

Test No.: 686 Lamprey holding 17°
Test Day: 11-24-06 to 12-1-06
Species: Lamprey

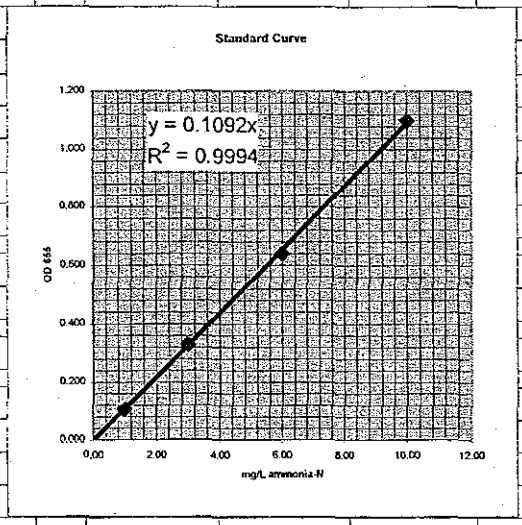
Overlying water

Analyst: 631
Date analysed: 12-29-06

Total Ammonia-N in Water: Computation Worksheet
Salicylate Method (SOP #5492)

Result

	Sample description	Dilution factor	OD655	NH3-N (mg/L)
	Blank	-----	-----	-----
	1.0 mg/L NH3-N Std.	-----	0.107	1.00
	3.0 mg/L NH3-N Std.	-----	0.330	3.00
	6.0 mg/L NH3-N Std.	-----	0.640	6.00
	10.0 mg/L NH3-N Std.	-----	1.100	10.00
	3.0 mg/L spike	-----	0.325	2.98
	3.0 mg/L spike dupl.	-----	0.320	2.93
	5.0 mg/L 2nd source	-----	0.485	4.44
1.	12-2-06 Tank #15	1	0.000	ND
2.	12-3-06 Tank #15	1	0.000	ND
3.	12-4-06 Tank #1	1	0.007	ND
4.	12-5-06 Tank #15	1	0.006	ND
5.	12-6-06 Tank #17	1	0.002	ND
6.	12-7-06 Tank #15	1	0.000	ND
7.	12-8-06 Tank #1	1	0.000	ND



Reporting limit (mg/L) =	0.1
Recovery (%) =	98.5
Precision (RPD) =	1.55
2nd source (%) =	88.8
Sample volume (ml):	0.50
Dilution factor	1

Sample Set Description:

Test No.: 686 Lamprey holding 22°
Test Day: 12-2-06 to 12-8-06
Species: Lamprey

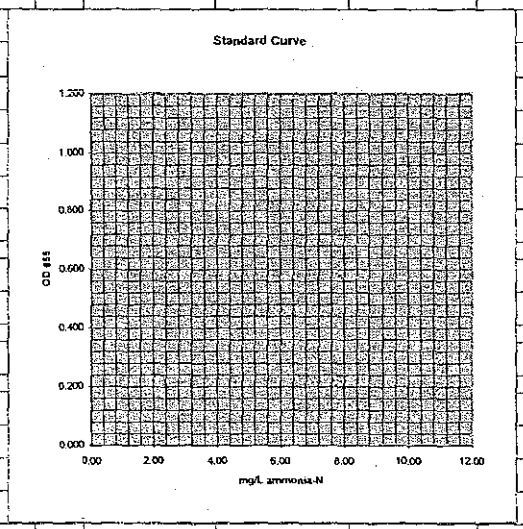
Overlying water

Analyst: GJI
Date analysed: 12/29/06

Total Ammonia-N in Water: Computation Worksheet
Salicylate Method (SOP #5492)

Result

	Sample description	Dilution factor	OD655	NH_3-N (mg/L)
	Blank	-----	-----	-----
	1.0 mg/L NH_3-N Std.	-----	0.107	1.00
	3.0 mg/L NH_3-N Std.	-----	0.330	3.00
	6.0 mg/L NH_3-N Std.	-----	0.640	6.00
	10.0 mg/L NH_3-N Std.	-----	1.100	10.00
	3.0 mg/L spike	-----	0.325	
	3.0 mg/L spike dupl.	-----	0.320	
	5.0 mg/L 2nd source	-----	0.485	
1.	12-2-06 Tank #15	1	0.000	
2.	12-3-06 Tank #15	1	0.000	
3.	12-4-06 Tank #1	1	0.007	
4.	12-5-06 Tank #15	1	0.006	
5.	12-6-06 Tank #17	1	0.002	
6.	12-7-06 Tank #15	1	0.000	
7.	12-8-06 Tank #1	1	0.000	



Reporting limit (mg/L) =	0.1
Recovery (%) =	#VALUE!
Precision (RPD) =	#VALUE!
2nd source (%) =	#VALUE!
Sample volume (ml):	0.50
Dilution factor	1

Sample Set Description:

Test No.: 686 Lamprey holding 22°
Test Day: 12-2-06 to 12-8-06
Species: Lamprey

Overlying water

Analyst: GJL
Date analysed: 12-29-06

TEST DATA ANALYSIS RECORDS

- ta c-try verified against laboratory bench sheet 2/15/07 JRL

	Date	Temp	pH	DO	Cond	Hard	Alk	NH3	comments
Siletz River	10/17/06	13.6	5.3	8.2	62	26	20		rec'ing data
Water	10/17/06					26			
	10/18/06	12.4	6.0	9.6	95	26	20		rec'ing data
	10/23/06	11.5	6.8	8.4	75	26	20		rec'ing data
	10/24/06	10.6	6.0	8.8	150	51	90		rec'ing data
Siletz River	**Mean**	12.0	6.0	8.8	96	31	38	---	
Water	**SD**	1.3	0.6	0.6	39	11	35	---	
	n	4	4	4	4	5	4	---	
	Min	10.6	5.3	8.2	62	26	20	---	
	Max	13.6	6.8	9.6	150	51	90	---	
Lab Holding									
holding for tests	10/18/06	12.3	7.4	10.7	135	43	50		
31-35	10/19/06	12.5	7.1	10.8	133	51	60		
	10/20/06	12.7	7.5	10.6	120	51	30		
	10/21/06	12.5	7.5	11.1	130	43	30		
	10/22/06	12.2	7.1	10.9	125	51	60		
	10/23/06	12.6	6.9	10.8	120	51	30		
	10/24/06	12.3	7.4	10.8	130	51	50		
	10/25/06	12.4	6.9	10.8	130	43	30	<0.1	
	10/26/06	12.6	7.4	10.6	130	43	50	<0.1	
	10/27/06	12.4	7.0	11.2	130	43	50	<0.1	
	10/28/06	12.4	7.1	10.8	130	43	40	<0.1	
	10/29/06	12.9	8.1	10.8	135	51	50	<0.1	
	10/30/06	12.7	8.0	10.4	130	43	50	<0.1	
	10/31/06	12.8	7.8	10.2	130	43	40	<0.1	
	11/1/06	12.6	7.9	10.3	135	43	40	<0.1	
	11/2/06	12.1	8.2	10.3	130	51	50	<0.1	
	11/3/06	11.8	7.9	10.8	130	51	40	<0.1	
	11/4/06	11.2	8.0	11.6	130	51	40	<0.1	
	11/5/06	11.6	7.9	11.2	135	51	50	<0.1	
	11/6/06	13.2	7.9	13.0	119	51	30	<0.1	
	11/7/06	11.9	7.7	11.4	130	51	50	<0.1	
	11/8/06	11.5	8.0	11.2	125	51	50	<0.1	
	11/9/06	11.8	8.0	11.3	125	51	40	<0.1	tests 31 - 34 began 11/9/06
holding for test 35	11/10/06	11.7	7.9	11.2	115	43	50	<0.1	
continues	11/11/06	11.2	7.7	11.1	120	51	40	<0.1	
	11/12/06	11.3	7.8	11.0	130	51	40	<0.1	

Page 48 of 73

	11/13/06	11.4	7.6	11.0	130	51	40	<0.1	
	11/14/06	11.6	7.5	10.9	125	51	40	<0.1	
	11/15/06	11.8	7.6	10.9	132	51	40	<0.1	
	11/16/06	11.4	7.4	11.4	130	43	50	<0.1	test 35 began 11/16/06
Interim holding	11/17/06	11.6	7.6	11.3	117	51	40	<0.1	
prior to acclimation	11/18/06	11.8	7.4	11.2	120	51	40	<0.1	
for temperature	11/20/06	11.9	7.3	11.4	110	51	40	<0.1	
experiments	11/21/06							<0.1	flow off; all tanks fed
	11/22/06	11.4	7.2	11.2	125	51	50	<0.1	
temperature	11/24/06	11.6	7.4	11.6	120	51	40	<0.1	
acclimation to 12C	11/25/06	12.0	7.6	11.3	135	60	50	0.1	
for test #36	11/26/06	11.9	7.6	11.2	140	60	50	<0.1	
	11/27/06	11.6	7.3	11.2	140	51	30	0.1	
	11/28/06	11.6	7.5	11.2	150	60	50	0.4	
	11/29/06	11.3	7.4	11.2	140	51	50	0.3	
	11/30/06	11.7	7.5	11.0	135	60	40	0.2	
	12/1/06	11.8	7.4	11.4	130	60	40	<0.1	test 36 (12C & 17C) began 12/1/06
temperature	12/2/06	11.9	7.3	11.2	130	51	40	0.3	
acclimation to 12C	12/3/06	11.8	7.0	10.4	145	51	30	0.4	
for test #37	12/4/06	11.4	7.3	10.6	140	60	40	0.2	
	12/5/06	11.0	6.9	11.2	140	51	40	0.3	
	12/6/06	12.2	7.3	10.7	125	60	40	0.2	
	12/7/06	12.0	7.4	10.9	135	60	40	0.2	
	12/8/06	12.2	7.4	11.0	120	51	40	0.3	test 37 (12C & 22C) began 12/8/06
temperature	11/24/06	12.2	7.2	11.4	125	51	40	<0.1	
acclimation to 17C	11/25/06	13.5	7.3	10.7	135	60	50	<0.1	
for test #36	11/26/06	14.6	7.5	10.2	140	60	40	<0.1	
	11/27/06	15.5	7.3	9.8	145	60	40	<0.1	
	11/28/06	16.8	7.8	9.6	140	60	50	<0.1	
	11/29/06	16.8	7.7	9.4	140	51	50	<0.1	
	11/30/06	17.0	7.5	9.3	140	60	40	<0.1	
	12/1/06	16.3	7.4	9.4	140	60	40	<0.1	test 36 (12C & 17C) began 12/1/06
temperature	12/1/06	16.9	7.3	8.8	145	51	30		
acclimation to 22C	12/2/06	17.9	7.3	8.9	140	51	30	<0.1	
for test #37	12/3/06	18.5	7.2	8.8	160	51	30	<0.1	
	12/4/06	19.3	7.2	9.0	155	51	40	<0.1	
	12/5/06	20.4	7.3	8.7	170	51	40	<0.1	
	12/6/06	21.6	7.5	8.5	155	51	50	<0.1	
	12/7/06	21.1	7.4	8.8	150	51	50	<0.1	
	12/8/06	21.9	7.5	8.8	150	51	40	<0.1	test 37 (12C & 22C) began 12/8/06

		Temp	pH	DO	Cond	Hard	Alk	NH3
Tests 31 - 34:	**Mean**	12.3	7.6	10.9	129	48	44	---
10/18/06-11/9/06	**SD**	0.5	0.4	0.6	5	4	9	---
	n	23	23	23	23	23	23	16
	Min	11.2	6.9	10.2	119	43	30	<0.1
	Max	13.2	8.2	13.0	135	51	60	<0.1

		Temp	pH	DO	Cond	Hard	Alk	NH3
Test 35:	**Mean**	12.1	7.6	11.0	128	48	44	---
10/18/06-11/16/06	**SD**	0.6	0.4	0.5	5	4	9	---
	n	30	30	30	30	30	30	23
	Min	11.2	6.9	10.2	115	43	30	<0.1
	Max	13.2	8.2	13.0	135	51	60	<0.1

		Temp	pH	DO	Cond	Hard	Alk	NH3
Test 36, 12C:	**Mean**	11.7	7.5	11.3	136	57	44	---
11/24/06-12/1/06	**SD**	0.2	0.1	0.2	9	5	7	---
	n	8	8	8	8	8	8	8
	Min	11.3	7.3	11.0	120	51	30	<0.1
	Max	12.0	7.6	11.6	150	60	50	0.4
Test 36, 17C:	**Mean**	15.3	7.5	10.0	138	58	44	---
11/24/06-12/1/06	**SD**	1.8	0.2	0.7	6	4	5	---
	n	8	8	8	8	8	8	8
	Min	12.2	7.2	9.3	125	51	40	<0.1
	Max	17.0	7.8	11.4	145	60	50	<0.1

		Temp	pH	DO	Cond	Hard	Alk	NH3
Test 37, 12C:	**Mean**	11.8	7.2	10.9	133.6	55	39	---
12/2/06-12/8/06	**SD**	0.4	0.2	0.3	9.0	5	4	---
	n	7	7	7	7	7	7	7
	Min	11.0	6.9	10.4	120.0	51	30	0.2
	Max	12.2	7.4	11.2	145.0	60	40	0.4
Test 37, 22C:	**Mean**	19.7	7.3	8.8	153	51	39	---
12/1/06-12/8/06	**SD**	1.8	0.1	0.1	9	0	8	---
	n	8	8	8	8	8	8	7
	Min	16.9	7.2	8.5	140	51	30	<0.1
	Max	21.9	7.5	9.0	170	51	50	<0.1

Data Entry verified against laboratory bench sheets
2-19-07
SMF

Aniline mg/L	Test 686-31 DAY	TEMP	pH	DO	COND	HARD	ALK
1,000	0	12.8	7.6	10.5	120	51	440
100	0	12.8	7.4	10.4			
10	0	12.9	7.4	10.4			
1	0	12.8	7.2	10.5			
0	0	12.8	7.2	10.4	110	51	40
1,000	1	12.4	7.4	10.3			
100	1	12.4	7.4	10.2			
10	1	12.3	7.4	10.4			
1	1	12.4	7.3	10.3			
0	1	12.3	7.2	10.2			
1,000	2	12.6	7.5	10.1	125	51	460
100	2	12.5	7.4	10.6			
10	2	12.4	7.4	10.6			
1	2	12.5	7.3	10.6			
0	2	12.4	7.3	10.6	120	51	40
1,000	3	12.8	7.6	10.4			
100	3	12.8	7.5	10.2			
10	3	12.6	7.4	9.9			
1	3	12.8	7.5	10.1			
0	3	12.9	7.5	10.2			
1,000	4	12.5	7.5	10.2	125	51	440
100	4	12.6	7.3	10.1			
10	4	12.3	7.3	10.3			
1	4	12.5	7.2	10.2			
0	4	12.4	7.2	10.2	120	51	40
	Mean	12.6	7.4	10.3	---	---	---
	SD	0.2	0.1	0.2	---	---	---
	n	25	25	25	6	6	6
	Min	12.3	7.2	9.9	110	51	40
	Max	12.9	7.6	10.6	125	51	460

Copper Test 686-32

mg/L	DAY	TEMP	pH	DO	COND	HARD	ALK
1.0	0	12.2	6.9	10.8	110	51	40
0.1	0	12.1	7.1	10.8			
0.01	0	12.2	7.1	10.7			
0.001	0	12.1	7.1	10.8			
0	0	12.3	7.1	10.6	110	51	40
1	1	12.2	7.2	10.6			
0.1	1	12.3	7.2	10.4			
0.01	1	12.3	7.2	10.2			
0.001	1	12.4	7.2	10.5			
0	1	12.6	7.2	10.3			
1.0	2	12.2	7.3	10.7	120	51	40
0.1	2	12.3	7.3	10.6			
0.01	2	12.3	7.3	10.6			
0.001	2	12.3	7.3	10.6			
0	2	12.6	7.3	10.4	115	51	40
1.0	3	12.7	7.5	10.4			
0.1	3	12.7	7.6	10.3			
0.01	3	12.8	7.6	10.5			
0.001	3	12.6	7.6	10.4			
0	3	12.8	7.6	10.4			
1.0	4	12.1	7.3	10.5	115	51	40
0.1	4	12.1	7.3	10.3			
0.01	4	12.1	7.2	10.4			
0.001	4	12.1	7.2	10.3			
0	4	12.1	7.2	10.2	110	51	40
	Mean	12.3	7.3	10.5	---	---	---
	SD	0.2	0.2	0.2	---	---	---
	n	25	25	25	6	6	6
	Min	12.1	6.9	10.2	110	51	40
	Max	12.8	7.6	10.8	120	51	40

data entry verified against laboratory bench sheets
2-19-07

Pentachlorophenol **Test 686-33**

Data Entry verified against Laboratory bench sheets 2-19-07 JRF

mg/L	DAY	TEMP	pH	DO	COND	HARD	ALK
4.0	0	12.2	7.2	10.4	115	51	40
0.4	0	12.2	7.1	10.4			
0.004	0	12.2	7.1	10.2			
0.004	0	12.2	7.1	10.4			
0	0	12.3	7.1	10.4	110	51	40
4.0	1	12.2	7.4	10.2			
0.4	1	12.2	7.3	10.4			
0.004	1	12.2	7.3	10.4			
0.004	1	12.2	7.2	10.2			
0	1	12.2	7.2	10.3			
4.0	2	12.2	7.5	10.5	125	51	40
0.4	2	12.2	7.4	10.5			
0.004	2	12.2	7.3	10.4			
0.004	2	12.3	7.3	10.6			
0	2	12.3	7.3	10.5	120	51	40
4.0	3	12.7	7.6	10.3			
0.4	3	12.7	7.6	10.4			
0.004	3	12.7	7.6	10.2			
0.004	3	12.8	7.6	10.3			
0	3	12.8	7.5	10.2			
4.0	4	12.1	7.3	10.6	115	51	40
0.4	4	12.1	7.3	10.6			
0.004	4	12.1	7.3	10.5			
0.004	4	12.1	7.2	10.4			
0	4	12.1	7.2	10.4	115	51	40
	Mean	12.3	7.3	10.4	---	---	---
	SD	0.2	0.2	0.1	---	---	---
	n	25	25	25	6	6	6
	Min	12.1	7.1	10.2	110	51	40
	Max	12.8	7.6	10.6	125	51	40

Lindane **Test 686-34**

Data Entry Verified against Laboratory bench sheets 2-19-07 JRF

mg/L	DAY	TEMP	pH	DO	COND	HARD	ALK
8.0	0	12.2	7.3	10.4	115	51	40
0.8	0	12.2	7.3	10.2			
0.08	0	12.3	7.2	10.2			
0.008	0	12.1	7.2	10.4			
0	0	12.2	7.2	10.2	115	51	40
8.0	1	12.1	7.5	10.1			
0.8	1	12.1	7.4	10.2			
0.08	1	12.2	7.3	10.5			
0.008	1	12.2	7.3	10.2			
0	1	12.1	7.3	10.4			
8.0	2	12.2	7.5	10.4	120	51	40
0.8	2	12.2	7.4	10.5			
0.08	2	12.2	7.4	10.4			
0.008	2	12.1	7.4	10.8			
0	2	12.2	7.3	10.6	120	51	40
8.0	3	12.7	7.6	10.4			
0.8	3	12.6	7.6	10.2			
0.08	3	12.8	7.6	10.3			
0.008	3	12.8	7.5	10.3			
0	3	12.6	7.5	10.4			
8.0	4	12.1	7.4	10.3	115	51	40
0.8	4	12.2	7.3	10.2			
0.08	4	12.2	7.3	10.4			
0.008	4	12.3	7.3	10.3			
0	4	12.1	7.2	10.2	115	51	40
	Mean	12.3	7.4	10.3	---	---	---
	SD	0.2	0.1	0.2	---	---	---
	n	25	25	25	6	6	6
	Min	12.1	7.2	10.1	115	51	40
	Max	12.8	7.6	10.8	120	51	40

Data Entry Verified against Laboratory Bench sheets 8-19-04 JRF

Diazinon mg/L	Test 686-35 DAY	TEMP	pH	DO	COND	HARD	ALK
40	0	12.2	7.3	10.6	115	51	30
4.0	0	12.1	7.3	10.6			
0.4	0	12.2	7.3	10.5			
0.04	0	12.1	7.3	10.7			
0	0	12.1	7.3	10.6	115	51	30
40	1	11.8	7.1	10.6			
4.0	1	11.8	7.1	10.5			
0.4	1	11.7	7.1	10.5			
0.04	1	11.8	7.1	10.4			
0	1	11.8	7.1	10.5			
40	2	11.9	7.3	10.4	120	51	30
4.0	2	12.0	7.3	10.3			
0.4	2	11.9	7.2	10.5			
0.04	2	11.7	7.2	10.6			
0	2	11.8	7.2	10.6	125	51	30
40	3	11.8	7.3	10.6			
4.0	3	11.7	7.3	10.4			
0.4	3	11.8	7.3	10.3			
0.04	3	11.8	7.3	10.3			
0	3	11.9	7.3	10.2			
40	4	11.9	7.3	10.5	120	51	30
4.0	4	11.8	7.3	10.6			
0.4	4	11.8	7.3	10.5			
0.04	4	11.9	7.3	10.3			
0	4	12	7.3	10.4	120	51	40
	Mean	11.9	7.2	10.5	---	---	---
	SD	0.1	0.1	0.1	---	---	---
	n	25	25	25	6	6	6
	Min	11.7	7.1	10.2	115	51	30
	Max	12.2	7.3	10.7	125	51	40

Data Entry verified against Laboratory Bench sheets 2-19-07 JRF

Temperature Experiment #1				Test 686-36			
12C	DAY	TEMP	pH	DO	COND	HARD	ALK
12C	0	12.6	7.3	11	120	51	30
12C	1	12.2	7.4	11.2	120		
12C	2	12.1	6.9	10.2	125	51	30
12C	3	12.2	7.4	10.4	120		
12C	4	12.5	6.9	10.6	130	51	30
	Mean	12.3	7.2	10.7	123	51	30
	SD	0.2	0.3	0.4	4	0	0
	n	5	5	5	5	3	3
	Min	12.1	6.9	10.2	120	51	30
	Max	12.6	7.4	11.2	130	51	30
17C	DAY	TEMP	pH	DO	COND	HARD	ALK
17C	0	16.5	7.3	9.7	125	51	30
17C	1	17.0	7.2	9	135		
17C	2	16.5	6.8	9.1	140	51	30
17C	3	17.3	7.4	8.8	130		
17C	4	17.0	7.0	9.0	140	51	30
	Mean	16.9	7.1	9.1	134	51	30
	SD	0.4	0.2	0.3	7	0	0
	n	5	5	5	5	3	3
	Min	16.5	6.8	8.8	125	51	30
	Max	17.3	7.4	9.7	140	51	30

Temperature Experiment #2				Test 686-37			
12C	DAY	TEMP	pH	DO	COND	HARD	ALK
12C	0	11.9	7.4	10.6	115	51	30
12C	1	12.3	7.0	10.1	120		
12C	2	12.6	7.1	10.2	110	51	30
12C	3	12.1	7.0	10.9	130		
12C	4	12.2	7.0	10.8	125	51	40
	Mean	12.2	7.1	10.5	120	51	33
	SD	0.3	0.2	0.4	8	0	6
	n	5	5	5	5	3	3
	Min	11.9	7.0	10.1	110	51	30
	Max	12.6	7.4	10.9	130	51	40
22C	DAY	TEMP	pH	DO	COND	HARD	ALK
22C	0	21.8	7.3	8.8	140	51	30
22C	1	23.0	6.9	8.2	140		
22C	2	22.6	7.3	8	140	51	40
22C	3	21.8	7.2	8.2	160		
22C	4	22.2	7.2	8.3	150	51	40
	Mean	22.3	7.2	8.3	146	51	37
	SD	0.5	0.2	0.3	9	0	6
	n	5	5	5	5	3	3
	Min	21.8	6.9	8.0	140	51	30
	Max	23.0	7.3	8.8	160	51	40

Test ID	Test No.	Nom. Conc. mg/L	Number Exposed	Number Suviving	% Surv.
Aniline	686-31	1,000	5	0	0
		100	5	5	100
		10	5	5	100
		1	5	5	100
		0	5	5	100
Copper	686-32	1	5	0	0
		0.1	5	2	40
		0.01	5	5	100
		0.001	5	5	100
		0	5	5	100
Penta	686-33	4	5	0	0
		0.4	5	0	0
		0.04	5	5	100
		0.004	5	5	100
		0	5	5	100
Lindane	686-34	8	5	0	0
		0.8	5	5	100
		0.08	5	5	100
		0.008	5	5	100
		0	5	5	100
Diazinon	686-35	40	5	0	0
		4	5	5	100
		0.4	5	5	100
		0.04	5	5	100
		0	5	5	100
17C	686-36	17C	5	5	100
		17C	5	5	100
		17C	5	5	100
		17C	5	5	100
12C	686-36	12C	5	5	100
		12C	5	5	100
		12C	5	5	100
		12C	5	5	100
22C	686-37	22C	5	5	100
		22C	5	4	80
		22C	5	5	100
		22C	5	5	100
12C	686-37	12C	5	5	100
		12C	5	5	100
		12C	5	5	100
		12C	5	5	100

Test ID	Test No.	Length (mm)	Weight (g)		Length (mm)	Weight (g)
Aniline	686-31	72	0.49	Mean	74	0.54
		67	0.38	SD	6	0.15
		71	0.47	n	5	5
		79	0.63	Min	67	0.38
		83	0.75	Max	83	0.75
Copper	686-32	55	0.25	Mean	54	0.26
		51	0.19	SD	3	0.09
		50	0.19	n	5	5
		56	0.24	Min	50	0.19
		58	0.42	Max	58	0.42
Penta	686-33	55	0.25	Mean	57	0.28
		51	0.18	SD	14	0.21
		50	0.15	n	5	5
		49	0.17	Min	49	0.15
		82	0.66	Max	82	0.66
Lindane	686-34	59	0.27	Mean	69	0.43
		58	0.27	SD	12	0.21
		68	0.37	n	5	5
		70	0.43	Min	58	0.27
		88	0.79	Max	88	0.79
Diazinon	686-35	70	0.41	Mean	74	0.52
		90	0.90	SD	9	0.22
		70	0.38	n	5	5
		74	0.53	Min	68	0.38
		68	0.40	Max	90	0.90
17C	686-36	80	0.72	Mean	74	0.59
		71	0.46	SD	7	0.15
		65	0.44	n	5	5
		72	0.55	Min	65	0.44
		82	0.78	Max	82	0.78
12C	686-36	88	1.00	Mean	66	0.55
		72	0.66	SD	15	0.28
		60	0.36	n	5	5
		64	0.42	Min	46	0.33
		46	0.33	Max	88	1.00
22C	686-37	70	0.56	Mean	64	0.44
		58	0.32	SD	7	0.11
		55	0.31	n	5	5
		68	0.48	Min	55	0.31
		70	0.51	Max	70	0.56
12C	686-37	65	0.41	Mean	70	0.48
		62	0.30	SD	7	0.14
		80	0.66	n	5	5
		70	0.48	Min	62	0.30
		71	0.55	Max	80	0.66
	Mean	**67**	**0.45**			
	SD	**11**	**0.20**			
	n	**45**	**45**			
	Min	**46**	**0.15**			
	Max	**90**	**1.00**			

Data Entry verified against Laboratory bench sheets 2-19-07 JMF

CHAIN-OF-CUSTODY RECORDS

CHAIN-OF-CUSTODY/TEST REQUEST FORM

№ 2409

Project/Client Name: WVG RA Lamprey ammocoete
Project Number:
Contact Name: Helle Andersen
Sampled By: TDO, M Luxon

Ship to: N.A.S.
Attn: Gary Buhler
Shipping Date: 10.17.06
Shipper:
Airbill Number:
Form filled out by: T.DO
Turnaround requested:

Sample Collection Date (m/d/y)	Time	Sample Identification	Volume of Sample / # of Containers	Matrix	Test(s) Requested (check test(s) required): tox.	hardness						Comments / Instructions (Jar tag number(s))
10.17.06	1655	Siletz R. (Cedar Ck.)	58	ammocoetes	X							
10.17.06	1655	Siletz R. (Cedar Ck.)	1	water		X						water temp: 12.9°C in situ
		Total Number of Containers		Purchase Order / Statement of Work #								

1) Released by:	1) Rec'd by:	2) Released by:	2) Rec'd by:
Print name: THAI DO	Gary Buhler	Print name:	
Signature:	Company: NAS	Signature:	Company:
Company: WINDWARD		Company:	
Date/Time: 10.17.06/1655	Date/Time: 10.17.06/1655	Date/Time:	Date/Time:

* Distribution: White copies accompany shipment; yellow retained by consignor.

Page 59 of 73

To be completed by Laboratory upon sample receipt:

Date of receipt::	Laboratory W.O. #:
Condition upon receipt:	Time of receipt:
Cooler temperature:	Received by:

Wind Ward environmental LLC
200 West Mercer Street
Suite 401
Seattle, WA 98119
Tel: (206) 378-1364
Fax: (206) 217-9343

CHAIN-OF-CUSTODY/TEST REQUEST FORM

№ 2407

Project/Client Name: LWG ERA - lamprey ammocoete (toxicity)
Project Number:
Contact Name: Helle Andersen
Sampled By: T Do, M Luxton

Ship to: N.A.S.
Attn: Gary Buhler
Shipper: hand del'd
Form filled out by: T Do

Shipping Date: 10.18.06
Airbill Number:
Turnaround requested:

Sample Collection Date (m/d/y)	Time	Sample Identification	Volume of Sample / # of Containers	Matrix	Test(s) Requested (check test(s) required): TOX.							Comments / Instructions (Jar tag number(s))
10.18.06	15:00	Siletz R. (Cedar Creek)	5 coolers ~250 ammocoetes	ammocoete	5							5 coolers, ~250 ammocoetes.
		Total Number of Containers		Purchase Order / Statement of Work #								

1) Released by:	1) Rec'd by:	2) Released by:	2) Rec'd by:
Print name: THAI DO	Gary Buhler	Print name:	
Signature:	Company: N.A.S.	Signature:	Company:
Company: WINDWARD ENV LLC		Company:	
Date/Time: 10.18.06/15:10	Date/Time: 10.18.06/15:10	Date/Time:	Date/Time:

* Distribution: White copies accompany shipment; yellow retained by consignor.

Wind Ward environmental LLC
200 West Mercer Street
Suite 401
Seattle, WA 98119
Tel: (206) 378-1364
Fax: (206) 217-9343

To be completed by Laboratory upon sample receipt:

Date of receipt:	Laboratory W.O. #:
Condition upon receipt:	Time of receipt:
Cooler temperature:	Received by:

1 of

CHAIN-OF-CUSTODY/TEST REQUEST FORM

№ 2408

Project/Client Name: LWG ERA-lamprey ammocoete (toxicity)
Project Number: 06.28.0445
Contact Name: Helle Andersen
Sampled By: TDO J Buening

Ship to: N.A.S.
Attn: Gary Buhler
Shipper: hand del'd.
Form filled out by: T.DO

Shipping Date:
Airbill Number: ——
Turnaround requested:

Sample Collection Date (m/d/y)	Time	Sample Identification	Volume of Sample / # of Containers	Matrix	Test(s) Requested (check test(s) required): tox. test							Comments / Instructions (Jar tag number(s))
10.23.06	1700	LW3-Siletz River	4 coolers ~200 ct.	ammocoetes	✓							in situ temp 12.1°C.
		Total Number of Containers		Purchase Order / Statement of Work #								

1) Released by:	1) Rec'd by:	2) Released by:	2) Rec'd by:
Print name: THAI DO	Gary Buhler	Print name:	
Signature:	Company: N.A.S.	Signature:	Company:
Company: WINDWARD ENV LLC		Company:	
Date/Time: 10.23.06 / 1710	Date/Time: 10.23.06 / 1710	Date/Time:	Date/Time:

* Distribution: White copies accompany shipment; yellow retained by consignor.

Page 61 of 73

To be completed by Laboratory upon sample receipt:

Date of receipt::	Laboratory W.O. #:
Condition upon receipt:	Time of receipt:
Cooler temperature:	Received by:

Wind Ward environmental LLC
200 West Mercer Street
Suite 401
Seattle, WA 98119
Tel: (206) 378-1364
Fax: (206) 217-9343

CHAIN-OF-CUSTODY/TEST REQUEST FORM

№ 2411

Project/Client Name: LWG ERA - lamprey ammocoete (toxicity)
Project Number: 06.28.04.45
Contact Name: Helle Andersen
Sampled By: TDo JBuesing

Ship to: NAS
Attn: Gary Buhler
Shipper: hand del'd
Form filled out by: T.Do

Shipping Date:
Airbill Number:
Turnaround requested:

Sample Collection Date (m/d/y)	Time	Sample Identification	Volume of Sample / # of Containers	Matrix	Test(s) Requested (check test(s) required): toxi test							Comments / Instructions (Jar tag number(s))
10.24.06	1750	LW3-Siletz River (Cedar Creek area)	6 coolers ~300 cf.	ammocoetes	X							in situ temp. 11.8°C
		Total Number of Containers		Purchase Order / Statement of Work #								

1) Released by:	1) Rec'd by:	2) Released by:	2) Rec'd by:
Print name: THAI DO	Gary Buhler	Print name:	
Signature:	Company: N.A.S.	Signature:	Company:
Company: WINDWARD ENV LLC		Company:	
Date/Time: 10.24.06/1750	Date/Time: 10.24.06/1750	Date/Time:	Date/Time:

* Distribution: White copies accompany shipment; yellow retained by consignor.

Page 62 of 73

Wind Ward environmental LLC
200 West Mercer Street
Suite 401
Seattle, WA 98119
Tel: (206) 378-1364
Fax: (206) 217-9343

To be completed by Laboratory upon sample receipt:

Date of receipt:	Laboratory W.O. #:
Condition upon receipt:	Time of receipt:
Cooler temperature:	Received by:

CHAIN OF CUSTODY RECORD

Northwestern Aquatic Sciences
3814 Yaquina Bay Rd., P.O. Box 1437, Newport, OR 97365
Tel: 541-265-7225, Fax: 541-265-2799, www.nwaquatic.com

Client Name	Project No.	Shipping Information
Windward Environmental	06-28-04-45	Carrier: UPS
Address: 200 West Mercer St., Suite 401	Phone No.: 206-577-1287	
City, State, Zip code: Seattle, WA 98119	Report Attention: Helle Anderson	Airbill No. 1Z849 1690 1100 3304 3

Sampled by G.A. Buhler

Lab Sample No.	Date Sampled	Time Sampled	Sample Description	Number of Containers	Copper	Lindane	Pentachlorophenol	Aniline		Comments
	11-9-06	1400	NAS# 0775G Day 0 - 1.0 mg/L Cu	1	X					
	11-9-06	1400	NAS# 0776G Day 0 - 0.1 mg/L Cu	1	X					
	11-9-06	1400	NAS# 0777G Day 0 – 0.01 mg/L Cu	1	X					
	11-9-06	1400	NAS# 0778G Day 0 – 0.001 mg/L Cu	1	X					
	11-9-06	1400	NAS# 0779G Day 0 – 0 mg/L Cu	1	X					
	11-9-06	1545	NAS# 0790G Day 0 – 1000 mg/L Aniline	1				X		
	11-9-06	1545	NAS# 0791G Day 0 – 100 mg/L Aniline	1				X		
	11-9-06	1545	NAS# 0792G Day 0 – 10 mg/L Aniline	1				X		
	11-9-06	1545	NAS# 0793G Day 0 – 1.0 mg/L Aniline	1				X		
	11-9-06	1545	NAS# 0794G Day 0 – 0 mg/L Aniline	1				X		

Signature	Print Name	Company	Date	Time
Relinquished by: Gary A Buhler	GARY A Buhler	NAS	11/10/06	1320
Received by				
Relinquished by				
Received by				
Relinquished by				
Received by laboratory				

Cooler Custody Seal: Present / Not Present; Intact / Not Intact

Internal Cooler Temperature Upon Lab Receipt (°C)

Page 63 of 73

CHAIN OF CUSTODY RECORD

Northwestern Aquatic Sciences
3814 Yaquina Bay Rd., P.O. Box 1437, Newport, OR 97365
Tel: 541-265-7225, Fax: 541-265-2799, www.nwaquatic.com

Client Name	Project No.	Shipping Information	Testing Required
Windward Environmental	06-28-04-45	Carrier: UPS	
Address: 200 West Mercer St., Suite 401	Phone No.: 206-577-1287		
City, State, Zip code: Seattle, WA 98119	Report Attention: Helle Anderson	Airbill No. 12 849169 01100033034	

Sampled by G.A. Buhler

Lab Sample No	Date Sampled	Time Sampled	Sample Description	Number of Containers	Copper	Lindane	Pentachlorophenol	Aniline		Comments
	11-9-06	1415	NAS# 0780G Day 0 – 4.0 mg/L Penta	1			X			
	11-9-06	1415	NAS# 0781G Day 0 – 0.4 mg/L Penta	1			X			
	11-9-06	1415	NAS# 0782G Day 0 – 0.04 mg/L Penta	1			X			
	11-9-06	1415	NAS# 0783G Day 0 – 0.004 mg/L Penta	1			X			
	11-9-06	1415	NAS# 0784G Day 0 – 0 mg/L Penta	1			X			
	11-9-06	1440	NAS# 0785G Day 0 – 8.0 mg/L Lindane	1		X				
	11-9-06	1440	NAS# 0786G Day 0 – 0.8 mg/L Lindane	1		X				
	11-9-06	1440	NAS# 0787G Day 0 – 0.08 mg/L Lindane	1		X				
	11-9-06	1440	NAS# 0788G Day 0 – 0.008 mg/L Lindane	1		X				
	11-9-06	1440	NAS# 0789G Day 0 – 0 mg/L Lindane	1		X				

Signature	Print Name	Company	Date	Time
Relinquished by: Gary A Buhler	Gary A Buhler	NAS	11-10-06	1320
Received by				
Relinquished by				
Received by				
Relinquished by				
Received by laboratory				

Cooler Custody Seal: Present / Not Present; Intact / Not Intact

Internal Cooler Temperature Upon Lab Receipt (°C)

CHAIN OF CUSTODY RECORD

Northwestern Aquatic Sciences
3814 Yaquina Bay Rd., P.O. Box 1437, Newport, OR 97365
Tel: 541-265-7225, Fax: 541-265-2799, www.nwaquatic.com

Client Name	Project No.	Shipping Information
Windward Environmental	06-28-04-45	Carrier: UPS
Address: 200 West Mercer St., Suite 401	Phone No.: 206-577-1287	
City, State, Zip code: Seattle, WA 98119	Report Attention: Helle Anderson	Airbill No. 12 849 169 01 1003 261 5

Sampled by G.A. Buhler

Lab Sample No.	Date Sampled	Time Sampled	Sample Description	Number of Containers	Copper	Lindane	Pentachlorophenol	Aniline		Comments
	11-11-06	1620	NAS# 0795G 48-hr - 1.0 mg/L Cu OLD	1	X					
	11-11-06	1620	NAS# 0796G 48-hr – 0.1 mg/L Cu OLD	1	X					
	11-11-06	1620	NAS# 0797G 48-hr – 0.01 mg/L Cu OLD	1	X					
	11-11-06	1620	NAS# 0798G 48-hr – 0.001 mg/L Cu OLD	1	X					
	11-11-06	1620	NAS# 0799G 48-hr - 0 mg/L Cu OLD	1	X					
	11-11-06	1545	NAS# 0800G 48-hr - 1.0 mg/L Cu NEW	1	X					
	11-11-06	1545	NAS# 0801G 48-hr – 0.1 mg/L Cu NEW	1	X					
	11-11-06	1545	NAS# 0802G 48-hr – 0.01 mg/L Cu NEW	1	X					
	11-11-06	1545	NAS# 0803G 48-hr – 0.001 mg/L Cu NEW	1	X					
	11-11-06	1545	NAS# 0804G 48-hr - 0 mg/L Cu NEW	1	X					

Signature	Print Name	Company	Date	Time
Relinquished by: Julie Fiore	Julie Fiore	NAS	11-13-06	10:00
Received by				
Relinquished by				
Received by				
Relinquished by				
Received by laboratory				

Cooler Custody Seal: Present / Not Present; Intact / Not Intact

Internal Cooler Temperature Upon Lab Receipt (°C)

CHAIN OF CUSTODY RECORD

Northwestern Aquatic Sciences
3814 Yaquina Bay Rd., P.O. Box 1437, Newport, OR 97365
Tel: 541-265-7225, Fax: 541-265-2799, www.nwaquatic.com

Client Name	Project No.	Shipping Information
Windward Environmental	06-28-04-45	Carrier: UPS
Address: 200 West Mercer St., Suite 401	Phone No.: 206-577-1287	Airbill No. 1Z 849 109 01 1003 260 6
City, State, Zip code: Seattle, WA 98119	Report Attention: Helle Anderson	

Sampled by G.A. Buhler

Lab Sample No.	Date Sampled	Time Sampled	Sample Description	Number of Containers	Copper	Lindane	Pentachlorophenol	Aniline		Comments
	11-11-06	1625	NAS# 0805G 48-hr – 4.0 mg/L Penta OLD	1			X			
	11-11-06	1625	NAS# 0806G 48-hr – 0.4 mg/L Penta OLD	1			X			
	11-11-06	1625	NAS# 0807G 48-hr – 0.04 mg/L Penta OLD	1			X			
	11-11-06	1625	NAS# 0808G 48-hr – 0.004 mg/L Penta OLD	1			X			
	11-11-06	1625	NAS# 0809G 48-hr – 0 mg/L Penta OLD	1			X			
	11-11-06	1555	NAS# 0810G 48-hr – 4.0 mg/L Penta NEW	1			X			
	11-11-06	1555	NAS# 0811G 48-hr – 0.4 mg/L Penta NEW	1			X			
	11-11-06	1555	NAS# 0812G 48-hr – 0.04 mg/L Penta NEW	1			X			
	11-11-06	1555	NAS# 0813G 48-hr – 0.004 mg/L Penta NEW	1			X			
	11-11-06	1555	NAS# 0814G 48-hr – 0 mg/L Penta NEW	1			X			

Signature	Print Name	Company	Date	Time
Relinquished by: Julie Fiore	JULIE FIORE	NAS	11-13-06	1000
Received by				
Relinquished by				
Received by				
Relinquished by				
Received by laboratory				

Cooler Custody Seal: Present / Not Present; Intact / Not Intact

Internal Cooler Temperature Upon Lab Receipt (°C)

CHAIN OF CUSTODY RECORD

Northwestern Aquatic Sciences
3814 Yaquina Bay Rd., P.O. Box 1437, Newport, OR 97365
Tel: 541-265-7225, Fax: 541-265-2799, www.nwaquatic.com

Client Name	Project No.	Shipping Information
Windward Environmental	06-28-04-45	Carrier: UPS
Address: 200 West Mercer St., Suite 401	Phone No.: 206-577-1287	
City, State, Zip code: Seattle, WA 98119	Report Attention: Helle Anderson	Airbill No. 12 849 169 01 1003 2599

Sampled by G.A. Buhler

Lab Sample No.	Date Sampled	Time Sampled	Sample Description	Number of Containers	Copper	Lindane	Pentachlorophenol	Aniline		Comments
	11-11-06	1635	NAS# 0815G 48hr – 8.0 mg/L Lindane OLD	1		X				
	11-11-06	1635	NAS# 0816G 48hr – 0.8 mg/L Lindane OLD	1		X				
	11-11-06	1635	NAS# 0817G 48hr – 0.08 mg/L Lindane OLD	1		X				
	11-11-06	1635	NAS# 0818G 48hr – 0.008 mg/L Lindane OLD	1		X				
	11-11-06	1635	NAS# 0819G 48hr – 0 mg/L Lindane OLD	1		X				
	11-11-06	1600	NAS# 0820G 48hr – 8.0 mg/L Lindane NEW	1		X				
	11-11-06	1600	NAS# 0821G 48hr – 0.8 mg/L Lindane NEW	1		X				
	11-11-06	1600	NAS# 0822G 48hr – 0.08 mg/L Lindane NEW	1		X				
	11-11-06	1600	NAS# 0823G 48hr – 0.008 mg/L Lindane NEW	1		X				
	11-11-06	1600	NAS# 0824G 48hr – 0 mg/L Lindane NEW	1		X				

Signature	Print Name	Company	Date	Time
Relinquished by: Julie Fiore	JULIE FIORE	NAS	11-13-06	1000
Received by				
Relinquished by				
Received by				
Relinquished by				
Received by laboratory				

Cooler Custody Seal: Present / Not Present; Intact / Not Intact

Internal Cooler Temperature Upon Lab Receipt (°C)

CHAIN OF CUSTODY RECORD

Northwestern Aquatic Sciences
3814 Yaquina Bay Rd., P.O. Box 1437, Newport, OR 97365
Tel: 541-265-7225, Fax: 541-265-2799, www.nwaquatic.com

Client Name	Project No.	Shipping Information
Windward Environmental	06-28-04-45	Carrier: UPS
Address: 200 West Mercer St., Suite 401	Phone No.: 206-577-1287	
City, State, Zip code: Seattle, WA 98119	Report Attention: Helle Anderson	Airbill No. 1Z 849 169 01 1003 256 0

Sampled by G.A. Buhler

Lab Sample No.	Date Sampled	Time Sampled	Sample Description	Number of Containers	Copper	Lindane	Pentachlorophenol	Aniline		Comments
	11-11-06	1645	NAS# 0825G 48-hr – 1000 mg/L Aniline OLD	1				X		
	11-11-06	1645	NAS# 0826G 48-hr – 100 mg/L Aniline OLD	1				X		
	11-11-06	1645	NAS# 0827G 48-hr – 10 mg/L Aniline OLD	1				X		
	11-11-06	1645	NAS# 0828G 48-hr – 1.0 mg/L Aniline OLD	1				X		
	11-11-06	1645	NAS# 0829G 48-hr – 0 mg/L Aniline OLD	1				X		
	11-11-06	1610	NAS# 0830G 48-hr – 1000 mg/L Aniline NEW	1				X		
	11-11-06	1610	NAS# 0831G 48-hr – 100 mg/L Aniline NEW	1				X		
	11-11-06	1610	NAS# 0832G 48-hr – 10 mg/L Aniline NEW	1				X		
	11-11-06	1610	NAS# 0833G 48-hr – 1.0 mg/L Aniline NEW	1				X		
	11-11-06	1610	NAS# 0834G 48-hr – 0 mg/L Aniline NEW	1				X		

	Signature	Print Name	Company	Date	Time
Relinquished by	Julie Fiore	JULIE FIORE	NAS	11-13-06	1000
Received by					
Relinquished by					
Received by					
Relinquished by					
Received by laboratory					

Cooler Custody Seal: Present / Not Present; Intact / Not Intact

Internal Cooler Temperature Upon Lab Receipt (°C)

CHAIN OF CUSTODY RECORD

Northwestern Aquatic Sciences
3814 Yaquina Bay Rd., P.O. Box 1437, Newport, OR 97365
Tel: 541-265-7225, Fax 541-265-2799, www.nwaquatic.com

Client Name	Project No.	Shipping Information
Windward Environmental	06-28-04-45	Carrier: UPS
Address: 200 West Mercer St., Suite 401	Phone No.: 206-577-1287	
City, State, Zip code: Seattle, WA 98119	Report Attention: Helle Anderson	Airbill No. 1Z 8F9 169 01 1003 2642

Sampled by G.A. Buhler

Lab Sample No.	Date Sampled	Time Sampled	Sample Description	Number of Containers	Copper	Lindane	Pentachlorophenol	Aniline		Comments
	11-13-06	1620	NAS# 0835G 96hr – 1.0 mg/L Cu	1	X					
	11-13-06	1620	NAS# 0836G 96hr – 0.1 mg/L Cu	1	X					
	11-13-06	1620	NAS# 0837G 96hr – 0.01 mg/L Cu	1	X					
	11-13-06	1620	NAS# 0838G 96hr – 0.001 mg/L Cu	1	X					
	11-13-06	1620	NAS# 0839G 96hr – 0 mg/L Cu	1	X					
	11-13-06	1720	NAS# 0850G 96hr – 1000 mg/L Aniline	1				X		
	11-13-06	1720	NAS# 0851G 96hr – 100 mg/L Aniline	1				X		
	11-13-06	1720	NAS# 0852G 96hr – 10 mg/L Aniline	1				X		
	11-13-06	1720	NAS# 0853G 96hr – 1.0 mg/L Aniline	1				X		
	11-13-06	1720	NAS# 0854G 96hr – 0 mg/L Aniline	1				X		

Signature	Print Name	Company	Date	Time
Relinquished by: Julie Fiore	JULIE FIORE	NAS	11-14-06	1030
Received by				
Relinquished by				
Received by				
Relinquished by				
Received by laboratory				

Cooler Custody Seal: Present / Not Present; Intact / Not Intact

Internal Cooler Temperature Upon Lab Receipt (°C)

CHAIN OF CUSTODY RECORD

Northwest Aquatic Sciences
3814 Yaquina Bay Rd., P.O. Box 1437, Newport, OR 97365
Tel: 541-265-7225, Fax: 541-265-2799, www.nwaquatic.com

Client Name	Project No.	Shipping Information
Windward Environmental	06-28-04-45	Carrier: UPS
Address: 200 West Mercer St., Suite 401	Phone No.: 206-577-1287	
City, State, Zip code: Seattle, WA 98119	Report Attention: Helle Anderson	Airbill No. 1Z 849 169 01 1003 2624

Sampled by G.A. Buhler

Lab Sample No.	Date Sampled	Time Sampled	Sample Description	Number of Containers	Copper	Lindane	Pentachlorophenol	Aniline		Comments
	11-13-06	1650	NAS# 0840G 96hr – 4.0 mg/L Penta	1			X			
	11-13-06	1650	NAS# 0841G 96hr – 0.4 mg/L Penta	1			X			
	11-13-06	1650	NAS# 0842G 96hr – 0.04 mg/L Penta	1			X			
	11-13-06	1650	NAS# 0843G 96hr – 0.004 mg/L Penta	1			X			
	11-13-06	1650	NAS# 0844G 96hr – 0 mg/L Penta	1			X			
	11-13-06	1710	NAS# 0845G 96hr – 8.0 mg/L Lindane	1		X				
	11-13-06	1710	NAS# 0846G 96hr – 0.8 mg/L Lindane	1		X				
	11-13-06	1710	NAS# 0847G 96hr – 0.08 mg/L Lindane	1		X				
	11-13-06	1710	NAS# 0848G 96hr – 0.008 mg/L Lindane	1		X				
	11-13-06	1710	NAS# 0849G 96hr – 0 mg/L Lindane	1		X				

Signature	Print Name	Company	Date	Time
Relinquished by: Julie Fiore	JULIE FIORE	NAS	11-14-06	1030
Received by				
Relinquished by				
Received by				
Relinquished by				
Received by laboratory				

Cooler Custody Seal: Present / Not Present; Intact / Not Intact

Internal Cooler Temperature Upon Lab Receipt (°C)

Page 70 of 73

CHAIN OF CUSTODY RECORD

Northwestern Aquatic Sciences
3814 Yaquina Bay Rd., P.O. Box 1437, Newport, OR 97365
Tel: 541-265-7225, Fax: 541-265-2799, www.nwaquatic.com

Client Name: Windward Environmental	Project No.: 06-28-04-45	Shipping Information	Testing Required
Address: 200 West Mercer St., Suite 401	Phone No.: 206-577-1287	Carrier: UPS	
City, State, Zip code: Seattle, WA 98119	Report Attention: Helle Andersen	Airbill No. 1Z849169 0110032651	

Sampled by G.A. Buhler

Lab Sample No.	Date Sampled	Time Sampled	Sample Description	Number of Containers	Diazinon					Comments
	11-16-06	1325	NAS# 0855G Day 0 – 40 mg/L Diazinon	1	X					
	11-16-06	1325	NAS# 0856G Day 0 – 4.0 mg/L Diazinon	1	X					
	11-16-06	1325	NAS# 0857G Day 0 – 0.4 mg/L Diazinon	1	X					
	11-16-06	1325	NAS# 0858G Day 0 – 0.04 mg/L Diazinon	1	X					
	11-16-06	1325	NAS# 0859G Day 0 – 0 mg/L Diazinon	1	X					

Signature	Print Name	Company	Date	Time
Relinquished by: [signature]	Gary Buhler	NAS	11/17/06	1300
Received by				
Relinquished by				
Received by				
Relinquished by				
Received by laboratory				

Cooler Custody Seal

Present / Not Present

Intact / Not Intact

Internal Cooler Temperature Upon Lab Receipt (°C)

CHAIN OF CUSTODY RECORD

Northwestern Aquatic Sciences
3814 Yaquina Bay Rd., P.O. Box 1437, Newport, OR 97365
Tel: 541-265-7225, Fax: 541-265-2799, www.nwaquatic.com

Client Name	Project No.	Shipping Information
Windward Environmental	06-28-04-45	Carrier: UPS
Address: 200 West Mercer St., Suite 401	Phone No.: 206-577-1287	
City, State, Zip code: Seattle, WA 98119	Report Attention: Helle Andersen	Airbill No.: 1Z849169 0110032964

Sampled by G.A. Buhler

Lab Sample No.	Date Sampled	Time Sampled	Sample Description	Number of Containers	Testing Required: Diazinon					Comments
	11-18-06	1330	NAS# 0860G 48-hr – 40 mg/L dizinon OLD	1	X					
	11-18-06	1330	NAS# 0861G 48-hr – 4.0 mg/L dizinon OLD	1	X					
	11-18-06	1330	NAS# 0862G 48-hr – 0.4 mg/L dizinon OLD	1	X					
	11-18-06	1330	NAS# 0863G 48-hr – 0.04 mg/L dizinon OLD	1	X					
	11-18-06	1330	NAS# 0864G 48-hr – 0 mg/L dizinon OLD	1	X					
	11-18-06	1320	NAS# 0865G 48-hr – 40 mg/L dizinon NEW	1	X					
	11-18-06	1320	NAS# 0866G 48-hr – 4.0 mg/L dizinon NEW	1	X					
	11-18-06	1320	NAS# 0867G 48-hr – 0.4 mg/L dizinon NEW	1	X					
	11-18-06	1320	NAS# 0868G 48-hr – 0.04 mg/L dizinon NEW	1	X					
	11-18-06	1320	NAS# 08169 48-hr – 0 mg/L dizinon NEW	1	X					

Signature	Print Name	Company	Date	Time
Relinquished by				
Received by				
Relinquished by				
Received by				
Relinquished by				
Received by laboratory				

Cooler Custody Seal
Present / Not Present
Intact / Not Intact

Internal Cooler Temperature Upon Lab Receipt (°C)

CHAIN OF CUSTODY RECORD

Northwestern Aquatic Sciences
3814 Yaquina Bay Rd., P.O. Box 1437, Newport, OR 97365
Tel: 541-265-7225, Fax: 541-265-2799, www.nwaquatic.com

Client Name	Project No.	Shipping Information
Windward Environmental	06-28-04-45	Carrier: UPS
Address: 200 West Mercer St., Suite 401	Phone No.: 206-577-1287	
City, State, Zip code: Seattle, WA 98119	Report Attention: Helle Andersen	Airbill No.: 1Z849169 0110032679

Sampled by G.A. Buhler

Lab Sample No.	Date Sampled	Time Sampled	Sample Description	Number of Containers	Diazinon					Comments
	11-20-06	1510	NAS# 0870G 96-hr – 40 mg/L dizinon	1	X					
	11-20-06	1510	NAS# 0871G 96-hr – 4.0 mg/L dizinon	1	X					
	11-20-06	1510	NAS# 0872G 96-hr – 0.4 mg/L dizinon	1	X					
	11-20-06	1510	NAS# 0873G 96-hr – 0.04 mg/L dizinon	1	X					
	11-20-06	1510	NAS# 0874G 96-hr – 0 mg/L dizinon	1	X					

	Signature	Print Name	Company	Date	Time
Relinquished by	[signature]	Gary Buhler	NAS	11-21-06	1200
Received by					
Relinquished by					
Received by					
Relinquished by					
Received by laboratory					

Cooler Custody Seal
Present / Not Present
Intact / Not Intact

Internal Cooler Temperature Upon Lab Receipt (°C)

Page 73 of 73

	Date	Temp	pH	DO	Cond	Hard	Alk	NH3	comments
Siletz River	10/17/2006	13.6	5.3	8.2	62	26	20		rec'ing data
Water	10/17/2006					26			
	10/18/2006	12.4	6.0	9.6	95	26	20		rec'ing data
	10/23/2006	11.5	6.8	8.4	75	26	20		rec'ing data
	10/24/2006	10.6	6.0	8.8	150	51	90		rec'ing data
Siletz River	**Mean**	12.0	6.0	8.8	96	31	38	---	
Water	**SD**	1.3	0.6	0.6	39	11	35	---	
	n	4	4	4	4	5	4	---	
	Min	10.6	5.3	8.2	62	26	20	---	
	Max	13.6	6.8	9.6	150	51	90	---	
Lab Holding									
holding for tests	10/18/2006	12.3	7.4	10.7	135	43	50		
31-35	10/19/2006	12.5	7.1	10.8	133	51	60		
	10/20/2006	12.7	7.5	10.6	120	51	30		
	10/21/2006	12.5	7.5	11.1	130	43	30		
	10/22/2006	12.2	7.1	10.9	125	51	60		
	10/23/2006	12.6	6.9	10.8	120	51	30		
	10/24/2006	12.3	7.4	10.8	130	51	50		
	10/25/2006	12.4	6.9	10.8	130	43	30	<0.1	
	10/26/2006	12.6	7.4	10.6	130	43	50	<0.1	
	10/27/2006	12.4	7.0	11.2	130	43	50	<0.1	
	10/28/2006	12.4	7.1	10.8	130	43	40	<0.1	
	10/29/2006	12.9	8.1	10.8	135	51	50	<0.1	
	10/30/2006	12.7	8.0	10.4	130	43	50	<0.1	
	10/31/2006	12.8	7.8	10.2	130	43	40	<0.1	
	11/1/2006	12.6	7.9	10.3	135	43	40	<0.1	
	11/2/2006	12.1	8.2	10.3	130	51	50	<0.1	
	11/3/2006	11.8	7.9	10.8	130	51	40	<0.1	
	11/4/2006	11.2	8.0	11.6	130	51	40	<0.1	
	11/5/2006	11.6	7.9	11.2	135	51	50	<0.1	
	11/6/2006	13.2	7.9	13.0	119	51	30	<0.1	
	11/7/2006	11.9	7.7	11.4	130	51	50	<0.1	
	11/8/2006	11.5	8.0	11.2	125	51	50	<0.1	
	11/9/2006	11.8	8.0	11.3	125	51	40	<0.1	tests 31 - 34 began 11/9/06
holding for test 35	11/10/2006	11.7	7.9	11.2	115	43	50	<0.1	
continues	11/11/2006	11.2	7.7	11.1	120	51	40	<0.1	
	11/12/2006	11.3	7.8	11.0	130	51	40	<0.1	
	11/13/2006	11.4	7.6	11.0	130	51	40	<0.1	

	11/14/2006	11.6	7.5	10.9	125	51	40	<0.1	
	11/15/2006	11.8	7.6	10.9	132	51	40	<0.1	
	11/16/2006	11.4	7.4	11.4	130	43	50	<0.1	test 35 began 11/16/06
Interim holding	11/17/2006	11.6	7.6	11.3	117	51	40	<0.1	
prior to acclimation	11/18/2006	11.8	7.4	11.2	120	51	40	<0.1	
for temperature	11/20/2006	11.9	7.3	11.4	110	51	40	<0.1	
experiments	11/21/2006							<0.1	flow off; all tanks fed
	11/22/2006	11.4	7.2	11.2	125	51	50	<0.1	
temperature	11/24/2006	11.6	7.4	11.6	120	51	40	<0.1	
acclimation to 12C	11/25/2006	12.0	7.6	11.3	135	60	50	0.1	
for test #36	11/26/2006	11.9	7.6	11.2	140	60	50	<0.1	
	11/27/2006	11.6	7.3	11.2	140	51	30	0.1	
	11/28/2006	11.6	7.5	11.2	150	60	50	0.4	
	11/29/2006	11.3	7.4	11.2	140	51	50	0.3	
	11/30/2006	11.7	7.5	11.0	135	60	40	0.2	
	12/1/2006	11.8	7.4	11.4	130	60	40	<0.1	test 36 (12C & 17C) began 12/1/06
temperature	12/2/2006	11.9	7.3	11.2	130	51	40	0.3	
acclimation to 12C	12/3/2006	11.8	7.0	10.4	145	51	30	0.4	
for test #37	12/4/2006	11.4	7.3	10.6	140	60	40	0.2	
	12/5/2006	11.0	6.9	11.2	140	51	40	0.3	
	12/6/2006	12.2	7.3	10.7	125	60	40	0.2	
	12/7/2006	12.0	7.4	10.9	135	60	40	0.2	
	12/8/2006	12.2	7.4	11.0	120	51	40	0.3	test 37 (12C & 22C) began 12/8/06
temperature	11/24/2006	12.2	7.2	11.4	125	51	40	<0.1	
acclimation to 17C	11/25/2006	13.5	7.3	10.7	135	60	50	<0.1	
for test #36	11/26/2006	14.6	7.5	10.2	140	60	40	<0.1	
	11/27/2006	15.5	7.3	9.8	145	60	40	<0.1	
	11/28/2006	16.8	7.8	9.6	140	60	50	<0.1	
	11/29/2006	16.8	7.7	9.4	140	51	50	<0.1	
	11/30/2006	17.0	7.5	9.3	140	60	40	<0.1	
	12/1/2006	16.3	7.4	9.4	140	60	40	<0.1	test 36 (12C & 17C) began 12/1/06
temperature	12/1/2006	16.9	7.3	8.8	145	51	30		
acclimation to 22C	12/2/2006	17.9	7.3	8.9	140	51	30	<0.1	
for test #37	12/3/2006	18.5	7.2	8.8	160	51	30	<0.1	
	12/4/2006	19.3	7.2	9.0	155	51	40	<0.1	
	12/5/2006	20.4	7.3	8.7	170	51	40	<0.1	
	12/6/2006	21.6	7.5	8.5	155	51	50	<0.1	
	12/7/2006	21.1	7.4	8.8	150	51	50	<0.1	
	12/8/2006	21.9	7.5	8.8	150	51	40	<0.1	test 37 (12C & 22C) began 12/8/06
		Temp	**pH**	**DO**	**Cond**	**Hard**	**Alk**	**NH3**	
Tests 31 - 34:	**Mean**	12.3	7.6	10.9	129	48	44	---	

10/18/06-11/9/06	**SD**	0.5	0.4	0.6	5	4	9	---
	n	23	23	23	23	23	23	16
	Min	11.2	6.9	10.2	119	43	30	<0.1
	Max	13.2	8.2	13.0	135	51	60	<0.1
		Temp	**pH**	**DO**	**Cond**	**Hard**	**Alk**	**NH3**
Test 35:	**Mean**	12.1	7.6	11.0	128	48	44	---
10/18/06-11/16/06	**SD**	0.6	0.4	0.5	5	4	9	---
	n	30	30	30	30	30	30	23
	Min	11.2	6.9	10.2	115	43	30	<0.1
	Max	13.2	8.2	13.0	135	51	60	<0.1
		Temp	**pH**	**DO**	**Cond**	**Hard**	**Alk**	**NH3**
Test 36, 12C:	**Mean**	11.7	7.5	11.3	136	57	44	---
11/24/06-12/1/06	**SD**	0.2	0.1	0.2	9	5	7	---
	n	8	8	8	8	8	8	8
	Min	11.3	7.3	11.0	120	51	30	<0.1
	Max	12.0	7.6	11.6	150	60	50	0.4
Test 36, 17C:	**Mean**	15.3	7.5	10.0	138	58	44	---
11/24/06-12/1/06	**SD**	1.8	0.2	0.7	6	4	5	---
	n	8	8	8	8	8	8	8
	Min	12.2	7.2	9.3	125	51	40	<0.1
	Max	17.0	7.8	11.4	145	60	50	<0.1
		Temp	**pH**	**DO**	**Cond**	**Hard**	**Alk**	**NH3**
Test 37, 12C:	**Mean**	11.8	7.2	10.9	133.6	55	39	---
12/2/06-12/8/06	**SD**	0.4	0.2	0.3	9.0	5	4	---
	n	7	7	7	7	7	7	7
	Min	11.0	6.9	10.4	120.0	51	30	0.2
	Max	12.2	7.4	11.2	145.0	60	40	0.4
Test 37, 22C:	**Mean**	19.7	7.3	8.8	153	51	39	---
12/1/06-12/8/06	**SD**	1.8	0.1	0.1	9	0	8	---
	n	8	8	8	8	8	8	7
	Min	16.9	7.2	8.5	140	51	30	<0.1
	Max	21.9	7.5	9.0	170	51	50	<0.1

Aniline	**Test 686-31**						
mg/L	DAY	TEMP	pH	DO	COND	HARD	ALK
1,000	0	12.8	7.6	10.5	120	51	440
100	0	12.8	7.4	10.4			
10	0	12.9	7.4	10.4			
1	0	12.8	7.2	10.5			
0	0	12.8	7.2	10.4	110	51	40
1,000	1	12.4	7.4	10.3			
100	1	12.4	7.4	10.2			
10	1	12.3	7.4	10.4			
1	1	12.4	7.3	10.3			
0	1	12.3	7.2	10.2			
1,000	2	12.6	7.5	10.1	125	51	460
100	2	12.5	7.4	10.6			
10	2	12.4	7.4	10.6			
1	2	12.5	7.3	10.6			
0	2	12.4	7.3	10.6	120	51	40
1,000	3	12.8	7.6	10.4			
100	3	12.8	7.5	10.2			
10	3	12.6	7.4	9.9			
1	3	12.8	7.5	10.1			
0	3	12.9	7.5	10.2			
1,000	4	12.5	7.5	10.2	125	51	440
100	4	12.6	7.3	10.1			
10	4	12.3	7.3	10.3			
1	4	12.5	7.2	10.2			
0	4	12.4	7.2	10.2	120	51	40
	Mean	12.6	7.4	10.3	---	---	---
	SD	0.2	0.1	0.2	---	---	---
	n	25	25	25	6	6	6
	Min	12.3	7.2	9.9	110	51	40
	Max	12.9	7.6	10.6	125	51	460

Copper Test 686-32

mg/L	DAY	TEMP	pH	DO	COND	HARD	ALK
1.0	0	12.2	6.9	10.8	110	51	40
0.1	0	12.1	7.1	10.8			
0.01	0	12.2	7.1	10.7			
0.001	0	12.1	7.1	10.8			
0	0	12.3	7.1	10.6	110	51	40
1	1	12.2	7.2	10.6			
0.1	1	12.3	7.2	10.4			
0.01	1	12.3	7.2	10.2			
0.001	1	12.4	7.2	10.5			
0	1	12.6	7.2	10.3			
1.0	2	12.2	7.3	10.7	120	51	40
0.1	2	12.3	7.3	10.6			
0.01	2	12.3	7.3	10.6			
0.001	2	12.3	7.3	10.6			
0	2	12.6	7.3	10.4	115	51	40
1.0	3	12.7	7.5	10.4			
0.1	3	12.7	7.6	10.3			
0.01	3	12.8	7.6	10.5			
0.001	3	12.6	7.6	10.4			
0	3	12.8	7.6	10.4			
1.0	4	12.1	7.3	10.5	115	51	40
0.1	4	12.1	7.3	10.3			
0.01	4	12.1	7.2	10.4			
0.001	4	12.1	7.2	10.3			
0	4	12.1	7.2	10.2	110	51	40
	Mean	12.3	7.3	10.5	---	---	---
	SD	0.2	0.2	0.2	---	---	---
	n	25	25	25	6	6	6
	Min	12.1	6.9	10.2	110	51	40
	Max	12.8	7.6	10.8	120	51	40

Pentachlorophenol **Test 686-33**

mg/L	DAY	TEMP	pH	DO	COND	HARD	ALK
4.0	0	12.2	7.2	10.4	115	51	40
0.4	0	12.2	7.1	10.4			
0.004	0	12.2	7.1	10.2			
0.004	0	12.2	7.1	10.4			
0	0	12.3	7.1	10.4	110	51	40
4.0	1	12.2	7.4	10.2			
0.4	1	12.2	7.3	10.4			
0.004	1	12.2	7.3	10.4			
0.004	1	12.2	7.2	10.2			
0	1	12.2	7.2	10.3			
4.0	2	12.2	7.5	10.5	125	51	40
0.4	2	12.2	7.4	10.5			
0.004	2	12.2	7.3	10.4			
0.004	2	12.3	7.3	10.6			
0	2	12.3	7.3	10.5	120	51	40
4.0	3	12.7	7.6	10.3			
0.4	3	12.7	7.6	10.4			
0.004	3	12.7	7.6	10.2			
0.004	3	12.8	7.6	10.3			
0	3	12.8	7.5	10.2			
4.0	4	12.1	7.3	10.6	115	51	40
0.4	4	12.1	7.3	10.6			
0.004	4	12.1	7.3	10.5			
0.004	4	12.1	7.2	10.4			
0	4	12.1	7.2	10.4	115	51	40
	Mean	12.3	7.3	10.4	---	---	---
	SD	0.2	0.2	0.1	---	---	---
	n	25	25	25	6	6	6
	Min	12.1	7.1	10.2	110	51	40
	Max	12.8	7.6	10.6	125	51	40

Lindane **Test 686-34**

mg/L	DAY	TEMP	pH	DO	COND	HARD	ALK
8.0	0	12.2	7.3	10.4	115	51	40
0.8	0	12.2	7.3	10.2			
0.08	0	12.3	7.2	10.2			
0.008	0	12.1	7.2	10.4			
0	0	12.2	7.2	10.2	115	51	40
8.0	1	12.1	7.5	10.1			
0.8	1	12.1	7.4	10.2			
0.08	1	12.2	7.3	10.5			
0.008	1	12.2	7.3	10.2			
0	1	12.1	7.3	10.4			
8.0	2	12.2	7.5	10.4	120	51	40
0.8	2	12.2	7.4	10.5			
0.08	2	12.2	7.4	10.4			
0.008	2	12.1	7.4	10.8			
0	2	12.2	7.3	10.6	120	51	40
8.0	3	12.7	7.6	10.4			
0.8	3	12.6	7.6	10.2			
0.08	3	12.8	7.6	10.3			
0.008	3	12.8	7.5	10.3			
0	3	12.6	7.5	10.4			
8.0	4	12.1	7.4	10.3	115	51	40
0.8	4	12.2	7.3	10.2			
0.08	4	12.2	7.3	10.4			
0.008	4	12.3	7.3	10.3			
0	4	12.1	7.2	10.2	115	51	40
	Mean	12.3	7.4	10.3	---	---	---
	SD	0.2	0.1	0.2	---	---	---
	n	25	25	25	6	6	6
	Min	12.1	7.2	10.1	115	51	40
	Max	12.8	7.6	10.8	120	51	40

Diazinon	**Test 686-35**						
mg/L	DAY	TEMP	pH	DO	COND	HARD	ALK
40	0	12.2	7.3	10.6	115	51	30
4.0	0	12.1	7.3	10.6			
0.4	0	12.2	7.3	10.5			
0.04	0	12.1	7.3	10.7			
0	0	12.1	7.3	10.6	115	51	30
40	1	11.8	7.1	10.6			
4.0	1	11.8	7.1	10.5			
0.4	1	11.7	7.1	10.5			
0.04	1	11.8	7.1	10.4			
0	1	11.8	7.1	10.5			
40	2	11.9	7.3	10.4	120	51	30
4.0	2	12.0	7.3	10.3			
0.4	2	11.9	7.2	10.5			
0.04	2	11.7	7.2	10.6			
0	2	11.8	7.2	10.6	125	51	30
40	3	11.8	7.3	10.6			
4.0	3	11.7	7.3	10.4			
0.4	3	11.8	7.3	10.3			
0.04	3	11.8	7.3	10.3			
0	3	11.9	7.3	10.2			
40	4	11.9	7.3	10.5	120	51	30
4.0	4	11.8	7.3	10.6			
0.4	4	11.8	7.3	10.5			
0.04	4	11.9	7.3	10.3			
0	4	12	7.3	10.4	120	51	40
	Mean	11.9	7.2	10.5	---	---	---
	SD	0.1	0.1	0.1	---	---	---
	n	25	25	25	6	6	6
	Min	11.7	7.1	10.2	115	51	30
	Max	12.2	7.3	10.7	125	51	40

Temperature Experiment #1				**Test 686-36**			
12C	DAY	TEMP	pH	DO	COND	HARD	ALK
12C	0	12.6	7.3	11	120	51	30
12C	1	12.2	7.4	11.2	120		
12C	2	12.1	6.9	10.2	125	51	30
12C	3	12.2	7.4	10.4	120		
12C	4	12.5	6.9	10.6	130	51	30
	Mean	12.3	7.2	10.7	123	51	30
	SD	0.2	0.3	0.4	4	0	0
	n	5	5	5	5	3	3
	Min	12.1	6.9	10.2	120	51	30
	Max	12.6	7.4	11.2	130	51	30
17C	DAY	TEMP	pH	DO	COND	HARD	ALK
17C	0	16.5	7.3	9.7	125	51	30
17C	1	17.0	7.2	9	135		
17C	2	16.5	6.8	9.1	140	51	30
17C	3	17.3	7.4	8.8	130		
17C	4	17.0	7.0	9.0	140	51	30
	Mean	16.9	7.1	9.1	134	51	30
	SD	0.4	0.2	0.3	7	0	0
	n	5	5	5	5	3	3
	Min	16.5	6.8	8.8	125	51	30
	Max	17.3	7.4	9.7	140	51	30

Temperature Experiment #2				**Test 686-37**			
12C	DAY	TEMP	pH	DO	COND	HARD	ALK
12C	0	11.9	7.4	10.6	115	51	30
12C	1	12.3	7.0	10.1	120		
12C	2	12.6	7.1	10.2	110	51	30
12C	3	12.1	7.0	10.9	130		
12C	4	12.2	7.0	10.8	125	51	40
	Mean	12.2	7.1	10.5	120	51	33
	SD	0.3	0.2	0.4	8	0	6
	n	5	5	5	5	3	3
	Min	11.9	7.0	10.1	110	51	30
	Max	12.6	7.4	10.9	130	51	40
22C	DAY	TEMP	pH	DO	COND	HARD	ALK
22C	0	21.8	7.3	8.8	140	51	30
22C	1	23.0	6.9	8.2	140		
22C	2	22.6	7.3	8	140	51	40
22C	3	21.8	7.2	8.2	160		
22C	4	22.2	7.2	8.3	150	51	40
	Mean	22.3	7.2	8.3	146	51	37
	SD	0.5	0.2	0.3	9	0	6
	n	5	5	5	5	3	3
	Min	21.8	6.9	8.0	140	51	30
	Max	23.0	7.3	8.8	160	51	40

Test ID	Test No.	Nom. Conc. mg/L	Number Exposed	Number Suviving	% Surv.
Aniline	686-31	1,000	5	0	0
		100	5	5	100
		10	5	5	100
		1	5	5	100
		0	5	5	100
Copper	686-32	1	5	0	0
		0.1	5	2	40
		0.01	5	5	100
		0.001	5	5	100
		0	5	5	100
Penta	686-33	4	5	0	0
		0.4	5	0	0
		0.04	5	5	100
		0.004	5	5	100
		0	5	5	100
Lindane	686-34	8	5	0	0
		0.8	5	5	100
		0.08	5	5	100
		0.008	5	5	100
		0	5	5	100
Diazinon	686-35	40	5	0	0
		4	5	5	100
		0.4	5	5	100
		0.04	5	5	100
		0	5	5	100
17C	686-36	17C	5	5	100
		17C	5	5	100
		17C	5	5	100
		17C	5	5	100
12C	686-36	12C	5	5	100
		12C	5	5	100
		12C	5	5	100
		12C	5	5	100
22C	686-37	22C	5	5	100
		22C	5	4	80
		22C	5	5	100
		22C	5	5	100
12C	686-37	12C	5	5	100
		12C	5	5	100
		12C	5	5	100
		12C	5	5	100

Test ID	**Test No.**	**Length (mm)**	**Weight (g)**		Length (mm)	Weight (g)
Aniline	686-31	72	0.49	Mean	74	0.54
		67	0.38	SD	6	0.15
		71	0.47	n	5	5
		79	0.63	Min	67	0.38
		83	0.75	Max	83	0.75
Copper	686-32	55	0.25	Mean	54	0.26
		51	0.19	SD	3	0.09
		50	0.19	n	5	5
		56	0.24	Min	50	0.19
		58	0.42	Max	58	0.42
Penta	686-33	55	0.25	Mean	57	0.28
		51	0.18	SD	14	0.21
		50	0.15	n	5	5
		49	0.17	Min	49	0.15
		82	0.66	Max	82	0.66
Lindane	686-34	59	0.27	Mean	69	0.43
		58	0.27	SD	12	0.21
		68	0.37	n	5	5
		70	0.43	Min	58	0.27
		88	0.79	Max	88	0.79
Diazinon	686-35	70	0.41	Mean	74	0.52
		90	0.90	SD	9	0.22
		70	0.38	n	5	5
		74	0.53	Min	68	0.38
		68	0.40	Max	90	0.90
17C	686-36	80	0.72	Mean	74	0.59
		71	0.46	SD	7	0.15
		65	0.44	n	5	5
		72	0.55	Min	65	0.44
		82	0.78	Max	82	0.78
12C	686-36	88	1.00	Mean	66	0.55
		72	0.66	SD	15	0.28
		60	0.36	n	5	5
		64	0.42	Min	46	0.33
		46	0.33	Max	88	1.00
22C	686-37	70	0.56	Mean	64	0.44
		58	0.32	SD	7	0.11
		55	0.31	n	5	5
		68	0.48	Min	55	0.31
		70	0.51	Max	70	0.56
12C	686-37	65	0.41	Mean	70	0.48
		62	0.30	SD	7	0.14
		80	0.66	n	5	5
		70	0.48	Min	62	0.30
		71	0.55	Max	80	0.66
	Mean	**67**	**0.45**			
	SD	**11**	**0.20**			
	n	**45**	**45**			
	Min	**46**	**0.15**			
	Max	**90**	**1.00**			

APPENDIX C. TOXICITY TESTING VALIDATION REPORT

DMR-0702

DMR

Dinnel Marine Resources

QUALITY ASSURANCE EVALUATIONS OF LAMPREY AMMOCOETE TOXICITY TESTING FOR PORTLAND HARBOR RI/FS: PHASE 1

Final Report

23 March 2007

For

Windward Environmental LLC
Seattle, Washington

Prepared By

Dinnel Marine Resources
Anacortes, WA

1.0 INTRODUCTION

Northwestern Aquatic Sciences (NAS) has been retained by Windward Environmental LLC to determine the sensitivity of lamprey (*Lampetra* sp.) larvae (ammocoetes) to various chemicals as part of the Portland Harbor RI/FS Round 3 Project. Lamprey tests are being conducted in two phases: Phase 1 explored methods for successful holding in the laboratory, generated range-finding data for five chemicals (aniline, lindane, pentachlorophenol, copper and diazinon), and evaluated ammocoete sensitivity to elevated temperatures (17 and 22 °C). Phase two, to be conducted during the spring/summer of 2007, will determine the toxicity of the same five chemicals (plus naphthalene) using definitive flow-through tests. NAS is a State of Washington accredited laboratory (Lab ID number C1238, expiration: 30 September 2007) and is certified to perform a wide range of bioassay testing of water, effluents and sediments. A copy of NAS' accreditation certificate and Scope of Accreditation appears in Appendix 1. There is no similar certification program in the State of Oregon.

This report summarizes the Quality Assurance/Quality Control (QA/QC) evaluations of the Phase I testing conducted by NAS. The QA steps taken to ensure high quality data and maximum data completeness before, during and after Phase 1 testing are described in this report. Major QA tasks included the following:

- A pre-test review of the laboratory test protocol and Standard Operating Procedures (SOPs) for the lamprey testing
- One audit of tests in progress
- An initial evaluation of all data for completeness, correct data entries, and accurate transcription
- A final QA evaluation of overall data quality and usability (this report)

2.0 QUALITY ASSURANCE AUDIT RESULTS

2.1 REVIEW OF LABORATORY PROTOCOL AND SOPs

There are no published protocols for conducting toxicity tests with lampreys, other than the ASTM and EPA generic protocols for conducting tests with fish and other aquatic life (ASTM 1996; EPA 2002). For this testing program, general guidance was provided by Windward Environmental (2006) and a draft protocol was written by NAS (Protocol No. NAS-686-Lamprey-rf) and reviewed by Dinnel Marine Resources prior to beginning the Phase 1 chemical range finding and elevated temperature testing. DMR found this draft protocol to be well written and reasonably complete given the lack of previous test experiences with this species.

2.2 TEST-IN-PROGRESS AUDIT

An informal test-in-progress "audit" was conducted by Dr. Paul Dinnel on 11 November 2006 during which time the following four chemicals were being tested: aniline, lindane, pentachlorophenol and copper. All testing procedures appeared to conform with NAS' draft lamprey protocol and no deviations were noted.

2.3 INITIAL DATA EVALUATIONS

All raw data forms and electronic database files were reviewed for completeness and fidelity of transcription to electronic formats. A 100% check was made of all data entered into NAS' internal electronic database and checks were made of all Excel spreadsheet calculations and formulae. All errors, omissions, clarifications, or changes needed were documented and communicated to NAS. Only a couple of corrections to the draft data report were needed. A copy of DMR's comment letter to NAS appears in Appendix 2.

2.4 FINAL QA EVALUATION OF OVERALL DATA QUALITY AND USABILITY

Following corrections to the data report by NAS personnel, a 100% check of the corrections was made on 22 March 2007 to verify each correction. All corrections made by NAS were deemed satisfactory. Following this, an overall evaluation of data completeness and quality was accomplished. DMR's conclusions regarding data completeness and quality follow below.

2.4.1 Chain of Custody and Sample Holding

All chain of custody protocols were properly observed in transfers of test animals (from Windward Environmental) and toxicant samples for chemical analyses (to Columbia Analytical Services). Only one piece of information was missing on the chain of custody forms: the cooler temperature on receipt of lampreys on 18 October 2006.

2.4.2 Ammocoete Holding and Feeding

Lamprey ammocoetes were successfully held in a sand substrate in laboratory tanks supplied with flowing seawater. NAS followed the methods outlined in their draft protocol for holding and acclimation of the ammocoetes except that the feeding regime was modified based on information supplied by Mr. William Swink, a lamprey expert with the USGS.

2.4.3 Toxicity Tests

Range-finding toxicity tests of the chemicals identified above were tested in a static beaker test system using one replicate of each test concentration and 5 test animals per beaker. The tests appeared to meet all provisions outlined in NAS' draft protocol except for one minor water quality deviation: The dilution water hardness registered 51 mg/liter as $CaCO_3$ in all batches of test water. This was very slightly above the water hardness limit of 50 mg/liter specified in the draft Field Sampling Plan (Windward 2006). This slight deviation should not have significantly affected the results of the toxicity tests. Loading rates ranged from 0.46 to 0.96 g of fish per liter of test water. These loading rates were all below the draft protocol specified 1.1 g/liter limit (based on EPA recommendations). Control survival in all tests was 100%. All toxicity tests were effective in achieving total mortality in the highest test concentrations and no mortality in the lowest test concentrations, thereby identifying appropriate test concentrations to be used in Phase 2 definitive testing of these same chemicals. The results of the toxicity tests will need to be paired with the chemical analyses conducted by Columbia Analytical Services to derive the actual chemical effects levels.

One chemical (naphthalene) was eliminated from the list of chemicals to be tested during Phase 1 when NAS had difficulty maintaining the concentration of this volatile chemical in the test beakers. All naphthalene testing will be conducted during Phase 2 using a flow through test system. In addition, two temperature stress tests, one at 17 and the other at 22 °C, were added to the test schedule for Phase 1 (see below).

2.4.4 Temperature Tests

Two temperature tests assessed possible stress to lamprey ammocetes, the first at 17 °C and the second at 22 °C. Each temperature was paired with a temperature of 12 °C, which acted as the control. Ammocetes were acclimated to their respective test temperatures at the rate of about 0.5 to 1 °C per day prior to testing. Ammocetes were tested in a static beaker test system using one replicate for each temperature and 5 test animals per beaker. The tests appeared to meet all provisions outlined in NAS' draft protocol except for one minor water quality deviation: The dilution water hardness registered 51 mg/liter as $CaCO_3$ in all batches of test water. This was very slightly above the water hardness limit of 50 mg/liter specified in the draft Field Sampling Plan (Windward 2006). This slight deviation should not have significantly affected the results of the temperature tests. Loading rates ranged from 0.79 to 1.05 g of fish per liter of test water. These loading rates were all below the draft protocol specified 1.1 g/liter limit (based on EPA recommendations). Control survival (12 °C) in all tests was 100% and survival in the elevated temperature treatments was 100% (17 °C) and 95% (22 °C).

2.4.5 Conclusions

NAS appears to have successfully completed Phase 1 testing. This phase of testing has validated methods for pre-test holding, acclimation and feeding of ammocetes and identified appropriate concentrations for definitive tests of the five chemicals to be tested in Phase 2. The two temperature tests were also successfully completed and showed that ammocetes are probably not unduly stressed at 17 °C. However, slight mortality (5%) at 22 °C indicates the possibility that ammocetes might be nearing their upper limit for temperature stress, although the mortality of just 1 of the 20 fish tested at this temperature could have easily been due to another factor. Should it be anticipated that future toxicity tests might be run in 22 °C test water, consideration should be given to refining the upper temperature stress limit by running an additional test with temperatures in the range of 20 to 30°C.

3.0 REFERENCES

ASTM (American Society for Testing and Materials). 1996. Standard guide for conducting acute toxicity tests on test materials with fishes, macroinvertebrates, and amphibians. E729-96. American Society for Testing and Materials, Philadelphia, PA.

EPA (U.S. Environmental Protection Agency). 2002. Methods for measuring the acute toxicity of effluents and receiving waters to freshwater and marine organisms (Fifth Edition). EPA-821-R-02-012. Office of Water, U.S. EPA, Washington, D.C.

Windward Environmental. 2006. Portland Harbor RI/FS, Round 3: Lamprey ammocoete toxicity testing field sampling plan (draft). Prepared for the Lower Willamette Group by Windward Environmental LLC, Seattle, WA. 20 pp.

Appendix 1

Northwestern Aquatic Sciences' State of Washington Accreditation Certificate and Scope of Accreditation

Appendix 2

Comments by Dinnel Marine Resources to Northwestern Aquatic Sciences Following DMR's QA Review of the Draft Toxicity Test Report

DMR

Dinnel Marine Resources
1519 13th St.
Anacortes, WA 98221

360-299-8468

16 March 2007

Ms. Michele Redmond
Northwestern Aquatic Sciences
PO Box 1437
Newport, OR 97365

Dear Michele:

I have completed my audit of your draft Phase 1 Portland Harbor Lamprey Ammocoete testing program. As usual, your draft data report is in excellent shape, with just a few minor items needing further attention.

1. Appendix II, page 3 of 73: The last temperature entry (for 12-8-06) appears to be 12.2 on my photocopy, but is recorded as 11.2 in the Excel database (page 49 of 73). Please review.

2. Test Data Analysis Records appendix, page 57 of 73: The two samples at the bottom of the page (22C and 12C) show 5 replicates, whereas only 4 replicates were tested (?).

3. Should you desire "true perfection" in your final report, I noted that on the 5th line under "Test Organisms" (page 2 of 7 of the main report), the word "measure" should be "measured". Nit picking it is!

Should you have any questions, please call me at 360-299-8468 or contact me via e-mail at (b) (6) [redacted] Thank you and your staff for your excellent work.

Sincerely,

Paul Dinnel, Project QA Monitor

The State of Washington Department of Ecology

This is to certify that

Northwestern Aquatic Sciences
Newport, OR

has complied with provisions set forth in Chapter 173-50 WAC and is hereby recognized by the Department of Ecology as an ACCREDITED LABORATORY for the analytical parameters listed on the accompanying Scope of Accreditation. This certificate is effective October 1, 2006, and shall expire September 30, 2007.

Witnessed under my hand on August 21, 2006.

Stewart M. Lombard
Lab Accreditation Unit Supervisor

Laboratory ID
C1238

Scope of Accreditation

Northwestern Aquatic Sciences

Newport, OR

is accredited by the State of Washington Department of Ecology to perform analyses for the parameters listed below using the analytical methods indicated. This Scope of Accreditation may apply to any of the following matrix types: non-potable water, drinking water, solid and chemical materials, and air and emissions. Accreditation for all parameters is final unless indicated otherwise in a note. Accreditation is for the latest version of a method unless otherwise specified in a note. EPA refers to the U.S. Environmental Protection Agency. SM refers to American Public Health Association's publication, Standard Methods for the Examination of Water and Wastewater, 18th, 19th or 20th Edition, unless otherwise noted. ASTM stands for the American Society for Testing and Materials. PSEP stands for Puget Sound Estuary Program. Other references are detailed in the notes section.

Matrix Type/Parameter Name	Reference	Method Number	Notes
Non-potable Water			
Ampelisca abdita	EPA	100.4	4
Ampelisca abdita	PSEP	1995	
Ampelisca abdita	ASTM	E 1367	
Atherinops affinis (West Coast)	EPA	1006.0	6,8
Bioaccumulation, Bedded Sediments	EPA	600/R-93/183	7
Bioaccumulation, Benthic Invert	ASTM	E 1688	
Bioconcentration, Fish, Mollusks	ASTM	E 1022	
Ceriodaphnia dubia	EPA	1002.0	2,8
Ceriodaphnia dubia	EPA	2002.0	1,8
Chironomus tentans	EPA	100.5	5
Chironomus tentans	ASTM	E 1706	
Chironomus tentans	EPA	100.2	5
Corbicula fluminea	ASTM	E 1688	
Crassostrea gigas	PSEP	1995	
Crassostrea gigas (West Coast)	EPA	1005.0	6,8
Cyprinodon variegatus	EPA	1004.0	3,8
Cyprinodon variegatus	EPA	2004.0	1,8
Dangerous Waste Static Salmonid	WDOE	80-12 Part A	
Daphnia magna	EPA	2021.0	1,8

Matrix Type/Parameter Name	Reference	Method Number	Notes
Daphnia pulex	EPA	2021.0	1,8
Dendraster excentricus	ASTM	E 1563	
Dendraster excentricus	PSEP	1995	
Dendraster excentricus (West Coast)	EPA	1008.0	6,8
Eohaustorius estuarius	ASTM	E 1367	
Eohaustorius estuarius	PSEP	1995	
Eohaustorius estuarius	EPA	100.4	4
Holmesimysis costata	EPA	821-R-02-012	1,8
Holmesimysis costata (West Coast)	EPA	1007.0	6,8
Hyalella azteca	EPA	100.4	5
Hyalella azteca	EPA	100.1	5
Hyalella azteca	ASTM	E 1706	
Leptocheirus plumulosus	ASTM	E 1367	
Leptocheirus plumulosus	EPA	100.4	4
Lumbriculus variegatus	EPA	100.3	5
Lumbriculus variegatus	ASTM	E 1688	
Macoma spp.	ASTM	E 1688	
Menidia beryllina	EPA	1006.0	3,8
Menidia spp.	EPA	2006.0	1,8
Mysidopsis bahia	EPA	1007.0	3,8
Mysidopsis bahia	EPA	2007.0	1,8
Mytilus spp.	PSEP	1995	
Mytilus spp. (West Coast)	EPA	1005.0	6,8
Neanthes arenaceodentata	PSEP	1995	
Nereis/Neanthes spp.	ASTM	E 1688	
Oncorhynchus mykiss	EPA	2019.0	1,8
Pimephales promelas	EPA	2000.0	1,8
Pimephales promelas, Chronic	EPA	1000.0	2,8
Rhepoxynius abronius	EPA	100.4	4
Rhepoxynius abronius	PSEP	1995	

Matrix Type/Parameter Name	Reference	Method Number	Notes
Rhepoxynius abronius	ASTM	E 1367	
Salvelinus fontinalis	EPA	2019.0	1,8
Strongylocentrotus purpuratus	ASTM	E 1563	
Strongylocentrotus purpuratus (WC)	EPA	1008.0	6,8
Strongylocentrotus purpuratus (WC)	EPA	600/R-95/136	6,8
Strongylocentrotus spp.	PSEP	1995	

Accredited Parameter Note Detail

(1) USEPA. "Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms." EPA-821-R-02-012. Fifth Edition. Oct 2002. (2) USEPA. "Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms." EPA-821-R-02-013. Fourth Edition. Oct 2002. (3) USEPA. "Short-term Methods for Measuring the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms." EPA-821-R-02-014. Fourth Edition. Oct 2002. (4) USEPA. "Methods for Assessing the Toxicity of Sediment-associated Contaminants with Estuarine and Marine Amphipods." EPA 600/R/R-94/025. June 1994. (5) USEPA. "Methods for Measuriing the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates." EPA 600/R-99/064. Second Edition. March 2000. (6) USEPA. "Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to West Coast Marine and Estuarine Organisms," EPA 600/R-95/136. Third Edition. Aug 1995. (7) USEPA. "Bedded Sediment Bioaccumulation Tests." EPA/600/R-93/183. Sept 1993. (8) Meets requirements of "Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria," Washington Dept. of Ecology, Pub. No. WQ-R-80, Rev. June 2005.

S M Lombard — August 21, 2006

Authentication Signature — Date

Stewart M. Lombard, Lab Accreditation Unit Supervisor

APPENDIX D. WATER CHEMISTRY VALIDATION REPORT

EcoChem, INC.
Environmental Data Quality

DATA QUALITY EVALUATION

PORTLAND HARBOR

LAMPREY AMMOCOETE TOXICITY STUDY

Aniline - Method SW8270C
Pentachlorophenol – Method SW8151
gamma-BHC (Lindane) – Method SW8081A
Diazinon – Method SW8141A
Copper – Method E200.8

Prepared for:

Integral Consulting
7900 SE 28th Street, Suite 300
Mercer Island, Washington 98040

Integral Project: B01-01-58C

Prepared by:

EcoChem, Inc.
710 Second Avenue, Suite 660
Seattle, Washington 98104

EcoChem Project: C22110-5

March 5, 2007

Approved for Release:

Eric Strout
Project Manager/Technical Director
EcoChem, Inc.

DATA QUALITY EVALUATION

BASIS OF DATA EVALUATION

The data were validated using guidance and quality control (QC) criteria documented in the analytical methods; *Guidance on Environmental Data Verification and Validation* (EPA 2002c); *Portland Harbor RI/FS, Round 2, Quality Assurance Project Plan* (QAPP) (Integral 2004)*; Addendum 7: Round 3 Chemical Analysis of Lamprey Ammocoete Toxicity Test Water* (Integral 2006), and *National Functional Guidelines for Organic and/or Inorganic Data Review* (USEPA 1994, 1999 & 2002).

Data qualifier definitions, reason codes, and validation criteria are included as **Appendix A**. Data validation reports, which discuss individual findings for each quality control element [by sample delivery group (SDG)], are provided in **Appendix B**. Data validation worksheets and communication records are organized by SDG and will be kept on file at EcoChem.

PROCESS FOR DATA VALIDATION

All electronic data deliverable files (EDD) were verified by comparing 100% of the field sample results and 10% of the QC sample results to the hardcopy data package.

Sixty percent (60%) of the data received a Level III validation, which included evaluation (as appropriate for each method) of:

- Package completeness
- Sample chain-of-custody and sample preservation
- Analytical holding times
- Blank contamination
- Precision (replicate analyses)
- Accuracy (compound recovery)
- Chromatogram review (pesticide, PCB, and fuel fractions)
- Detection limits
- Instrument performance (initial calibration, continuing calibration, tuning, sensitivity and degradation)

All other data packages received full (Level IV) data validation, which includes evaluation of compound identification and quantitation (transcription and calculation checks).

A dual-tier system of primary and secondary reviewers is utilized to ensure technical correctness and QC of the validation process; and all data validation is documented using standardized and controlled validation worksheets and spreadsheets. These worksheets are completed for each SDG, documenting all deficiencies, outliers and subsequent qualifiers.

After qualifiers are entered into the EcoChem database, a second party verifies 100% of the qualifier entry. Interpretive qualifiers are then applied to the field samples and qualified data is exported to the project database (Integral).

SUMMARY OF DATA VALIDATION:

Twenty (20) water samples were analyzed for aniline, pentachlorophenol, gamma-BHC (Lindane), diazinon, and copper. The water samples represented different concentrations of these analytes at different time periods after dosing, as part of the lamprey ammocoete toxicity test study. Columbia Analytical Services (CAS) completed the analyses.

The data for the samples were acceptable. None of the data were qualified for any reason.

The laboratory data were evaluated in terms of completeness, holding times, instrument performance, bias, and precision. The results of the QC procedures used during sample analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 100% complete.

Holding Times and Sample Preservation

All samples were extracted and analyzed within the method specified holding times.

Instrument Performance

Calibrations

Initial and continuing calibrations were completed at the proper frequency. All initial and continuing calibrations met all acceptance criteria.

Endrin/DDT Breakdown

Breakdown evaluation mixtures were analyzed at the proper frequency to measure percent breakdown. All percent breakdown values met the acceptance criteria.

Method Blank Analyses

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times (5x) the concentration detected in the blank. If a contaminant is detected in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U). If the result is also less than the reporting limit, then the result is elevated to the reporting limit. No action is taken if the sample result is greater than the action level, or for non-detected results.

Gamma-BHC (Lindane) was detected in several method blanks. The concentrations in the associated samples were greater than the action level. No action was necessary. All other method blanks were free of contamination.

Accuracy

Surrogate Compound Recoveries

The surrogates were either not recovered or the recovery value was outside the control limits in several of the gamma-BCH (Lindane) and diazinon analyses due to the required dilution factors. No action was taken. All other surrogate recovery values were acceptable.

Matrix Spike Recoveries

Matrix and duplicate matrix spike (MS/MSD) analyses were not performed. Accuracy was assessed using the surrogate compound and laboratory control sample (LCS) analyses.

Laboratory Control Sample Recoveries

The gamma-BHC (Lindane) recovery was greater than the upper control limit in one LCS analysis. Since the recoveries were acceptable in the associated LCS duplicate (LCSD) analysis and in all other LCS/LSCD sets, no action was taken. The recovery values for all other analytes were acceptable in all other LCS/LCSD sets.

Precision

LCS/LCSD analyses were evaluated for laboratory precision. All relative percent difference (RPD) values were acceptable.

Method Detection Limits and Method Reporting Limits

With the exception of the copper analyses, most of the samples were analyzed at dilution factors ranging from 5x to 50,000x. Detection/reporting limits were adjusted accordingly.

Field Quality Control Samples

No field QC samples were collected for this study.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Lamprey Toxicity Study
Aniline by EPA Method 8270C
Columbia Analytical Services - Kelso

This report documents the review of analytical data from the analyses of water samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Columbia Analytical Services, Inc., Kelso, Washington.

SDG	No. Samples	Validation Level
K0610008	5 Water	Full
K0610013	10 Water	Summary
K0610065	5 Water	Summary

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (10%).

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

1 Holding Times and Sample Receipt
Initial Calibration (ICAL)
Continuing Calibration (CCAL)
Laboratory Blanks
Surrogate Compounds
1 Matrix Spikes/Matrix Spike Duplicates
Laboratory Control Samples (LCS/LCSD)
1 Reporting Limits (MDL and MRL)
Compound Identification
1 Calculation Verification (full validation only)

[1] ***Quality control results are discussed below, but no data were qualified.***
[2] ***Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.***

Holding Times and Sample Receipt

Some coolers were received at temperatures below the recommended range of 4°C ±2°. These temperature outliers did not impact data quality and no qualifiers were required.

Matrix Spike/Matrix Spike Duplicates

No matrix spike/matrix spike duplicate analyses were performed with these SDG due to limited sample volumes. Accuracy and precision were assessed from the laboratory control sample/laboratory control sample duplicate (LCS/LCSD).

Reporting Limits (Method Detection Limit and Method Reporting Limit)

The reporting limits were elevated in the following samples due to dilutions:

SDG	Sample ID	Dilution Factor
K00610008	NAS# 0790G Day 0 – 1000 mg/L Aniline	10,000x
	NAS# 0791G Day 0 – 100 mg/L Aniline	1,000x
	NAS# 0792G Day 0 – 10 mg/L Aniline	50x
	NAS #0793G Day 0 – 1.0 mg/L Aniline	5x
K00610013	NAS# 0805G 48-hr – 1000 mg/L Aniline Old	10,000x
	NAS# 0829G 48-hr – 100 mg/L Aniline Old	1,000x
	NAS# 0829G 48-hr – 10 mg/L Aniline Old	100x
	NAS# 0829G 48-hr – 1.0 mg/L Aniline Old	10x
	NAS# 0830G 48-hr – 1000 mg/L Aniline Old	10,000x
	NAS# 0830G 48-hr – 100 mg/L Aniline New	1,000x
	NAS# 0832G 48-hr – 10 mg/L Aniline New	50x
	NAS #0833G 48-hr – 1.0 mg/L Aniline New	10x
K0610065	NAS# 0850G 96 hr-1000 mg/L Aniline	10,000x
	NAS# 0851G 96 hr-100 mg/L Aniline	1,000x
	NAS# 0852G 96 hr-10 mg/L Aniline	100x
	NAS# 0853G 96 hr-1 mg/L Aniline	10x

Calculation Verification

SDG K0610008: Calculation verifications were performed on this SDG. No errors were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory performed an appropriate analytical method. Accuracy was acceptable, as demonstrated by the surrogate and LCS/LCSD percent recovery values. Precision was acceptable as demonstrated by the relative percent difference values for the LCS/LCSD analyses.

No data were qualified for any reason.

All data, as reported, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Lamprey Toxicity Study
Pentachlorophenol - EPA Method 8151
Columbia Analytical Services - Kelso

This report documents the review of analytical data from the analyses of water samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Columbia Analytical Services, Inc., Kelso, Washington.

SDG	No. Samples	Validation Level
K0610008	5 Water	Full
K0610013	10 Water	Summary
K0610065	5 Water	Summary

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (10%).

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

1	Holding Times and Sample Receipt	1	Matrix Spikes/Matrix Spike Duplicates
	Initial Calibration (ICAL)		Laboratory Control Samples (LCS/LCSD)
	Continuing Calibration (CCAL)	1	Reporting Limits (MDL and MRL)
	Laboratory Blanks		Compound Identification
	Surrogate Compounds	1	Calculation Verification (full validation only)

[1] ***Quality control results are discussed below, but no data were qualified.***
[2] ***Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.***

Holding Times and Sample Receipt

Some coolers were received at temperatures below the recommended range of 4°C ±2°. These temperature outliers did not impact data quality and no qualifiers were required.

Matrix Spike/Matrix Spike Duplicates

No matrix spike/matrix spike duplicate analyses were performed due to limited sample volumes. Accuracy and precision were assessed from the laboratory control sample/laboratory control sample duplicate (LCS/LCSD).

Reporting Limits (Method Detection Limit and Method Reporting Limit)

The reporting limits were elevated in the following samples due to dilutions:

SDG	Sample ID	Dilution Factor
K00610008	NAS# 0780G Day 0 – 4.0 mg/L Penta	50x
	NAS #0781G Day 0 – 0.4 mg/L Penta	20x
K00610013	NAS# 0805G 48-hr – 4.0 mg/L Penta Old	50x
	NAS# 0806G 48-hr – 0.4 mg/L Penta Old	20x
	NAS# 0810G 48-hr – 4.0 mg/L Penta New	50x
	NAS #0811G 48-hr – 0.4 mg/L Penta New	20x
K0610065	NAS# 0840G 96 hr-4.0mg/L Penta	40x
	NAS# 0841G 96 hr-0.4mg/L Penta	5x

Calculation Verification

SDG K0610008: Calculation verifications were performed on this SDG. No calculation errors were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory performed an appropriate analytical method. Accuracy was acceptable, as demonstrated by the surrogate and LCS/LCSD percent recovery values. Precision was acceptable as demonstrated by the relative percent difference values for the LCS/LCSD analyses.

No data were qualified for any reason.

All data, as reported, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Lamprey Toxicity Study
gamma-BHC (Lindane) - EPA Method 8081A
Columbia Analytical Services - Kelso

This report documents the review of analytical data from the analyses of water samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Columbia Analytical Services, Inc., Kelso, Washington.

SDG	No. Samples	Validation Level
K0610008	5 Water	Full
K0610013	10 Water	Summary
K0610065	5 Water	Summary

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (10%).

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

1 Holding Times and Sample Receipt
Instrument Breakdown Check
Initial Calibration (ICAL)
Continuing Calibration (CCAL)
1 Laboratory Blanks
1 Surrogate Compounds
1 Matrix Spikes/Matrix Spike Duplicates
1 Laboratory Control Samples (LCS)
1 Reporting Limits (MDL and MRL)
Compound Identification
1 Calculation Verification (full validation only)

[1] ***Quality control results are discussed below, but no data were qualified.***
[2] ***Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.***

Holding Times and Sample Receipt

Some coolers were received at temperatures below the recommended range of 4°C ±2°. These temperature outliers did not impact data quality and no qualifiers were required.

Laboratory Blanks

Method blanks are used to evaluate all associated samples, including field blanks. Any remaining positive results in the field blanks are used to evaluate all associated samples.

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times the concentration detected in the blank. If a contaminant is detected in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U-7). If the result is also less than the reporting limit, then the result is elevated to the reporting limit. No action is taken if the sample result is greater than the action level, or for non-detected results.

SDGs K0610008 & K0610013: A positive value for gamma-BHC (lindane) was reported in the method blank. All sample results were greater than the action level and no qualifiers were required.

SDG K0610065: A positive value for gamma-BHC was reported in the method blank. All sample results were greater than the action level and no qualifiers were required.

Surrogate Compounds

SDG K0610008: Surrogates were not recovered or recovered outside the control limits in Samples NAS# 0785G Day0 – 8.0 mg/L Lindane (20,000x) and NAS# 0786G Day 0 – 0.8 mg/L Lindane (2,500x) due to sample dilution. No qualifiers were assigned.

SDG K0610013: Surrogates were not recovered in some samples due to sample dilution:

NAS# 0815G 48-hr – 8.0 mg/L Lindane Old (5,000x)
NAS# 0816G 48-hr – 0.8 mg/L Lindane Old (500x)
NAS# 0820G 48-hr – 8.0 mg/L Lindane New (50,000x)
NAS# 0821G 48-hr – 0.8 mg/L Lindane New (5,000x)
NAS #0822G 48-hr – 0.08 mg/L Lindane New (250x)

No qualifiers were assigned.

SDG K0610065: Surrogates were not recovered or recovered outside the control limits due to sample dilutions in Samples NAS# 0845G 96hr – 8.0 mg/L Lindane (50,000x) and NAS# 0846G 96hr – 0.8 mg/L Lindane (5,000x). No qualifiers were assigned.

Matrix Spike/Matrix Spike Duplicates

No matrix spike/matrix spike duplicate (MS/MSD) analyses were performed with these SDG due to limited sample volumes. Accuracy and precision were assessed from the laboratory control sample/laboratory control sample duplicate (LCS/LCSD).

Laboratory Control Samples

SDG K0610065: The percent recovery (%R) value for gamma-BHC (lindane) in the LCS was greater than the upper control limit of 130%, at 155%. The %R value in the LCSD was acceptable and no qualifiers were assigned.

Reporting Limits (Method Detection Limit and Method Reporting Limit)

The reporting limits were elevated in the following samples due to dilutions:

SDG	Sample ID	Dilution Factor
K00610008	NAS# 0785G Day 0 – 8.0 mg/L Lindane	20,000x
	NAS# 0786G Day 0 – 0.8 mg/L Lindane	2,500x
	NAS# 0787G Day 0 – 0.08 mg/L Lindane	250x
	NAS# 0788G Day 0– 0.008 mg/L Lindane	50x
	NAS #0789G Day 0 – 0 mg/L Lindane	20x
K00610013	NAS# 0815G 48-hr – 8.0 mg/L Lindane Old	5,000x
	NAS# 0816G 48-hr – 0.8 mg/L Lindane Old	500x
	NAS# 0817G 48-hr – 0.08 mg/L Lindane Old	250x
	NAS# 0818G 48-hr – 0.008 mg/L Lindane Old	50x
	NAS# 0819G 48-hr – 0 mg/L Lindane Old	10x
	NAS# 0820G 48-hr – 8.0 mg/L Lindane New	50,000x
	NAS# 0821G 48-hr – 0.8 mg/L Lindane New	5,000x
	NAS #0822G 48-hr – 0.08 mg/L Lindane New	250x
	NAS #0823G 48-hr – 0.008 mg/L Lindane New	50x
K0610065	NAS# 0845G 96hr 0 – 8.0 mg/L Lindane	50,000x
	NAS# 96hr – 0.8 mg/L Lindane	5,000x
	NAS# 0847G 96hr – 0.08 mg/L Lindane	100x
	NAS# 0848G 96hr– 0.008 mg/L Lindane	100x
	NAS #0849G 96hr – 0 mg/L Lindane	100x

Calculation Verification

SDG K0610008: Calculation verifications were performed on this SDG. No calculation errors were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory performed an appropriate analytical method. Accuracy was acceptable, as demonstrated by the surrogate and LCS/LCSD %R values, with the exceptions noted above. Precision was acceptable as demonstrated by the relative percent difference values for the LCS/LCSD analyses.

No data were qualified for any reason.

All data, as reported, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Lamprey Toxicity Study
Diazinon - EPA Method 8141A
Columbia Analytical Services - Kelso

This report documents the review of analytical data from the analyses of water samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Columbia Analytical Services, Inc., Kelso, Washington.

SDG	No. Samples	Validation Level
K0610210	5 Water	Summary
K0610229	10 Water	Summary
K0610283	5 Water	Full

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy data package. Laboratory QC results were also verified (10%).

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

1 Holding Times and Sample Receipt
Instrument Breakdown Check
Initial Calibration (ICAL)
Continuing Calibration (CCAL)
Laboratory Blanks
1 Surrogate Compounds
1 Matrix Spikes/Matrix Spike Duplicates
Laboratory Control Samples (LCS)
1 Reporting Limits (MDL and MRL)
Compound Identification
1 Calculation Verification (full validation only)

[1] ***Quality control results are discussed below, but no data were qualified.***
[2] ***Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.***

Holding Times and Sample Receipt

SDG K0610210: The validation guidance documents state that the cooler temperatures should be within an advisory temperature range of 2° to 6°C. The laboratory received the sample cooler at 9.4°C. This outlier was determined to have no impact on data quality and no qualifiers were assigned.

Surrogate Compounds

SDG K0610210: Surrogates were not recovered in Samples NAS# 0855G Day 0 – 40 mg/L Diazinon (5,000x) and NAS# 0856G Day 0 – 4.0 mg/L Diazinon (500x) due to sample dilution. No qualifiers were assigned.

SDG K0610229: Surrogates were not recovered in Samples NAS# 0860G 48-hr – 40 mg/L Diazinon Old (5,000x), NAS# 0861G 48-hr – 4.0 mg/L Diazinon Old (500x), NAS# 0865G 48-hr – 40 mg/L Diazinon New (10,000x), and NAS #0866G 48-hr – 4.0 mg/L Diazinon New (1,000x) due to sample dilution. No qualifiers were assigned.

SDG K0610283: Surrogates were not recovered in Samples NAS# 0870G 96-hr-40 mg/L Diazinon (5,000x) and NAS# 0871G 96-hr-4.0 mg/L Diazinon (500x) due to sample dilution. No qualifiers were assigned.

Matrix Spike/Matrix Spike Duplicates

SDG K0610210, K0610229, & K0610283: No matrix spike/matrix spike duplicate (MS/MSD) analyses were performed with these SDG due to limited sample volumes. Accuracy and precision were assessed from the laboratory control sample/laboratory control sample duplicate (LCS/LCSD).

Reporting Limits (Method Detection Limit and Method Reporting Limit)

The reporting limits were elevated in the following samples due to dilutions:

SDG	Sample ID	Dilution Factor
K00610210	NAS# 0855G Day 0 – 40 mg/L Diazinon	5,000x
	NAS# 0856G Day 0 – 4.0 mg/L Diazinon	500x
	NAS# 0857G Day 0 – 0.4 mg/L Diazinon	50x
	NAS# 0858G Day 0 – 0.04 mg/L Diazinon	10x
K00610229	NAS# 0860G 48-hr – 40 mg/L Diazinon Old	5,000x
	NAS# 0861G 48-hr – 4.0 mg/L Diazinon Old	500x
	NAS# 0862G 48-hr – 0.4 mg/L Diazinon Old	50x
	NAS# 0863G 48-hr – 0.04 mg/L Diazinon Old	10x
	NAS# 0865G 48-hr – 40 mg/L Diazinon New	10,000x
	NAS# 0866G 48-hr – 4.0 mg/L Diazinon New	1,000x
	NAS# 0867G 48-hr – 0.4 mg/L Diazinon New	100x
	NAS# 0868G 48-hr – 0.04 mg/L Diazinon New	10x
K0610065	NAS# 0870G 96-hr – 40 mg/L Diazinon	5,000x
	NAS# 0871G 96-hr – 4.0 mg/L Diazinon	500x
	NAS# 0872G 96-hr – 0.4 mg/L Diazinon	50x
	NAS# 0873G 96-hr – 0.04 mg/L Diazinon	10x

Calculation Verification

SDG K0610283: Calculation verifications were performed on this SDG. No errors were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory performed an appropriate analytical method. Accuracy was acceptable, as demonstrated by the surrogate and LCS/LCSD percent recovery values, with the exceptions noted above. Precision was acceptable as demonstrated by the relative percent difference values for the LCS/LCSD.

No data were qualified for any reason.

All data, as reported, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Lamprey Toxicity Study
Copper - EPA Method 200.8
Columbia Analytical Services - Kelso

This report documents the review of analytical data from the analyses of water samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Columbia Analytical Services, Inc., Kelso, Washington.

SDG	No. Samples	Validation Level
K0610008	5 Water	Full
K0610013	10 Water	Summary
K0610065	5 Water	Summary

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

I. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (10%).

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

1 Holding Times and Sample Preservation
Initial Calibration
Calibration Verification
CRDL Standards
Laboratory Blanks
Laboratory Control Samples
Matrix Spike Samples
Laboratory Duplicates
ICPMS Internal Standards
Reporting Limits (MDL and MRL)
1 Calculation Verification (Full validation only)

[1] ***Quality control results are discussed below, but no data were qualified.***
[2] ***Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.***

Holding Times and Sample Preservation

Some coolers were received at temperatures below the recommended range of 4°C ±2°. These temperature outliers did not impact data quality and no qualifiers were assigned.

Calculation Verification

SDG K0610008: Several results were verified by recalculation from the raw data. No calculation or transcription errors were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory performed an appropriate analytical method. Accuracy was acceptable, as demonstrated by the LCS/LCSD and MS percent recovery values. Precision was acceptable as demonstrated by the relative percent difference values for the LCS/LCSD and laboratory duplicate analyses.

No data were qualified for any reason.

All data, as reported, are acceptable for use.

APPENDIX E. PHOTO DOCUMENTATION

Photo 1: Siletz River 1

Photo 2: Siletz River 2

Photo 3: Electrofishing

Photo 4: Ammocoete caught in net

Photo 5: Ammocoetes in catch bucket

Photo 6: Ammocoetes transferred to cooler 1

Photo 7: Ammocoetes transferred to cooler 2

Photo 8: Packing coolers

Photo 9: Transport of coolers

Photo 10: Temperature room with 14 tanks

Photo 11: Ten-gallon tank setup

Photo 12: Head tank

Photo 13: Holding tank

Photo 14: Chiller system