# PASSAGE SURVIVAL INVESTIGATION OF JUVENILE CHINOOK SALMON THROUGH BONNEVILLE POWERHOUSE II BYPASS SLUICE AT TWO TAILWATER CONDITIONS COLUMBIA RIVER, WASHINGTON


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## APRIL 2001

## EXECUTIVE SUMMARY

The U. S. Army Corps of Engineers, Portland District, sponsored a two-part investigation to determine injury rate and survival (direct effects) of hatchery-reared chinook salmon smolts, *Oncorhynchus tshawytscha*, in passage through a surrogate high flow outfall bypass structure (1,000 and 2,500 cfs discharge) at Bonneville Powerhouse II (B2), Columbia River. Tests were conducted during a period of high tailwater (June 12 through 18, 2000) and low tailwater (September 28 through October 6, 2000). Fish length averaged 160 and 178 for the spring and fall studies, respectively. The investigation concentrated on the periphery of an outfall jet, the area expected to produce the greatest chance of injury/mortality to bypassed fish.

During the spring high tailwater tests (elevation range 16.4 to 23.2 ft, mean 19.7 ft), mean entry velocities of the outfall jet were 31 to 37 ft/sec, with a maximum of 40 ft/sec. For the fall low tailwater tests (elevation range 7.9 to 11.3 ft, mean 10.3 ft), mean entry velocities of the outfall jet were higher (40 to 45 ft/sec, maximum of 48 ft/sec).

Experimental fish were acquired from the Carson National Fish Hatchery, Washington for the high tailwater study, and the Lewis Hatchery, Washington for the low tailwater study. A truck transported the fish to raceways at B2 Fingerling Engineering and Research Laboratory. Raceways were supplied continuously with ambient river water. Water temperature during the high and low tailwater releases ranged from 13.5 to 16.0°C (56.3 to 60.8°F) and 15.5 to 17.5°C (60.0 to 63.5°F), respectively.

"Sensor fish", an instrumented package designed to determine exposure histories based on measurements of acceleration, pressure, and rate of strain were also released through the sluice to complement the fish injury data.

Survival estimation (direct only) and fish condition assessment involved the use of the HI-Z Turb'N tag-recapture technique (balloon tag). Treatment passage survival probabilities (1 h and 48 h) were estimated relative to those of controls released downstream of the outfall flow. A release sample size of 598 and 596 treatment fish at two discharge rates (1,000 and approximately 2,500 cfs, respectively) was paired with 597 control fish.

Treatment fish recapture rate (physical retrieval of alive and dead fish) was 100.0% for both tailwater levels. All but three control fish were recaptured. A stationary signal was present on two unrecaptured control (assigned dead) and the status on the other control could not be determined (assigned unknown).

Survival probabilities ( $\hat{\tau}$ ) and their standard errors were estimated using the reduced model ($H_O$:$P_A$=$P_D$), *i.e.*, the recapture probability of alive ($P_A$) and dead ($P_D$) fish is equal. The estimated 1 h and 48 h survival probabilities at both discharge rates and tailrace elevations ranged between 0.994 and 1.00; these are summarized below. The 90% CI on all estimates were ≤±0.02.

| | High Tailwater | | Low Tailwater | |
|---|---|---|---|---|
| | 1 h | 48 h | 1 h | 48 h |
| 1,000 cfs | 0.996 (0.985-1.00) | 0.996 (0.985-1.00) | 1.00 (0.998-1.00) | 1.00 (0.983-1.00) |
| 2,500 cfs | 1.00 (0.997-1.00) | 1.00 (0.997-1.00) | 1.00 (0.998-1.00) | 0.994 (0.966-1.00) |

Incidence of injury, scale loss, or loss of equilibrium was low at both discharge rates during both the high and low tailwater tests. Only 8 of the 1,194 (0.7%) recaptured treatment fish displayed any visible injuries; 6 of 693 (0.9%) were passed during the low tailwater test and the remaining 2 of 501 (0.4%) during the high tailwater test. The two injured fish for the high tailwater test were from the 1,000 cfs discharge rate. Injures to 4 of the 6 fish from the low tailwater test were classified as major, primarily consisting of scrapes and/or bruises. Similar injuries were observed on two fish from the high tailwater test. Only one specimen (low tailwater test) had a tearing type injury, which was at its right operculum. Two of the 594 (0.3%) control fish suffered minor injuries, consisting of small bruises.

Scale loss (considered major if >40% in two of the five zones on either side of a fish) was evident on only a few of the treatment (0.2%) and control (0.5%) fish. There was no apparent relationship between scale loss and treatment condition.

Loss of equilibrium rate was 1% for the treatment fish and 0.5% for the control fish and was temporary for all but one specimen (treatment), which later died.

Based on the results of the present field study, the periphery region of the B2 outfall sluice chute, with estimated entry velocities of 31 to 48 ft/sec, inflicts minimal mortality and injury to entrained juvenile salmon. These field tests indicated that a high flow outfall with entry velocities <48 ft/sec should provide safe fish passage, provided other factors such as sufficient tailrace depth, no predator haven, and minimal outfall jet recirculation are also present.

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# 1.0 INTRODUCTION

Historically, spillways and sluiceways at hydroelectric dams were constructed as conduits for transporting excess river flow or debris with little focus on their potential for safe fish passage routes. In recent times, however, these conveyances are increasingly viewed as viable fish passage routes and are used to increase survival for the declining salmonid populations. Recently, emphasis has been placed on developing criteria for high flow (>1,000 cfs) outfall structures that will ensure safe fish passage. Current outfall criteria were developed for low flow outfalls and are not always applicable to high flow bypass facilities. Preliminary guidelines for the design of benign high flow outfalls were presented by Johnson *et al.* (1999); they proposed 10 preliminary guidelines. They suggested that further research was needed to ascertain the effects of two of these guidelines on bypassed fish: 1) receiving water characteristics and 2) entry velocity. The primary purpose of the present evaluation was to provide survival and injury data on juvenile salmon passed through a high flow outfall that will be relevant for developing safe fish passage design at future high flow outfalls. The U. S. Army Corps of Engineers (the Corps) is currently in a design phase for high flow outfalls at Bonneville Second Powerhouse (B2) sluice chute and The Dalles Dam sluiceway and information on fish injury/mortality is lacking.

The existing B2 sluice chute was selected as a field test site to examine receiving water characteristics and potential effects of entry velocity on bypassed fish. Survival and condition of fish passed (direct effects) at the B2 sluice was ascertained by the HI-Z Turb'N Tag (balloon tag) recapture technique. Laboratory studies were also conducted which involved controlled introduction and retrieval of fish in a high velocity flume (Battelle *et al.* 2000).

Both field and laboratory tests primarily dealt with evaluating the effects on fish entrained in the periphery of the jet as a worst-case condition. The periphery of an outfall jet is where most energy dissipation occurs and, hence, is where entrained fish are most vulnerable to direct injury when entering the tailwater. This is a conservative approach to high flow outfall research because, for the jet as a whole, the periphery is a much smaller region for fish to be distributed in than is the main body of the jet. Assuming fish are uniformly distributed across a jet most fish will be in the main body compared to the periphery. The specific purpose of the field tests was to ascertain potential problems for fish entrained in the periphery of a high flow jet as it plunged from different heights to the tailrace.

## 1.1 Study Objectives

The specific study objective was to estimate absolute survival and condition of yearling chinook salmon, *Oncorhynchus tshawytscha*, at two different outfall flows, (1,000 and 2,500 cfs) and two tailrace levels (high and low). This study was conducted to assess only the direct effects of juvenile fish passing at a surrogate high flow outfall sluice chute at B2.

## 1.2 Study Site

Bonneville Dam is the first dam upriver (river mile 145 or 232 river km) on the main stem of the Columbia River (Figure 1-1) and is located east of Portland, Oregon. It consists of two powerhouses, a spillway, and a navigation lock. The first powerhouse (B1) was completed in 1938 and is located between the Oregon shore and Bradford Island. The second powerhouse (B2) was built in 1982, and is located between the Washington shore and Cascades Island. The spillway, consisting of 18 gates, each 50 ft wide, is located between Bradford and Cascades Island, spanning the north channel. The spill gates are raised to allow excess river flow to pass under them at a depth of about 50 ft below the upstream water surface. Spill gates are typically raised 1 to 7 ft to facilitate downstream migration of juvenile salmonids. The total hydraulic capacity of both the B1 and B2 is 288,000 cfs. B1 has a rated generating capacity of 612 MW at full forebay. Hydraulic capacity of the spillway is 1,600,000 cfs. An outfall sluice chute is located on the south side of B2 (Figure 1-1). The present study was conducted at this sluice during a period of high tailwater (12 through 18 June 2000) and low tailwater (28 September through 6 October 2000).

## 1.3 Entry Velocity

The hydraulic conditions at the B2 sluice and tailrace area during the conduct of the high and low tailwater tests are presented in Table 1-1 and Appendix A. Tailrace elevation at the B2 outfall ranged from 16.4 to 23.2 ft with a mean of 19.7 during the high tailwater fish releases. The tailrace was approximately 10 ft lower (7.9 to 11.3 ft, mean 10.2 ft) during the low tailwater fall test.

The 1,000 cfs discharge rate through the sluice remained nearly constant for all fish releases by adjusting the depth of the sluice gate opening to the forebay elevation. The approximate 2,500 cfs discharge rate was achieved by fully opening the sluice gate and the actual flow depended on the forebay elevation. The high discharge rate ranged from 2,150 to 2,570 cfs, mean 2,400 cfs in the spring and 2,280 to 2,800 cfs, mean 2,480 cfs in the fall (Table 1-1).

The entry velocity of the outfall jet when it intercepted the receiving water varied depending on the tailrace elevation and the sluice discharge rate. Table 1-2 and Appendix A presents outfall jet entry velocities determined by theoretical calculations and 1:30 model measurements for both the spring and fall tests. The mean entry velocity during the high tailwater tests was 31 and 37 ft/sec at the low and high discharge rates, respectively. Maximum respective entry velocities were 33 and 40 ft/sec. The lower tailwater elevation in the fall resulted in higher mean entry velocities of 40 and 45 ft/sec for the 1,000 and approximate 2,500 cfs discharge rates. The maximum entry velocities were 42 and 48 ft/sec, respectively.

## 2.0 STUDY DESIGN

There are two primary components of the overall effects on fish using any exit route: direct and indirect effects. Direct effects are manifested immediately after passage (*e.g.*, instantaneous fish mortality, injury, loss of equilibrium); indirect effects (*e.g.*, predation, disease, physiological stress) may occur over an extended period or distance after passage. The most straightforward approach to estimating the direct effects of passage is to introduce a known number of marked live fish into a passage route, recapture them immediately after passage, enumerate the live and dead fish, and carefully examine the condition of each fish. The present study was designed to estimate the direct effects of passage through the B2 outfall sluice. Thus, the sample size calculations discussed below refer to the number of fish needed for estimating direct passage survival within a prespecified precision (ε) level.

### 2.1 Sample Size Requirements

Prior to initiating the fish survival investigation at the B2 sluice, the sample size requirement to obtain a high level of precision on the survival estimates was determined. The desired precision (ε) was to be ≤± 0.035, 90% of the time (α) on the individual estimates of passage survival ( $\hat{\tau}$ ). The treatments were two outfall flow rates (1,000 and approximately 2,500 cfs) during both the high and low tailwater periods.

The sample size is a function of the recapture rate ($P_A$), expected passage survival ( $\hat{\tau}$ ) or mortality ($1-\hat{\tau}$), survival of control fish (S), and the desired precision (ε) at a given probability of significance (α). In general, sample size requirements decrease with an increase in control survival and recapture rates. Only precision (ε) and α levels can be strictly controlled by an investigator. The expression to calculate sample sizes for achieving a specified precision (ε) level is given in Normandeau Associates *et al.* (1996a).

#### 2.1.1 Precision (ε) of Survival Estimate

Based on results of numerous balloon tag studies at spillways and sluices at other sites on the Columbia and Snake rivers (Table 2-1) we expected a recapture rate of 0.98, control survival rate (S) of 0.99, and passage survival ( $\hat{\tau}$ ) of 0.97 may be achievable. Based on these values, the prespecified precision (ε) level of ≤±0.035, 90% of the time should be achievable by releasing 388 fish (194 treatment and 194 controls) for each treatment condition (Table 2-2). Past experience has also shown a single control can be paired with two treatment conditions and that the sample sizes can be adjusted as a study progresses because the results are available daily. If recapture and control survival rates are higher than initially assumed, sample size can be reduced. Conversely, if the values of these parameters are lower than initially assumed, then sample size can be increased to achieve the prespecified statistical precision.

### 2.2 Source of Specimens

The investigation utilized juvenile chinook salmon. The fish for the high tailwater test were obtained from the Carson National Fish Hatchery, Washington and the low tailwater test fish were obtained from Lewis River Fish Hatchery, Washington (Table 2-3). A truck transported the fish to the raceways at the

Fingerling Engineering and Research Laboratory at B2. Each raceway was supplied continuously with ambient river water. Fish were held for a minimum of 24 h prior to tagging to acclimate them to ambient river conditions. Ambient river temperature during the high and low tailwater releases ranged from 13.5 to 16.0°C (56.3 to 60.8°F) and 15.5 to 17.5°C (60.0 to 63.5°F), respectively.

Individual treatment and control fish on any given day were drawn non-selectively from a supply tank, thereby assuring that both groups were of similar size and condition. Figures 2-1 and 2-2 shows the length frequency distribution of fish used in the experiment. Treatment fish length averaged 160 and 178 mm for the high and low tailwater evaluations, respectively. The average total lengths of control fish for both evaluations were virtually identical to the treatment (160 mm for the high tailwater tests, 177 mm for the low tailwater tests). The length of the fish released ranged from 138 to 200 mm and 135 to 202 mm for the high and low tailwater tests, respectively.

Groups of 5 to 10 fish were taken from holding tanks to the adjacent tagging site with a water-sanctuary-equipped net. Fish displaying abnormal behavior, severe injury, fungal infection, or descaling (>20% per side) were not used. The same fish selection criteria were applied to both the treatment and control group transports. During the low tailwater tests, fish in two of the five transports from the hatchery (fish lots F1 and F4) displayed a greater incidence of scale loss and mucus removal. These factors appeared to contribute to higher mortality prior to testing (Table 2-3).

## 2.3 Tagging and Release

Tagging techniques were identical to those previously used at Bonneville Dam in 1995, 1999, and 2000 and in other passage survival investigations of juvenile salmonids on the Columbia River Basin (RMC and Skalski 1994a,b; RMC *et al.* 1994; Normandeau Associates *et al.* 1995, 1996a,b,c,d,e, 1997, 2000a; Normandeau Associates and Skalski 1998, 1999, 2000a,b). Briefly, while anesthetized in 0.5% MS-222 fish were equipped with two uninflated balloon tags (Heisey *et al.* 1992) and a miniature radio tag (Figure 2-3). A stainless steel pin placed through the musculature beneath the dorsal and adipose fins attached the tags. A miniature radio tag was attached in combination with the dorsal balloon tag. For estimating 48 h survival of each treatment and control fish a uniquely numbered VI tag (Visual Implant, Northwest Marine Technology, Inc., Shaw Island, Washington) was inserted in the postocular tissue. Balloon tagged fish were placed in a covered 20 gal container continually supplied with ambient river water until fully recovered from anesthesia (generally 30 to 45 min, minimum 20 min). After full recovery fish were individually placed into the induction system (Figure 2-3), tags were activated, and the fish was released.

The induction apparatus consisted of a 10,000 gal steel storage tank, a 150 gal steel release tank, and two 8 in pipes (Figure 2-3). Fish were placed into either of two 8 in diameter PVC pipes partially submerged in the release tank. These two pipes interconnected with 8 in diameter pipes from the water storage tank and then traversed most of the sluice channel. Near the end of the sluice channel these pipes connected to smooth-walled steel pipes that were sequentially narrowed down to 6 in, and then to 4 in (Figure 2-4). The head and diameter reduction of the pipes were designed so that the exit velocity of the treatment pipe would approximate the velocity in the sluice and the exit velocity of the control pipe would be less than 30 ft/sec. The treatment pipe location was on the north wall of the chute with the last 4 ft of the pipe 6 in from the bottom and 6 in from the north wall (Figure 2-4). The end of the pipe was even with the end of the sluice channel. This location was chosen to introduce fish in the "periphery" of the discharge jet, the expected area of greatest turbulence, shear forces, and impact velocity. The control release pipe was located adjacent to the outfall pool on its north side (Figures 2-4 and 2-5). The exit of the control pipe was placed as close as possible to the outfall jet entry region without the control fish becoming entrained in the outfall jet. The outfall jet centerline was approximately 15 to 20 ft from the end of the chute at 1,000 cfs discharge and approximately 30 to 40 ft at 2,500 cfs discharge (Figure 2-5). Release of control fish, which were treated identically to treatment fish, accounted for tagging, handling, recapture effects, predation, and induction system effects.

The desired discharge rate of 1,000 or 2,500 cfs was established in the sluice for at least 10 min before fish were released. Groups of 10 fish were released within approximately 3 min and then closing of the sluice was initiated. Depending upon the discharge rate, it was approximately 2 to 4 min before the discharge was curtailed.

## 2.4 Fish Release and Recapture

During high tailwater tests, 250 and 251 treatment fish were released at the low (1,000 cfs) and high (approximately 2,500 cfs) flow discharge rates, respectively (Table 2-4). Two hundred and fifty control fish were also released, divided equally between the two sluice flows. During the low tailwater test in the fall, 348 and 345 treatment fish were released at the low and high flow discharge rates, respectively (Table 2-4). Also, 173 and 174 control fish were released during low and high sluice flows, respectively. An additional 14 treatment and 1 control fish in the spring and 7 treatment and 1 control fish in the fall were released. These fish were replaced because they could not be retrieved from the crevices between the large boulders along the Cascades Island shoreline or they were out of the water when the recapture boats retrieved them from within or near the rip-rap. A total of 75 fish for the spring and fall studies were successfully extricated from the rip-rap and were included in the data set. The extricated fish included 33 fish (19 at 1,000 cfs, 12 at 2,500 cfs, and 2 control fish at 1,000 cfs) from the spring investigation and 42 fish (24 at 1,000 cfs, 16 at 2,500 cfs, and 2 control fish at 2,500 cfs) from the fall investigation. Only one (treatment at 2,500 cfs) of the 33 fish from the spring releases displayed loss of equilibrium. Two (one treatment at 1,000 cfs and one control at 2,500 cfs) of the 42 fish from the fall investigation displayed some bruising when recaptured from within or near the rip-rap shoreline. Although the status of the replaced fish could not be fully evaluated, their condition should have been similar to the fish which were successfully extricated from within or near the rip-rap. Less than 1 of the 23 replaced fish should have been injured if the proportion of injured fish extricated from the rocks is considered representative. The non-recoverable and exposed, entrapped fish were replaced because this is a site-specific feature and should be corrected in any future high flow outfall designs. New high flow outfalls will not be located as close to a shoreline as the existing B2 sluice chute outfall.

Fish were retrieved by one of the three recapture boat crews when the balloon tags buoyed the fish to the surface. Balloon tag inflation time was delayed until after the fish exited the sluice and was partially regulated by the temperature and amount of water injected into the tags. Only crew-members trained in fish handling were used to retrieve tagged fish. Boat crews were notified of the radio tag frequency before releasing each lot of 10 fish. Radio signals were received on a 5-element Yagi antenna coupled to a receiver (Advanced Telemetry Systems, Inc., Isanti, Minnesota). The radio signal transmission enabled the boat crew(s) to follow the movement of each fish after passage and position the boat for quick retrieval when the balloon tag buoyed the fish to the surface. The approximate recapture location of each fish was recorded on a map of the B2 tailrace (Figures 2-6 and 2-7 and Appendix B). Recaptured fish were placed into an on-board holding facility, and a pin puller (modified pliers) removed the tag(s). Each fish was examined for descaling and injuries and assigned codes, if applicable, relative to descriptions presented in Table 2-5. Tagging and data recording personnel were notified via a two-way radio system of each fish's recovery time and condition.

Recaptured alive fish were transferred in 5 gal pails to raceways at the B2 Fingerling Engineering and Research Laboratory to estimate 48 h post passage survival. Both treatment and control fish were held in the same section of a raceway. Raceways were continuously supplied with ambient river water.

## 2.5 Classification of Recaptured Fish

As in previous similar investigations (Normandeau Associates *et al.* 1996a,b,c,d,e; Normandeau Associates and Skalski 1998, 1999, 2000a,b) the immediate post passage status of recaptured fish and recovery of inflated tags dislodged from fish was classified as alive, dead, predation, inflated tag(s) recovered, or unknown. The following criteria have been established to make these designations: (1) alive--recaptured alive and remaining so for 1 h; (2) alive--fish does not surface but radio signals indicate movement patterns typical of emigrating juveniles; (3) dead--recaptured dead or dead within 1 h of release; (4) dead--only inflated tag(s) without fish are recovered and telemetric tracking, or the manner in which inflated tags surfaced, is not indicative of predation; (5) unknown--no fish or dislodged tags are recaptured, or radio signals are received only briefly, and the subsequent status cannot be ascertained; and (6) predation--fish are either observed being preyed upon, the predator is buoyed to the surface, or subsequent radio telemetric tracking indicates predation (*i.e.*, rapid movements of tagged fish in and out of turbulent waters or sudden appearance of fully inflated tags). Preyed upon fish are assumed dead in the calculations.

Evaluation of descaling was based on methods (Basham *et al.* 1982) used for monitoring descaling of salmonids at hydroelectric dams (*i.e.*, each side of fish is divided into five zones). If descaling of approximately 40% occurred in two zones on the same side, the fish was considered descaled.

Mortalities of recaptured fish occurring after 1 h were assigned 48 h post-passage effects although fish were observed at approximately 12 h intervals. All fish that died were necropsied to determine the probable cause of death. Specimens were examined for descaling and injury immediately upon recapture. Injury and descaling were categorized by type, extent, and area of body. Additionally, all specimens alive at 48 h were re-anesthetized and closely examined for injury and descaling. The re-examination of immobilized fish minimizes the need for extensive handling and associated stress upon immediate recapture. The initial examination allows detection of some injuries, such as bleeding and minor bruising that may not be evident after 48 h due to natural healing processes (Normandeau Associates *et al.* 1996a,c).

Injuries were also categorized as minor or major, following procedures established in laboratory studies at Pacific Northwest National Laboratory (PNNL), Richland, Washington (Battelle *et al.* 2000). These are as follows:

> Minor – Injuries that were visible but not life threatening and tended to heal and disappear over the post-exposure observation period. Small bruises (approximately 0.5 cm in diameter) with minor discoloration (most commonly observed at the dorsal insertion of the operculum) were given a minor injury rating because fish quickly recovered from such injuries with no apparent ill effects.
>
> Major - Any injury that resulted in prolonged loss of equilibrium and the more severe injuries that were life threatening or persisted throughout the post-exposure observation were rated major. For example, a large bruise (approximately 0.5 cm in diameter), damage to the spinal column, cuts with visible bleeding, injured eyeballs (bulged, hemorrhaged, or missing), gill damage (inverted gill arches, or tears at the insertions of the gill arches severe enough to result in bleeding), and descaling were placed in major injury category.

### 2.5.1 Assignment of Probable Injury Sources

Recent and ongoing controlled laboratory studies provide probable causative mechanisms of observed fish injuries in the field (Battelle *et al.* 2000). In some instances an injury symptom (*i.e.*, bulging eyes) could be manifested by two different sources (shear or pressure) and accurate delineation of a cause and effect relationship may be difficult (Eicher Associates 1987). Thus, only probable causal mechanisms of injuries were assigned to injured fish recaptured after passing the B2 outfall sluice chute. Detailed injury information on each fish is presented in Appendix C.

## 2.6 Survival Estimation and Data Analysis

Absolute passage survival rates were calculated by adjusting for the control survival. Data from individual trials (see Appendix C) were used in the analysis. A likelihood ratio test was used to determine whether recapture probabilities were similar for alive ($P_A$) and dead ($P_D$) fish (RMC and Skalski 1994a,b). The statistic tested the null hypothesis of the simplified model ($H_O$:$P_A$=$P_D$) versus the alternative of the generalized model ($H_A$:$P_A \neq P_D$). Depending upon the outcome of this analysis the parameters and their associated standard errors were calculated using that model.

Chi-square analyses were performed for homogeneity (P=0.05) between treatment releases with respect to recapture probabilities of alive, dead, and non-recovered fish; a similar analysis was performed for daily control trials. Tests of homogeneity (P=0.05) between individual trials were performed using chi-square analysis.

The 90% confidence intervals on the estimated survival were calculated using the profile likelihood method (Hudson 1971). This profile method constructs confidence intervals without assuming normality for $\hat{\tau}$ and is generally assumed superior to the normal approximations.

The statistical outputs are provided in Appendix D and the disposition of each fish along with the corresponding conditions codes are given in Appendix C. Only summarized information is discussed in the main body of the report.

### 2.7 Sensor Fish

Ninety-one "sensor fish" were also released via the treatment or control pipe at the B2 sluice. The sensor fish is an instrumented package designed to determine exposure histories along a passage route based on measurements of acceleration, pressure, and rate of strain. This instrumented fish was developed by PNNL. The sensor fish were equipped with three balloon tags and a radio tag which facilitated recapture from the tailwater after passage. Results of the sensor fish releases are presented in Battelle *et al.* (2000).

## 3.0 RESULTS

### 3.1 Recapture Locations

Treatment and control fish were not uniformly distribute downstream of the outfall exit during the spring high tailwater test (Figure 2-6 and Appendix B). Control fish recapture locations were concentrated within approximately 600 ft of the sluice exit, while treatment fish were more widely dispersed down river. The dispersion of treatment fish was greatest for the higher discharge rate (2,500 cfs). Approximately 10 to 15% of the treatment fish were recaptured adjacent to, or in, the rip-rap shoreline of Cascades Island, primarily in the back eddy area adjacent to the outfall exit or within 900 ft of the outfall (Figure 2-6 and Appendix B). Treatment fish from the higher discharge had a greater tendency to move towards Cascades Island shoreline. Few control fish were recaptured near the shore.

During the low tailwater (fall) tests most fish from both treatment and control releases were widely dispersed through much of the tailrace from the outfall downstream beyond Cascades Island (Figure 2-7 and Appendix B). There was a minor congregation of fish within 600 ft of the sluice exit and in the vicinity of the Cascades Island shoreline, similar to the spring high tailwater tests. Entrainment in the back eddy area adjacent to the outfall exit was most prominent for the high discharge. Some control fish also moved towards Cascades Island.

The greater downstream dispersion of fish during the low tailwater tests can be partially attributed to different hydraulic conditions (Table 1-1). The tailrace depth and amount of discharge from B2 differed considerably for the high and low tailwater periods. The mean tailrace elevation was 19.7 ft and 10.3 ft during the high and low tailwater tests, respectively. The B2 mean discharge rate was considerably higher in the fall (95.4 kcfs) than in the spring (39.8 kcfs). This higher volume of water in the tailrace during the fall tests appeared to contribute to the greater dispersion of the passed fish.

### 3.2 Recapture Status

All of the 501 treatment fish released for the high tailwater test were recaptured (Table 3-1). All fish were alive with the exception of two released at the low flow. These two fish suffered acute mortality (dead <1 h). All of the 250 control fish were recaptured but one (Table 3-1). Based on radio telemetry, the unrecovered fish was presumed dead. During the 48 h delayed assessment, one, two, and three fish died from the low flow treatment, high flow treatment, and control releases, respectively. Predation of tagged fish was not observed.

All of the 693 treatment fish and all but two of the control fish from the low tailwater test were recaptured (Table 3-2). A stationary radio signal was present on the one unrecovered control fish (assigned dead). The status of the other unrecovered control fish could not be determined (assigned unknown). As in the spring test, predation of tagged fish was not observed.

During the delayed assessment period for the low tailwater test, 13 (0.037) and 18 (0.052) treatment fish died from the low and high flow releases, respectively (Table 3-2). Fifteen (0.043) of the control fish also died. These mortalities appeared to be primarily related to the condition of the fish prior to testing. During the fall, 432 of 2,330 (18.5%) of the fish died during transport or pretest holding compared to 0 of 1,200 fish in the spring (Table 2-3). The fish acquired in the fall exhibited a noticeably higher incidence of patchy scale loss prior to testing.

## 3.3 Retrieval Times

Retrieval times (the time interval between release through the induction system until the fish was retrieved) for high tailwater treatment releases averaged 5.2 min, while low tailwater releases were longer with an average time of 8.3 min. Control recapture times averaged 5.6 and 7.2 min for high and low tailwater releases, respectively (Figures 3-1 and 3-2).

## 3.4 Survival Probabilities

The chi-square test indicated homogeneity (P>0.05) between trials within each group, suggesting data could be pooled. The likelihood ratio test indicated no significant difference (P>0.05) between the reduced ($H_O$:$P_A$=$P_D$) and generalized ($H_A$:$P_A \neq P_D$) model. Thus, survival and its associated standard error was calculated using the $P_A$=$P_D$ model.

The estimated survival probabilities during the high tailwater tests at both flows (1,000 and approximately 2,500 cfs) were at or near 1.00 (Table 3-3). The estimated 1 h survival probability at 1,000 cfs was 0.996 (90% CI=0.985 to 1.007) and at the high flow rate (approximately 2,500 cfs) it was 1.004 (90% CI=0.997 to 1.011).

A slight increase in fish survival occurred at 48 h to 1.004 (90% CI=0.986 to 1.022) and 1.008 (90% CI=0.992 to 1.024) for the two respective flow rates. Because 48 h survival should not be higher than the initial survival, the 48 h survival was established at .0996 and 1.00 for the low and high flow releases, respectively. The prespecified precision level (ε) of ≤±0.035, 90% of the time was met.

The 1 h survival probabilities during the low tailwater tests were 1.003 (90% CI=0.998 to 1.008) at both flows (Table 3-4).

The 48 h survival at 1,000 cfs was 1.009 (90% CI=0.983 to 1.036) while the 48 h survival rate for the 2,500 cfs flow was 0.994 (90% CI=0.966 to 1.022). The prespecified precision level (ε) of ≤±0.035, 90% of the time was met. The 48 h survival rate was established at 1.00 and 0.994 for the low and high flow releases, respectively.

## 3.5 Injury

Incidence of injury, scale loss, or loss of equilibrium, was low at both discharge rates during both the high and low tailwater tests (Table 3-5 and Appendix Tables C-1 and C-2). Only 8 of the 1,194 (0.7%) recaptured treatment fish displayed any visible injuries. Six of 693 (0.9%) of these injured fish were passed during the low tailwater test and the remaining two (2 of 501 or 0.4%) during the high tailwater test. The two injured fish for the high tailwater test were from the 1,000 cfs discharge rate. Injures to four of the six fish from the low tailwater test were classified as major. Injuries to the two fish from the high tailwater test were also classified major. Injuries consisted primarily of scrapes and/or bruises. Only one specimen (low tailwater at high discharge test) had a tearing type injury, which was at its right operculum (Figure 3-3). Two of the 594 (0.3%) control fish recaptured from the receiving waters were injured. These injuries were classified as minor and consisted of small bruises.

Scale loss (considered major if >40% in two of the five zones on either side of a fish) was evident on only a few of the treatment (0.2%) and control (0.5%) fish (Table 3-5 and Appendix Tables C-1 and C-2; Figure 3-3). There was no apparent relationship between scale loss and treatment condition.

A total of 12 treatment fish (1.0%) displayed only loss of equilibrium (Table 3-5 and Appendix Tables C-1 and C-2). All but one of these fish recovered soon after recapture and the loss of equilibrium was classified as minor except for the fish that died. Three (0.5%) of the control fish also displayed temporary loss of equilibrium. Again, there was no apparent relationship between incidence of loss of equilibrium and the different treatment conditions.

### 3.5.1 Probable Source of Injury

The mechanism which contributed to the few visible injuries observed for B2 sluice passed fish appeared to be primarily related to mechanical and or shear forces (Appendix Tables C-1 and C-2). Scrapes could have resulted from contacting structures in the fish release path or the bottom of the tailrace. Bruises have been attributed to either mechanical or shear forces. One fish with a tear at its right operculum likely encountered shear forces (Figure 3-3). This fish was released during the most severe hydraulic conditions tested, high discharge and low tailrace.

## 4.0 DISCUSSION

The tag and recapture methodology should not favor either treatment or control fish. The present study was designed to minimize sampling bias. Effects of the externally attached balloon and radio tags on the condition and survival estimates of fish passed through the B2 sluice should be minimal. Although the fish were not observed exiting the sluice, the release system was designed to allow fish to orient similarly to untagged fish. The stepwise reduction in the diameter of the treatment and control release pipes (from 8 in to 6 in, 6 in to 4 in) gradually exposed the fish to increased water velocity (from 5 ft/sec at the induction point to 30 ft/sec at the exit). The calculated velocity of the sluice ranged from approximately 30 to 40 ft/sec depending on the discharge rate. Additionally, all fish were introduced tail first into the release pipes, reportedly the orientation of emigrating juvenile salmon. The low initial in-pipe velocity and large pipe diameter were sufficient to allow fish to choose its orientation prior to exit.

The balloon tags, particularly when inflated, and radio tag may affect the mobility of small fish and may possibly increase the risk of injury and predation. However, the effects of these factors were minimized by releasing balloon tagged control specimens into the receiving tailwaters in the vicinity of the sluice outfall. None of the 597 control specimens were known to have been preyed upon during the study and only two had minor visible injuries.

The survival estimate from balloon tag evaluations can be conservative because when only inflated, detached balloon tag(s) are recovered the fish is classified as dead. Sluice passed fish experience higher turbulence than controls and have an increased chance of tag dislodgment without receiving passage route induced injury. This phenomenon was not a factor during the present evaluation since none of the balloon tags became dislodged.

Two B2 sluice outfall areas where entrained fish would likely have the greatest chance of injury are at the point where the outfall intercepts the receiving waters (highest shear zone) and where the plume forcefully contacts submerged structures or the river bottom. The external tags should not lessen the chance of potential injury of sluice passed fish at either of these areas, but instead the tags may actually increase the risk of injury since the tagged fish (primarily smaller specimens) are slightly less mobile. Because the tags are neutrally buoyant until inflated, the tagged fish should also have the same opportunity to be carried deep within the water column by the plunging water and thus encounter submerged objects or the river bottom.

Passage through spillbays and bypass outfalls can subject entrained fish to varying hydraulic forces (*e.g.*, turbulence, shear, pressure changes, magnitude of water cushion, variable terminal velocity) potential impact collisions with rock outcrops, abrasive surfaces, obstructions in the flow path, or contact with spill gates (Bell *et al.* 1972, Ruggles and Murray 1983; Heisey *et al.* 1996). Therefore, fish survivability and injury rate may vary depending upon the magnitude of the influence of these factors at each site and also upon the orientation and trajectory of fish (Groves 1972) entering the downstream water.

The low incidence of observed injury (<1%) to fish passed through the B2 sluice is generally lower than that observed for juvenile salmon passed through standard and modified spillbays (Tables 4-1 and 4-2). Some 31% of the balloon tagged fish passed via these spillbays had a very low injury rate of ≤1%. Injury rates of 2 to 5% were observed for 41% of the fish passed during these tests. Although not prevalent, injury rates as high as 6 to 7% were observed at 8% of the spillbay tests. These higher rates all occurred at one dam. This indicates that the conditions tested at the B2 sluice were generally more fish friendly than those found at the spillbays of six large Columbia and Snake River dams.

The incidence of fish injury at sluices or fish bypass systems was examine at only three other sites besides the present B2 sluice tests (Tables 4-1 and 4-2). Single tests were conducted at the Wanapum Dam sluice and Wanapum Dam bypass pipe. The rate of injury for these tests were 2.6% at the sluice (Normandeau Associates *et al.* 1996a) and 0% at the bypass pipe (Normandeau Associates, Inc. and Skalski 2000c). Two separate tests conducted at the Lower Granite Dam surface bypass collector found injury rates of 1.7 and 2.3%, respectively (Normandeau Associates *et al.* 1996e, 2000b).

The fate of fish exiting non-turbine passed fish, such as sluices or spillways, depends upon, to a large extent, whether the fish collides with solid objects and the impact velocity at which the collision occurs.

The virtual absence of injury to B2 sluice passed fish indicates that the jet entry velocity of up to 0 45 ft/sec and the jet impact velocity (not known) at obstructions (boulder, tailrace bottom) encountered by the plunging jet were below threshold levels injurious to entrained fish. Johnson (1970a,b, 1972, cited in Cada *et al.* 1997) reported that no fish mortality occurred when fish entered standing water at ≤58 ft/sec via a submerged jet. However, Bell *et al.* (1972) reported variable mortality occurred where fish struck a solid object at a velocity exceeding 20 ft/sec. The potential detrimental effects of juvenile salmon contacting structures, while in a plunging jet, was observed at spillbays at Rock Island Dam on the Columbia River (Normandeau Associates and Skalski 1998). Fish within a 1,850 cfs surface spill that plunged approximately 25 ft onto a concrete sill had a higher incidence of injury (4.9 versus 1.2%) than fish within a 10,000 cfs surface spill jet that plunged approximately 40 ft into a spill pool. Additionally, the fish that potentially encountered the sill display a higher rate (7 versus 1.2%) of disorientation upon recapture from the tailrace. A subsequent study at the Rock Island Dam spillbay found that fish entrained in a spillbay overflow jet (2,500 cfs discharge) that plunged into a spill pool with a 16 ft deep submerged steel flow deflector were uninjured (Normandeau Associates and Skalski 2000d). The jet plunged approximately 40 ft before intercepting the tailrace.

## 5.0 CONCLUSIONS

The primary objectives of the study were met. Direct passage related survival rates were determined for juvenile salmon passing through the B2 sluice within the prespecified precision (ε) level of ≤±0.035, 90% of the time. The physical condition of virtually all of the fish was also determined within 1 h and 48 h post-passage.

Based on the results of the present field study, the periphery region of the B2 outfall sluice chute, with estimated entry velocities of 31 to 45 ft/sec, inflicts minimal mortality and injury to entrained juvenile salmon. These field tests indicated that a high flow outfall with entry velocities <45 ft/sec should provide safe fish passage, provided other factors such as sufficient tailrace depth, no predator haven, and minimal outfall jet recirculation are also present.

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# TABLES

# FIGURES

# APPENDIX A –

# STATION PARAMETERS

# APPENDIX B –

# RECAPTURE LOCATIONS OF FISH

# APPENDIX C –

# FISH INJURY DATA, INDIVIDUAL TRIAL DATA, AND INDIVIDUAL FISH DISPOSITION DATA AND ASSOCIATED CONDITION CODES

# APPENDIX D -

# DERIVATION OF PRECISION, SAMPLE SIZE, MAXIMUM LIKELIHOOD PARAMETERS, AND STATISTICAL OUTPUTS

## DERIVATION OF PRECISION, SAMPLE SIZE, AND MAXIMUM LIKELIHOOD PARAMETERS

The estimation for the likelihood model parameters and sample size requirements discussed in the text are given herein. Additionally, the results of statistical analyses for evaluating homogeneity in recapture and survival probabilities, and in testing hypotheses of equality in parameter estimates under the simplified ($H_O$:$P_A$=$P_D$) versus the most generalized model ($H_A$:$P_A \neq P_D$) are given. The following terms were defined for the equations and likelihood functions which follow:

| | | |
|---|---|---|
| $R_C$ | = | Number of control fish released |
| $R_T$ | = | Number of treatment fish released |
| R | = | $R_C$=$R_T$ |
| n | = | Number of replicate estimates of $\hat{\tau}_i$ ($i$=1,…,n) |
| $a_C$ | = | Number of control fish recaptured alive |
| $d_C$ | = | Number of control fish recaptured dead |
| $a_T$ | = | Number of treatment fish recaptured alive |
| $d_T$ | = | Number of treatment fish recaptured dead |
| S | = | Probability fish survive from the release point of the controls to recapture |
| $P_A$ | = | Probability a live fish is recaptured |
| $P_D$ | = | Probability a dead fish is recaptured |
| $\hat{\tau}$ | = | Probability a treatment fish survives to the point of the control releases (*i.e.*, passage survival) |
| $1-\hat{\tau}$ | = | Passage-related mortality. |

The precision of the estimate was defined (RMC *et al.* 1994) as:

$$P(-\varepsilon < \hat{\tau} - \tau < \varepsilon) = 1 - \alpha$$

or equivalently

$$P(-\varepsilon <| \hat{\tau} - \tau |< \varepsilon) = 1 - \alpha$$

where the absolute errors in estimation, *i.e.*, $|\hat{\tau} - \tau|$, is <ε (1-α) 100% of the time, $\hat{\tau}$ is the estimated passage survival, and ε is the half-width of a (1-α) 100% confidence interval for $\hat{\tau}$ or 1-$\hat{\tau}$. A precision of ±5%, 90% of the time is expressed as P($|\hat{\tau} - \tau|$<0.05)=0.90.

Using the above precision definition the required total sample size (R) is as follows:

$$P\left(\frac{-\varepsilon}{Var(\hat{\tau})} < Z < \frac{\varepsilon}{Var(\hat{\tau})}\right) = 1 - \alpha$$

$$P\left(Z < \frac{-\varepsilon}{Var(\hat{\tau})}\right) = \alpha / 2$$

$$\Phi\left(\frac{-\varepsilon}{Var(\hat{\tau})}\right) = \alpha/2$$

$$\frac{-\varepsilon}{Var(\hat{\tau})} = Z_{\alpha/2}$$

$$Var(\hat{\tau}) = \frac{\varepsilon^2}{Z^2_{1-\frac{\alpha}{2}}}$$

$$\frac{\tau}{SP_A}\left[\frac{(1-S\tau P_A)}{R_T} + \frac{(1-SP_A)\tau}{R_C}\right] = \frac{\varepsilon^2}{Z^2_{1-\frac{\alpha}{2}}} \ .$$

where Z is a standard normal deviate satisfying the relationship $P(Z>Z_{1-\alpha/2})=\alpha/2$, and $\Phi$ is the cumulative distribution function for a standard normal deviate.

If data can be pooled across trials and letting $R_C=R_T=R$, the sample size for each release is

$$R = \frac{\tau}{SP_A}\left[1+\tau-2S\tau P_A\right]\frac{Z^2_{1-\alpha/2}}{\varepsilon^2} \ .$$

By rearranging, this equation can be solved to predetermine the anticipated precision given the available number of fish for a study.

If data cannot be pooled across trials the precision is based on (Skalski 1992)

$$\sum_{i=1}^{n}(1-\hat{\tau}_i)/n = 1-\sum_{i=1}^{n}\hat{\tau}_i/n = 1-\bar{\hat{\tau}} \ .$$

Precision is defined as

$$P(|\bar{\hat{\tau}}-\bar{\tau}|<\varepsilon) = 1-\alpha$$

$$P(-\varepsilon < \bar{\hat{\tau}}-\bar{\tau}|<\varepsilon) = 1-\alpha$$

$$P\left(\frac{-\varepsilon}{\sqrt{Var(\bar{\hat{\tau}})}} < \tau_{n-1} < \frac{\varepsilon}{\sqrt{Var(\bar{\hat{\tau}})}}\right) = 1-\alpha$$

$$P\left(\tau_{n-1} < \frac{-\varepsilon}{\sqrt{Var(\bar{\hat{\tau}})}}\right) = \alpha / 2$$

$$\frac{\Phi}{\tau}\left(\frac{-\varepsilon}{Var(\bar{\hat{\tau}})}\right) = \alpha / 2$$

$$\frac{-\varepsilon}{\sqrt{Var(\bar{\hat{\tau}})}} = t_{\alpha/2,n-1}$$

$$Var(\bar{\hat{\tau}}) = \frac{\varepsilon^2}{t^2_{1-\alpha/2,n-1}}$$

$$\frac{\sigma_\tau^2 + \frac{\tau}{SP_A}\left[\frac{(1-S\tau P_A)}{R_T} + \frac{(1-SP_A)^\tau}{R_C}\right]}{n} = \frac{\varepsilon^2}{t_{1-\alpha/2,n-1}}$$

where $\sigma_\tau^2$=natural variation in passage-related mortality.

Now letting $R_T$=$R_C$

$$\frac{\sigma_\tau^2 + \frac{\tau}{SP_A}\left[\frac{(1-S\tau P_A)}{R} + \frac{(1-SP_A)^\tau}{R}\right]}{n} = \frac{\varepsilon^2}{t_{1-\alpha/2,n-1}}$$

which must be iteratively solved for n given R. Or R given n where

$$R = \frac{\frac{\tau}{SP_A}\left[(1-S\tau P_A) + (1-SP_A)\tau\right]}{\left[\frac{n\varepsilon^2}{t^2_{1-\alpha/2,n-1}} - \sigma_\tau^2\right]}$$

$$R = \frac{\frac{\tau(1+\tau)}{SP_A}}{\left[\frac{n\varepsilon^2}{t^2_{1-\alpha/2,n-1}} - \sigma_\tau^2\right]}$$

$$R = \frac{\tau(1+\tau)}{SP_A}\left[\frac{t^2_{1-\alpha/2,n-1}}{n\varepsilon^2 - \sigma^2_\tau t^2_{1-\alpha/2,n-1}}\right].$$

The joint likelihood for the passage-related mortality is:

$$L\,(S,\ \tau,\ P_A,\ P_D \mid R_C,\ R_T,\ a_C,\ a_T,\ d_C,\ d_T) =$$

$$\binom{R_C}{a_c d_C}(SP_A)^{a_C}((1-S)P_D)^{d_C}(1-SP_A-(1-S)P_D)^{R_C-a_C-d_C}$$

$$\times\binom{R_T}{a_T d_T}(S\tau P_A)^{a_T}((1-S\tau)P_D)^{d_T}(1-S\tau P_A-(1-S\tau)P_D)^{R_T-a_T-d_T}\ .$$

The likelihood model is based on the following assumptions: (1) fate of each fish is independent, (2) the control and treatment fish come from the same population of inference and share that same survival probability, (3) all alive fish have the same probability, $P_A$, of recapture, (4) all dead fish have the same probability, $P_D$, of recapture, and (5) passage survival ($\tau$) and survival (S) to the recapture point are conditionally independent. The likelihood model has four parameters ($P_A$, $P_D$, S, $\tau$) and four minimum sufficient statistics ($a_C$, $d_C$, $a_T$, $d_T$).

Because any two treatment releases were made concurrently with a single shared control group we used the likelihood model which took into account dependencies within the study design (Normandeau Associates *et al.* 1995). For any two treatment groups (denoted $T_1$ and $T_2$), the likelihood model is as follows:

$$L(S,\tau_1,\tau_2,P_A,P_D \mid R_C,R_{T_1},R_{T_2},a_C,d_c,a_{T_1},d_{T_1},a_{T_2},d_{T_2}) =$$

$$\binom{R_C}{a_c d_C}(SP_A)^{a_C}((1-S)P_D)^{d_C}(1-SP_A-(1-S)P_D)^{R_C-a_C-d_C}$$

$$\times\binom{R_{T_1}}{a_{T_1} d_{T_1}}(S\tau_1 P_A)^{a_{T_1}}((1-S\tau_1)P_D)^{d_{T_1}}(1-S\tau_1 P_A-(1-S\tau_1)P_D)^{R_{T_1}-a_{T_1}-d_{T_1}}$$

$$\times\binom{R_{T_2}}{a_{T_2} d_{T_2}}(S\tau_2 P_A)^{a_{T_2}}((1-S\tau_2)P_D)^{d_{T_2}}(1-S\tau_2 P_A-(1-S\tau_2)P_D)^{R_{T_2}-a_{T_2}-d_{T_2}}\ .$$

This likelihood model has the same assumptions as stated in RMC and Skalski (1994a,b) and RMC *et al.* (1994) but has five estimable parameters (S, $\tau_1$, $\tau_2$, $P_A$, and $P_D$). The survival rate for treatment $T_1$ is estimated by $\tau_1$ and for treatment $T_2$, by $\tau_2$. A likelihood ratio test with 1 degree of freedom was used to test for equality in survival rates between treatments $\tau_1$ and $\tau_2$ based on the hypothesis $H_O$: $\tau_1 = \tau_2$ versus $H_a$: $\tau_1 \neq \tau_2$.

Likelihood models are based on the following assumptions: (a) the fate of each fish is independent; (b) the control and treatment fish come from the same population of inference and share the same natural survival probability, S; (c) all alive fish have the same probability, $P_A$, of recapture; (d) all dead fish have the same probability, $P_D$, of recapture; and (e) passage survival ($\tau$) and natural survival (S) to the recapture point are conditionally independent.

The estimators associated with the likelihood model are:

$$\hat{\tau} = \frac{a_T R_C}{R_T a_C}$$

$$\hat{S} = \frac{R_T d_C a_C - R_C d_T a_C}{R_C d_C a_T - R_C d_T a_C}$$

$$\hat{P}_A = \frac{d_C a_T - d_T a_C}{R_T d_C - R_C d_T}$$

$$\hat{P}_D = \frac{d_C a_T - d_T a_C}{R_C a_T - R_T a_C} \; .$$

The variance (Var) and standard error (SE) of the estimated passage mortality ($1 - \hat{\tau}$) or survival ($\hat{\tau}$) are:

$$Var(1-\hat{\tau}) = Var(\hat{\tau}) = \frac{\hat{\tau}}{SP_A}\left[\frac{(1-S\hat{\tau}P_{A)}}{R_T} + \frac{(1-SP_A)\hat{\tau}}{R_C}\right]$$

$$SE(1-\hat{\tau}) = SE(\hat{\tau}) = \sqrt{Var(1-\hat{\tau})} \; .$$

## DERIVATION OF VARIANCE FOR WEIGHTED AVERAGE SURVIVAL ESTIMATE

$$Var(1-\hat{\tau}_w) = Var\left[\frac{\sum(1-\hat{\tau}_i)\frac{1}{Var_i}}{\sum\frac{1}{Var_i}}\right]$$

$$= Var\frac{\left[\sum(1-\hat{\tau}_i)\frac{1}{Var_i}\right]}{\left(\sum\frac{1}{Var_i}\right)^2}$$

$$= \frac{\sum Var(1-\hat{\tau}_i)\frac{1}{(Var_{i^2})}}{\left(\sum\frac{1}{Var_i}\right)^2}$$

$$= \frac{\sum Var_i \left( \frac{1}{Var_i} \right)^2}{\left( \sum \frac{1}{Var_i} \right)^2}$$

$$= \frac{\sum \frac{1}{Var_i}}{\left( \sum \frac{1}{Var_i} \right)^2}$$

$$Var(1 - \hat{\tau}_w) = \frac{1}{\sum_{i=1}^{n} \left( \frac{1}{Var(\hat{\tau}_i)} \right)} \ .$$

# Passage Survival Investigation of Juvenile Chinook Salmon Through Bonneville Powerhouse II Bypass Sluice at Two Tailwater Conditions Columbia River, Washington

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**APRIL 2001**

| **File/Folder Name** | **Description** | **File Type** |
|---|---|---|
| 18309.finalrpt.doc | Report text | MSWord (Office 97) |
| 18309.finalrpt.xls | Report tables; appendix tables A-1, A-2, A-3, C-1, C-2, C-3, C-4 | MSExcel (Office 97) |
| Appendix table c5.txt | Appendix table C-5 | General text file (open with NotePad/WordPad) |
| *Report Figures (folder)* | | |
| 18309.finalrpt.cdr | Figures 1-1, 2-3, 2-4, 2-5, 3-3 | Corel Draw (Version 7) |
| Fig2-1.doc | Figure 2-1 | MSWord (Office 97) |
| Fig2-2.doc | Figure 2-2 | MSWord (Office 97) |
| Fig2-6.cpt | Figure 2-6 | Corel PhotoPaint (Version 7/8/9) |
| Fig2-7.cpt | Figure 2-7 | Corel PhotoPaint (Version 7/8/9) |
| Fig3-1.doc | Figure 3-1 | MSWord (Office 97) |
| Fig3-2.doc | Figure 3-2 | MSWord (Office 97) |
| *Appendix B (folder)* | | |
| *.cpt files (13 total) | GPS fish location maps | Corel PhotoPaint (Version 7/8/9) |
| *Appendix D (folder)* | | |
| BonHi1h.doc | Statistical output (high flow, 1 h) | MSWord (Office 97) |
| BonHi48h.doc | Statistical output (high flow, 48 h) | MSWord (Office 97) |
| BonLow1h.doc | Statistical output (low flow, 1 h) | MSWord (Office 97) |
| BonLow48h.doc | Statistical output (low flow, 48 h) | MSWord (Office 97) |

Forty-eight hour survival estimates for juvenile chinook salmon passed through the Bonneville powerhouse sluice at 1,000 and 2,500 cfs, September 28 - October 6, 2000.

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**RESULTS FOR FULL MODEL (UNEQUAL LIVE/DEAD RECOVERY)**

| | estim. | std.err. | |
|---|---|---|---|
| S1 = | 0.9510 | (0.0116) | Control group survival |
| Pa = | 1.0 | N/A | Live recovery probability* |
| Pd = | 0.9792 | (0.0206) | Dead recovery probability |
| S2 = | 0.9626 | (0.0102) | 1000 cfs survival |
| S3 = | 0.9478 | (0.0120) | 2500 cfs survival |

* -- Because of contraints in the data set, this probability is assumed equal to 1.0; not estimated.

log-likelihood : -198.8788

Tau = 1.0122 (0.0163) 1000 cfs/Control ratio
Tau = 0.9967 (0.0175) 2500 cfs/Control ratio

Z statistic for the equality of equal turbine survivals: 0.6513

Compare with quantiles of the normal distribution:

| | 1-tailed | 2-tailed |
|---|---|---|
| For significance level 0.10: | 1.2816 | 1.6449 |
| For significance level 0.05: | 1.6449 | 1.9600 |
| For significance level 0.01: | 2.3263 | 2.5758 |

Variance-Covariance matrix for estimated probabilities:

| | | | | |
|---|---|---|---|---|
| 0.00013427 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| 0.00000000 | 0.00000000 | 0.00042499 | 0.00000000 | 0.00000000 |
| 0.00000000 | 0.00000000 | 0.00000000 | 0.00010334 | 0.00000000 |
| 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00014334 |

Confidence intervals:

| | 1000 cfs Tau | 2500 cfs Tau |
|---|---|---|
| 90 percent: | (0.9854, 1.0391) | (0.9679, 1.0254) |
| 95 percent: | (0.9802, 1.0442) | (0.9624, 1.0309) |
| 99 percent: | (0.9702, 1.0543) | (0.9516, 1.0417) |

Forty-eight hour survival estimates for juvenile chinook salmon passed through the Bonneville powerhouse sluice at 1,000 and 2,500 cfs, September 28 - October 6, 2000.

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**RESULTS FOR REDUCED MODEL (EQUAL LIVE/DEAD RECOVERY)**

| | estim. | std.err. | |
|---|---|---|---|
| S1 = | 0.9538 | (0.0113) | Control group survival |
| Pa = Pd | 0.9990 | (0.0010) | Recovery probability |
| S2 = | 0.9626 | (0.0102) | 1000 cfs survival |
| S3 = | 0.9478 | (0.0120) | 2500 cfs survival |

* -- Because of contraints in the data set, this probability is assumed equal to 1.0; not estimated.

log-likelihood : -198.9199

| | | | |
|---|---|---|---|
| Tau = | 1.0093 | (0.0160) | 1000 cfs/Control ratio |
| Tau = | 0.9938 | (0.0172) | 2500 cfs/Control ratio |

Z statistic for the equality of equal turbine survivals: 0.6611

Compare with quantiles of the normal distribution:

| | 1-tailed | 2-tailed |
|---|---|---|
| For significance level 0.10: | 1.2816 | 1.6449 |
| For significance level 0.05: | 1.6449 | 1.9600 |
| For significance level 0.01: | 2.3263 | 2.5758 |

Variance-Covariance matrix for estimated probabilities:

| | | | |
|---|---|---|---|
| 0.00012747 | 0.00000000 | 0.00000000 | 0.00000000 |
| 0.00000000 | 0.00000092 | 0.00000000 | 0.00000000 |
| 0.00000000 | 0.00000000 | 0.00010334 | 0.00000000 |
| 0.00000000 | 0.00000000 | 0.00000000 | 0.00014334 |

Confidence intervals:

| | 1000 cfs Tau | 2500 cfs Tau |
|---|---|---|
| 90 percent: | (0.9830, 1.0357) | (0.9655, 1.0221) |
| 95 percent: | (0.9779, 1.0407) | (0.9601, 1.0275) |
| 99 percent: | (0.9681, 1.0505) | (0.9495, 1.0381) |

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Likelihood ratio statistic for equality of recovery probabilities: 0.0822

Compare with quantiles of the chi-squared distribution with 1 d.f.:

For significance level 0.10: 2.706
For significance level 0.05: 3.841
For significance level 0.01: 6.635

One hour survival estimates for juvenile chinook salmon passed through the Bonneville powerhouse sluice at 1,000 and 2,500 cfs, June 12 -18, 2000.

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**RESULTS FOR FULL MODEL (UNEQUAL LIVE/DEAD RECOVERY)**

| | estim. | std.err. | |
|---|---|---|---|
| S1 = | 0.9960 | (0.0040) | Control group survival |
| Pa = | 1.0 | N/A | Live recovery probability* |
| Pd = | 0.9999 | (0.0053) | Dead recovery probability |
| S2 = | 1.0 | N/A | 2,500 cfs spill survival* |
| S3 = | 0.9920 | (0.0056) | 1,000 cfs spill survival |

* -- Because of contraints in the data set, this probability is assumed equal to 1.0; not estimated.

log-likelihood : -18.1683

Tau = 1.0040 (0.0040) 2,500 cfs spill/Control ratio
Tau = 0.9960 (0.0069) 1,000 cfs spill/Control ratio

Z statistic for the equality of equal turbine survivals: 1.0030

Compare with quantiles of the normal distribution:

| | 1-tailed | 2-tailed |
|---|---|---|
| For significance level 0.10: | 1.2816 | 1.6449 |
| For significance level 0.05: | 1.6449 | 1.9600 |
| For significance level 0.01: | 2.3263 | 2.5758 |

Variance-Covariance matrix for estimated probabilities:

| | | | | |
|---|---|---|---|---|
| 0.00001594 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| 0.00000000 | 0.00000000 | 0.00002818 | 0.00000000 | 0.00000000 |
| 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00003174 |

Confidence intervals:

| | 2,500 cfs spill Tau | 1,000 cfs spill Tau |
|---|---|---|
| 90 percent: | (0.9974, 1.0106) | (0.9846, 1.0074) |
| 95 percent: | (0.9961, 1.0119) | (0.9824, 1.0096) |
| 99 percent: | (0.9937, 1.0144) | (0.9782, 1.0138) |

One hour survival estimates for juvenile chinook salmon passed through the Bonneville powerhouse sluice at 1,000 and 2,500 cfs, June 12 -18, 2000.

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**RESULTS FOR REDUCED MODEL (EQUAL LIVE/DEAD RECOVERY)**

| | estim. | std.err. | |
|---|---|---|---|
| S1 = | 0.9960 | (0.0040) | Control group survival |
| Pa = Pd | 1.0 | N/A | Recovery probability* |
| S2 = | 1.0 | N/A | 2,500 cfs spill survival* |
| S3 = | 0.9920 | (0.0056) | 1,000 cfs spill survival |

* -- Because of contraints in the data set, this probability is assumed equal to 1.0; not estimated.

log-likelihood : -18.1681

Tau = 1.0040 (0.0040) 2,500 cfs spill/Control ratio
Tau = 0.9960 (0.0069) 1,000 cfs spill/Control ratio

Z statistic for the equality of equal turbine survivals: 1.0031

Compare with quantiles of the normal distribution:

| | 1-tailed | 2-tailed |
|---|---|---|
| For significance level 0.10: | 1.2816 | 1.6449 |
| For significance level 0.05: | 1.6449 | 1.9600 |
| For significance level 0.01: | 2.3263 | 2.5758 |

Variance-Covariance matrix for estimated probabilities:

| | | | |
|---|---|---|---|
| 0.00001594 | 0.00000000 | 0.00000000 | 0.00000000 |
| 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| 0.00000000 | 0.00000000 | 0.00000000 | 0.00003175 |

Confidence intervals:

| | 2,500 cfs spill Tau | 1,000 cfs spill Tau |
|---|---|---|
| 90 percent: | (0.9974, 1.0106) | (0.9846, 1.0074) |
| 95 percent: | (0.9961, 1.0119) | (0.9824, 1.0096) |
| 99 percent: | (0.9937, 1.0144) | (0.9782, 1.0138) |

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Likelihood ratio statistic for equality of recovery probabilities: -0.0005

Compare with quantiles of the chi-squared distribution with 1 d.f.:
For significance level 0.10: 2.706
For significance level 0.05: 3.841
For significance level 0.01: 6.635

One hour survival estimates for juvenile chinook salmon passed through the Bonneville powerhouse sluice at 1,000 and 2,500 cfs, September 28 - October 6, 2000.

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**RESULTS FOR FULL MODEL (UNEQUAL LIVE/DEAD RECOVERY)**

| | estim. | std.err. | |
|---|---|---|---|
| S1 = | 0.9942 | ( +NAN) | Control group survival |
| Pa = | 1.0 | N/A | Live recovery probability* |
| Pd = | 0.5000 | ( +NAN) | Dead recovery probability |
| S2 = | 1.0 | N/A | 1000 cfs survival* |
| S3 = | 1.0 | N/A | 2500 cfs survival* |

* -- Because of contraints in the data set, this probability is assumed equal to 1.0; not estimated.

log-likelihood : -13.6929

Tau = 1.0058 ( +NAN) 1000 cfs/Control ratio
Tau = 1.0058 ( +NAN) 2500 cfs/Control ratio

Z statistic for the equality of equal turbine survivals: +NAN

Compare with quantiles of the normal distribution:

| | 1-tailed | 2-tailed |
|---|---|---|
| For significance level 0.10: | 1.2816 | 1.6449 |
| For significance level 0.05: | 1.6449 | 1.9600 |
| For significance level 0.01: | 2.3263 | 2.5758 |

Variance-Covariance matrix for estimated probabilities:

| | | | | |
|---|---|---|---|---|
| -0.00003284 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| -0.00001452 | 0.00000000 | -0.00000049 | 0.00000000 | 0.00000000 |
| 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |

Confidence intervals:

| | 1000 cfs Tau | 2500 cfs Tau |
|---|---|---|
| 90 percent: | ( +NAN, +NAN) | ( +NAN, +NAN) |
| 95 percent: | ( +NAN, +NAN) | ( +NAN, +NAN) |
| 99 percent: | ( +NAN, +NAN) | ( +NAN, +NAN) |

One hour survival estimates for juvenile chinook salmon passed through the Bonneville powerhouse sluice at 1,000 and 2,500 cfs, September 28 - October 6, 2000.

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**RESULTS FOR REDUCED MODEL (EQUAL LIVE/DEAD RECOVERY)**

| | estim. | std.err. | |
|---|---|---|---|
| S1 = | 0.9971 | (0.0029) | Control group survival |
| Pa = Pd | 0.9990 | (0.0010) | Recovery probability |
| S2 = | 1.0 | N/A | 1000 cfs survival* |
| S3 = | 1.0 | N/A | 2500 cfs survival* |

* -- Because of contraints in the data set, this probability is assumed equal to 1.0; not estimated.

log-likelihood : -14.7915

Tau = 1.0029 (0.0029) 1000 cfs/Control ratio
Tau = 1.0029 (0.0029) 2500 cfs/Control ratio

Z statistic for the equality of equal turbine survivals: 0.0000

Compare with quantiles of the normal distribution:

| | 1-tailed | 2-tailed |
|---|---|---|
| For significance level 0.10: | 1.2816 | 1.6449 |
| For significance level 0.05: | 1.6449 | 1.9600 |
| For significance level 0.01: | 2.3263 | 2.5758 |

Variance-Covariance matrix for estimated probabilities:

| | | | |
|---|---|---|---|
| 0.00000833 | 0.00000000 | 0.00000000 | 0.00000000 |
| 0.00000000 | 0.00000092 | 0.00000000 | 0.00000000 |
| 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |

Confidence intervals:

| | 1000 cfs Tau | 2500 cfs Tau |
|---|---|---|
| 90 percent: | (0.9981, 1.0077) | (0.9981, 1.0077) |
| 95 percent: | (0.9972, 1.0086) | (0.9972, 1.0086) |
| 99 percent: | (0.9954, 1.0104) | (0.9954, 1.0104) |

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Likelihood ratio statistic for equality of recovery probabilities: 2.1972

Compare with quantiles of the chi-squared distribution with 1 d.f.:
For significance level 0.10: 2.706
For significance level 0.05: 3.841
For significance level 0.01: 6.635

Forty-eight hour survival estimates for juvenile chinook salmon passed through the Bonneville powerhouse sluice at 1,000 and 2,500 cfs,  June 12 -18, 2000.

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**RESULTS FOR FULL MODEL (UNEQUAL LIVE/DEAD RECOVERY)**

```
        estim. std.err.
S1 =    0.9840 ( +NAN)   Control group survival
Pa =    1.0        N/A      Live recovery probability*
Pd =    1.0       N/A      Dead recovery probability*
S2 =    0.9920 (0.0056)   2,500 cfs spill survival
S3 =    0.9880 (0.0069)   1,000 cfs spill survival
```

* --  Because of contraints in the data set, this probability is assumed equal to 1.0; not estimated.

log-likelihood : -48.4157

Tau =    1.0082 (  +NAN)   2,500 cfs spill/Control ratio
Tau =    1.0041 (  +NAN)   1,000 cfs spill/Control ratio

Z statistic for the equality of equal turbine survivals:        +NAN

Compare with quantiles of the normal distribution:

| | 1-tailed | 2-tailed |
|---|---|---|
| For significance level 0.10: | 1.2816 | 1.6449 |
| For significance level 0.05: | 1.6449 | 1.9600 |
| For significance level 0.01: | 2.3263 | 2.5758 |

Variance-Covariance matrix for estimated probabilities:

```
-0.00024787  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00003149  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00004742
```

Confidence intervals:

| | 2,500 cfs spill Tau | 1,000 cfs spill Tau |
|---|---|---|
| 90 percent: | (  +NAN,   +NAN) | (  +NAN,   +NAN) |
| 95 percent: | (  +NAN,   +NAN) | (  +NAN,   +NAN) |
| 99 percent: | (  +NAN,   +NAN) | (  +NAN,   +NAN) |

Forty-eight hour survival estimates for juvenile chinook salmon passed through the Bonneville powerhouse sluice at 1,000 and 2,500 cfs, June 12 -18, 2000.

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**RESULTS FOR REDUCED MODEL (EQUAL LIVE/DEAD RECOVERY)**

| | estim. | std.err. | |
|---|---|---|---|
| S1 = | 0.9840 | (0.0079) | Control group survival |
| Pa = Pd | 1.0 | N/A | Recovery probability* |
| S2 = | 0.9920 | (0.0056) | 2,500 cfs spill survival |
| S3 = | 0.9880 | (0.0069) | 1,000 cfs spill survival |

* -- Because of contraints in the data set, this probability is assumed equal to 1.0; not estimated.

log-likelihood : -48.4156

Tau = 1.0082 (0.0099) 2,500 cfs spill/Control ratio
Tau = 1.0041 (0.0107) 1,000 cfs spill/Control ratio

Z statistic for the equality of equal turbine survivals: 0.2806

Compare with quantiles of the normal distribution:

| | 1-tailed | 2-tailed |
|---|---|---|
| For significance level 0.10: | 1.2816 | 1.6449 |
| For significance level 0.05: | 1.6449 | 1.9600 |
| For significance level 0.01: | 2.3263 | 2.5758 |

Variance-Covariance matrix for estimated probabilities:

| | | | |
|---|---|---|---|
| 0.00006298 | 0.00000000 | 0.00000000 | 0.00000000 |
| 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| 0.00000000 | 0.00000000 | 0.00003149 | 0.00000000 |
| 0.00000000 | 0.00000000 | 0.00000000 | 0.00004742 |

Confidence intervals:

| | 2,500 cfs spill Tau | 1,000 cfs spill Tau |
|---|---|---|
| 90 percent: | (0.9918, 1.0245) | (0.9865, 1.0217) |
| 95 percent: | (0.9887, 1.0276) | (0.9831, 1.0250) |
| 99 percent: | (0.9826, 1.0337) | (0.9765, 1.0316) |

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Likelihood ratio statistic for equality of recovery probabilities: -0.0001

Compare with quantiles of the chi-squared distribution with 1 d.f.:
For significance level 0.10: 2.706
For significance level 0.05: 3.841
For significance level 0.01: 6.635

**Table 1-1**

**Conditions at the Bonneville Powerhouse II sluice chute during fish passage tests, 12 through 18 June (spring) and 28 September through 6 October (fall), 2000.**

| Parameter | Minimum | Maximum | Mean | Median |
|---|---|---|---|---|
| ***Spring*** | | | | |
| Powerhouse II Tailwater Elevation (ft)[a] | 16.4 | 23.2 | 19.7 | 18.7 |
| Powerhouse II Forebay Elevation (ft) | 73.4 | 75.0 | 74.4 | 74.3 |
| Sluice Discharge, 1,000 cfs, (cfs)[b] | 1,000 | 1,000 | 1,000 | 1,000 |
| Sluice Discharge, 2,500 cfs, (cfs)[b] | 2,150 | 2,570 | 2,400 | 2,380 |
| Powerhouse II Discharge (kcfs) | 5.4 | 82.1 | 39.8 | 45.6 |
| Spill Discharge (kcfs) | 71.4 | 109.0 | 89.2 | 87.0 |
| Total Project Discharge (kcfs) | 168.7 | 273.1 | 226.1 | 222.8 |
| ***Fall*** | | | | |
| Powerhouse II Tailwater Elevation (ft)[a] | 7.9 | 11.3 | 10.2 | 10.4 |
| Powerhouse II Forebay Elevation (ft) | 73.9 | 75.8 | 74.7 | 74.7 |
| Sluice Discharge, 1,000 cfs, (cfs)[b] | 1,000 | 1,000 | 1,000 | 1,000 |
| Sluice Discharge, 2,500 cfs, (cfs)[b] | 2,280 | 2,800 | 2,480 | 2,480 |
| Powerhouse II Discharge (kcfs) | 68.6 | 115.5 | 95.4 | 94.1 |
| Spill Discharge (kcfs) | 0.6 | 0.6 | 0.6 | 0.6 |
| Total Project Discharge (kcfs) | 78.3 | 128.3 | 110.9 | 114.0 |

a Measured at staff gauge at Bonneville Powerhouse II sluice chute outlet.

b Calculated from rating curve.

**Table 1-2**

**Entry velocities and energy dissipation rates based on theoretical calculations and 1:30 velocity measurements for hydraulic conditions[1] that existed at the Bonneville Powerhouse II sluice during the spring and fall fish passage tests[2].**

| | Based on Theoretical Calculations | | | Based on 1:30 Model Measurements | | |
|---|---|---|---|---|---|---|
| Outfall Discharge (cfs) | Mean Entry Velocity (fps) | Maximum Entry Velocity (fps) | Maximum Mean Energy Dissipation Rate[3] (ft-lbs/s/ft^3) | Mean Entry Velocity (fps) | Maximum Entry Velocity (fps) | Maximum Mean Energy Dissipation Rate[4] (ft-lbs/s/ft^3) |
| | | | ***Spring*** | | | |
| 1,000 | 30.9 | 33.3 | 301.4 | 30.9 | 33.3 | 154.0 |
| 2,500 | 36.6 | 40.1 | 392.5 | 36.6 | 40.1 | 274.0 |
| | | | ***Fall*** | | | |
| 1,000 | 40.5 | 42.4 | 676.8 | 40.5 | 42.4 | 440.3 |
| 2,500 | 45.0 | 47.8 | 727.4 | 45.0 | 47.8 | 1195.2 |

1 Hydraulic conditions presented in Table 1-1 and Appendix A.

2 Theoretical calculations are based on the assumption of normal flow and a logarithmic velocity profile in the channel. Entry velocities for 1:30 model measurements are the same as theoretical calculations, because theoretical flow depths were set in model.

3 Calculated as jet entry to the tailrace from theoretical equation (Battelle *et al.* 2000).

4 Based on measured velocity profile at a cross-section 12.2-16.2 (40-53 ft) downstream from outfall in 1:30 model.

**Table 2-1**

**Sample size, recapture and control survival rates, and estimated 48 h survival (direct effects) of anadromous fishes in passage through non-turbine exit routes at hydroelectric dams. Estimates based on balloon tag-recapture methodology (Heisey *et al.* 1992).**

| Station | Exit Route | Species | Sample Size | Head (ft) | Test Discharge (cfs) | Recapture Rates (%) Control | Recapture Rates (%) Treatment | Control Survival (%) | Passage Survival (%) | Source |
|---|---|---|---|---|---|---|---|---|---|---|
| Crescent, NY | Spillway | Juvenile herring | 110 | 13 | 40 | 90.0 | 93.6 | 82.1 | 88.3 | Mathur *et al.* (1996) |
| Cabot, MA | Sluice | American shad | 150 | 69 | 225 | 96.0 | 96.0 | 93.9 | 98.3 | NAI (1995) |
| Bellows Falls, VT | Sluice | Atlantic salmon | 100 | 59 | 300 | 99.0 | 95.0 | 100.0 | 96.0 | Heisey *et al.* (1993) |
| Vernon, VT/NH | "Fish tube" (Sluice) | Atlantic salmon | | 27 | 40 | | | | 93.3 | Heisey *et al.* (1996) |
| Wilder, VT | Sluice | Atlantic salmon | 100 | 52 | 200 | 99.0 | 100.0 | 99.0 | 97.0 | Heisey *et al.* (1993) |
| | Sluice | Atlantic salmon | 45 | 52 | 300 | 100.0 | 97.8 | 100.0 | 91.0 | Heisey *et al.* (1993) |
| | Sluice | Atlantic salmon | 100 | 52 | 500 | 99.0 | 99.0 | 99.0 | 97.0 | Heisey *et al.* (1993) |
| Bonneville, WA | Spillway | Chinook salmon | 280 | 60 | 12,000 | 96.1 | 96.8 | 96.1 | 100.0 | NAI *et al.* (1996b) |
| | Spillway[a] | Chinook salmon | 280 | 60 | 12,000 | 96.1 | 99.3 | 96.1 | 100.0 | NAI *et al.* (1996b) |
| The Dalles, WA | Spillway | Chinook salmon | 270 | 81 | 10,500 | 97.0 | 94.1 | 97.0 | 95.5 | NAI *et al.* (1996c) |
| | Spillway[b] | Chinook salmon | 271 | 81 | 10,500 | 97.0 | 97.4 | 97.0 | 99.3 | NAI *et al.* (1996c) |
| | Spillway[b] | Chinook salmon | 210 | 81 | 4,500 | 96.2 | 94.3 | 96.2 | 99.0 | NAI *et al.* (1996c) |
| Wanapum, WA | Sluice | Chinook salmon | 195 | 79 | 2,000 | 100.0 | 97.9 | 100.0 | 97.4 | NAI *et al.* (1996a) |
| | Spillway | Chinook salmon | 235 | 79 | 4,300 | 100.0 | 99.6 | 99.6 | 99.6 | NAI *et al.* (1996a) |
| | Spillway[a] | Chinook salmon | 235 | 79 | 4,300 | 100.0 | 97.9 | 99.6 | 95.7 | NAI *et al.* (1996a) |
| | Spillway[b] | Chinook salmon | 155 | 79 | 2,000 | 100.0 | 97.4 | 100.0 | 92.0 | NAI *et al.* (1996a) |
| | Spillway[b] | Chinook salmon | 160 | 79 | 4,000 | 96.7 | 98.8 | 96.7 | 96.9 | NAI *et al.* (1996a) |
| | Spillway | Chinook salmon | 180 | 82 | 2,800 | 100.0 | 100.0 | 94.5 | 100.0 | NAI and Skalski (1999) |
| | Spillway | Chinook salmon | 244 | 82 | 6,000 | 100.0 | 99.6 | 95.8 | 99.3 | NAI and Skalski (1999) |
| | Spillway | Chinook salmon | 130 | 82 | 11,500 | 98.4 | 99.2 | 94.3 | 94.6 | NAI and Skalski (1999) |
| | Spillway[a] | Chinook salmon | 200 | 82 | 2,800 | 100.0 | 100.0 | 96.5 | 99.0 | NAI and Skalski (1999) |
| | Spillway[a] | Chinook salmon | 199 | 82 | 6,000 | 100.0 | 98.5 | 95.3 | 97.6 | NAI and Skalski (1999) |
| | Spillway[a] | Chinook salmon | 191 | 82 | 11,500 | 98.4 | 96.7 | 94.3 | 92.8 | NAI and Skalski (1999) |
| | Spillway | Chinook salmon | 180 | 82 | 2,800 | 100.0 | 100.0 | 97.5 | 99.4 | NAI and Skalski (2000a) |
| | Spillway | Chinook salmon | 169 | 82 | 6,000 | 100.0 | 100.0 | 95.8 | 97.6 | NAI and Skalski (2000a) |
| | Spillway | Chinook salmon | 198 | 82 | 7,500 | 100.0 | 100.0 | 94.3 | 99.5 | NAI and Skalski (2000a) |
| | Spillway[a] | Chinook salmon | 180 | 82 | 2,800 | 100.0 | 100.0 | 96.5 | 98.3 | NAI and Skalski (2000a) |
| | Spillway[a] | Chinook salmon | 170 | 82 | 6,000 | 100.0 | 98.8 | 95.3 | 98.2 | NAI and Skalski (2000a) |
| | Spillway[a] | Chinook salmon | 210 | 82 | 7,500 | 100.0 | 99.0 | 82.3 | 97.6 | NAI and Skalski (2000a) |
| | Bypass Pipe | Chinook salmon | 500 | 76-80 | 420 | 99.6 | 99.8 | 99.6 | 100.0 | NAI and Skalski (2000c) |
| Lower Granite, WA | Spillway[a] | Chinook salmon | 120 | 90 | 3,400 | 100.0 | 100.0 | 100.0 | 97.5 | NAI *et al.* (1996e) |
| | Surface Bypass Collector[a] | Chinook salmon | 120 | 90 | 3,400 | 100.0 | 99.2 | 100.0 | 95.8 | NAI *et al.* (1996e) |
| | Spillway[a] | Chinook salmon | 130 | 90 | 3,400 | 92.1 | 94.6 | 92.1 | 97.6 | NAI *et al.* (2000b) |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Surface Bypass Collector[a] | Chinook salmon | 133 | 90 | 3,400 | 92.1 | 97.8 | 92.1 | 97.0 | NAI *et al.* (2000b) |

**Table 2-1**

**Continued.**

| Station | Exit Route | Species | Sample Size | Head (ft) | Test Discharge (cfs) | Recapture Rates Control | Recapture Rates Treatment | Control Survival | Survival (%) | Source |
|---|---|---|---|---|---|---|---|---|---|---|
| Little Goose, WA | Spillway | Steelhead | 150 | 90 | 5,600 | 100.0 | 100.0 | 100.0 | 100.0 | NAI *et al.* (1997) |
| | Spillway | Steelhead | 150 | 90 | 9,500 | 100.0 | 100.0 | 100.0 | 100.0 | NAI *et al.* (1997) |
| | Spillway | Steelhead | 100 | 90 | 1,800 | 99.0 | 100.0 | 99.0 | 100.0 | NAI *et al.* (1997) |
| | Spillway[c] | Steelhead | 40 | 90 | 5,600 | 100.0 | 98.0 | 100.0 | 100.0 | NAI *et al.* (1997) |
| | Spillway[c] | Steelhead | 120 | 90 | 9,500 | 100.0 | 99.0 | 100.0 | 98.3 | NAI *et al.* (1997) |
| | Spillway[a] | Steelhead | 150 | 90 | 5,600 | 100.0 | 99.0 | 100.0 | 98.0 | NAI *et al.* (1997) |
| | Spillway[a] | Steelhead | 150 | 90 | 9,500 | 100.0 | 100.0 | 100.0 | 100.0 | NAI *et al.* (1997) |
| | Spillway[a] | Steelhead | 100 | 90 | 1,800 | 99.0 | 100.0 | 99.0 | 99.0 | NAI *et al.* (1997) |
| | Spillway[a,c] | Steelhead | 39 | 90 | 5,600 | 100.0 | 100.0 | 100.0 | 100.0 | NAI *et al.* (1997) |
| | Spillway[a,c] | Steelhead | 120 | 90 | 9,500 | 100.0 | 99.0 | 100.0 | 99.2 | NAI *et al.* (1997) |
| Rock Island, WA | Spillway[b,d] | Chinook salmon | 250 | 41 | 1,850 | NA | 98.0 | NA | 95.1 | NAI and Skalski (1998) |
| | Spillway[b] | Chinook salmon | 250 | 41 | 10,000 | NA | 100.0 | NA | 98.4 | NAI and Skalski (1998) |
| | Spillway[b] | Chinook salmon | 200 | 41-49 | 2,500 | 100.0 | 99.5 | 99.5 | 99.5 | NAI and Skalski (2000b) |
| | Spillway[b] | Chinook salmon | 200 | 41-49 | 10,000 | 100.0 | 100.0 | 99.5 | 99.5 | NAI and Skalski (2000b) |
| | Spillway[a,b,e] | Chinook salmon | 200 | 40-41 | 2,500 | 100.0 | 99.5 | 100.0 | 99.0 | NAI and Skalski (2000d) |
| | Spillway[a,b] | Chinook salmon | 200 | 40-41 | 2,500 | 100.0 | 100.0 | 100.0 | 100.0 | NAI and Skalski (2000d) |

a Spillbay with flow deflector.
b Overflow weir or slot to attract surface oriented juvenile salmonids.
c Fish released into head pond vortices upstream of tainter gates.
d Spill directed onto concrete slab; survival is relative to survival at another spillbay.
e Periphery release.

**Table 2-2**

**Required sample sizes (R) if control survival (S)=1.00, 0.99, or 0.98, recapture rate (P̂)=0.99 or 0.98, and expected survival probability τ) of treatment fish passed through a bypas pipe=0.97 or 0.99 to achieve a precision level ε) of ≤±0.035, 90% of the time.**

| | Expected Passage Survival (τ) | |
|---|---|---|
| **Control Survival (S)** | **0.97** | **0.99** |
| | ***Recapture Rate =0.99*** | |
| 1.00 | 107 | 66 |
| 0.99 | 150 | 110 |
| 0.98 | 194 | 156 |
| | ***Recapture Rate =0.98*** | |
| 1.00 | 150 | 111 |
| 0.99 | 194 | 156 |
| 0.98 | 238 | 201 |

Table 2-3

**Water quality parameters and status of juvenile salmon in holding prior to testing at Bonneville Powerhouse II sluice.**

| Transport Lot Number | Date | Number Transported | Number Died in: Transport | Holding | Dissolved Oxygen (mg/l) in Holding Tanks | Water Temperature (°C) Hatchery | Holding Tanks | Testing Date | Number of Fish Used | Number Culled |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ***High Tailwater (Spring)*** | | | | | |
| S1 | 12 Jun | 1,200 | 0 | 0 | - | | 13.5-16.0* | 12-18 June | ~800 | - |
| | | | | | ***Low Tailwater (Fall)*** | | | | | |
| F1 | 26 Sep | 1,150 | 62 | 128 | 8.5 | 11.8 | - | 28 Sep | 150 | 41 |
| | 27 Sep | | | 118 | 8.5 | | 17.0 | - | - | 0 |
| | 28 Sep | | | 71 | 8.6 | | 17.0 | - | - | 0 |
| | 29 Sep | | | 34 | 8.4 | | 17.0 | - | 25 | 0 |
| | 30 Sep | | | 5 | - | | - | - | - | 0 |
| | 01 Oct | | | 7 | - | | - | - | - | 0 |
| F2 | 27 Sep | 300 | 1 | 1 | 8.5 | 11.8 | 17.0 | 29 Sep | 150 | 14 |
| | 28 Sep | | 0 | | 8.6 | | 17.0 | 30 Sep | 150 | 24 |
| F3 | 30 Sep | 320 | 0 | | 8.6 | 12.3 | 17.0 | 02 Oct | 160 | 12 |
| | 02 Oct | | 0 | | 8.6 | | 17.5 | 03 Oct | 160 | 0 |
| F4 | 02 Oct | 430 | 5 | | 8.4 | 10.5 | 17.0 | 04 Oct | 150 | 40 |
| | 03 Oct | | 0 | | 8.5 | | 15.5 | 05 Oct | 125 | 58 |
| | 04 Oct | | 0 | | 8.8 | | 17.0 | - | 52 | 0 |
| F5 | 04 Oct | 130 | 0 | | 8.9 | 13.7 | 17.0 | 06 Oct | 130 | 5 |

* Ambient river temperature increased from 13.5°C on 12 June to 16.0°C on 18 June.

**Table 2-4**

**Sample size apportionment of juvenile chinook salmon passed through the Bonneville Powerhouse II sluice chute at two discharge rates (1,000 cfs and approximately 2,500 cfs) and two tailwater elevations (high and low), June and September/October 2000.**

| | Treatment | | Control | |
|---|---|---|---|---|
| **Date** | **1,000 cfs** | **2,500 cfs** | **1,000 cfs** | **2,500 cfs** |
| | ***High Tailwater (Spring)*** | | | |
| 12 Jun | 5 | 5 | | 5 |
| 13 Jun | 28 | 29 | 10 | 9 |
| 14 Jun | 52 | 51 | 30 | 31 |
| 15 Jun | 40 | 40 | 20 | 20 |
| 16 Jun | 40 | 38 | 20 | 20 |
| 17 Jun | 40 | 41 | 25 | 20 |
| 18 Jun | 45 | 47 | 20 | 20 |
| *Totals* | *250* [a] | *251* [a] | *125* | *125* [a] |
| | ***Low Tailwater (Fall)*** | | | |
| 28 Sep | 40 | 40 | 18 | 20 |
| 29 Sep | 50 | 50 | 20 | 20 |
| 30 Sep | 39 | 40 | 20 | 20 |
| 02 Oct | 49 | 49 | 30 | 30 |
| 03 Oct | 40 | 39 | 20 | 20 |
| 04 Oct | 50 | 48 | 20 | 29 |
| 05 Oct | 50 | 49 | 30 | 20 |
| 06 Oct | 30 | 30 | 15 | 15 |
| *Totals* | *348* [b] | *345* [b] | *173* | *174* [b] |

a An additional 4 (1,000 cfs) and 10 (2,500 cfs) treatment and 1 control (2,500 cfs) fish replaced that were trapped within the Cascades Island shoreline rip-rap and could not be recaptured or were exposed on the rip-rap.

b An additional 2 (1,000 cfs) and 5 (2,500 cfs) treatment and 1 control (2,500 cfs) fish replaced that were trapped within the Cascades Island shoreline rip-rap and could not be recaptured or were exposed on the rip-rap.

**Table 2-5**

**Condition codes assigned to fish and dislodged balloon tags for fish passage survival evaluation**

**FISH CODES**

| | |
|---|---|
| **A** | No visible marks on fish |
| **B** | Flesh tear at tag site(s) |
| **C** | Minor scale loss, 3 to 20% (%s for entire body in immediate recovery; for detailed injury examination %s are for section only) |
| **D** | Major scale loss, >20% |
| **E** | Laceration(s); tear(s) on body |
| **F** | Severed body parts |
| **G** | Hemorrhaging, bruised |
| **H** | Stressed (lethargic, swimming poorly or sporadically) |
| **I** | Spasmodic movement of body |
| **J** | Very weak, barely gilling, died within 60 minutes of recovery |
| **K** | Failed to enter system |
| **L** | Fish likely preyed on based on telemetry, and/or circumstances relative to Turb'N recapture |
| **M** | Substantial bleeding at tag site |
| **N** | Bulging or missing eye(s) |
| **P** | Observed predator attack or marks indicative of predator |
| **Q** | Other information |
| **R** | Replaced due to unrecoverable conditions I.e. in rocks, recovery time expired |
| **T** | Trapped inside tunnel/gate well |
| **V** | Fins damaged (ripped, split, torn) or pulled from origin |
| **W** | Abrasion/scrape |
| **X** | No recovery information at all; fish remains unrecovered |
| **Z** | Radio telemetry or other information; fish remains unrecovered |

**DISSECTION CODES**

| | |
|---|---|
| **B** | Swim bladder ruptured or expanded |
| **D** | Kidneys damaged (hemorrhaging) |
| **E** | Broken bones obvious |
| **F** | Hemorrhaging internally |
| **L** | Organ displacement |
| **N** | Heart damage, ruptured, hemorrhaging, etc. |
| **O** | Liver damage, ruptured, hemorrhaging, etc. |
| **R** | Necropsied, no obvious injuries |
| **S** | Necropsied, internal injuries observed |
| **W** | Head removed, i.e., otolith |

**TURB'N TAG CODES (not used in database)**

| | |
|---|---|
| **A** | Fully inflated |
| **B** | Partially inflated |
| **C** | Pinhole, leaking |
| **D** | Burst |
| **E** | Not inflated at all |

**Table 3-1**

**Tag-recapture data on chinook salmon smolt passed through the Bonneville Powerhouse II sluice chute at two discharge rates (1,000 cfs and approximately 2,500 cfs) at high tailwater, June 2000. Proportions are given in parentheses.**

| | Sluice Chute (Treatment) | | |
|---|---|---|---|
| | 1,000 cfs | 2,250-2,550 cfs | Control |
| Number released | 250 | 251 | 250 |
| Number recaptured alive | 248 (0.992) | 251 (1.000) | 249 (0.996) |
| Number recaptured dead | 2 (0.008) | 0 (0.000) | 0 (0.000) |
| Number assigned deac[a] | 0 (0.000) | 0 (0.000) | 1 (0.004) |
| Unknown | 0 (0.000) | 0 (0.000) | 0 (0.000) |
| Number held | 248 | 251 | 249 |
| Number alive at 48 h | 247 | 249 | 246 |

[a] Fish assigned dead based on telemetry.

**Table 3-2**

**Tag-recapture data on chinook salmon smolt passed through the Bonneville Powerhouse II sluice chute at two discharge rates (1,000 cfs and approximately 2,500 cfs) at low tailwater, September 28 through October 6, 2000. Proportions are given in parentheses.**

| | Sluice Chute (Treatment) | | Control | |
|---|---|---|---|---|
| | 1,000 cfs | 2,500 cfs | 1,000 cfs | 2,500 cfs |
| Number released | 348 | 345 | 173 | 174 |
| Number recaptured alive | 348 (1.000) | 345 (1.000) | 172 (0.994) | 173 (0.994) |
| Number recaptured dead | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) |
| Number assigned deac[a] | 0 (0.000) | 0 (0.000) | 0 (0.000) | 1 (0.006) |
| Unknown | 0 (0.000) | 0 (0.000) | 1 (0.006) | 0 (0.000) |
| Number held | 348 | 345 | 172 | 173 |
| Number alive at 48 h | 335 | 327 | 164 | 166 |

[a] Fish assigned dead based on telemetry.

**Table 3-3**

**Estimated 1 h and 48 h survival probabilities τ) of juvenile chinook salmon in passage throug the Bonneville Powerhouse II sluice chute at two discharge rates (1,000 cfs and approximately 2,500 cfs) at high tailwater, June 2000.**

| Spill Rate | Survival (τ) | 90% CI |
|---|---|---|
| | ***Immediate (1 h) Survival*** | |
| 1,000 cfs | 0.996 | 0.985-1.007 |
| 2,250-2,550 cfs | 1.004 | 0.997-1.011 |
| | ***48 h Survival*** | |
| 1,000 cfs | 1.004* | 0.986-1.022 |
| 2,250-2,550 cfs | 1.008* | 0.992-1.024 |

* 48 h survival should not exceed 1 h survival rate and truncated at 1.00, therefore 48 h survival rate established at 0.996 and 1.000.

**Table 3-4**

**Estimated 1 h and 48 h survival probabilities τ) of juvenile chinook salmon in passage throug the Bonneville Powerhouse II sluice chute at two discharge rates (1,000 cfs and approximately 2,500 cfs) at low tailwater, September 28 through October 6, 2000.**

| Spill Rate | Survival (τ) | 90% CI |
|---|---|---|
| | ***Immediate (1 h) Survival*** | |
| 1,000 cfs | 1.003 | 0.998-1.008 |
| 2,500 cfs | 1.003 | 0.998-1.008 |
| | ***48 h Survival*** | |
| 1,000 cfs | 1.009* | 0.983-1.036 |
| 2,500 cfs | 0.994 | 0.966-1.022 |

* 48 h survival should not exceed 1 h survival rate and truncated at 1.00, therefore 48 h survival rate established at 1.00.

**Table 3-5**

**Summary of loss of equilibrium, scale loss, and visible injuries to fish passed through Bonneville Dam Powerhouse II sluice during high tailwater tests (June) and low tailwater tests (September/October), 2000. Some fish had multiple injuries.**

| | Number Released | Number Examined | L.O.E.[a] | | Scale Loss[b] | | Visible Injury | | Seriousness of Affliction | | Injury Type | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number | Percent | Number | Percent | Number | Percent | Major | Minor | External Hemorrhage/ Scrape | Cuts/Tears/ Lacerations |
| | | | | | | ***1,000 cfs Discharge*** | | | | | | |
| High tailwater | 250 | 250 | 2 | 0.8 | 0 | 0.0 | 2 | 0.8 | 2 | 2 | 2 | 0 |
| Low tailwater | 348 | 348 | 4 | 1.1 | 1 | 0.3 | 3 | 0.9 | 2 | 6 | 3 | 0 |
| ***Totals*** | ***598*** | ***598*** | ***6*** | ***1.0*** | ***1*** | ***0.2*** | ***5*** | ***0.8*** | ***4*** | ***8*** | ***5*** | ***0*** |
| | | | | | | ***Approximately 2,500 cfs Discharge*** | | | | | | |
| High tailwater | 251 | 251 | 3 | 1.2 | 0 | 0.0 | 0 | 0.0 | 0 | 3 | 0 | 0 |
| Low tailwater | 345 | 345 | 3 | 0.9 | 1 | 0.3 | 3 | 0.9 | 4 | 3 | 2[c] | 1 |
| ***Totals*** | ***596*** | ***596*** | ***6*** | ***1.0*** | ***1*** | ***0.2*** | ***3*** | ***0.5*** | ***4*** | ***6*** | ***2*** | ***1*** |
| | | | | | | ***Controls*** | | | | | | |
| High tailwater | 250 | 249 | 1 | 0.4 | 1 | 0.4 | 0 | 0.0 | 1 | 1 | 0 | 0 |
| Low tailwater | 347 | 345 | 2 | 0.6 | 2 | 0.6 | 2 | 0.6 | 2 | 4 | 2 | 0 |
| ***Totals*** | ***597*** | ***594*** | ***3*** | ***0.5*** | ***3*** | ***0.5*** | ***2*** | ***0.3*** | ***3*** | ***5*** | ***2*** | ***0*** |
| ***GRAND TOTAL*** | ***1,791*** | ***1,788*** | ***15*** | ***0.8*** | ***5*** | ***0.3*** | ***10*** | ***0.6*** | ***11*** | ***19*** | ***9*** | ***1*** |

a - Fish with only loss of equilibrium, no visible internal or external injuries.

b - Fish with only scale loss (>40% in two of five zones on either side of fish), no visible internal or external injuries.

c - One fish also had a hemorrhaged eye.

**Table 4-1**

**Sample size, recapture and control survival rates, estimated 48 h survival (direct effects), and condition (incidence of injury, loss of equilibrium) of juvenile chinook salmon and steelhead (only at Little Goose) in passage through non-turbine exit routes at Columbia and Snake River hydroelectric dams. Estimates based on balloon tag-recapture methodology (Heisey *et al.* 1992).**

| Station | Exit Route | Head (ft) | Spill Volume (cfs) | Sample Size | 48 h Survival (%) | Number Examined | Injured No. (%) | Major Scale Loss No. (%) | Only Loss of Equilibrium No. (%) | Dominant Injury Type (% of injured fish) | Source |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Bonneville, WA | Spillway | 60 | 12,000 | 280 | 100.0 | 271 | 5 (1.8) | 0 (0.0) | 4 (1.5) | Eye damage (80.0) | NAI *et al.* (1996b) |
| | Spillway[a] | 60 | 12,000 | 280 | 100.0 | 278 | 5 (1.8) | 1 (0.4) | 0 (0.0) | Bruised head (40.0) | NAI *et al.* (1996b) |
| The Dalles, WA | Spillway | 81 | 10,500 | 270 | 95.5 | 254 | 5 (2.0) | 0 (0.0) | 3 (1.2) | Damaged/hemorraged eye (80.0) | NAI *et al.* (1996c) |
| | Spillway[b] | 81 | 10,500 | 271 | 99.3 | 264 | 8 (3.0) | 1 (0.4) | 1 (0.4) | Gills scrape/cut/hemorrage (62.5) | NAI *et al.* (1996c) |
| | Spillway[b] | 81 | 4,500 | 210 | 99.0 | 198 | 7 (3.5) | 0 (0.0) | 0 (0.0) | Damaged/hemorraged eye (57.1) | NAI *et al.* (1996c) |
| Wanapum, WA | Sluice | 79 | 2,000 | 195 | 97.4 | 191 | 5 (2.6) | 0 (0.0) | 9 (4.7) | Damaged/hemorraged eye (80.0) | NAI *et al.* (1996a) |
| | Spillway | 79 | 4,300 | 235 | 99.6 | 234 | 15 (6.4) | 0 (0.0) | 2 (0.9) | Damaged/hemorraged eye (53.3) | NAI *et al.* (1996a) |
| | Spillway[a] | 79 | 4,300 | 235 | 95.7 | 230 | 9 (3.9) | 0 (0.0) | 3 (1.3) | Damaged/hemorraged eye (55.6) | NAI *et al.* (1996a) |
| | Spillway[b] | 79 | 2,000 | 155 | 92.0 | 151 | 10 (6.6) | 0 (0.0) | 4 (2.6) | Damaged/hemorraged eye (60.0) | NAI *et al.* (1996a) |
| | Spillway[b] | 79 | 4,000 | 160 | 96.9 | 158 | 11 (7.0) | 0 (0.0) | 4 (2.5) | Damaged/hemorraged eye (72.7) | NAI *et al.* (1996a) |
| | Spillway | 82 | 2,800 | 180 | 100.0 | 180 | 2 (1.1) | 1 (0.6) | 1 (0.6) | Abrsn/tear on operculum (100.0) | NAI and Skalski (1999) |
| | Spillway | 82 | 6,000 | 244 | 99.3 | 243 | 6 (2.5) | 0 (0.0) | 6 (2.5) | Internal injuries (66.7) | NAI and Skalski (1999) |
| | Spillway | 82 | 11,500 | 130 | 94.6 | 129 | 3 (2.3) | 0 (0.0) | 3 (2.3) | Dmg/hmg eye (1), intrnl (1) (33.3) | NAI and Skalski (1999) |
| | Spillway[a] | 82 | 2,800 | 200 | 99.0 | 200 | 8 (4.0) | 0 (0.0) | 2 (1.0) | Damaged/hemorraged eye (37.5) | NAI and Skalski (1999) |
| | Spillway[a] | 82 | 6,000 | 199 | 97.6 | 195 | 8 (4.1) | 0 (0.0) | 4 (2.1) | Damaged/hemorraged eye (75.0) | NAI and Skalski (1999) |
| | Spillway[a] | 82 | 11,500 | 191 | 92.8 | 182 | 7 (3.8) | 0 (0.0) | 10 (5.5) | Internal injuries (57.1) | NAI and Skalski (1999) |
| | Spillway | 82 | 2,800 | 180 | 99.4 | 180 | 1 (0.6) | 0 (0.0) | 0 (0.0) | Damaged/hemorraged eye (100.0) | NAI and Skalski (2000a) |
| | Spillway | 82 | 6,000 | 169 | 97.6 | 169 | 5 (3.0) | 0 (0.0) | 0 (0.0) | Abrsn/hem on head/body (60.0) | NAI and Skalski (2000a) |
| | Spillway | 82 | 7,500 | 198 | 99.5 | 198 | 3 (1.5) | 0 (0.0) | 1 (0.5) | Damaged/hemorraged eye (66.7) | NAI and Skalski (2000a) |
| | Spillway[a] | 82 | 2,800 | 180 | 98.3 | 180 | 7 (3.9) | 1 (0.6) | 1 (0.6) | Damaged/hemorraged eye (85.7) | NAI and Skalski (2000a) |
| | Spillway[a] | 82 | 6,000 | 170 | 98.2 | 168 | 4 (2.4) | 3 (1.8) | 0 (0.0) | Damaged/hemorraged eye (75.0) | NAI and Skalski (2000a) |
| | Spillway[a] | 82 | 7,500 | 210 | 97.6 | 208 | 6 (2.9) | 0 (0.0) | 0 (0.0) | Damaged/hemorraged eye (50.0) | NAI and Skalski (2000a) |
| | Bypass Pipe | 76.1-80 | 420 | 500 | 100.0 | 499 | 0 (0.0) | 2 (0.4) | 2 (0.4) | - (0.0) | NAI and Skalski (2000c) |
| Little Goose, WA | Spillway | 90 | 5,600 | 150 | 100.0 | 150 | 3 (2.0) | 0 (0.0) | 0 (0.0) | Gill arch inverted (66.7) | NAI *et al.* (1997) |
| | Spillway | 90 | 9,500 | 150 | 100.0 | 150 | 0 (0.0) | 0 (0.0) | 1 (0.7) | - (0.0) | NAI *et al.* (1997) |
| | Spillway | 90 | 1,800 | 100 | 100.0 | 100 | 0 (0.0) | 0 (0.0) | 0 (0.0) | Internal hemorrhage (0.0) | NAI *et al.* (1997) |
| | Spillway[c] | 90 | 5,600 | 40 | 100.0 | 39 | 0 (0.0) | 0 (0.0) | 5 (12.8) | - (0.0) | NAI *et al.* (1997) |
| | Spillway[c] | 90 | 9,500 | 120 | 98.3 | 119 | 3 (2.5) | 0 (0.0) | 1 (0.8) | Bruised body (66.7) | NAI *et al.* (1997) |
| | Spillway[a] | 90 | 5,600 | 150 | 98.0 | 149 | 1 (0.7) | 0 (0.0) | 0 (0.0) | Torn operc.inverted gill (100.0) | NAI *et al.* (1997) |
| | Spillway[a] | 90 | 9,500 | 150 | 100.0 | 150 | 0 (0.0) | 0 (0.0) | 0 (0.0) | - (0.0) | NAI *et al.* (1997) |
| | Spillway[a] | 90 | 1,800 | 100 | 99.0 | 100 | 3 (3.0) | 0 (0.0) | 1 (1.0) | External hemorrhaging (66.7) | NAI *et al.* (1997) |
| | Spillway[a,c] | 90 | 5,600 | 39 | 100.0 | 39 | 0 (0.0) | 0 (0.0) | 0 (0.0) | - (0.0) | NAI *et al.* (1997) |
| | Spillway[a,c] | 90 | 9,500 | 120 | 99.2 | 119 | 2 (1.7) | 0 (0.0) | 1 (0.8) | Dmg/hmg eye (1), intrnl (1) (50.0) | NAI *et al.* (1997) |

**Table 4-1**

**Continued.**

| Station | Exit Route | Head (ft) | Spill Volume (cfs) | Sample Size | 48 h Survival (%) | Number Examined | Injured No. (%) | Major Scale Loss No. (%) | Only Loss of Equilibrium No. (%) | Dominant Injury Type (% of injured fish) | Source |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Lower Granite, WA | Spillway[a] | 90 | 3,400 | 120 | 97.5 | 120 | 1 (0.8) | 0 (0.0) | 0 (0.0) | Internal injuries (100.0) | NAI *et al.* (1996e) |
| | SBC[a] | 90 | 3,400 | 120 | 95.8 | 119 | 2 (1.7) | 0 (0.0) | 2 (1.7) | Hmrrgd eye, intrnl hmrrg (100.0) | NAI *et al.* (1996e) |
| | Spillway[a] | 90 | 3,400 | 130 | 97.6 | 123 | 3 (2.4) | 0 (0.0) | 1 (0.8) | Hmrrgd eye, intrnl hmrrg (100.0) | NAI *et al.* (2000b) |
| | SBC[a] | 90 | 3,400 | 133 | 97.0 | 130 | 3 (2.3) | 0 (0.0) | 2 (1.5) | Hmrrgd eye, intrnl hmrrg (100.0) | NAI *et al.* (2000b) |
| Rock Island, WA | Spillway[b,d] | 30 | 1,850 | 250 | 95.1 | 244 | 12 (4.9) | 0 (0.0) | 17 (7.0) | Internal injuries (41.7) | NAI and Skalski (1998) |
| | Spillway[b] | 41 | 10,000 | 250 | 98.4 | 249 | 3 (1.2) | 0 (0.0) | 3 (1.2) | Dmg/hm eye(1), int(1),ext(1) (33.3) | NAI and Skalski (1998) |
| | Spillway[b] | 41-49 | 2,500 | 200 | 99.5 | 197 | 0 (0.0) | 0 (0.0) | 0 (0.0) | None (0.0) | NAI and Skalski (2000b) |
| | Spillway[b] | 41-49 | 10,000 | 200 | 99.5 | 200 | 1 (0.5) | 0 (0.0) | 0 (0.0) | Minor internal hemorrhage (100.0) | NAI and Skalski (2000b) |
| | Spillway[a,b,e] | 40-41 | 2,500 | 200 | 99.0 | 199 | 1 (0.5) | 0 (0.0) | 1 (0.5) | Torn rt operculum (100.0) | NAI and Skalski (2000d) |
| | Spillway[a,b] | 40-41 | 2,500 | 200 | 100.0 | 200 | 0 (0.0) | 0 (0.0) | 0 (0.0) | - (0.0) | NAI and Skalski (2000d) |

a Spillbay with flow deflector.
b Overflow weir or slot to attract surface oriented juvenile salmonids.
c Fish released into head pond vortices upstream of tainter gates.
d Spill directed onto concrete slab.
e Periphery release location.

**Table 4-2**

**Comparison of observed injury rates to balloon tagged juvenile salmon passed through non-turbine passage routes at large dams (Bonneville, The Dalles, Wanapum, Rock Island, Little Goose, and Lower Granite) on the Columbia and Snake Rivers.**

| Observed Visible Injury Rate[1] | Number of Tests | | | |
|---|---|---|---|---|
| | Unmodified Spillbay | Modified Spillbay[2] | Sluice/Bypass Structure[3] | Combined |
| 0% | 3 | 4 | 2 | 9 |
| 0.1-1.0% | 1 | 4 | 3 | 8 |
| 1.1-2.0% | 5 | 3 | 1 | 9 |
| 2.1-3.0% | 4 | 5 | 1 | 10 |
| 3.1-4.0% | 0 | 5 | 1 | 6 |
| 4.1-5.0% | 0 | 2 | 0 | 2 |
| 5.1-6.0% | 0 | 0 | 0 | 0 |
| 6.1-7.0% | 1 | 2 | 0 | 3 |
| ***Total*** | ***14*** | ***25*** | ***8*** | ***47*** |

1 Not adjusted for any control injuries.
2 Modified spill gate and/or flow deflector in spill basin.
3 Includes present study at B2 sluice.

**Appendix Table A-1**

**Station parameters during fish passage tests for Bonneville Powerhouse II sluiceway outfall at high tailwater conditions, June 2000.**

| Date | Time | Forebay Elevation (ft) | Tailrace Elevation (ft)* | Sluice Gate Setting (ft) | Approximate Discharge (cfs) |
|---|---|---|---|---|---|
| 6/13/2000 | 1200-1440 | 73.7 | 18.3 | 61.0 | 2,250 |
| | 1525-1800 | 73.7 | 18.3 | 66.2 | 1,000 |
| | 1815-1830 | 75.0 | 18.8 | 61.0 | 2,250 |
| 6/14/2000 | 811-1030 | 73.4 | 23.0 | 65.9 | 1,000 |
| | 1045-1400 | 73.4 | 23.0 | 61.0 | 2,250 |
| | 1430-1710 | 74.0 | 23.2 | 65.9 | 1,000 |
| | 1720-1740 | 74.0 | 23.2 | 65.9 | 1,000 |
| 6/15/2000 | 750-1220 | 74.7 | 18.7 | 61.0 | 2,450 |
| | 1230-1640 | 74.7 | 18.7 | 67.2 | 1,000 |
| 6/16/2000 | 1100-1140 | 75.0 | 21.7 | 61.0 | 2,550 |
| | 1200-1240 | 75.0 | 21.7 | 67.5 | 1,000 |
| | 1300-1400 | 74.8 | 21.7 | 61.0 | 2,550 |
| | 1410-1600 | 74.8 | 21.7 | 67.5 | 1,000 |
| | 1610-1650 | 74.8 | 21.7 | 61.0 | 2,550 |
| 6/17/2000 | 837-945 | 74.2 | 17.8 | 61.0 | 2,350 |
| | 1000-1040 | 74.2 | 17.8 | 66.7 | 1,000 |
| | 1055-1140 | 74.0 | 17.9 | 61.0 | 2,350 |
| | 1220-1255 | 74.0 | 17.9 | 66.7 | 1,000 |
| | 1310-1500 | 74.0 | 17.9 | 61.0 | 2,350 |
| | 1515-1615 | 74.0 | 17.9 | 66.7 | 1,000 |
| | 1630-1640 | 74.0 | 17.9 | 66.7 | 1,000 |
| 6/18/2000 | 756-900 | 74.3 | 16.4 | 66.8 | 1,000 |
| | 915-1000 | 74.3 | 16.4 | 61.0 | 2,400 |
| | 1015-1210 | 74.3 | 16.4 | 66.8 | 1,000 |
| | 1230-1315 | 74.3 | 16.4 | 66.8 | 1,000 |
| | 1330-1445 | 74.3 | 16.4 | 61.0 | 2,400 |
| | 1500-1515 | 74.3 | 16.4 | 66.8 | 1,000 |

* Staff gauge adjacent to sluice outfall.

**Appendix Table A-2**

**Station parameters during fish passage tests for Bonneville Powerhouse II sluiceway outfall at low tailwater conditions, September/October 2000.**

| Date | Time | Flow Condition* | Elevation (ft) Forebay | Elevation (ft) Tailrace** | Sluice Gate Setting (ft) |
|---|---|---|---|---|---|
| 09/28/00 | 847 | Treatment-low | 74.2 | 10.2 | 66.7 |
| | 941 | Treatment-low | 74.5 | 10.7 | 67.0 |
| | 1023 | Treatment-high | 74.5 | 10.7 | 61.0 |
| | 1108 | Treatment-high | 73.9 | 10.8 | 61.0 |
| | 1147 | Control-low | 74.4 | 10.6 | 66.9 |
| | 1302 | Control-low | 74.1 | 10.7 | 66.6 |
| | 1355 | Treatment-low | 74.1 | 10.3 | 66.6 |
| | 1440 | Treatment-high | 74.1 | 10.0 | 61.0 |
| | 1513 | Control-high | 74.1 | 10.0 | 61.0 |
| | 1548 | Treatment-low | 74.3 | 10.0 | 66.8 |
| | 1619 | Treatment-high | 74.3 | 10.0 | 61.0 |
| | 1651 | Control-high | 74.3 | 10.0 | 61.0 |
| 09/29/00 | 826 | Treatment-low | 74.3 | 9.3 | 66.8 |
| | 907 | Treatment-low | 74.2 | 10.1 | 66.7 |
| | 947 | Treatment-high | 74.2 | 10.6 | 61.0 |
| | 1020 | Treatment-high | 74.2 | 11.0 | 61.0 |
| | 1106 | Control-high | 74.1 | 11.2 | 61.0 |
| | 1143 | Control-high | 74.1 | 11.3 | 61.0 |
| | 1225 | Treatment-high | 74.1 | 11.3 | 61.0 |
| | 1300 | Treatment-high | 74.2 | 11.3 | 61.0 |
| | 1336 | Treatment-low | 74.1 | 11.0 | 66.6 |
| | 1409 | Treatment-low | 74.1 | 10.8 | 66.6 |
| | 1459 | Control-low | 74.1 | 11.2 | 66.6 |
| | 1552 | Control-low | 74.1 | 11.2 | 66.6 |
| | 1631 | Treatment-low | 74.4 | 10.9 | 66.9 |
| | 1703 | Treatment-high | 74.4 | 11.0 | 61.0 |
| 09/30/00 | 817 | Treatment-high | 74.8 | 8.0 | 61.0 |
| | 901 | Treatment-high | 74.8 | 7.9 | 61.0 |
| | 941 | Control-high | 74.9 | 8.0 | 61.0 |
| | 1048 | Control-high | 74.8 | 10.1 | 61.0 |
| | 1126 | Treatment-low | 74.8 | 9.0 | 67.3 |
| | 1215 | Treatment-low | 74.9 | 9.8 | 67.4 |
| | 1247 | Treatment-high | 75.0 | 10.0 | 61.0 |
| | 1328 | Treatment-high | 75.1 | 9.8 | 61.0 |
| | 1406 | Treatment-low | 75.2 | 9.8 | 67.7 |
| | 1443 | Treatment-low | 74.9 | 9.8 | 67.4 |
| | 1520 | Control-low | 75.3 | 9.8 | 67.8 |
| | 1553 | Control-low | 75.4 | 9.9 | 67.9 |

**Appendix Table A-2**

**Continued.**

| | | | Elevation (ft) | | Sluice Gate |
|---|---|---|---|---|---|
| **Date** | **Time** | **Flow Condition*** | **Forebay** | **Tailrace**** | **Setting (ft)** |
| 10/02/00 | 829 | Control-low | 74.7 | 9.7 | 67.2 |
| | 905 | Control-low | 74.8 | 9.7 | 67.3 |
| | 1007 | Treatment-low | 74.6 | 10.0 | 67.1 |
| | 1051 | Treatment-low | 74.7 | 10.5 | 67.2 |
| | 1124 | Treatment-high | 74.9 | 10.5 | 61.0 |
| | 1205 | Treatment-high | 74.8 | 10.7 | 61.0 |
| | 1237 | Treatment-low | 74.7 | 10.8 | 67.2 |
| | 1322 | Treatment-low | 74.8 | 10.9 | 67.3 |
| | 1354 | Control-high | 74.7 | 10.9 | 61.0 |
| | 1434 | Control-high | 74.9 | 10.5 | 61.0 |
| | 1504 | Treatment-high | 74.7 | 10.5 | 61.0 |
| | 1538 | Treatment-high | 74.9 | 10.8 | 61.0 |
| | 1615 | Control-high | 74.9 | 10.4 | 61.0 |
| | 1649 | Treatment-low | 74.9 | 10.5 | 67.4 |
| | 1725 | Treatment-high | 75.0 | 10.4 | 61.0 |
| | 1801 | Control-low | 75.2 | 10.2 | 67.7 |
| 10/03/00 | 1045 | Treatment-high | 74.6 | 10.2 | 61.0 |
| | 1122 | Treatment-high | 74.5 | 10.5 | 61.0 |
| | 1215 | Treatment-low | 74.6 | 10.8 | 67.1 |
| | 1249 | Treatment-low | 74.4 | 10.4 | 66.9 |
| | 1334 | Control-low | 74.2 | 10.2 | 66.7 |
| | 1412 | Control-high | 74.5 | 10.4 | 61.0 |
| | 1441 | Treatment-high | 74.4 | 10.5 | 61.0 |
| | 1517 | Treatment-low | 74.4 | 10.4 | 66.9 |
| | 1603 | Control-low | 74.4 | 10.5 | 66.9 |
| | 1646 | Treatment-low | 74.6 | 10.4 | 67.1 |
| | 1719 | Treatment-high | 74.9 | 10.2 | 61.0 |
| | 1757 | Control-high | 75.0 | 10.4 | 61.0 |
| 10/04/00 | 832 | Treatment-low | 74.0 | 11.0 | 66.5 |
| | 906 | Treatment-low | 74.4 | 10.8 | 66.9 |
| | 950 | Treatment-high | 74.5 | 10.8 | 61.0 |
| | 1024 | Treatment-high | 74.6 | 10.6 | 61.0 |
| | 1058 | Control-low | 74.8 | 10.6 | 67.3 |
| | 1142 | Control-low | 74.6 | 10.6 | 67.1 |
| | 1217 | Treatment-high | 74.7 | 10.6 | 61.0 |
| | 1258 | Treatment-high | 74.5 | 10.6 | 61.0 |
| | 1329 | Treatment-low | 74.8 | 10.4 | 67.3 |
| | 1403 | Treatment-low | 74.8 | 10.6 | 67.3 |
| | 1447 | Control-high | 75.0 | 10.4 | 61.0 |

| | | | | |
|---|---|---|---|---|
| 1524 | Control-high | 75.0 | 10.4 | 61.0 |

**Appendix Table A-2**

**Continued.**

| Date | Time | Flow Condition* | Elevation (ft) Forebay | Elevation (ft) Tailrace** | Sluice Gate Setting (ft) |
|---|---|---|---|---|---|
| 10/04/00 | 1554 | Treatment-low | 75.0 | 10.4 | 67.5 |
| | 1626 | Treatment-high | 75.0 | 10.2 | 61.0 |
| | 1659 | Control-high | 75.1 | 10.4 | 61.0 |
| 10/05/00 | 802 | Control-low | 75.2 | 10.6 | 67.7 |
| | 842 | Control-low | 75.1 | 10.6 | 67.6 |
| | 913 | Treatment-low | 75.2 | 10.6 | 67.7 |
| | 956 | Treatment-low | 75.2 | 10.5 | 67.7 |
| | 1101 | Control-high | 75.4 | 10.2 | 61.0 |
| | 1132 | Control-high | 75.5 | 10.2 | 61.0 |
| | 1211 | Treatment-high | 75.7 | 10.0 | 61.0 |
| | 1252 | Treatment-high | 75.6 | 9.8 | 61.0 |
| | 1329 | Treatment-low | 75.8 | 9.8 | 68.3 |
| | 1403 | Treatment-low | 75.7 | 9.8 | 68.2 |
| | 1438 | Treatment-high | 75.7 | 10.0 | 61.0 |
| | 1518 | Treatment-high | 75.7 | 10.2 | 61.0 |
| | 1604 | Control-low | 75.7 | 10.0 | 68.2 |
| | 1633 | Treatment-low | 75.8 | 10.0 | 68.3 |
| | 1705 | Treatment-high | 75.8 | 10.1 | 61.0 |
| 10/06/00 | 758 | Treatment-high | 74.0 | 9.6 | 61.0 |
| | 837 | Treatment-high | 74.0 | 9.8 | 61.0 |
| | 917 | Control-low | 74.3 | 9.8 | 66.8 |
| | 1000 | Control-low | 74.3 | 9.5 | 66.8 |
| | 1015 | Treatment-low | 74.3 | 10.0 | 66.8 |
| | 1059 | Treatment-low | 74.3 | 9.8 | 66.8 |
| | 1134 | Treatment-high | 74.3 | 9.2 | 61.0 |
| | 1205 | Control-high | 74.2 | 9.6 | 61.0 |
| | 1228 | Control-high | 74.2 | 9.6 | 61.0 |
| | 1400 | Treatment-low | 74.3 | 9.7 | 66.8 |

* Low flow is 1,000 cfs, high flow is approximatley 2,500 cfs.

** Staff gauge adjacent to sluice outfall.

**Appendix Table A-3**

**Station parameters and calculated entrance velocity of Bonneville Powerhouse II sluiceway outfall during high tailwater fish passage tests, June 2000. Data supplied by the Corps.**

| Date | Time | Elevation (ft) | | | Sluice Gauge | Head Over Sluice Control | Estimated Flow (trendline) | End d (trendline) | End v (trendline) | Total Plunge (Plume c/l to tr) | | Vmag |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Forebay | Tailrace[1] | Difference | Setting (ft) | Gate (ft) | ft^3/s | (ft) | (Vx) (ft/s) | (ft)[2] | Vy (ft/s)[3] | (ft/s)[4] |
| 6/13/2000 | 8:10 | 73.7 | 18.3 | 55.4 | 61.0 | | 2,250 | 6.2 | 24.3 | 13.8 | 29.8 | 38.5 |
| | | 73.7 | 18.3 | 55.4 | 66.2 | | 1,000 | 3.9 | 17.6 | 12.6 | 28.5 | 33.5 |
| | 16:15 | 75.0 | 18.8 | 56.2 | 67.5 | | 1,000 | 3.9 | 17.6 | 12.1 | 27.9 | 33.0 |
| | | 75.0 | 18.8 | 56.2 | 61.0 | | 2,600 | 6.9 | 25.5 | 13.6 | 29.6 | 39.1 |
| 6/14/2000 | 8:11 | 73.4 | 23.0 | 50.4 | 61.0 | | 2,250 | 6.2 | 24.3 | 9.1 | 24.2 | 34.3 |
| | | 73.4 | 23.0 | 50.4 | 65.9 | | 1,000 | 3.9 | 17.6 | 7.9 | 22.6 | 28.6 |
| | 16:05 | 74.0 | 23.2 | 50.8 | | | 2,250 | 6.2 | 24.3 | 8.9 | 24.0 | 34.2 |
| | | 74.0 | 23.2 | 50.8 | | | 1,000 | 3.9 | 17.6 | 7.7 | 22.3 | 28.4 |
| 6/15/2000 | 7:50 | 74.7 | 18.7 | 56.0 | 61.0 | | 2,450 | 6.6 | 25.0 | 13.6 | 29.6 | 38.8 |
| | | 74.7 | 18.7 | 56.0 | 67.2 | | 1,000 | 3.9 | 17.6 | 12.2 | 28.1 | 33.1 |
| | 16:33 | 74.9 | 18.7 | 56.2 | | | 2,450 | 6.6 | 25.0 | 13.6 | 29.6 | 38.8 |
| | | 74.9 | 18.7 | 56.2 | | | 1,000 | 3.9 | 17.6 | 12.2 | 28.1 | 33.1 |
| 6/16/2000 | 8:20 | 75.0 | 21.7 | 53.3 | 61.0 | | 2,550 | 6.8 | 25.4 | 10.7 | 26.2 | 36.5 |
| | | 75.0 | 21.7 | 53.3 | 67.5 | | 1,000 | 3.9 | 17.6 | 9.2 | 24.4 | 30.1 |
| | 16:42 | 74.8 | 21.7 | 53.1 | | | 2,550 | 6.8 | 25.4 | 10.7 | 26.2 | 36.5 |
| | | 74.8 | 21.7 | 53.1 | | | 1,000 | 3.9 | 17.6 | 9.2 | 24.4 | 30.1 |
| 6/17/2000 | 8:37 | 74.2 | 17.8 | 56.4 | 61.0 | | 2,350 | 6.4 | 24.7 | 14.4 | 30.5 | 39.2 |
| | | 74.2 | 17.8 | 56.4 | 66.7 | | 1,000 | 3.9 | 17.6 | 13.1 | 29.1 | 34.0 |
| | 15:45 | 74.0 | 17.9 | 56.1 | | | 2,350 | 6.4 | 24.7 | 14.3 | 30.4 | 39.1 |
| | | 74.0 | 17.9 | 56.1 | | | 1,000 | 3.9 | 17.6 | 13.0 | 29.0 | 33.9 |
| 6/18/2000 | 7:56 | 74.3 | 16.4 | 57.9 | 61.0 | | 2,400 | 6.5 | 24.9 | 15.9 | 32.0 | 40.5 |
| | | 74.3 | 16.4 | 57.9 | 66.8 | | 1,000 | 3.9 | 17.6 | 14.5 | 30.6 | 35.3 |

1 Staff gauge adjacent to sluice outfall.
2 Plunge height from center line of plume to surface of tailrace.
3 Mean calculated entrance velocity
4 Maximum calculated entrance velocity.

**Appendix Table A-3, *continued.***

**Station parameters and calculated entrance velocity of Bonneville Powerhouse II sluiceway outfall during high tailwater fish passage tests, June 2000. Data supplied by the Corps.**

| | | Elevation (ft) | | | | Head Over Sluice Control Gate (ft) | Estimated Flow (trendline) ft^3/s | End d (trendline) (ft) | End v (trendline) (Vx) (ft/s) | Total Plunge (Plume c/l to tr) (ft)[2] | | Vmag (ft/s)[4] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Forebay | Tailrace[1] | Difference | Sluice Gauge Setting (ft) | | | | | | Vy (ft/s)[3] | |
| **From Researcher Log:** | | | | | | | | | | | | |
| Min | | 73.4 | 16.4 | 57.0 | | | 2,150 | 6.0 | 24.0 | 15.6 | 31.7 | 39.8 |
| Max | | 75.0 | 23.2 | 51.8 | | | 2,570 | 6.8 | 25.4 | 9.2 | 24.4 | 35.2 |
| Mean | | 74.4 | 19.7 | 54.7 | | | 2,400 | 6.5 | 24.9 | 12.6 | 28.4 | 37.8 |
| Median | | 74.3 | 18.7 | 55.6 | | | 2,380 | 6.5 | 24.8 | 13.5 | 29.5 | 38.6 |
| | **Min** | **Max** | **Mean** | **Median** | | | | | | | | |
| Tailrace Elev (ft)[5] | 16.4 | 23.2 | 19.7 | 18.7 | | | | | | | | |
| Forebay Eleve (ft) | 73.4 | 75.0 | 74.4 | 74.3 | | | | | | | | |
| Calc I&T Q (kcfs) | 2.15 | 2.57 | 2.40 | 2.38 | | | | | | | | |
| **From Control Room Records[6]** | | | | | | | | | | | | |
| Min | | 73.1 | 15.9 | 57.2 | | | 2070 | 5.9 | 23.6 | 16.0 | 32.1 | 39.9 |
| Max | | 75.7 | 21.5 | 54.2 | | | 2770 | 7.2 | 26.1 | 11.1 | 26.7 | 37.3 |
| Mean | | 73.0 | 18.8 | 54.2 | | | 2030 | 5.8 | 23.5 | 13.1 | 29.1 | 37.4 |
| Median | | 74.0 | 18.6 | 55.4 | | | 2300 | 6.3 | 24.5 | 13.6 | 29.6 | 38.4 |
| | **Min** | **Max** | **Mean** | **Median** | | | | | | | | |
| PH1 TW (ft) | 15.9 | 21.5 | 18.8 | 18.6 | | | | | | | | |
| Proj FB (ft) | 73.1 | 75.7 | 74.2 | 74.0 | | | | | | | | |
| Calc I&T Q (kcfs) | 2.07 | 2.77 | 2.03 | 2.30 | | | | | | | | |

1 Staff gauge adjacent to sluice outfall.
2 Plunge height from center line of plume to surface of tailrace.
3 Mean calculated entrance velocity
4 Maximum calculated entrance velocity.
5 Data assumed to be taken from staff gage near the ice and trash chute exit similar to the fall.
6 Data obtained from hourly log summary sheet.

**Appendix Table A-3, *continued.***

**Station parameters and calculated entrance velocity of Bonneville Powerhouse II sluiceway outfall during low tailwater fish passage tests, September/October 2000. Data supplied by the Corps.**

| Date | Time | Elevation (ft) Forebay | Tailrace[1] | Difference | Sluice Gauge Setting (ft) | Head Over Sluice Control Gate (ft) | Estimated Flow (trendline) ft^3/s | End d (trendline) (ft) | End v (trendline) (Vx) (ft/s) | Total Plunge (Plume c/l to tr) (ft)[2] | Vy (ft/s)[3] | Vmag (ft/s)[4] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9/28/2000 | 847 | 74.2 | 10.2 | 64.0 | 66.7 | 7.5 | 1,000 | 3.9 | 17.6 | 20.7 | 36.5 | 40.5 |
| | 941 | 74.5 | 10.7 | 63.8 | 67.0 | 7.5 | 1,000 | 3.9 | 17.6 | 20.2 | 36.1 | 40.2 |
| | 1023 | 74.5 | 10.7 | 63.8 | 61.0 | 13.5 | 2,430 | 6.6 | 25.0 | 21.6 | 37.3 | 44.9 |
| | 1108 | 73.9 | 10.8 | 63.1 | 61.0 | 12.9 | 2,270 | 6.3 | 24.4 | 21.3 | 37.1 | 44.4 |
| | 1147 | 74.4 | 10.6 | 63.8 | 66.9 | 7.5 | 1,000 | 3.9 | 17.6 | 20.3 | 36.2 | 40.2 |
| | 1302 | 74.1 | 10.7 | 63.4 | 66.6 | 7.5 | 1,000 | 3.9 | 17.6 | 20.2 | 36.1 | 40.2 |
| | 1355 | 74.1 | 10.3 | 63.8 | 66.6 | 7.5 | 1,000 | 3.9 | 17.6 | 20.6 | 36.4 | 40.5 |
| | 1440 | 74.1 | 10.0 | 64.1 | 61.0 | 13.1 | 2,320 | 6.4 | 24.6 | 22.2 | 37.8 | 45.1 |
| | 1513 | 74.1 | 10.0 | 64.1 | 61.0 | 13.1 | 2,320 | 6.4 | 24.6 | 22.2 | 37.8 | 45.1 |
| | 1548 | 74.3 | 10.0 | 64.3 | 66.8 | 7.5 | 1,000 | 3.9 | 17.6 | 20.9 | 36.7 | 40.7 |
| | 1619 | 74.3 | 10.0 | 64.3 | 61.0 | 13.3 | 2,380 | 6.5 | 24.8 | 22.2 | 37.8 | 45.2 |
| | 1651 | 74.3 | 10.0 | 64.3 | 61.0 | 13.3 | 2,380 | 6.5 | 24.8 | 22.2 | 37.8 | 45.2 |
| 9/29/2000 | 826 | 74.3 | 9.3 | 65.0 | 66.8 | 7.5 | 1,000 | 3.9 | 17.6 | 21.6 | 37.3 | 41.3 |
| | 907 | 74.2 | 10.1 | 64.1 | 66.7 | 7.5 | 1,000 | 3.9 | 17.6 | 20.8 | 36.6 | 40.6 |
| | 947 | 74.2 | 10.6 | 63.6 | 61.0 | 13.2 | 2,350 | 6.4 | 24.7 | 21.6 | 37.3 | 44.7 |
| | 1020 | 74.2 | 11.0 | 63.2 | 61.0 | 13.2 | 2,350 | 6.4 | 24.7 | 21.2 | 37.0 | 44.5 |
| | 1106 | 74.1 | 11.2 | 62.9 | 61.0 | 13.1 | 2,320 | 6.4 | 24.6 | 21.0 | 36.8 | 44.2 |
| | 1143 | 74.1 | 11.3 | 62.8 | 61.0 | 13.1 | 2,320 | 6.4 | 24.6 | 20.9 | 36.7 | 44.2 |
| | 1225 | 74.1 | 11.3 | 62.8 | 61.0 | 13.1 | 2,320 | 6.4 | 24.6 | 20.9 | 36.7 | 44.2 |
| | 1300 | 74.2 | 11.3 | 62.9 | 61.0 | 13.2 | 2,350 | 6.4 | 24.7 | 20.9 | 36.7 | 44.2 |
| | 1336 | 74.1 | 11.0 | 63.1 | 66.6 | 7.5 | 1,000 | 3.9 | 17.6 | 19.9 | 35.8 | 39.9 |
| | 1409 | 74.1 | 10.8 | 63.3 | 66.6 | 7.5 | 1,000 | 3.9 | 17.6 | 20.1 | 36.0 | 40.1 |
| | 1459 | 74.1 | 11.2 | 62.9 | 66.6 | 7.5 | 1,000 | 3.9 | 17.6 | 19.7 | 35.6 | 39.7 |
| | 1552 | 74.1 | 11.2 | 62.9 | 66.6 | 7.5 | 1,000 | 3.9 | 17.6 | 19.7 | 35.6 | 39.7 |
| | 1631 | 74.4 | 10.9 | 63.5 | 66.9 | 7.5 | 1,000 | 3.9 | 17.6 | 20.0 | 35.9 | 40.0 |
| | 1703 | 74.4 | 11.0 | 63.4 | 61.0 | 13.4 | 2,400 | 6.5 | 24.9 | 21.3 | 37.0 | 44.6 |
| 9/30/2000 | 817 | 74.8 | 8.0 | 66.8 | 61.0 | 13.8 | 2,510 | 6.7 | 25.2 | 24.4 | 39.6 | 47.0 |
| | 901 | 74.8 | 7.9 | 66.9 | 61.0 | 13.8 | 2,510 | 6.7 | 25.2 | 24.5 | 39.7 | 47.0 |
| | 941 | 74.9 | 8.0 | 66.9 | 61.0 | 13.9 | 2,540 | 6.8 | 25.3 | 24.4 | 39.6 | 47.0 |
| | 1048 | 74.8 | 10.1 | 64.7 | 61.0 | 13.8 | 2,510 | 6.7 | 25.2 | 22.3 | 37.9 | 45.5 |
| | 1126 | 74.8 | 9.0 | 65.8 | 67.3 | 7.5 | 1,000 | 3.9 | 17.6 | 21.9 | 37.6 | 41.5 |
| | 1215 | 74.9 | 9.8 | 65.1 | 67.4 | 7.5 | 1,000 | 3.9 | 17.6 | 21.1 | 36.9 | 40.9 |
| | 1247 | 75.0 | 10.0 | 65.0 | 61.0 | 14.0 | 2,570 | 6.8 | 25.4 | 22.4 | 38.0 | 45.7 |
| | 1328 | 75.1 | 9.8 | 65.3 | 61.0 | 14.1 | 2,590 | 6.9 | 25.5 | 22.6 | 38.2 | 45.9 |
| | 1406 | 75.2 | 9.8 | 65.4 | 67.7 | 7.5 | 1,000 | 3.9 | 17.6 | 21.1 | 36.9 | 40.9 |
| | 1443 | 74.9 | 9.8 | 65.1 | 67.4 | 7.5 | 1,000 | 3.9 | 17.6 | 21.1 | 36.9 | 40.9 |
| | 1520 | 75.3 | 9.8 | 65.5 | 67.8 | 7.5 | 1,000 | 3.9 | 17.6 | 21.1 | 36.9 | 40.9 |
| | 1553 | 75.4 | 9.9 | 65.5 | 67.9 | 7.5 | 1,000 | 3.9 | 17.6 | 21.0 | 36.8 | 40.8 |

**Appendix Table A-3, *continued.***

**Station parameters and calculated entrance velocity of Bonneville Powerhouse II sluiceway outfall during low tailwater fish passage tests, September/October 2000. Data supplied by the Corps.**

| Date | Time | Elevation (ft) Forebay | Tailrace[1] | Difference | Sluice Gauge Setting (ft) | Head Over Sluice Control Gate (ft) | Estimated Flow (trendline) ft^3/s | End d (trendline) (ft) | End v (trendline) (Vx) (ft/s) | Total Plunge (Plume c/l to tr) (ft)[2] | Vy (ft/s)[3] | Vmag (ft/s)[4] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/2/2000 | 829 | 74.7 | 9.7 | 65.0 | 67.2 | 7.5 | 1,000 | 3.9 | 17.6 | 21.2 | 37.0 | 40.9 |
| | 905 | 74.8 | 9.7 | 65.1 | 67.3 | 7.5 | 1,000 | 3.9 | 17.6 | 21.2 | 37.0 | 40.9 |
| | 1007 | 74.6 | 10.0 | 64.6 | 67.1 | 7.5 | 1,000 | 3.9 | 17.6 | 20.9 | 36.7 | 40.7 |
| | 1051 | 74.7 | 10.5 | 64.2 | 67.2 | 7.5 | 1,000 | 3.9 | 17.6 | 20.4 | 36.3 | 40.3 |
| | 1124 | 74.9 | 10.5 | 64.4 | 61.0 | 13.9 | 2,540 | 6.8 | 25.3 | 21.9 | 37.5 | 45.3 |
| | 1205 | 74.8 | 10.7 | 64.1 | 61.0 | 13.8 | 2,510 | 6.7 | 25.2 | 21.7 | 37.3 | 45.1 |
| | 1237 | 74.7 | 10.8 | 63.9 | 67.2 | 7.5 | 1,000 | 3.9 | 17.6 | 20.1 | 36.0 | 40.1 |
| | 1322 | 74.8 | 10.9 | 63.9 | 67.3 | 7.5 | 1,000 | 3.9 | 17.6 | 20.0 | 35.9 | 40.0 |
| | 1354 | 74.7 | 10.9 | 63.8 | 61.0 | 13.7 | 2,480 | 6.7 | 25.1 | 21.4 | 37.1 | 44.9 |
| | 1434 | 74.9 | 10.5 | 64.4 | 61.0 | 13.9 | 2,540 | 6.8 | 25.3 | 21.9 | 37.5 | 45.3 |
| | 1504 | 74.7 | 10.5 | 64.2 | 61.0 | 13.7 | 2,480 | 6.7 | 25.1 | 21.8 | 37.5 | 45.1 |
| | 1538 | 74.9 | 10.8 | 64.1 | 61.0 | 13.9 | 2,540 | 6.8 | 25.3 | 21.6 | 37.3 | 45.1 |
| | 1615 | 74.9 | 10.4 | 64.5 | 61.0 | 13.9 | 2,540 | 6.8 | 25.3 | 22.0 | 37.6 | 45.4 |
| | 1649 | 74.9 | 10.5 | 64.4 | 67.4 | 7.5 | 1,000 | 3.9 | 17.6 | 20.4 | 36.3 | 40.3 |
| | 1725 | 75.0 | 10.4 | 64.6 | 61.0 | 14.0 | 2,570 | 6.8 | 25.4 | 22.0 | 37.7 | 45.4 |
| | 1801 | 75.2 | 10.2 | 65.0 | 67.7 | 7.5 | 1,000 | 3.9 | 17.6 | 20.7 | 36.5 | 40.5 |
| 10/3/2000 | 1045 | 74.6 | 10.2 | 64.4 | 61.0 | 13.6 | 2,460 | 6.6 | 25.1 | 22.1 | 37.7 | 45.3 |
| | 1122 | 74.5 | 10.5 | 64.0 | 61.0 | 13.5 | 2,430 | 6.6 | 25.0 | 21.8 | 37.5 | 45.0 |
| | 1215 | 74.6 | 10.8 | 63.8 | 67.1 | 7.5 | 1,000 | 3.9 | 17.6 | 20.1 | 36.0 | 40.1 |
| | 1249 | 74.4 | 10.4 | 64.0 | 66.9 | 7.5 | 1,000 | 3.9 | 17.6 | 20.5 | 36.4 | 40.4 |
| | 1334 | 74.2 | 10.2 | 64.0 | 66.7 | 7.5 | 1,000 | 3.9 | 17.6 | 20.7 | 36.5 | 40.5 |
| | 1412 | 74.5 | 10.4 | 64.1 | 61.0 | 13.5 | 2,430 | 6.6 | 25.0 | 21.9 | 37.5 | 45.1 |
| | 1441 | 74.4 | 10.5 | 63.9 | 61.0 | 13.4 | 2,400 | 6.5 | 24.9 | 21.8 | 37.4 | 44.9 |
| | 1517 | 74.4 | 10.4 | 64.0 | 66.9 | 7.5 | 1,000 | 3.9 | 17.6 | 20.5 | 36.4 | 40.4 |
| | 1603 | 74.4 | 10.5 | 63.9 | 66.9 | 7.5 | 1,000 | 3.9 | 17.6 | 20.4 | 36.3 | 40.3 |
| | 1646 | 74.6 | 10.4 | 64.2 | 67.1 | 7.5 | 1,000 | 3.9 | 17.6 | 20.5 | 36.4 | 40.4 |
| | 1719 | 74.9 | 10.2 | 64.7 | 61.0 | 13.9 | 2,540 | 6.8 | 25.3 | 22.2 | 37.8 | 45.5 |
| | 1757 | 75.0 | 10.4 | 64.6 | 61.0 | 14.0 | 2,570 | 6.8 | 25.4 | 22.0 | 37.7 | 45.4 |
| 10/4/2000 | 832 | 74.0 | 11.0 | 63.0 | 66.5 | 7.5 | 1,000 | 3.9 | 17.6 | 19.9 | 35.8 | 39.9 |
| | 906 | 74.4 | 10.8 | 63.6 | 66.9 | 7.5 | 1,000 | 3.9 | 17.6 | 20.1 | 36.0 | 40.1 |
| | 950 | 74.5 | 10.8 | 63.7 | 61.0 | 13.5 | 2,430 | 6.6 | 25.0 | 21.5 | 37.2 | 44.8 |
| | 1024 | 74.6 | 10.6 | 64.0 | 61.0 | 13.6 | 2,460 | 6.6 | 25.1 | 21.7 | 37.4 | 45.0 |
| | 1058 | 74.8 | 10.6 | 64.2 | 67.3 | 7.5 | 1,000 | 3.9 | 17.6 | 20.3 | 36.2 | 40.2 |
| | 1142 | 74.6 | 10.6 | 64.0 | 67.1 | 7.5 | 1,000 | 3.9 | 17.6 | 20.3 | 36.2 | 40.2 |
| | 1217 | 74.7 | 10.6 | 64.1 | 61.0 | 13.7 | 2,480 | 6.7 | 25.1 | 21.7 | 37.4 | 45.1 |
| | 1258 | 74.5 | 10.6 | 63.9 | 61.0 | 13.5 | 2,430 | 6.6 | 25.0 | 21.7 | 37.4 | 44.9 |
| | 1329 | 74.8 | 10.4 | 64.4 | 67.3 | 7.5 | 1,000 | 3.9 | 17.6 | 20.5 | 36.4 | 40.4 |
| | 1403 | 74.8 | 10.6 | 64.2 | 67.3 | 7.5 | 1,000 | 3.9 | 17.6 | 20.3 | 36.2 | 40.2 |

**Appendix Table A-3, *continued.***

**Station parameters and calculated entrance velocity of Bonneville Powerhouse II sluiceway outfall during low tailwater fish passage tests, September/October 2000. Data supplied by the Corps.**

| Date | Time | Elevation (ft) Forebay | Tailrace[1] | Difference | Sluice Gauge Setting (ft) | Head Over Sluice Control Gate (ft) | Estimated Flow (trendline) ft^3/s | End d (trendline) (ft) | End v (trendline) (Vx) (ft/s) | Total Plunge (Plume c/l to tr) (ft)[2] | Vy (ft/s)[3] | Vmag (ft/s)[4] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/4/2000 | 1447 | 75.0 | 10.4 | 64.6 | 61.0 | 14.0 | 2,570 | 6.8 | 25.4 | 22.0 | 37.7 | 45.4 |
| | 1524 | 75.0 | 10.4 | 64.6 | 61.0 | 14.0 | 2,570 | 6.8 | 25.4 | 22.0 | 37.7 | 45.4 |
| | 1554 | 75.0 | 10.4 | 64.6 | 67.5 | 7.5 | 1,000 | 3.9 | 17.6 | 20.5 | 36.4 | 40.4 |
| | 1626 | 75.0 | 10.2 | 64.8 | 61.0 | 14.0 | 2,570 | 6.8 | 25.4 | 22.2 | 37.8 | 45.6 |
| | 1659 | 75.1 | 10.4 | 64.7 | 61.0 | 14.1 | 2,590 | 6.9 | 25.5 | 22.0 | 37.7 | 45.5 |
| 10/5/2000 | 802 | 75.2 | 10.6 | 64.6 | 67.7 | 7.5 | 1,000 | 3.9 | 17.6 | 20.3 | 36.2 | 40.2 |
| | 842 | 75.1 | 10.6 | 64.5 | 67.6 | 7.5 | 1,000 | 3.9 | 17.6 | 20.3 | 36.2 | 40.2 |
| | 913 | 75.2 | 10.6 | 64.6 | 67.7 | 7.5 | 1,000 | 3.9 | 17.6 | 20.3 | 36.2 | 40.2 |
| | 956 | 75.2 | 10.5 | 64.7 | 67.7 | 7.5 | 1,000 | 3.9 | 17.6 | 20.4 | 36.3 | 40.3 |
| | 1101 | 75.4 | 10.2 | 65.2 | 61.0 | 14.4 | 2,680 | 7.0 | 25.8 | 22.3 | 37.9 | 45.9 |
| | 1132 | 75.5 | 10.2 | 65.3 | 61.0 | 14.5 | 2,710 | 7.1 | 25.9 | 22.3 | 37.9 | 45.9 |
| | 1211 | 75.7 | 10.0 | 65.7 | 61.0 | 14.7 | 2,760 | 7.2 | 26.0 | 22.6 | 38.1 | 46.2 |
| | 1252 | 75.6 | 9.8 | 65.8 | 61.0 | 14.6 | 2,730 | 7.1 | 25.9 | 22.8 | 38.3 | 46.3 |
| | 1329 | 75.8 | 9.8 | 66.0 | 68.3 | 7.5 | 1,000 | 3.9 | 17.6 | 21.1 | 36.9 | 40.9 |
| | 1403 | 75.7 | 9.8 | 65.9 | 68.2 | 7.5 | 1,000 | 3.9 | 17.6 | 21.1 | 36.9 | 40.9 |
| | 1438 | 75.7 | 10.0 | 65.7 | 61.0 | 14.7 | 2,760 | 7.2 | 26.0 | 22.6 | 38.1 | 46.2 |
| | 1518 | 75.7 | 10.2 | 65.5 | 61.0 | 14.7 | 2,760 | 7.2 | 26.0 | 22.4 | 38.0 | 46.0 |
| | 1604 | 75.7 | 10.0 | 65.7 | 68.2 | 7.5 | 1,000 | 3.9 | 17.6 | 20.9 | 36.7 | 40.7 |
| | 1633 | 75.8 | 10.0 | 65.8 | 68.3 | 7.5 | 1,000 | 3.9 | 17.6 | 20.9 | 36.7 | 40.7 |
| | 1705 | 75.8 | 10.1 | 65.7 | 61.0 | 14.8 | 2,790 | 7.2 | 26.1 | 22.5 | 38.1 | 46.2 |
| 10/6/2000 | 758 | 74.0 | 9.6 | 64.4 | 61.0 | 13.0 | 2,300 | 6.3 | 24.5 | 22.6 | 38.1 | 45.3 |
| | 837 | 74.0 | 9.8 | 64.2 | 61.0 | 13.0 | 2,300 | 6.3 | 24.5 | 22.4 | 37.9 | 45.2 |
| | 917 | 74.3 | 9.8 | 64.5 | 66.8 | 7.5 | 1,000 | 3.9 | 17.6 | 21.1 | 36.9 | 40.9 |
| | 1000 | 74.3 | 9.5 | 64.8 | 66.8 | 7.5 | 1,000 | 3.9 | 17.6 | 21.4 | 37.1 | 41.1 |
| | 1015 | 74.3 | 10.0 | 64.3 | 66.8 | 7.5 | 1,000 | 3.9 | 17.6 | 20.9 | 36.7 | 40.7 |
| | 1059 | 74.3 | 9.8 | 64.5 | 66.8 | 7.5 | 1,000 | 3.9 | 17.6 | 21.1 | 36.9 | 40.9 |
| | 1134 | 74.3 | 9.2 | 65.1 | 61.0 | 13.3 | 2,380 | 6.5 | 24.8 | 23.0 | 38.5 | 45.8 |
| | 1205 | 74.2 | 9.6 | 64.6 | 61.0 | 13.2 | 2,350 | 6.4 | 24.7 | 22.6 | 38.2 | 45.5 |
| | 1228 | 74.2 | 9.6 | 64.6 | 61.0 | 13.2 | 2,350 | 6.4 | 24.7 | 22.6 | 38.2 | 45.5 |
| | 1400 | 74.3 | 9.7 | 64.6 | 66.8 | 7.5 | 1,000 | 3.9 | 17.6 | 21.2 | 37.0 | 40.9 |

1 Staff gauge adjacent to sluice outfall.
2 Plunge height from center line of plume to surface of tailrace.
3 Mean calculated entrance velocity
4 Maximum calculated entrance velocity.

**Appendix Table A-3, *continued.***

**Station parameters and calculated entrance velocity of Bonneville Powerhouse II sluiceway outfall during low tailwater fish passage tests, September/October 2000. Data supplied by the Corps.**

| Date | Time | Elevation (ft) Forebay | Tailrace[1] | Difference | Sluice Gauge Setting (ft) | Head Over Sluice Control Gate (ft) | Estimated Flow (trendline) ft^3/s | End d (trendline) (ft) | End v (trendline) (Vx) (ft/s) | Total Plunge (Plume c/l to tr) (ft)[2] | Vy (ft/s)[3] | Vmag (ft/s)[4] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **From Researcher Log:** | | | | | | | | | | | | |
| Min | | 73.9 | 7.9 | 66.0 | | | 2280 | 6.3 | 24.4 | 24.2 | 39.5 | 46.5 |
| Max | | 75.8 | 11.3 | 64.5 | | | 2800 | 7.2 | 26.2 | 21.3 | 37.1 | 45.4 |
| Mean | | 74.7 | 10.3 | 64.4 | | | 2480 | 6.7 | 25.1 | 22.0 | 37.7 | 45.3 |
| Median | | 74.7 | 10.4 | 64.3 | | | 2480 | 6.7 | 25.1 | 21.9 | 37.6 | 45.2 |
| | **Min** | **Max** | **Mean** | **Median** | | | | | | | | |
| Tailrace Elev (ft)[5] | 7.9 | 11.3 | 10.3 | 10.4 | | | | | | | | |
| Forebay Eleve (ft) | 73.9 | 75.8 | 74.7 | 74.7 | | | | | | | | |
| Calc I&T Q (kcfs) | 2.28 | 2.80 | 2.48 | 2.48 | | | | | | | | |
| **From Control Room Records[6]** | | | | | | | | | | | | |
| Min | | 73.8 | 8.4 | 65.4 | | | 2250 | 6.2 | 24.3 | 23.7 | 39.1 | 46.0 |
| Max | | 75.9 | 11.5 | 64.4 | | | 2830 | 7.3 | 26.2 | 21.2 | 36.9 | 45.3 |
| Mean | | 74.8 | 10.5 | 64.3 | | | 2500 | 6.7 | 25.2 | 21.8 | 37.5 | 45.2 |
| Median | | 74.8 | 10.8 | 64.0 | | | 2480 | 6.7 | 25.1 | 21.5 | 37.2 | 44.9 |
| | **Min** | **Max** | **Mean** | **Median** | | | | | | | | |
| B2 TW (ft) | 8.4 | 11.5 | 10.5 | 10.8 | | | | | | | | |
| B2 FB (ft) | 73.8 | 75.9 | 74.8 | 74.8 | | | | | | | | |
| Calc I&T Q (kcfs) | 2.25 | 2.83 | 2.50 | 2.48 | | | | | | | | |

1 Staff gauge adjacent to sluice outfall.
2 Plunge height from center line of plume to surface of tailrace.
3 Mean calculated entrance velocity
4 Maximum calculated entrance velocity.
5 B2 staff gauge at exit of ice and trash chute.
6 Data obtained from project operations spreadsheet as requested by NWP.

**Appendix Table C-1**

**Incidence of injury, scale loss, and loss of equilibrium to juvenile chinook salmon passed during high tailwater through Bonneville Powerhouse II sluice, at a high (approximately 2,500 cfs) and low (1,000 cfs) discharge, June 2000.**

| Date | Fish ID Number | Injury Description | Injury Designation | Status | Photo | Possible Injury Source |
|---|---|---|---|---|---|---|
| | | ***Treatment 1,000 cfs*** | | | | |
| 13 Jun | YL2 | Loss of equilibrium | Minor | Alive | No | |
| 14 Jun | VP1 | Loss of equilibrium | Major | 1 h | No | |
| 16 Jun | WL7 | Scale loss; scrape | Major | 24 h | Yes | Mechanical |
| 17 Jun | RY5 | Bruises; scrapes both sides | Major | 1 h | Yes | Mechanical |
| 17 Jun | RP5 | No apparent injury | | 48 h | No | |
| | | ***Treatment 2,500 cfs*** | | | | |
| 14 Jun | VM0 | Loss of equilibrium | Minor | Alive | No | |
| 14 Jun | VN3 | No apparent injury | | 48 h | No | |
| 15 Jun | WC8 | Loss of equilibrium | Minor | Alive | No | |
| 16 Jun | WL9 | Loss of equilibrium | Minor | Alive | No | |
| | | ***Control 1,000cfs*** | | | | |
| 13 Jun | PA8 | Loss of equilibrium | Minor | Alive | No | |
| 15 Jun | WJ6 | Scale loss | Major | 48 h | Yes | Mechanical |
| 17 Jun | JL2 | No apparent injury | | 24 h | No | |
| | | ***Control 2,500 cfs*** | | | | |
| 17 Jun | RV2 | No apparent injury | | 24 h | No | |

**Appendix Table C-2**

**Incidence of injury, scale loss, and loss of equilibrium to juvenile chinook salmon passed during low tailwater through the Bonneville Powerhouse II sluice, at a high (approximately 2,500 cfs) and low (1,000 cfs) discharge, September and October 2000.**

| Date | Fish ID Number | Injury Description | Injury Designation | Status | Photo | Possible Injury Source |
|---|---|---|---|---|---|---|
| | | ***Treatment 1,000 cfs*** | | | | |
| 28 Sep | AM9 | Loss of equilibrium | Minor | Alive | No | |
| 28 Sep | AM5 | Loss of equilibrium | Minor | Alive | No | |
| 28 Sep | AN9 | Bruised mouth; scrape on right operculum | Major | 24 h | No | Mechanical |
| 28 Sep | AN7 | Scale loss on left side; loss of equilibrium | Major | 24 h | Yes | Mechanical |
| 29 Sep | AT9 | Loss of equilibrium | Minor | Alive | No | |
| 29 Sep | AP4 | Slight bruise behind adipose fin | Minor | Alive | No | Mechanical |
| 30 Sep | ZS6 | Loss of equilibrium | Minor | Alive | No | Mechanical |
| 06 Oct | BM0 | Hemorrhaging left side | Minor | Alive | No | |
| 28 Sep | 1 fish | No apparent injury | | 48 h | No | |
| 28 Sep to 5 Oct | 10 fish | No apparent injury | | 24 h | No | |
| | | ***Treatment 2,500 cfs*** | | | | |
| 29 Sep | Z70 | Loss of equilibrium | Minor | Alive | No | |
| 29 Sep | Z45 | Torn right operculum; loss of equilibrium | Major | 24h | Yes | Shear |
| 30 Sep | AV1 | Loss of equilibrium | Minor | Alive | No | |
| 30 Sep | ZN0 | Scale loss right side; bruised operculum and eye | Major | 24 h | Yes | Shear |
| 02 Oct | ZZ5 | Loss of equilibrium | Minor | Alive | No | |
| 05 Oct | ZL2 | Scale loss on right side | Major | Alive | No | Mechanical |
| 06 Oct | AW9 | Crescent shaped bruise on right side | Major | 48 h | No | Mechanical |
| 28 Sep to 4 Oct | 9 fish | No apparent injury | | 24 h | No | |
| 28 Sep to 4 Oct | 6 fish | No apparent injury | | 48 h | No | |

**Appendix Table C-2**

**Continued.**

| Date | Fish ID Number | Injury Description | Injury Designation | Status | Photo | Possible Injury Source |
|---|---|---|---|---|---|---|
| | | ***Control 1,000 cfs*** | | | | |
| 29 Sep | AR5 | Loss of equilibrium | Minor | Alive | No | |
| 05 Oct | ZD2 | Hemorrhage on pectoral fin | Minor | Alive | No | Mechanical/Shear |
| 06 Oct | AZ3 | Scale loss right side | Major | 24 h | No | Mechanical |
| 28 Sep | 1 fish | No apparent injury | | 48 h | No | |
| 28 Sep to 5 Oct | 6 fish | No apparent injury | | 24 h | No | |
| | | ***Control 2,500 cfs*** | | | | |
| 28 Sep | AW3 | Loss of equilibrium | Minor | Alive | No | |
| 29 Sep | Z91 | Slight bruise behind left operculum | Minor | Alive | No | Mechanical/Shear |
| 29 Sep | Z95 | Scale loss on right side | Major | 48 h | No | Mechanical |
| 29 Sep | 1fish | No apparent injuries | | 48 h | No | |
| 30 Sep to 5 Oct | 5 fish | No apparent injuries | | 24 h | No | |

**Appendix Table C-3**

**Tag-recapture data (1 h and 48 h) on chinook salmon smolt survival/condition estimation in passage through the Bonneville Powerhouse II sluice chute during high and low tailwater evaluations, June and September/October, 2000. Proportions given in parentheses.**

| | 12 Jun | 13 Jun | 14 Jun | 15 Jun | 16 Jun | 17 Jun | 18 Jun | Total |
|---|---|---|---|---|---|---|---|---|
| | | | | ***Spring - 1,000 cfs*** | | | | |
| Number released | 5 | 28 | 52 | 40 | 40 | 40 | 45 | 250 |
| Number recaptured alive | 5 (1.000) | 28 (1.000) | 51 (0.981) | 40 (1.000) | 40 (1.000) | 39 (0.975) | 45 (1.000) | 248 (0.992) |
| Number recaptured dead | 0 (0.000) | 0 (0.000) | 1 (0.019) | 0 (0.000) | 0 (0.000) | 1 (0.025) | 0 (0.000) | 2 (0.008) |
| Assigned dead* | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) |
| Unknown | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) |
| Number held | 5 | 28 | 51 | 40 | 40 | 39 | 45 | 248 |
| Number alive at 48 h | 5 | 28 | 51 | 40 | 40 | 38 | 45 | 247 |
| | | | | ***Spring - 2,500 cfs*** | | | | |
| Number released | 5 | 29 | 51 | 40 | 38 | 41 | 47 | 251 |
| Number recaptured alive | 5 (1.000) | 29 (1.000) | 51 (1.000) | 40 (1.000) | 38 (1.000) | 41 (1.000) | 47 (1.000) | 251 (1.000) |
| Number recaptured dead | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) |
| Assigned dead* | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) |
| Unknown | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) |
| Number held | 5 | 29 | 51 | 40 | 38 | 41 | 47 | 251 |
| Number alive at 48 h | 5 | 29 | 50 | 40 | 37 | 41 | 47 | 249 |
| | | | | ***Spring - Control*** | | | | |
| Number released | 5 | 19 | 61 | 40 | 40 | 45 | 40 | 250 |
| Number recaptured alive | 5 (1.000) | 18 (0.947) | 61 (1.000) | 40 (1.000) | 40 (1.000) | 45 (1.000) | 40 (1.000) | 249 (0.996) |
| Number recaptured dead | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) |
| Assigned dead* | 0 (0.000) | 1 (0.053) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 1 (0.004) |
| Unknown | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) |
| Number held | 5 | 18 | 61 | 40 | 40 | 45 | 40 | 249 |
| Number alive at 48 h | 5 | 18 | 61 | 39 | 40 | 43 | 40 | 246 |

* Fish unrecovered, fish assigned dead based on telemetry.

**Appendix Table C-3**

**Continued.**

| | 28 Sep | 29 Sep | 30 Sep | 2 Oct | 3 Oct | 4 Oct | 5 Oct | 6 Oct | To |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | ***Fall - 1,000 cfs*** | | | | |
| Number released | 40 | 50 | 39 | 49 | 40 | 50 | 50 | 30 | 34 |
| Number recaptured alive | 40 (1.000) | 50 (1.000) | 39 (1.000) | 49 (1.000) | 40 (1.000) | 50 (1.000) | 50 (1.000) | 30 (1.000) | 348 |
| Number recaptured dead | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 |
| Assigned dead* | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 |
| Unknown | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 |
| Number held | 40 | 50 | 39 | 49 | 40 | 50 | 50 | 30 | 34 |
| Number alive at 48 h | 35 | 48 | 35 | 48 | 40 | 50 | 49 | 30 | 33 |
| | | | | | ***Fall - 2,500 cfs*** | | | | |
| Number released | 40 | 50 | 40 | 49 | 39 | 48 | 49 | 30 | 34 |
| Number recaptured alive | 40 (1.000) | 50 (1.000) | 40 (1.000) | 49 (1.000) | 39 (1.000) | 48 (1.000) | 49 (1.000) | 30 (1.000) | 345 |
| Number recaptured dead | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 |
| Assigned dead* | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 |
| Unknown | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 |
| Number held | 40 | 50 | 40 | 49 | 39 | 48 | 49 | 30 | 34 |
| Number alive at 48 h | 34 | 48 | 34 | 49 | 38 | 46 | 49 | 29 | 32 |
| | | | | | ***Fall - Control*** | | | | |
| Number released | 38 | 40 | 40 | 60 | 40 | 49 | 50 | 30 | 34 |
| Number recaptured alive | 38 (1.000) | 39 (0.975) | 40 (1.000) | 59 (0.983) | 40 (1.000) | 49 (1.000) | 50 (1.000) | 30 (1.000) | 345 |
| Number recaptured dead | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 |
| Assigned dead* | 0 (0.000) | 0 (0.000) | 0 (0.000) | 1 (0.017) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 1 |
| Unknown | 0 (0.000) | 1 (0.025) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 0 (0.000) | 1 |
| Number held | 38 | 39 | 40 | 59 | 40 | 49 | 50 | 30 | 34 |
| Number alive at 48 h | 37 | 37 | 36 | 58 | 39 | 48 | 46 | 29 | 33 |

* Fish unrecovered, fish assigned dead based on telemetry.

| tal |
|---|
| 48 |
| (1.000) |
| (0.000) |
| (0.000) |
| (0.000) |
| 48 |
| 35 |
| |
| 45 |
| (1.000) |
| (0.000) |
| (0.000) |
| (0.000) |
| 45 |
| 27 |
| |
| 47 |
| (0.994) |
| (0.000) |
| (0.003) |
| (0.003) |
| 45 |
| 30 |

**Appendix Table C-4**

**Condition codes assigned to fish and dislodged balloon tags for fish passage survival evaluation**

**FISH CODES**

| | |
|---|---|
| **A** | No visible marks on fish |
| **B** | Flesh tear at tag site(s) |
| **C** | Minor scale loss, 3 to 20% (%s for entire body in immediate recovery; for detailed injury examination %s are for section only) |
| **D** | Major scale loss, >20% |
| **E** | Laceration(s); tear(s) on body |
| **F** | Severed body parts |
| **G** | Hemorrhaging, bruised |
| **H** | Stressed (lethargic, swimming poorly or sporadically) |
| **I** | Spasmodic movement of body |
| **J** | Very weak, barely gilling, died within 60 minutes of recovery |
| **K** | Failed to enter system |
| **L** | Fish likely preyed on based on telemetry, and/or circumstances relative to Turb'N recapture |
| **M** | Substantial bleeding at tag site |
| **N** | Bulging or missing eye(s) |
| **P** | Observed predator attack or marks indicative of predator |
| **Q** | Other information |
| **R** | Replaced due to unrecoverable conditions i.e. in rocks, recovery time expired |
| **T** | Trapped inside tunnel/gate well |
| **V** | Fins damaged (ripped, split, torn) or pulled from origin |
| **W** | Abrasion/scrape |
| **X** | No recovery information at all; fish remains unrecovered |
| **Z** | Radio telemetry or other information; fish remains unrecovered |

**DISSECTION CODES**

| | |
|---|---|
| **B** | Swim bladder ruptured or expanded |
| **D** | Kidneys damaged (hemorrhaging) |
| **E** | Broken bones obvious |
| **F** | Hemorrhaging internally |
| **L** | Organ displacement |
| **N** | Heart damage, ruptured, hemorrhaging, etc. |
| **O** | Liver damage, ruptured, hemorrhaging, etc. |
| **R** | Necropsied, no obvious injuries |
| **S** | Necropsied, internal injuries observed |
| **W** | Head removed, i.e, otolith |

**TURB'N TAG CODES (not used in database)**

| | |
|---|---|
| **A** | Fully inflated |
| **B** | Partially inflated |
| **C** | Pinhole, leaking |
| **D** | Burst |
| **E** | Not inflated at all |

APPENDIX TABLE C-5.

Short-term turbine passage survival data on individual chinook salmon released at different flows of the bypass sluice during high (June) and low (October) tailwater at Bonneville Dam Powerhouse II, 2000. Fish were tagged with Normandeau's HI-Z Turb-N tags. Description of condition codes and details on injured fish are presented in Appendix Table C-4.

| Fish No. | Time | | | No. of Turb-N Tags recovered | Fish Data | | | |
|---|---|---|---|---|---|---|---|---|
| | Re-leased | Re-covered | At Large (min.) | | Alive/ Dead | Condition Codes | Total Length (mm) | Comments |
| 12 June 2000 - Testlot 1 : High flow , Bypass Sluice - Water temp=13.5 C | | | | | | | | |
| JJ2 | 17:20 | 17:23 | 3 | 2 | ALIVE | A | 170 | |
| JJ3 | 17:19 | 17:24 | 5 | 2 | ALIVE | A | 147 | |
| JJ4 | 17:18 | 17:28 | 10 | 2 | ALIVE | A | 151 | |
| JJ5 | 17:19 | 17:24 | 5 | 2 | ALIVE | A | 150 | |
| JJ6 | 17:15 | 17:22 | 7 | 2 | ALIVE | A | 158 | |
| 12 June 2000 - Testlot 1 : Low flow, Bypass Sluice - Water temp=13.5 C | | | | | | | | |
| JJ7 | 17:44 | 17:49 | 5 | 2 | ALIVE | A | 160 | |
| JJ8 | 17:42 | 17:46 | 4 | 2 | ALIVE | A | 155 | |
| JJ9 | 17:42 | 17:51 | 9 | 2 | ALIVE | A | 161 | |
| JK0 | 17:43 | 17:47 | 4 | 2 | ALIVE | A | 202 | |
| JK1 | 17:43 | 17:49 | 6 | 2 | ALIVE | A | 154 | |
| 12 June 2000 - Testlot 1 : Control - Water temp=13.5 C | | | | | | | | |
| JK2 | 16:29 | 16:34 | 5 | 2 | ALIVE | A | 160 | |
| JK3 | 16:28 | 16:32 | 4 | 2 | ALIVE | A | 156 | |
| JK4 | 16:26 | 16:34 | 8 | 2 | ALIVE | A | 158 | |
| JK5 | 16:27 | 16:37 | 10 | 2 | ALIVE | A | 162 | |
| JK6 | 16:29 | 16:37 | 8 | 2 | ALIVE | A | 141 | |

13 June 2000 - Testlot 2 : High flow , Bypass Sluice - Water temp=14.5 C

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PB0 | 18:24 | 18:27 | 3 | 2 | ALIVE | A | 162 | |
| PB1 | 18:25 | 18:28 | 3 | 2 | ALIVE | A | 160 | |
| PB2 | 18:24 | 18:39 | 15 | 2 | ALIVE | A | 166 | |
| PB3 | 18:25 | 18:27 | 2 | 2 | ALIVE | A | 158 | |
| PB4 | 18:25 | 18:29 | 4 | 2 | ALIVE | A | 169 | |
| PB5 | 18:27 | 18:32 | 5 | 2 | ALIVE | A | 147 | |
| PB6 | 18:27 | 18:31 | 4 | 2 | ALIVE | A | 160 | |
| PB7 | 18:26 | 18:33 | 7 | 2 | ALIVE | A | 150 | |
| PB8 | 18:26 | 18:29 | 3 | 2 | ALIVE | A | 159 | |
| PB9 | 18:27 | 18:31 | 4 | 2 | ALIVE | A | 170 | |
| YF0 | 12:12 | 12:16 | 4 | 2 | ALIVE | A | 161 | |
| YF1 | 12:11 | 12:22 | 11 | 2 | ALIVE | A | 152 | |
| YF2 | 12:13 | 12:17 | 4 | 2 | ALIVE | A | 155 | |
| YF3 | 12:12 | 12:15 | 3 | 2 | ALIVE | A | 156 | |
| YF4 | 12:11 | 12:26 | 15 | 2 | ALIVE | A | 155 | |
| YF5 | 12:15 | 12:26 | 11 | 2 | ALIVE | A | 169 | |
| YF6 | 12:14 | 12:19 | 5 | 2 | ALIVE | A | 157 | |
| YF7 | 12:14 | 12:26 | 12 | 2 | ALIVE | A | 156 | |
| YF8 | 12:15 | 12:19 | 4 | 2 | ALIVE | A | 164 | |
| YF9 | 12:14 | 12:18 | 4 | 2 | ALIVE | A | 169 | |
| YH0 | 12:58 | 13:12 | 14 | 2 | ALIVE | A | 174 | |
| YH1 | 12:58 | 13:18 | 20 | 2 | ALIVE | A | 156 | |
| YH2 | 12:58 | 13:01 | 3 | 2 | ALIVE | A | 160 | |



APPENDIX TABLE C-5. Continued.

| Fish No. | Time | | | No. of Turb-N Tags recovered | Fish Data | | | |
|---|---|---|---|---|---|---|---|---|
| | Re-leased | Re-covered | At Large (min.) | | Alive/ Dead | Condition Codes | Total Length (mm) | Comments |
| YH3 | 12:59 | 13:08 | 9 | 2 | ALIVE | A | 161 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| YH5 | 12:59 | 13:05 | 6 | 2 | ALIVE | A | 149 |
| YH6 | 13:00 | 13:21 | 21 | 2 | ALIVE | A | 164 |
| YH7 | 13:00 | 13:03 | 3 | 2 | ALIVE | A | 165 |
| YH8 | 13:00 | 13:03 | 3 | 2 | ALIVE | A | 165 |
| YH9 | 13:01 | 13:07 | 6 | 2 | ALIVE | A | 172 |

13 June 2000 - Testlot 2 : Low flow, Bypass Sluice - Water temp=14.5 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| XL0 | 17:55 | 18:03 | 8 | 2 | ALIVE | A | 160 |
| XL1 | 17:54 | 17:59 | 5 | 2 | ALIVE | A | 160 |
| XL2 | 17:55 | 18:03 | 8 | 2 | ALIVE | A | 156 |
| XL3 | 17:55 | 18:04 | 9 | 2 | ALIVE | A | 170 |
| XL4 | 17:57 | 18:00 | 3 | 2 | ALIVE | A | 171 |
| XL5 | 17:54 | 17:56 | 2 | 2 | ALIVE | A | 164 |
| XL6 | 17:57 | 18:01 | 4 | 2 | ALIVE | A | 150 |
| XL7 | 17:56 | 17:58 | 2 | 2 | ALIVE | A | 176 |
| XL8 | 17:56 | 17:59 | 3 | 2 | ALIVE | A | 145 |
| XL9 | 17:56 | 18:00 | 4 | 2 | ALIVE | A | 188 |
| YK0 | 15:33 | 15:45 | 12 | 2 | ALIVE | A | 164 |
| YK1 | 15:33 | 15:36 | 3 | 2 | ALIVE | A | 159 |
| YK3 | 15:34 | 15:40 | 6 | 2 | ALIVE | A | 171 |
| YK4 | 15:33 | 15:39 | 6 | 2 | ALIVE | A | 151 |
| YK5 | 15:35 | 15:38 | 3 | 2 | ALIVE | A | 185 |
| YK6 | 15:36 | 15:40 | 4 | 2 | ALIVE | A | 145 |
| YK7 | 15:36 | 15:40 | 4 | 2 | ALIVE | A | 161 |
| YK9 | 15:35 | 15:40 | 5 | 2 | ALIVE | A | 159 |
| YL0 | 16:23 | 16:28 | 5 | 2 | ALIVE | A | 165 |
| YL1 | 16:21 | 16:28 | 7 | 2 | ALIVE | A | 162 |
| YL2 | 16:22 | 16:35 | 13 | 2 | ALIVE | H | 160 |
| YL3 | 16:22 | 16:32 | 10 | 2 | ALIVE | A | 170 |
| YL4 | 16:23 | 16:26 | 3 | 2 | ALIVE | A | 152 |
| YL5 | 16:24 | 16:27 | 3 | 2 | ALIVE | A | 155 |
| YL6 | 16:24 | 16:35 | 11 | 2 | ALIVE | A | 155 |
| YL7 | 16:23 | 16:27 | 4 | 2 | ALIVE | A | 177 |
| YL8 | 16:24 | 16:27 | 3 | 2 | ALIVE | A | 151 |
| YL9 | 16:23 | 16:26 | 3 | 2 | ALIVE | A | 153 |

13 June 2000 - Testlot 2 : Control - Water temp=14.5 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| YJ0 | 14:36 | 14:40 | 4 | 2 | ALIVE | A | 173 |
| YJ2 | 14:35 | 14:43 | 8 | 2 | ALIVE | A | 186 |
| YJ3 | 14:35 | 14:39 | 4 | 2 | ALIVE | A | 160 |
| YJ4 | 14:26 | 14:29 | 3 | 2 | ALIVE | A | 165 |
| YJ5 | 14:37 | . | . | 0 | DEAD | Z | 148 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| YJ6 | 14:37 | 14:46 | 9 | 2 | ALIVE | A | 149 | |
| YJ7 | 14:38 | 14:40 | 2 | 2 | ALIVE | A | 162 | |
| YJ8 | 14:36 | 14:40 | 4 | 2 | ALIVE | A | 169 | |
| YJ9 | 14:37 | 14:40 | 3 | 2 | ALIVE | A | 144 | |

13 June 2000 - Testlot 2 : Control - Water temp=14.5 C

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PA0 | 17:00 | 17:04 | 4 | 2 | ALIVE | A | 157 | |
| PA1 | 17:00 | 17:38 | 38 | 2 | ALIVE | A | 161 | |
| PA2 | 17:01 | 17:04 | 3 | 2 | ALIVE | A | 147 | |
| PA3 | 17:01 | 17:05 | 4 | 2 | ALIVE | A | 155 | |



APPENDIX TABLE C-5. Continued.

| Fish No. | Time | | | No. of Turb-N Tags recovered | Fish Data | | | |
|---|---|---|---|---|---|---|---|---|
| | Re-leased | Re-covered | At Large (min.) | | Alive/ Dead | Condition Codes | Total Length (mm) | Comments |
| PA4 | 17:01 | 17:05 | 4 | 2 | ALIVE | A | 165 | |
| PA5 | 17:02 | 17:06 | 4 | 2 | ALIVE | A | 185 | |
| PA6 | 17:03 | 17:06 | 3 | 2 | ALIVE | A | 159 | |
| PA7 | 17:03 | 17:38 | 35 | 2 | ALIVE | A | 155 | |
| PA8 | 17:02 | 17:38 | 36 | 2 | ALIVE | H | 151 | |
| PA9 | 17:02 | 17:38 | 36 | 2 | ALIVE | A | 182 | |

14 June 2000 - Testlot 3 : High flow , Bypass Sluice - Water temp=15.0 C

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| JK7 | 17:01 | 17:04 | 3 | 2 | ALIVE | A | 167 | |
| JK8 | 17:01 | 17:03 | 2 | 2 | ALIVE | A | 160 | |
| PH0 | 11:08 | 11:12 | 4 | 2 | ALIVE | A | 163 | |
| PH1 | 11:09 | 11:12 | 3 | 2 | ALIVE | A | 149 | |
| PH2 | 11:09 | 11:11 | 2 | 2 | ALIVE | A | 174 | |
| PH3 | 11:08 | 11:14 | 6 | 2 | ALIVE | A | 175 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PH4 | 11:09 | 11:17 | 8 | 2 | ALIVE | A | 181 |
| PH5 | 11:10 | 11:12 | 2 | 2 | ALIVE | A | 155 |
| PH6 | 11:11 | 11:19 | 8 | 2 | ALIVE | A | 172 |
| PH7 | 11:10 | 11:13 | 3 | 2 | ALIVE | A | 165 |
| PH8 | 11:11 | 11:18 | 7 | 2 | ALIVE | A | 156 |
| PH9 | 11:11 | 11:19 | 8 | 2 | ALIVE | A | 162 |
| PJ1 | 11:39 | 11:45 | 6 | 2 | ALIVE | A | 165 |
| PJ2 | 11:38 | 11:40 | 2 | 2 | ALIVE | A | 155 |
| PJ3 | 11:38 | 11:40 | 2 | 2 | ALIVE | A | 160 |
| PJ4 | 11:39 | 11:43 | 4 | 2 | ALIVE | A | 151 |
| PJ5 | 11:40 | 11:43 | 3 | 2 | ALIVE | A | 156 |
| PJ6 | 11:40 | 11:47 | 7 | 2 | ALIVE | A | 152 |
| PJ7 | 11:41 | 11:47 | 6 | 2 | ALIVE | A | 164 |
| PJ8 | 11:40 | 11:42 | 2 | 2 | ALIVE | A | 160 |
| PJ9 | 11:41 | 11:44 | 3 | 2 | ALIVE | A | 160 |
| VM0 | 13:16 | 13:35 | 19 | 2 | ALIVE | H | 145 |
| VM1 | 13:14 | 13:18 | 4 | 2 | ALIVE | A | 162 |
| VM2 | 13:15 | 13:23 | 8 | 2 | ALIVE | A | 162 |
| VM3 | 13:15 | 13:19 | 4 | 2 | ALIVE | A | 185 |
| VM4 | 13:16 | 13:20 | 4 | 2 | ALIVE | A | 150 |
| VM5 | 13:17 | 13:24 | 7 | 2 | ALIVE | A | 170 |
| VM6 | 13:18 | 13:23 | 5 | 2 | ALIVE | A | 155 |
| VM7 | 13:18 | 13:20 | 2 | 2 | ALIVE | A | 165 |
| VM8 | 13:17 | 13:40 | 23 | 2 | ALIVE | A | 175 |
| VM9 | 13:17 | 13:20 | 3 | 2 | ALIVE | A | 164 |
| VN0 | 13:55 | 14:01 | 6 | 2 | ALIVE | A | 160 |
| VN1 | 13:55 | 14:01 | 6 | 2 | ALIVE | A | 182 |
| VN2 | 13:55 | 14:04 | 9 | 2 | ALIVE | A | 153 |
| VN3 | 13:54 | 14:02 | 8 | 2 | ALIVE | A | 151 |
| VN4 | 13:54 | 14:01 | 7 | 2 | ALIVE | A | 172 |
| VN5 | 13:57 | 14:01 | 4 | 2 | ALIVE | A | 165 |
| VN6 | 13:57 | 13:59 | 2 | 2 | ALIVE | A | 156 |
| VN7 | 13:56 | 13:59 | 3 | 2 | ALIVE | A | 171 |
| VN8 | 13:56 | 14:02 | 6 | 2 | ALIVE | A | 171 |
| VN9 | 13:56 | 13:59 | 3 | 2 | ALIVE | A | 159 |
| VU0 | 16:58 | 17:01 | 3 | 2 | ALIVE | A | 155 |
| VU1 | 17:00 | 17:02 | 2 | 2 | ALIVE | A | 150 |
| VU2 | 16:59 | 17:05 | 6 | 2 | ALIVE | A | 156 |
| VU3 | 16:58 | 17:08 | 10 | 2 | ALIVE | A | 153 |
| VU4 | 16:59 | 17:03 | 4 | 2 | ALIVE | A | 155 |
| VU5 | 16:59 | 17:07 | 8 | 1 | ALIVE | A | 161 |
| VU6 | 17:01 | 17:09 | 8 | 2 | ALIVE | A | 162 |
| VU7 | 17:02 | 17:07 | 5 | 2 | ALIVE | A | 165 |

APPENDIX TABLE C-5. Continued.

| Fish No. | Time | | | No. of Turb-N Tags recovered | Fish Data | | | |
|---|---|---|---|---|---|---|---|---|
| | Re-leased | Re-covered | At Large (min.) | | Alive/ Dead | Condition Codes | Total Length (mm) | Comments |
| VU8 | 17:00 | 17:02 | 2 | 2 | ALIVE | A | 165 | |
| VU9 | 17:02 | 17:04 | 2 | 2 | ALIVE | A | 154 | |
| 14 June 2000 - Testlot 3 : Low flow, Bypass Sluice - Water temp=15.0 C | | | | | | | | |
| JL7 | 17:35 | 17:38 | 3 | 2 | ALIVE | A | 171 | |
| JL8 | 17:36 | 17:37 | 1 | 2 | ALIVE | A | 169 | |
| PE0 | 9:42 | 9:49 | 7 | 2 | ALIVE | A | 154 | |
| PE1 | 9:41 | 9:45 | 4 | 2 | ALIVE | A | 155 | |
| PE2 | 9:42 | 9:47 | 5 | 2 | ALIVE | A | 155 | |
| PE3 | 9:41 | 9:51 | 10 | 2 | ALIVE | A | 145 | |
| PE4 | 9:41 | 9:54 | 13 | 1 | ALIVE | A | 175 | |
| PE5 | 9:43 | 9:47 | 4 | 2 | ALIVE | A | 174 | |
| PE6 | 9:44 | 9:46 | 2 | 2 | ALIVE | A | 170 | |
| PE7 | 9:44 | 9:54 | 10 | 2 | ALIVE | A | 150 | |
| PE8 | 9:43 | 9:46 | 3 | 2 | ALIVE | A | 160 | |
| PE9 | 9:43 | 9:50 | 7 | 2 | ALIVE | A | 160 | |
| PF0 | 10:18 | 10:23 | 5 | 2 | ALIVE | A | 166 | |
| PF1 | 10:19 | 10:26 | 7 | 2 | ALIVE | A | 152 | |
| PF2 | 10:19 | 10:23 | 4 | 2 | ALIVE | A | 153 | |
| PF3 | 10:19 | 10:23 | 4 | 2 | ALIVE | A | 147 | |
| PF4 | 10:18 | 10:21 | 3 | 2 | ALIVE | A | 154 | |
| PF5 | 10:21 | 10:27 | 6 | 2 | ALIVE | A | 180 | |
| PF6 | 10:20 | 10:28 | 8 | 2 | ALIVE | A | 165 | |
| PF7 | 10:20 | 10:27 | 7 | 2 | ALIVE | A | 165 | |
| PF8 | 10:20 | 10:23 | 3 | 2 | ALIVE | A | 155 | |
| PF9 | 10:21 | 10:27 | 6 | 1 | ALIVE | B | 172 | |
| VP0 | 14:48 | 14:51 | 3 | 2 | ALIVE | A | 166 | |
| VP1 | 14:48 | 14:58 | 10 | 2 | DEAD | HJ | 160 | |
| VP2 | 14:49 | 14:51 | 2 | 2 | ALIVE | A | 155 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| VP3 | 14:47 | 14:50 | 3 | 2 | ALIVE | A | 159 | |
| VP4 | 14:48 | 14:58 | 10 | 2 | ALIVE | A | 160 | |
| VP5 | 14:50 | 15:03 | 13 | 2 | ALIVE | A | 158 | |
| VP6 | 14:49 | 14:52 | 3 | 2 | ALIVE | A | 188 | |
| VP7 | 14:50 | 14:53 | 3 | 2 | ALIVE | A | 169 | |
| VP8 | 14:51 | 14:56 | 5 | 2 | ALIVE | A | 170 | |
| VP9 | 14:51 | 14:53 | 2 | 2 | ALIVE | A | 175 | |
| VR0 | 15:24 | 15:38 | 14 | 2 | ALIVE | A | 162 | |
| VR1 | 15:24 | 15:30 | 6 | 2 | ALIVE | A | 165 | |
| VR2 | 15:23 | 15:25 | 2 | 2 | ALIVE | A | 158 | |
| VR3 | 15:23 | 15:29 | 6 | 2 | ALIVE | A | 152 | |
| VR4 | 15:23 | 15:26 | 3 | 2 | ALIVE | A | 165 | |
| VR5 | 15:25 | 15:29 | 4 | 2 | ALIVE | A | 170 | |
| VR6 | 15:24 | 15:29 | 5 | 2 | ALIVE | A | 160 | |
| VR7 | 15:25 | 15:28 | 3 | 2 | ALIVE | A | 158 | |
| VR8 | 15:25 | 15:28 | 3 | 2 | ALIVE | A | 137 | |
| VR9 | 15:26 | 15:31 | 5 | 2 | ALIVE | A | 179 | |
| VW0 | 17:33 | 17:37 | 4 | 2 | ALIVE | A | 156 | |
| VW1 | 17:34 | 17:36 | 2 | 2 | ALIVE | A | 141 | |
| VW2 | 17:34 | 17:42 | 8 | 2 | ALIVE | A | 157 | |
| VW3 | 17:34 | 17:40 | 6 | 2 | ALIVE | A | 158 | |
| VW4 | 17:33 | 17:44 | 11 | 2 | ALIVE | A | 150 | |
| VW5 | 17:33 | 17:37 | 4 | 2 | ALIVE | A | 175 | |
| VW6 | 17:35 | 17:46 | 11 | 2 | ALIVE | A | 153 | |
| VW7 | 17:36 | 17:38 | 2 | 2 | ALIVE | A | 162 | |
| VW8 | 17:35 | 17:41 | 6 | 2 | ALIVE | A | 160 | |
| VW9 | 17:36 | 17:38 | 2 | 2 | ALIVE | A | 150 | |



APPENDIX TABLE C-5. Continued.

| Fish No. | Time | | | No. of Turb-N Tags recovered | Fish Data | | | |
|---|---|---|---|---|---|---|---|---|
| | Re-leased | Re-covered | At Large (min.) | | Alive/ Dead | Condition Codes | Total Length (mm) | Comments |

14 June 2000 - Testlot 3 : Control - Water temp=15.0 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| JK9 | 16:33 | 16:37 | 4 | 2 | ALIVE | A | 144 |
| PK0 | 12:19 | 12:23 | 4 | 2 | ALIVE | A | 166 |
| PK1 | 12:20 | 12:22 | 2 | 2 | ALIVE | A | 155 |
| PK2 | 12:19 | 12:23 | 4 | 2 | ALIVE | A | 155 |
| PK3 | 12:20 | 12:26 | 6 | 2 | ALIVE | A | 150 |
| PK4 | 12:20 | 12:23 | 3 | 2 | ALIVE | A | 166 |
| PK5 | 12:22 | 12:25 | 3 | 2 | ALIVE | A | 161 |
| PK6 | 12:23 | 12:28 | 5 | 2 | ALIVE | A | 162 |
| PK7 | 12:22 | 12:25 | 3 | 2 | ALIVE | A | 155 |
| PK8 | 12:21 | 12:27 | 6 | 2 | ALIVE | A | 166 |
| PK9 | 12:21 | 12:24 | 3 | 2 | ALIVE | A | 156 |
| PL0 | 12:52 | 12:59 | 7 | 2 | ALIVE | A | 155 |
| PL1 | 12:52 | 12:55 | 3 | 2 | ALIVE | A | 172 |
| PL2 | 12:52 | 12:55 | 3 | 2 | ALIVE | A | 156 |
| PL3 | 12:51 | 12:55 | 4 | 2 | ALIVE | A | 177 |
| PL4 | 12:53 | 12:58 | 5 | 2 | ALIVE | A | 156 |
| PL5 | 12:53 | 12:57 | 4 | 2 | ALIVE | A | 181 |
| PL6 | 12:54 | 12:59 | 5 | 2 | ALIVE | A | 167 |
| PL7 | 12:55 | 12:59 | 4 | 2 | ALIVE | A | 172 |
| PL8 | 12:53 | 12:57 | 4 | 2 | ALIVE | A | 155 |
| PL9 | 12:54 | 12:57 | 3 | 2 | ALIVE | A | 153 |
| VT0 | 16:32 | 16:38 | 6 | 2 | ALIVE | A | 157 |
| VT1 | 16:31 | 16:33 | 2 | 2 | ALIVE | A | 170 |
| VT2 | 16:31 | 16:37 | 6 | 2 | ALIVE | A | 154 |
| VT3 | 16:30 | 16:39 | 9 | 2 | ALIVE | A | 162 |
| VT4 | 16:31 | 16:38 | 7 | 2 | ALIVE | A | 162 |
| VT5 | 16:32 | 16:38 | 6 | 2 | ALIVE | A | 150 |
| VT6 | 16:34 | 16:38 | 4 | 2 | ALIVE | A | 185 |
| VT7 | 16:34 | 16:37 | 3 | 2 | ALIVE | A | 161 |
| VT8 | 16:34 | 16:37 | 3 | 2 | ALIVE | A | 145 |
| VT9 | 16:33 | 16:38 | 5 | 2 | ALIVE | A | 148 |

14 June 2000 - Testlot 3 : Control - Water temp=15.0 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PC0 | 8:34 | 8:38 | 4 | 2 | ALIVE | A | 162 |
| PC1 | 8:35 | 8:40 | 5 | 2 | ALIVE | A | 163 |
| PC2 | 8:33 | 8:42 | 9 | 2 | ALIVE | A | 165 |
| PC3 | 8:34 | 8:38 | 4 | 2 | ALIVE | A | 170 |
| PC4 | 8:34 | 8:37 | 3 | 2 | ALIVE | A | 181 |
| PC5 | 8:35 | 8:38 | 3 | 2 | ALIVE | A | 160 |
| PC6 | 8:36 | 8:39 | 3 | 2 | ALIVE | A | 159 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PC7 | 8:35 | 8:40 | 5 | 2 | ALIVE | A | 145 | |
| PC8 | 8:36 | 8:41 | 5 | 2 | ALIVE | A | 179 | |
| PC9 | 8:37 | 8:40 | 3 | 2 | ALIVE | A | 156 | |
| PD0 | 9:10 | 9:17 | 7 | 2 | ALIVE | A | 149 | |
| PD1 | 9:11 | 9:14 | 3 | 2 | ALIVE | A | 145 | |
| PD2 | 9:10 | 9:16 | 6 | 2 | ALIVE | A | 160 | |
| PD3 | 9:10 | 9:16 | 6 | 2 | ALIVE | A | 158 | |
| PD4 | 9:11 | 9:14 | 3 | 2 | ALIVE | A | 145 | |
| PD5 | 9:12 | 9:17 | 5 | 2 | ALIVE | A | 159 | |
| PD6 | 9:12 | 9:16 | 4 | 2 | ALIVE | A | 139 | |
| PD7 | 9:13 | 9:17 | 4 | 2 | ALIVE | A | 163 | |
| PD8 | 9:11 | 9:16 | 5 | 2 | ALIVE | A | 171 | |
| PD9 | 9:12 | 9:16 | 4 | 2 | ALIVE | A | 150 | |



APPENDIX TABLE C-5. Continued.

| Fish No. | Time | | | No. of Turb-N Tags recovered | Fish Data | | | |
|---|---|---|---|---|---|---|---|---|
| | Re-leased | Re-covered | At Large (min.) | | Alive/ Dead | Condition Codes | Total Length (mm) | Comments |
| VS0 | 16:07 | 16:09 | 2 | 2 | ALIVE | A | 155 | |
| VS1 | 16:06 | 16:15 | 9 | 2 | ALIVE | A | 155 | |
| VS2 | 16:06 | 16:10 | 4 | 2 | ALIVE | A | 160 | |
| VS3 | 16:06 | 16:13 | 7 | 2 | ALIVE | A | 162 | |
| VS4 | 16:05 | 16:09 | 4 | 2 | ALIVE | A | 165 | |
| VS5 | 16:08 | 16:10 | 2 | 2 | ALIVE | A | 168 | |
| VS6 | 16:07 | 16:14 | 7 | 2 | ALIVE | A | 152 | |
| VS7 | 16:08 | 16:11 | 3 | 2 | ALIVE | A | 160 | |
| VS8 | 16:07 | 16:12 | 5 | 2 | ALIVE | A | 165 | |
| VS9 | 16:08 | 16:12 | 4 | 2 | ALIVE | A | 155 | |
| 15 June 2000 - Testlot 4 : High flow , Bypass Sluice - Water temp=15.0 C | | | | | | | | |
| V96 | 12:12 | 12:15 | 3 | 2 | ALIVE | A | 151 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| VW0 | 8:31 | 8:49 | 18 | 2 | ALIVE | A | 153 |
| VW1 | 8:30 | 8:32 | 2 | 2 | ALIVE | A | 143 |
| VW2 | 8:29 | 8:33 | 4 | 2 | ALIVE | A | 164 |
| VW3 | 8:30 | 8:30 | 0 | 2 | ALIVE | A | 154 |
| VW4 | 8:29 | 8:33 | 4 | 2 | ALIVE | A | 150 |
| VW5 | 8:32 | 8:35 | 3 | 2 | ALIVE | A | 157 |
| VW6 | 8:31 | 8:32 | 1 | 2 | ALIVE | A | 148 |
| VW7 | 8:31 | 8:34 | 3 | 2 | ALIVE | A | 190 |
| VW8 | 8:33 | 8:44 | 11 | 2 | ALIVE | A | 160 |
| VW9 | 8:32 | 8:35 | 3 | 2 | ALIVE | A | 164 |
| VX0 | 9:06 | 9:09 | 3 | 2 | ALIVE | A | 165 |
| VX1 | 9:05 | 9:08 | 3 | 2 | ALIVE | A | 153 |
| VX2 | 9:06 | 9:09 | 3 | 2 | ALIVE | A | 159 |
| VX3 | 9:06 | 9:13 | 7 | 2 | ALIVE | A | 176 |
| VX4 | 9:05 | 9:12 | 7 | 2 | ALIVE | A | 181 |
| VX5 | 9:07 | 9:09 | 2 | 2 | ALIVE | A | 179 |
| VX6 | 9:07 | 9:17 | 10 | 2 | ALIVE | A | 147 |
| VX7 | 9:07 | 9:10 | 3 | 2 | ALIVE | A | 175 |
| VX8 | 9:08 | 9:13 | 5 | 2 | ALIVE | A | 165 |
| VX9 | 9:08 | 9:11 | 3 | 2 | ALIVE | A | 158 |
| WA0 | 11:33 | 11:42 | 9 | 2 | ALIVE | A | 161 |
| WA1 | 11:33 | 11:41 | 8 | 2 | ALIVE | A | 155 |
| WA2 | 11:32 | 11:36 | 4 | 2 | ALIVE | A | 158 |
| WA3 | 11:33 | 11:39 | 6 | 2 | ALIVE | A | 155 |
| WA4 | 11:34 | 11:43 | 9 | 2 | ALIVE | A | 166 |
| WA5 | 11:35 | 11:43 | 8 | 2 | ALIVE | A | 163 |
| WA6 | 11:34 | 11:37 | 3 | 2 | ALIVE | A | 180 |
| WA7 | 11:35 | 11:38 | 3 | 2 | ALIVE | A | 161 |
| WA9 | 11:35 | 11:47 | 12 | 2 | ALIVE | A | 171 |
| WC0 | 12:10 | 12:18 | 8 | 2 | ALIVE | A | 155 |
| WC1 | 12:11 | 12:19 | 8 | 2 | ALIVE | A | 160 |
| WC2 | 12:09 | 12:11 | 2 | 2 | ALIVE | A | 151 |
| WC3 | 12:09 | 12:12 | 3 | 2 | ALIVE | A | 151 |
| WC4 | 12:09 | 12:12 | 3 | 2 | ALIVE | A | 156 |
| WC5 | 12:13 | 12:19 | 6 | 2 | ALIVE | A | 153 |
| WC6 | 12:11 | 12:15 | 4 | 2 | ALIVE | A | 158 |
| WC7 | 12:13 | 12:15 | 2 | 2 | ALIVE | A | 138 |
| WC8 | 12:13 | 12:17 | 4 | 1 | ALIVE | BH | 166 |
| WC9 | 12:12 | 12:18 | 6 | 2 | ALIVE | A | 160 |

15 June 2000 - Testlot 4 : Low flow, Bypass Sluice - Water temp=15.0 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| WB0 | 12:37 | 12:39 | 2 | 2 | ALIVE | A | 155 |

APPENDIX TABLE C-5. Continued.

| Fish No. | Time | | | No. of Turb-N Tags recovered | Fish Data | | | |
|---|---|---|---|---|---|---|---|---|
| | Re-leased | Re-covered | At Large (min.) | | Alive/ Dead | Condition Codes | Total Length (mm) | Comments |
| WB1 | 12:38 | 12:46 | 8 | 2 | ALIVE | A | 166 | |
| WB2 | 12:37 | 12:39 | 2 | 2 | ALIVE | A | 182 | |
| WB3 | 12:38 | 12:46 | 8 | 2 | ALIVE | A | 162 | |
| WB4 | 12:38 | 12:41 | 3 | 2 | ALIVE | A | 161 | |
| WB5 | 12:39 | 12:49 | 10 | 2 | ALIVE | A | 163 | |
| WB6 | 12:40 | 12:43 | 3 | 2 | ALIVE | A | 155 | |
| WB7 | 12:40 | 12:42 | 2 | 2 | ALIVE | A | 149 | |
| WB8 | 12:40 | 12:46 | 6 | 2 | ALIVE | A | 158 | |
| WB9 | 12:41 | 12:44 | 3 | 2 | ALIVE | A | 158 | |
| WD0 | 14:03 | 14:06 | 3 | 2 | ALIVE | A | 148 | |
| WD1 | 14:04 | 14:10 | 6 | 2 | ALIVE | A | 149 | |
| WD2 | 14:04 | 14:09 | 5 | 2 | ALIVE | A | 166 | |
| WD3 | 14:04 | 14:06 | 2 | 2 | ALIVE | A | 157 | |
| WD4 | 14:03 | 14:09 | 6 | 2 | ALIVE | A | 159 | |
| WD5 | 14:19 | 14:21 | 2 | 2 | ALIVE | A | 169 | |
| WD6 | 14:20 | 14:22 | 2 | 2 | ALIVE | A | 165 | |
| WD7 | 14:19 | 14:23 | 4 | 2 | ALIVE | A | 168 | |
| WD8 | 14:20 | 14:25 | 5 | 2 | ALIVE | A | 160 | |
| WD9 | 14:19 | 14:23 | 4 | 2 | ALIVE | A | 143 | |
| WE0 | 14:41 | 14:44 | 3 | 2 | ALIVE | A | 156 | |
| WE1 | 14:40 | 14:43 | 3 | 2 | ALIVE | A | 161 | |
| WE2 | 14:39 | 14:42 | 3 | 2 | ALIVE | A | 151 | |
| WE3 | 14:40 | 14:42 | 2 | 2 | ALIVE | A | 160 | |
| WE4 | 14:41 | 14:43 | 2 | 2 | ALIVE | A | 186 | |
| WE5 | 14:42 | 14:44 | 2 | 2 | ALIVE | A | 153 | |
| WE6 | 14:42 | 14:44 | 2 | 2 | ALIVE | A | 164 | |
| WE7 | 14:41 | 14:44 | 3 | 2 | ALIVE | A | 160 | |
| WE8 | 14:43 | 14:46 | 3 | 2 | ALIVE | A | 168 | |
| WE9 | 14:43 | 14:49 | 6 | 2 | ALIVE | A | 157 | |
| WF0 | 15:18 | 15:21 | 3 | 2 | ALIVE | A | 153 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| WF1 | 15:17 | 15:28 | 11 | 2 | ALIVE | A | 152 | |
| WF2 | 15:17 | 15:28 | 11 | 2 | ALIVE | A | 165 | |
| WF3 | 15:18 | 15:22 | 4 | 2 | ALIVE | A | 169 | |
| WF4 | 15:19 | 15:21 | 2 | 2 | ALIVE | A | 170 | |
| WF5 | 15:20 | 15:28 | 8 | 2 | ALIVE | A | 164 | |
| WF6 | 15:21 | 15:23 | 2 | 2 | ALIVE | A | 156 | |
| WF7 | 15:19 | 15:22 | 3 | 2 | ALIVE | A | 165 | |
| WF8 | 15:20 | 15:22 | 2 | 2 | ALIVE | A | 162 | |
| WF9 | 15:20 | 15:25 | 5 | 2 | ALIVE | A | 163 | |
| 15 June 2000 - Testlot 4 : Control - Water temp=15.0 C | | | | | | | | |
| VY0 | 10:28 | 10:36 | 8 | 2 | ALIVE | A | 173 | |
| VY1 | 10:27 | 10:36 | 9 | 2 | ALIVE | A | 155 | |
| VY2 | 10:29 | 10:31 | 2 | 2 | ALIVE | A | 165 | |
| VY3 | 10:29 | 10:33 | 4 | 2 | ALIVE | A | 168 | |
| VY4 | 10:29 | 10:32 | 3 | 2 | ALIVE | A | 166 | |
| VY5 | 10:30 | 10:36 | 6 | 2 | ALIVE | A | 159 | |
| VY6 | 10:31 | 10:34 | 3 | 2 | ALIVE | A | 156 | |
| VY7 | 10:30 | 10:33 | 3 | 2 | ALIVE | A | 172 | |
| VY8 | 10:31 | 10:39 | 8 | 2 | ALIVE | A | 166 | |
| VY9 | 10:31 | 10:35 | 4 | 2 | ALIVE | A | 184 | |
| VZ0 | 10:59 | 11:15 | 16 | 2 | ALIVE | TA | 179 | |
| VZ1 | 11:00 | 11:03 | 3 | 2 | ALIVE | A | 155 | |
| VZ2 | 11:00 | 11:05 | 5 | 2 | ALIVE | A | 173 | |
| VZ3 | 10:59 | 11:05 | 6 | 2 | ALIVE | A | 166 | |
| VZ4 | 11:00 | 11:16 | 16 | 2 | ALIVE | TA | 155 | |
| VZ5 | 11:01 | 11:15 | 14 | 2 | ALIVE | TA | 161 | |



APPENDIX TABLE C-5. Continued.

| Fish No. | Time | | | | Fish Data | | | |
|---|---|---|---|---|---|---|---|---|
| | Re-leased | Re-covered | At Large (min.) | No. of Turb-N Tags recovered | Alive/ Dead | Condition Codes | Total Length (mm) | Comments |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| VZ6 | 11:01 | 11:15 | 14 | 2 | ALIVE | TA | 154 |
| VZ7 | 11:02 | 11:05 | 3 | 2 | ALIVE | A | 156 |
| VZ8 | 11:02 | 11:16 | 14 | 2 | ALIVE | TA | 155 |
| VZ9 | 11:01 | 11:04 | 3 | 2 | ALIVE | A | 145 |

15 June 2000 - Testlot 4 : Control - Water temp=15.0 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| WH0 | 15:54 | 16:03 | 9 | 2 | ALIVE | A | 152 |
| WH1 | 15:54 | 15:57 | 3 | 2 | ALIVE | A | 152 |
| WH2 | 15:56 | 15:59 | 3 | 2 | ALIVE | A | 170 |
| WH3 | 15:55 | 16:03 | 8 | 2 | ALIVE | A | 179 |
| WH4 | 15:56 | 16:00 | 4 | 2 | ALIVE | A | 149 |
| WH5 | 15:57 | 16:01 | 4 | 2 | ALIVE | A | 150 |
| WH6 | 15:57 | 16:03 | 6 | 2 | ALIVE | A | 153 |
| WH7 | 15:56 | 16:00 | 4 | 2 | ALIVE | A | 172 |
| WH8 | 15:55 | 16:03 | 8 | 2 | ALIVE | A | 159 |
| WH9 | 15:58 | 16:03 | 5 | 2 | ALIVE | A | 157 |
| WJ0 | 16:31 | 16:35 | 4 | 2 | ALIVE | A | 177 |
| WJ1 | 16:30 | 16:37 | 7 | 2 | ALIVE | A | 169 |
| WJ2 | 16:30 | 16:38 | 8 | 2 | ALIVE | A | 145 |
| WJ3 | 16:30 | 16:35 | 5 | 2 | ALIVE | A | 161 |
| WJ4 | 16:31 | 16:36 | 5 | 2 | ALIVE | A | 151 |
| WJ5 | 16:32 | 16:35 | 3 | 2 | ALIVE | A | 152 |
| WJ6 | 16:32 | 16:35 | 3 | 2 | ALIVE | A | 155 |
| WJ7 | 16:33 | 16:41 | 8 | 2 | ALIVE | A | 160 |
| WJ8 | 16:32 | 16:36 | 4 | 2 | ALIVE | A | 153 |
| WJ9 | 16:33 | 16:36 | 3 | 2 | ALIVE | A | 142 |

16 June 2000 - Testlot 5 : High flow , Bypass Sluice - Water temp=15.5 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| KK0 | 16:18 | 16:20 | 2 | 2 | ALIVE | A | 165 |
| KK1 | 16:17 | 16:19 | 2 | 2 | ALIVE | A | 170 |
| KK2 | 16:18 | 16:27 | 9 | 2 | ALIVE | A | 175 |
| KK3 | 16:18 | 16:23 | 5 | 2 | ALIVE | A | 163 |
| KK4 | 16:17 | 16:29 | 12 | 2 | ALIVE | A | 162 |
| KK5 | 16:20 | 16:23 | 3 | 2 | ALIVE | A | 162 |
| KK6 | 16:20 | 16:23 | 3 | 2 | ALIVE | A | 163 |
| KK7 | 16:19 | 16:23 | 4 | 2 | ALIVE | A | 151 |
| KK8 | 16:19 | 16:27 | 8 | 2 | ALIVE | A | 146 |
| KK9 | 16:19 | 16:23 | 4 | 2 | ALIVE | A | 161 |
| KL0 | 16:46 | 16:55 | 9 | 2 | ALIVE | A | 157 |
| KL1 | 16:46 | 16:55 | 9 | 2 | ALIVE | A | 158 |
| KL2 | 16:46 | 16:49 | 3 | 2 | ALIVE | A | 160 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| KL4 | 16:47 | 16:51 | 4 | 2 | ALIVE | A | 164 | |
| KL5 | 16:47 | 16:52 | 5 | 2 | ALIVE | A | 153 | |
| KL7 | 16:48 | 16:53 | 5 | 2 | ALIVE | A | 157 | |
| KL8 | 16:49 | 17:19 | 30 | 2 | ALIVE | A | 176 | |
| KL9 | 16:48 | 16:55 | 7 | 2 | ALIVE | A | 162 | |
| WK0 | 13:09 | 13:15 | 6 | 2 | ALIVE | A | 154 | |
| WK1 | 13:10 | 13:12 | 2 | 2 | ALIVE | A | 146 | |
| WK2 | 13:08 | 13:11 | 3 | 2 | ALIVE | A | 149 | |
| WK3 | 13:10 | 13:22 | 12 | 2 | ALIVE | A | 156 | |
| WK4 | 13:09 | 13:26 | 17 | 2 | ALIVE | A | 172 | |
| WK5 | 13:10 | 13:18 | 8 | 2 | ALIVE | A | 154 | |
| WK6 | 13:11 | 13:30 | 19 | 2 | ALIVE | A | 158 | |
| WK7 | 13:11 | 13:16 | 5 | 2 | ALIVE | A | 144 | |
| WK8 | 13:11 | 13:13 | 2 | 2 | ALIVE | A | 160 | |



APPENDIX TABLE C-5. Continued.

| Fish No. | Time | | | | Fish Data | | | |
|---|---|---|---|---|---|---|---|---|
| | Re-leased | Re-covered | At Large (min.) | No. of Turb-N Tags recovered | Alive/ Dead | Condition Codes | Total Length (mm) | Comments |
| WK9 | 13:10 | 13:17 | 7 | 2 | ALIVE | A | 168 | |
| WL0 | 13:48 | 13:51 | 3 | 2 | ALIVE | A | 167 | |
| WL1 | 13:49 | 13:52 | 3 | 2 | ALIVE | A | 174 | |
| WL2 | 13:49 | 13:51 | 2 | 2 | ALIVE | A | 182 | |
| WL3 | 13:49 | 13:53 | 4 | 2 | ALIVE | A | 148 | |
| WL4 | 13:48 | 13:54 | 6 | 2 | ALIVE | A | 143 | |
| WL5 | 13:49 | 13:56 | 7 | 2 | ALIVE | A | 150 | |
| WL6 | 13:50 | 13:54 | 4 | 2 | ALIVE | A | 163 | |
| WL7 | 13:50 | 13:55 | 5 | 2 | ALIVE | A | 143 | |
| WL8 | 13:51 | 13:55 | 4 | 2 | ALIVE | A | 149 | |
| WL9 | 13:50 | 13:54 | 4 | 2 | ALIVE | HB | 181 | |

16 June 2000 - Testlot 5 : Low flow, Bypass Sluice - Water temp=15.5 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| KA0 | 14:15 | 14:19 | 4 | 2 | ALIVE | A | 156 |
| KA1 | 14:16 | 14:19 | 3 | 2 | ALIVE | A | 150 |
| KA2 | 14:16 | 14:19 | 3 | 2 | ALIVE | A | 156 |
| KA3 | 14:15 | 14:17 | 2 | 2 | ALIVE | A | 155 |
| KA4 | 14:15 | 14:19 | 4 | 2 | ALIVE | A | 165 |
| KA5 | 14:16 | 14:25 | 9 | 2 | ALIVE | A | 165 |
| KA6 | 14:17 | 14:24 | 7 | 2 | ALIVE | A | 167 |
| KA7 | 14:17 | 14:20 | 3 | 2 | ALIVE | A | 183 |
| KA8 | 14:18 | 14:21 | 3 | 2 | ALIVE | A | 173 |
| KA9 | 14:18 | 14:21 | 3 | 2 | ALIVE | A | 152 |
| KB0 | 14:47 | 14:49 | 2 | 2 | ALIVE | A | 156 |
| KB1 | 14:46 | 14:51 | 5 | 2 | ALIVE | A | 166 |
| KB2 | 14:46 | 14:51 | 5 | 2 | ALIVE | A | 158 |
| KB3 | 14:47 | 14:53 | 6 | 2 | ALIVE | A | 152 |
| KB4 | 14:47 | 14:53 | 6 | 2 | ALIVE | A | 158 |
| KB5 | 14:48 | 14:54 | 6 | 2 | ALIVE | A | 156 |
| KB6 | 14:49 | 14:52 | 3 | 2 | ALIVE | A | 150 |
| KB7 | 14:48 | 14:51 | 3 | 2 | ALIVE | A | 165 |
| KB8 | 14:49 | 14:52 | 3 | 2 | ALIVE | A | 145 |
| KB9 | 14:48 | 14:51 | 3 | 2 | ALIVE | A | 168 |
| KH0 | 15:16 | 15:18 | 2 | 2 | ALIVE | A | 152 |
| KH1 | 15:17 | 15:25 | 8 | 2 | ALIVE | A | 155 |
| KH2 | 15:16 | 15:18 | 2 | 2 | ALIVE | A | 158 |
| KH3 | 15:16 | 15:32 | 16 | 2 | ALIVE | A | 178 |
| KH4 | 15:17 | 15:23 | 6 | 2 | ALIVE | A | 146 |
| KH5 | 15:18 | 15:21 | 3 | 2 | ALIVE | A | 150 |
| KH6 | 15:18 | 15:22 | 4 | 2 | ALIVE | A | 166 |
| KH7 | 15:01 | 15:21 | 20 | 2 | ALIVE | A | 161 |
| KH8 | 15:19 | 15:21 | 2 | 2 | ALIVE | A | 172 |
| KH9 | 15:17 | 15:20 | 3 | 2 | ALIVE | A | 166 |
| KJ0 | 15:51 | 15:53 | 2 | 2 | ALIVE | A | 148 |
| KJ1 | 15:52 | 15:57 | 5 | 2 | ALIVE | A | 162 |
| KJ2 | 15:51 | 15:59 | 8 | 2 | ALIVE | A | 142 |
| KJ3 | 15:52 | 15:57 | 5 | 2 | ALIVE | A | 186 |
| KJ4 | 15:52 | 15:54 | 2 | 2 | ALIVE | A | 156 |
| KJ5 | 15:54 | 15:57 | 3 | 2 | ALIVE | A | 164 |
| KJ6 | 15:53 | 15:55 | 2 | 2 | ALIVE | A | 150 |
| KJ7 | 15:54 | 15:58 | 4 | 2 | ALIVE | A | 153 |
| KJ8 | 15:53 | 15:56 | 3 | 2 | ALIVE | A | 144 |
| KJ9 | 15:53 | 15:56 | 3 | 2 | ALIVE | A | 184 |

16 June 2000 - Testlot 5 : Control - Water temp=15.5 C



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| KC0 | 11:01 | 11:18 | 17 | 2 | ALIVE | TA | 155 |

APPENDIX TABLE C-5. Continued.

| Fish No. | Time | | | No. of Turb-N Tags recovered | Fish Data | | | |
|---|---|---|---|---|---|---|---|---|
| | Re-leased | Re-covered | At Large (min.) | | Alive/ Dead | Condition Codes | Total Length (mm) | Comments |
| KC1 | 11:01 | 11:04 | 3 | 2 | ALIVE | A | 150 | |
| KC2 | 11:01 | 11:04 | 3 | 2 | ALIVE | A | 162 | |
| KC3 | 11:00 | 11:18 | 18 | 2 | ALIVE | TA | 155 | |
| KC4 | 11:00 | 11:04 | 4 | 2 | ALIVE | A | 161 | |
| KC5 | 11:03 | 11:07 | 4 | 2 | ALIVE | A | 144 | |
| KC6 | 11:02 | 11:09 | 7 | 2 | ALIVE | A | 165 | |
| KC7 | 11:03 | 11:09 | 6 | 2 | ALIVE | A | 160 | |
| KC8 | 11:02 | 11:07 | 5 | 2 | ALIVE | A | 159 | |
| KC9 | 11:04 | 11:09 | 5 | 2 | ALIVE | A | 143 | |
| KD0 | 11:33 | 11:37 | 4 | 2 | ALIVE | A | 159 | |
| KD1 | 11:33 | 11:35 | 2 | 2 | ALIVE | A | 162 | |
| KD2 | 11:34 | 11:40 | 6 | 2 | ALIVE | A | 155 | |
| KD3 | 11:34 | 11:37 | 3 | 2 | ALIVE | A | 162 | |
| KD4 | 11:33 | 11:35 | 2 | 2 | ALIVE | A | 147 | |
| KD5 | 11:34 | 11:37 | 3 | 2 | ALIVE | A | 160 | |
| KD6 | 11:35 | 11:37 | 2 | 2 | ALIVE | A | 160 | |
| KD7 | 11:36 | 11:41 | 5 | 2 | ALIVE | A | 154 | |
| KD8 | 11:36 | 11:39 | 3 | 2 | ALIVE | A | 163 | |
| KD9 | 11:35 | 11:48 | 13 | 2 | ALIVE | A | 165 | |
| 16 June 2000 - Testlot 5 : Control - Water temp=15.5 C | | | | | | | | |
| KE0 | 12:04 | 12:14 | 10 | 2 | ALIVE | TA | 158 | |
| KE1 | 12:04 | 12:06 | 2 | 2 | ALIVE | A | 153 | |
| KE2 | 12:05 | 12:09 | 4 | 2 | ALIVE | A | 155 | |
| KE3 | 12:05 | 12:07 | 2 | 2 | ALIVE | A | 156 | |
| KE4 | 12:05 | 12:07 | 2 | 2 | ALIVE | A | 169 | |
| KE5 | 12:06 | 12:08 | 2 | 2 | ALIVE | A | 159 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| KE6 | 12:05 | 12:09 | 4 | 2 | ALIVE | A | 166 | |
| KE7 | 12:06 | 12:09 | 3 | 2 | ALIVE | A | 150 | |
| KE8 | 12:07 | 12:09 | 2 | 2 | ALIVE | A | 150 | |
| KE9 | 12:07 | 12:10 | 3 | 2 | ALIVE | A | 177 | |
| KF0 | 12:34 | 12:37 | 3 | 2 | ALIVE | A | 153 | |
| KF1 | 12:33 | 12:35 | 2 | 2 | ALIVE | A | 162 | |
| KF2 | 12:35 | 12:40 | 5 | 2 | ALIVE | A | 145 | |
| KF3 | 12:34 | 12:37 | 3 | 2 | ALIVE | A | 173 | |
| KF4 | 12:34 | 12:39 | 5 | 2 | ALIVE | A | 172 | |
| KF5 | 12:37 | 12:39 | 2 | 2 | ALIVE | A | 150 | |
| KF6 | 12:35 | 12:40 | 5 | 2 | ALIVE | A | 167 | |
| KF7 | 12:35 | 12:39 | 4 | 2 | ALIVE | A | 166 | |
| KF8 | 12:36 | 12:40 | 4 | 2 | ALIVE | A | 150 | |
| KF9 | 12:36 | 12:39 | 3 | 2 | ALIVE | A | 168 | |

17 June 2000 - Testlot 6 : High flow , Bypass Sluice - Water temp=15.5 C

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| JL9 | 14:53 | 15:00 | 7 | 2 | ALIVE | A | 150 | |
| RM0 | 9:12 | 9:14 | 2 | 2 | ALIVE | A | 155 | |
| RM1 | 9:12 | 9:15 | 3 | 2 | ALIVE | A | 155 | |
| RM2 | 9:11 | 9:22 | 11 | 2 | ALIVE | A | 156 | |
| RM3 | 9:11 | 9:14 | 3 | 2 | ALIVE | A | 150 | |
| RM4 | 9:11 | 9:13 | 2 | 2 | ALIVE | A | 160 | |
| RM5 | 9:12 | 9:17 | 5 | 2 | ALIVE | A | 167 | |
| RM6 | 9:13 | 9:15 | 2 | 2 | ALIVE | A | 180 | |
| RM7 | 9:14 | 9:17 | 3 | 2 | ALIVE | A | 156 | |
| RM8 | 9:13 | 9:18 | 5 | 2 | ALIVE | A | 145 | |
| RM9 | 9:13 | 9:19 | 6 | 2 | ALIVE | A | 180 | |
| RN0 | 9:42 | 9:44 | 2 | 2 | ALIVE | A | 151 | |



APPENDIX TABLE C-5. Continued.

| Fish No. | Time: Re-leased | Time: Re-covered | Time: At Large (min.) | No. of Turb-N Tags recovered | Fish Data: Alive/ Dead | Fish Data: Condition Codes | Fish Data: Total Length (mm) | Fish Data: Comments |
|---|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| RN1 | 9:43 | 9:46 | 3 | 2 | ALIVE | A | 166 |
| RN2 | 9:42 | 9:49 | 7 | 2 | ALIVE | A | 150 |
| RN3 | 9:43 | 9:47 | 4 | 2 | ALIVE | A | 179 |
| RN4 | 9:41 | 9:47 | 6 | 2 | ALIVE | A | 175 |
| RN5 | 9:44 | 9:47 | 3 | 2 | ALIVE | A | 190 |
| RN6 | 9:45 | 9:48 | 3 | 2 | ALIVE | A | 140 |
| RN7 | 9:45 | 9:48 | 3 | 2 | ALIVE | A | 159 |
| RN8 | 9:44 | 9:48 | 4 | 2 | ALIVE | A | 160 |
| RN9 | 9:43 | 9:47 | 4 | 2 | ALIVE | A | 170 |
| RW0 | 13:18 | 13:21 | 3 | 2 | ALIVE | A | 158 |
| RW1 | 13:19 | 13:23 | 4 | 2 | ALIVE | A | 154 |
| RW2 | 13:19 | 13:23 | 4 | 2 | ALIVE | A | 154 |
| RW4 | 13:19 | 13:35 | 16 | 2 | ALIVE | A | 190 |
| RW5 | 13:20 | 13:33 | 13 | 2 | ALIVE | A | 136 |
| RW6 | 13:20 | 13:28 | 8 | 2 | ALIVE | A | 152 |
| RW7 | 13:20 | 13:30 | 10 | 2 | ALIVE | A | 170 |
| RW8 | 13:20 | 13:32 | 12 | 2 | ALIVE | A | 160 |
| RW9 | 13:21 | 13:25 | 4 | 2 | ALIVE | A | 153 |
| RX0 | 14:08 | 14:18 | 10 | 2 | ALIVE | A | 158 |
| RX1 | 14:09 | 14:12 | 3 | 2 | ALIVE | A | 145 |
| RX2 | 14:08 | 14:10 | 2 | 2 | ALIVE | A | 154 |
| RX4 | 14:08 | 14:13 | 5 | 2 | ALIVE | A | 142 |
| RX6 | 14:10 | 14:13 | 3 | 2 | ALIVE | A | 150 |
| RX7 | 14:52 | 14:55 | 3 | 2 | ALIVE | A | 153 |
| RX8 | 14:52 | 14:56 | 4 | 2 | ALIVE | A | 158 |
| RX9 | 14:09 | 14:12 | 3 | 2 | ALIVE | A | 173 |
| TB7 | 14:53 | 15:01 | 8 | 2 | ALIVE | A | 148 |
| TB8 | 14:53 | 14:57 | 4 | 2 | ALIVE | A | 155 |
| U00 | 14:52 | 14:59 | 7 | 2 | ALIVE | A | 152 |

17 June 2000 - Testlot 6 : Low flow, Bypass Sluice - Water temp=15.5 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| RP5 | 16:13 | 16:16 | 3 | 2 | ALIVE | A | 164 |
| RS0 | 11:02 | 11:15 | 13 | 2 | ALIVE | A | 147 |
| RS1 | 11:01 | 11:04 | 3 | 2 | ALIVE | A | 153 |
| RS2 | 11:00 | 11:03 | 3 | 2 | ALIVE | A | 150 |
| RS3 | 11:01 | 11:05 | 4 | 2 | ALIVE | A | 162 |
| RS4 | 11:02 | 11:04 | 2 | 2 | ALIVE | A | 172 |
| RS5 | 11:03 | 11:06 | 3 | 2 | ALIVE | A | 146 |
| RS6 | 11:03 | 11:08 | 5 | 2 | ALIVE | A | 151 |
| RS7 | 11:02 | 11:08 | 6 | 2 | ALIVE | A | 170 |
| RS8 | 11:03 | 11:14 | 11 | 2 | ALIVE | A | 160 |
| RS9 | 11:04 | 11:06 | 2 | 2 | ALIVE | A | 155 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| RT0 | 11:35 | 11:39 | 4 | 2 | ALIVE | A | 154 | |
| RT2 | 11:34 | 11:36 | 2 | 2 | ALIVE | A | 167 | |
| RT3 | 11:34 | 11:40 | 6 | 2 | ALIVE | A | 150 | |
| RT4 | 11:33 | 11:37 | 4 | 2 | ALIVE | A | 163 | |
| RT5 | 11:35 | 11:40 | 5 | 2 | ALIVE | A | 166 | |
| RT6 | 11:36 | 11:38 | 2 | 2 | ALIVE | A | 157 | |
| RT7 | 11:35 | 11:42 | 7 | 2 | ALIVE | A | 145 | |
| RT8 | 11:36 | 11:41 | 5 | 2 | ALIVE | A | 145 | |
| RT9 | 11:36 | 11:40 | 4 | 2 | ALIVE | A | 153 | |
| RY0 | 15:18 | 15:21 | 3 | 2 | ALIVE | A | 145 | |
| RY1 | 15:18 | 15:21 | 3 | 2 | ALIVE | A | 163 | |
| RY2 | 15:19 | 15:25 | 6 | 2 | ALIVE | A | 176 | |
| RY3 | 15:19 | 15:21 | 2 | 2 | ALIVE | A | 196 | |
| RY4 | 15:18 | 15:21 | 3 | 2 | ALIVE | A | 158 | |
| RY5 | 15:20 | 15:22 | 2 | 2 | DEAD | JPG | 146 | |



APPENDIX TABLE C-5. Continued.

| Fish No. | Time | | | No. of Turb-N Tags recovered | Fish Data | | | |
|---|---|---|---|---|---|---|---|---|
| | Re-leased | Re-covered | At Large (min.) | | Alive/ Dead | Condition Codes | Total Length (mm) | Comments |
| RY6 | 15:21 | 15:23 | 2 | 2 | ALIVE | A | 152 | |
| RY7 | 15:20 | 15:26 | 6 | 2 | ALIVE | A | 155 | |
| RY8 | 15:20 | 15:23 | 3 | 2 | ALIVE | A | 153 | |
| RY9 | 15:19 | 15:23 | 4 | 2 | ALIVE | A | 167 | |
| RZ0 | 16:11 | 16:16 | 5 | 2 | ALIVE | A | 157 | |
| RZ1 | 16:10 | 16:16 | 6 | 2 | ALIVE | A | 152 | |
| RZ2 | 16:11 | 16:17 | 6 | 2 | ALIVE | A | 156 | |
| RZ3 | 16:10 | 16:12 | 2 | 2 | ALIVE | A | 156 | |
| RZ4 | 16:10 | 16:13 | 3 | 2 | ALIVE | A | 170 | |
| RZ5 | 16:12 | 16:14 | 2 | 2 | ALIVE | A | 153 | |
| RZ6 | 16:13 | 16:18 | 5 | 2 | ALIVE | A | 163 | |
| RZ7 | 16:12 | 16:14 | 2 | 2 | ALIVE | A | 140 | |
| RZ8 | 16:12 | 16:16 | 4 | 2 | ALIVE | A | 162 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| RZ9 | 16:11 | 16:16 | 5 | 2 | ALIVE | A | 164 |

17 June 2000 - Testlot 6 : Control - Water temp=15.5 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| RU0 | 12:26 | 12:31 | 5 | 2 | ALIVE | A | 147 |
| RU1 | 12:27 | 12:32 | 5 | 2 | ALIVE | A | 157 |
| RU2 | 12:26 | 12:31 | 5 | 2 | ALIVE | A | 166 |
| RU3 | 12:25 | 12:32 | 7 | 2 | ALIVE | A | 162 |
| RU4 | 12:25 | 12:32 | 7 | 2 | ALIVE | A | 193 |
| RU5 | 12:27 | 12:32 | 5 | 2 | ALIVE | A | 138 |
| RU6 | 12:28 | 12:33 | 5 | 2 | ALIVE | A | 154 |
| RU7 | 12:28 | 12:33 | 5 | 2 | ALIVE | A | 163 |
| RU8 | 12:27 | 12:33 | 6 | 2 | ALIVE | A | 151 |
| RU9 | 12:28 | 12:33 | 5 | 2 | ALIVE | A | 154 |
| RV0 | 12:49 | 12:54 | 5 | 2 | ALIVE | A | 152 |
| RV1 | 12:50 | 12:53 | 3 | 2 | ALIVE | A | 153 |
| RV2 | 12:50 | 12:56 | 6 | 2 | ALIVE | A | 161 |
| RV3 | 12:49 | 12:54 | 5 | 2 | ALIVE | A | 179 |
| RV4 | 12:50 | 12:54 | 4 | 2 | ALIVE | A | 196 |
| RV5 | 12:52 | 12:54 | 2 | 2 | ALIVE | A | 152 |
| RV6 | 12:51 | 12:59 | 8 | 2 | ALIVE | A | 171 |
| RV7 | 12:51 | 13:00 | 9 | 2 | ALIVE | A | 164 |
| RV8 | 12:51 | 13:00 | 9 | 2 | ALIVE | A | 191 |
| RV9 | 12:52 | 13:00 | 8 | 2 | ALIVE | A | 159 |

17 June 2000 - Testlot 6 : Control - Water temp=15.5 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| JL0 | 16:35 | 16:37 | 2 | 2 | ALIVE | A | 166 |
| JL1 | 16:36 | 16:38 | 2 | 2 | ALIVE | A | 154 |
| JL2 | 16:35 | 16:38 | 3 | 2 | ALIVE | A | 155 |
| JL3 | 16:35 | 16:37 | 2 | 2 | ALIVE | A | 151 |
| JL4 | 16:35 | 16:39 | 4 | 2 | ALIVE | A | 170 |
| RP0 | 10:08 | 10:11 | 3 | 2 | ALIVE | A | 146 |
| RP1 | 10:09 | 10:12 | 3 | 2 | ALIVE | A | 149 |
| RP2 | 10:08 | 10:13 | 5 | 2 | ALIVE | A | 154 |
| RP3 | 10:09 | 10:12 | 3 | 2 | ALIVE | A | 147 |
| RP4 | 10:10 | 10:14 | 4 | 2 | ALIVE | A | 180 |
| RP6 | 10:11 | 10:14 | 3 | 2 | ALIVE | A | 163 |
| RP7 | 10:10 | 10:14 | 4 | 2 | ALIVE | A | 154 |
| RP8 | 10:11 | 10:13 | 2 | 2 | ALIVE | A | 156 |
| RP9 | 10:10 | 10:12 | 2 | 2 | ALIVE | A | 155 |
| RR0 | 10:34 | 10:37 | 3 | 2 | ALIVE | A | 156 |
| RR1 | 10:34 | 10:38 | 4 | 2 | ALIVE | A | 145 |
| RR2 | 10:33 | 10:37 | 4 | 2 | ALIVE | A | 170 |

APPENDIX TABLE C-5. Continued.

| Fish No. | Time | | | No. of Turb-N Tags recovered | Fish Data | | | |
|---|---|---|---|---|---|---|---|---|
| | Re- leased | Re- covered | At Large (min.) | | Alive/ Dead | Condition Codes | Total Length (mm) | Comments |
| RR3 | 10:33 | 10:40 | 7 | 2 | ALIVE | A | 181 | |
| RR4 | 10:33 | 10:37 | 4 | 2 | ALIVE | A | 176 | |
| RR5 | 10:34 | 10:39 | 5 | 2 | ALIVE | A | 162 | |
| RR6 | 10:35 | 10:40 | 5 | 2 | ALIVE | A | 153 | |
| RR7 | 10:36 | 10:39 | 3 | 2 | ALIVE | A | 165 | |
| RR8 | 10:35 | 10:39 | 4 | 2 | ALIVE | A | 166 | |
| RR9 | 10:35 | 10:40 | 5 | 2 | ALIVE | A | 148 | |
| TB6 | 10:11 | 10:14 | 3 | 2 | ALIVE | A | 142 | |
| 18 June 2000 - Testlot 7 : High flow , Bypass Sluice - Water temp=16.0 C | | | | | | | | |
| TP0 | 9:22 | 9:24 | 2 | 2 | ALIVE | A | 154 | |
| TP1 | 9:21 | 9:25 | 4 | 2 | ALIVE | A | 151 | |
| TP2 | 9:21 | 9:27 | 6 | 2 | ALIVE | A | 147 | |
| TP3 | 9:21 | 9:30 | 9 | 2 | ALIVE | A | 159 | |
| TP4 | 9:21 | 9:26 | 5 | 2 | ALIVE | A | 146 | |
| TP5 | 9:24 | 9:32 | 8 | 2 | ALIVE | A | 155 | |
| TP6 | 9:23 | 9:26 | 3 | 2 | ALIVE | A | 147 | |
| TP7 | 9:22 | 9:26 | 4 | 2 | ALIVE | A | 166 | |
| TP8 | 9:22 | 9:26 | 4 | 2 | ALIVE | A | 162 | |
| TP9 | 9:23 | 9:30 | 7 | 2 | ALIVE | A | 175 | |
| TR0 | 9:49 | 9:57 | 8 | 2 | ALIVE | A | 165 | |
| TR1 | 9:51 | 9:53 | 2 | 2 | ALIVE | A | 164 | |
| TR2 | 9:50 | 9:59 | 9 | 2 | ALIVE | A | 154 | |
| TR3 | 9:50 | 9:53 | 3 | 2 | ALIVE | A | 152 | |
| TR4 | 9:50 | 9:56 | 6 | 2 | ALIVE | A | 158 | |
| TR5 | 9:52 | 9:59 | 7 | 2 | ALIVE | A | 156 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| TR6 | 9:52 | 9:56 | 4 | 2 | ALIVE | A | 144 | |
| TR7 | 9:51 | 9:58 | 7 | 2 | ALIVE | A | 158 | |
| TR8 | 9:51 | 10:03 | 12 | 2 | ALIVE | A | 176 | |
| TR9 | 9:52 | 9:56 | 4 | 2 | ALIVE | A | 157 | |
| TY0 | 13:41 | 13:47 | 6 | 2 | ALIVE | A | 155 | |
| TY1 | 13:39 | 13:43 | 4 | 2 | ALIVE | A | 161 | |
| TY2 | 13:40 | 13:43 | 3 | 2 | ALIVE | A | 169 | |
| TY3 | 13:40 | 13:43 | 3 | 2 | ALIVE | A | 177 | |
| TY4 | 13:40 | 13:44 | 4 | 2 | ALIVE | A | 175 | |
| TY5 | 13:42 | 13:46 | 4 | 2 | ALIVE | A | 156 | |
| TY6 | 13:42 | 13:46 | 4 | 2 | ALIVE | A | 144 | |
| TY7 | 13:41 | 13:44 | 3 | 2 | ALIVE | A | 160 | |
| TY8 | 13:42 | 13:44 | 2 | 2 | ALIVE | A | 161 | |
| TY9 | 13:41 | 13:44 | 3 | 2 | ALIVE | A | 157 | |
| TZ0 | 14:10 | 14:14 | 4 | 2 | ALIVE | A | 175 | |
| TZ1 | 14:12 | 14:14 | 2 | 2 | ALIVE | A | 161 | |
| TZ2 | 14:11 | 14:17 | 6 | 2 | ALIVE | A | 159 | |
| TZ3 | 14:11 | 14:13 | 2 | 2 | ALIVE | A | 177 | |
| TZ4 | 14:12 | 14:16 | 4 | 2 | ALIVE | A | 157 | |
| TZ6 | 14:14 | 14:18 | 4 | 2 | ALIVE | A | 155 | |
| TZ7 | 14:13 | 14:16 | 3 | 2 | ALIVE | A | 149 | |
| TZ8 | 14:12 | 14:16 | 4 | 2 | ALIVE | A | 170 | |
| TZ9 | 14:13 | 14:19 | 6 | 2 | ALIVE | A | 154 | |
| U02 | 14:40 | 14:42 | 2 | 2 | ALIVE | A | 161 | |
| U03 | 14:40 | 14:44 | 4 | 2 | ALIVE | A | 169 | |
| U04 | 14:41 | 14:46 | 5 | 2 | ALIVE | A | 182 | |
| U05 | 14:42 | 14:45 | 3 | 2 | ALIVE | A | 164 | |
| U06 | 14:41 | 14:43 | 2 | 2 | ALIVE | A | 177 | |
| U13 | 14:40 | 14:42 | 2 | 2 | ALIVE | A | 174 | |
| U14 | 15:23 | 15:26 | 3 | 2 | ALIVE | A | 138 | |
| U15 | 15:23 | 15:26 | 3 | 2 | ALIVE | A | 146 | |



APPENDIX TABLE C-5. Continued.

| Fish No. | Time | | | No. of Turb-N Tags | Fish Data | | | |
|---|---|---|---|---|---|---|---|---|
| | Re-leased | Re-covered | At Large | | Alive/ Dead | Condition Codes | Total Length | Comments |

| | | | (min.) | recovered | | | (mm) |
|---|---|---|---|---|---|---|---|

18 June 2000 - Testlot 7 : Low flow, Bypass Sluice - Water temp=16.0 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| TS0 | 10:25 | 10:27 | 2 | 2 | ALIVE | A | 157 |
| TS1 | 10:25 | 10:34 | 9 | 2 | ALIVE | A | 156 |
| TS2 | 10:26 | 10:28 | 2 | 2 | ALIVE | A | 155 |
| TS3 | 10:23 | 10:26 | 3 | 2 | ALIVE | A | 162 |
| TS4 | 10:24 | 10:27 | 3 | 2 | ALIVE | A | 152 |
| TS5 | 10:26 | 10:32 | 6 | 2 | ALIVE | A | 186 |
| TS6 | 10:26 | 10:31 | 5 | 2 | ALIVE | A | 160 |
| TS7 | 10:26 | 10:31 | 5 | 2 | ALIVE | A | 155 |
| TS8 | 10:27 | 10:29 | 2 | 2 | ALIVE | A | 165 |
| TS9 | 10:27 | 10:31 | 4 | 2 | ALIVE | A | 164 |
| TT0 | 10:52 | 10:55 | 3 | 2 | ALIVE | A | 160 |
| TT1 | 10:54 | 11:01 | 7 | 2 | ALIVE | A | 156 |
| TT2 | 10:54 | 10:57 | 3 | 2 | ALIVE | A | 145 |
| TT3 | 10:53 | 11:07 | 14 | 2 | ALIVE | A | 164 |
| TT4 | 10:53 | 10:57 | 4 | 2 | ALIVE | A | 159 |
| TT5 | 10:55 | 10:59 | 4 | 2 | ALIVE | A | 160 |
| TT6 | 10:56 | 10:59 | 3 | 2 | ALIVE | A | 155 |
| TT7 | 10:55 | 11:04 | 9 | 2 | ALIVE | A | 150 |
| TT8 | 10:54 | 10:57 | 3 | 2 | ALIVE | A | 172 |
| TT9 | 10:55 | 10:59 | 4 | 2 | ALIVE | A | 167 |
| TU0 | 11:31 | 11:41 | 10 | 2 | ALIVE | A | 153 |
| TU1 | 11:32 | 11:39 | 7 | 2 | ALIVE | A | 165 |
| TU2 | 11:31 | 11:34 | 3 | 2 | ALIVE | A | 150 |
| TU3 | 11:31 | 11:40 | 9 | 2 | ALIVE | A | 167 |
| TU4 | 11:31 | 11:33 | 2 | 2 | ALIVE | A | 169 |
| TU5 | 11:33 | 11:35 | 2 | 2 | ALIVE | A | 168 |
| TU7 | 11:33 | 11:37 | 4 | 2 | ALIVE | A | 155 |
| TU8 | 11:32 | 11:35 | 3 | 2 | ALIVE | A | 180 |
| TU9 | 11:33 | 11:35 | 2 | 2 | ALIVE | A | 151 |
| TV0 | 12:06 | 12:11 | 5 | 2 | ALIVE | A | 164 |
| TV1 | 12:07 | 12:19 | 12 | 2 | ALIVE | A | 152 |
| TV2 | 12:06 | 12:10 | 4 | 2 | ALIVE | A | 148 |
| TV3 | 12:06 | 12:16 | 10 | 2 | ALIVE | A | 181 |
| TV4 | 12:07 | 12:11 | 4 | 2 | ALIVE | A | 190 |
| TV5 | 12:08 | 12:19 | 11 | 2 | ALIVE | A | 155 |
| TV6 | 12:08 | 12:16 | 8 | 2 | ALIVE | A | 160 |
| TV7 | 12:09 | 12:13 | 4 | 2 | ALIVE | A | 150 |
| TV8 | 12:08 | 12:11 | 3 | 2 | ALIVE | A | 155 |
| TV9 | 12:08 | 12:11 | 3 | 2 | ALIVE | A | 165 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| U07 | 15:08 | 15:12 | 4 | 2 | ALIVE | A | 156 | |
| U08 | 15:08 | 15:12 | 4 | 2 | ALIVE | A | 146 | |
| U09 | 15:09 | 15:11 | 2 | 2 | ALIVE | A | 164 | |
| U10 | 15:09 | 15:11 | 2 | 2 | ALIVE | A | 156 | |
| U11 | 15:08 | 15:11 | 3 | 2 | ALIVE | A | 165 | |
| U12 | 15:08 | 15:12 | 4 | 2 | ALIVE | A | 163 | |
| 18 June 2000 - Testlot 7 : Control - Water temp=16.0 C | | | | | | | | |
| TM0 | 8:27 | 8:36 | 9 | 2 | ALIVE | A | 155 | |
| TM1 | 8:28 | 8:36 | 8 | 2 | ALIVE | A | 154 | |
| TM2 | 8:27 | 8:34 | 7 | 2 | ALIVE | A | 146 | |
| TM3 | 8:27 | 8:31 | 4 | 2 | ALIVE | A | 153 | |
| TM4 | 8:28 | 8:36 | 8 | 2 | ALIVE | A | 146 | |
| TM5 | 8:30 | 8:35 | 5 | 2 | ALIVE | A | 161 | |



APPENDIX TABLE C-5. Continued.

| Fish No. | Time | | | No. of Turb-N Tags recovered | Fish Data | | | |
|---|---|---|---|---|---|---|---|---|
| | Re-leased | Re-covered | At Large (min.) | | Alive/ Dead | Condition Codes | Total Length (mm) | Comments |
| TM6 | 8:29 | 8:35 | 6 | 2 | ALIVE | A | 154 | |
| TM7 | 8:29 | 8:35 | 6 | 2 | ALIVE | A | 152 | |
| TM8 | 8:30 | 8:35 | 5 | 2 | ALIVE | A | 156 | |
| TM9 | 8:30 | 8:36 | 6 | 2 | ALIVE | A | 162 | |
| TN0 | 8:55 | 9:04 | 9 | 2 | ALIVE | A | 162 | |
| TN1 | 8:54 | 9:01 | 7 | 2 | ALIVE | A | 144 | |
| TN2 | 8:55 | 9:01 | 6 | 2 | ALIVE | A | 144 | |
| TN3 | 8:55 | 9:00 | 5 | 2 | ALIVE | A | 153 | |
| TN4 | 8:54 | 9:01 | 7 | 2 | ALIVE | A | 162 | |
| TN5 | 8:56 | 9:00 | 4 | 2 | ALIVE | A | 156 | |
| TN6 | 8:57 | 9:02 | 5 | 2 | ALIVE | A | 156 | |
| TN7 | 8:56 | 9:01 | 5 | 2 | ALIVE | A | 152 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| TN8 | 8:56 | 9:01 | 5 | 2 | ALIVE | A | 150 |
| TN9 | 8:57 | 9:02 | 5 | 2 | ALIVE | A | 157 |

18 June 2000 - Testlot 7 : Control - Water temp=16.0 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| TW0 | 12:39 | 12:45 | 6 | 2 | ALIVE | A | 161 |
| TW1 | 12:39 | 12:48 | 9 | 2 | ALIVE | A | 159 |
| TW2 | 12:39 | 12:45 | 6 | 2 | ALIVE | A | 160 |
| TW3 | 12:38 | 12:41 | 3 | 2 | ALIVE | A | 173 |
| TW4 | 12:38 | 12:48 | 10 | 2 | ALIVE | A | 167 |
| TW5 | 12:40 | 12:48 | 8 | 2 | ALIVE | A | 157 |
| TW6 | 12:41 | 12:44 | 3 | 2 | ALIVE | A | 145 |
| TW7 | 12:41 | 12:48 | 7 | 2 | ALIVE | A | 140 |
| TW8 | 12:40 | 12:48 | 8 | 2 | ALIVE | A | 159 |
| TW9 | 12:40 | 12:48 | 8 | 2 | ALIVE | A | 162 |
| TX0 | 13:09 | 13:22 | 13 | 2 | ALIVE | A | 157 |
| TX1 | 13:10 | 13:17 | 7 | 2 | ALIVE | A | 161 |
| TX2 | 13:09 | 13:15 | 6 | 2 | ALIVE | A | 163 |
| TX3 | 13:09 | 13:15 | 6 | 2 | ALIVE | A | 149 |
| TX4 | 13:10 | 13:15 | 5 | 2 | ALIVE | A | 175 |
| TX5 | 13:11 | 13:17 | 6 | 2 | ALIVE | A | 162 |
| TX6 | 13:12 | 13:15 | 3 | 2 | ALIVE | A | 162 |
| TX7 | 13:11 | 13:16 | 5 | 2 | ALIVE | A | 154 |
| TX8 | 13:10 | 13:16 | 6 | 2 | ALIVE | A | 165 |
| TX9 | 13:11 | 13:17 | 6 | 2 | ALIVE | A | 175 |

28 September 2000 - Testlot 2 : Low flow, Bypass Sluice - Water temp=17.0 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| AM0 | 8:47 | 8:51 | 4 | 2 | ALIVE | A | 174 |
| AM1 | 8:47 | 8:58 | 11 | 2 | ALIVE | A | 188 |
| AM2 | 8:47 | 8:54 | 7 | 2 | ALIVE | A | 173 |
| AM3 | 8:48 | 8:56 | 8 | 2 | ALIVE | A | 170 |
| AM4 | 8:48 | 8:53 | 5 | 2 | ALIVE | A | 183 |
| AM5 | 8:49 | 8:55 | 6 | 2 | ALIVE | H | 182 |
| AM6 | 8:49 | 8:56 | 7 | 2 | ALIVE | A | 177 |
| AM7 | 8:49 | 9:02 | 13 | 2 | ALIVE | A | 195 |
| AM8 | 8:50 | 8:56 | 6 | 2 | ALIVE | A | 176 |
| AM9 | 8:50 | 8:57 | 7 | 2 | ALIVE | TH | 167 |
| AN0 | 9:42 | 9:48 | 6 | 2 | ALIVE | A | 171 |
| AN1 | 9:41 | 9:48 | 7 | 2 | ALIVE | A | 168 |
| AN2 | 9:41 | 9:44 | 3 | 2 | ALIVE | A | 170 |
| AN3 | 9:42 | 9:58 | 16 | 2 | ALIVE | AS | 161 |
| AN4 | 9:42 | 9:46 | 4 | 2 | ALIVE | A | 172 |
| AN5 | 9:44 | 9:50 | 6 | 2 | ALIVE | A | 163 |

| AN6 | 9:44 | 9:50 | 6 | 2 | ALIVE | A | 173 | |
|---|---|---|---|---|---|---|---|---|



APPENDIX TABLE C-5. Continued.

| Fish No. | Time: Re-leased | Time: Re-covered | Time: At Large (min.) | No. of Turb-N Tags recovered | Fish Data: Alive/ Dead | Fish Data: Condition Codes | Fish Data: Total Length (mm) | Fish Data: Comments |
|---|---|---|---|---|---|---|---|---|
| AN7 | 9:43 | 9:47 | 4 | 2 | ALIVE | H | 161 | |
| AN8 | 9:43 | 9:54 | 11 | 2 | ALIVE | AS | 192 | |
| AN9 | 9:44 | 9:51 | 7 | 2 | ALIVE | A | 175 | |
| AU0 | 13:56 | 13:59 | 3 | 2 | ALIVE | A | 167 | |
| AU1 | 13:55 | 14:06 | 11 | 2 | ALIVE | A | 170 | |
| AU2 | 13:56 | 13:59 | 3 | 2 | ALIVE | A | 186 | |
| AU3 | 13:55 | 14:25 | 30 | 2 | ALIVE | A | 186 | |
| AU4 | 13:56 | 14:05 | 9 | 2 | ALIVE | A | 172 | |
| AU5 | 13:57 | 14:00 | 3 | 2 | ALIVE | A | 167 | |
| AU6 | 13:57 | 14:00 | 3 | 2 | ALIVE | A | 166 | |
| AU7 | 13:57 | 14:09 | 12 | 2 | ALIVE | A | 179 | |
| AU8 | 13:58 | 14:11 | 13 | 2 | ALIVE | AS | 160 | |
| AU9 | 13:58 | 14:01 | 3 | 2 | ALIVE | A | 167 | |
| AX0 | 15:48 | 15:54 | 6 | 2 | ALIVE | A | 178 | |
| AX1 | 15:49 | 15:52 | 3 | 2 | ALIVE | A | 178 | |
| AX2 | 15:49 | 15:54 | 5 | 2 | ALIVE | A | 178 | |
| AX3 | 15:48 | 15:59 | 11 | 2 | ALIVE | A | 187 | |
| AX4 | 15:48 | 15:53 | 5 | 2 | ALIVE | A | 176 | |
| AX5 | 15:51 | 15:57 | 6 | 2 | ALIVE | A | 178 | |
| AX6 | 15:50 | 15:56 | 6 | 2 | ALIVE | A | 177 | |
| AX7 | 15:51 | 15:57 | 6 | 2 | ALIVE | A | 188 | |
| AX8 | 15:50 | 15:53 | 3 | 2 | ALIVE | A | 193 | |
| AX9 | 15:50 | 15:54 | 4 | 2 | ALIVE | A | 157 | |

28 September 2000 - Testlot 2 : High flow , Bypass Sluice - Water temp=17.0 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| AP0 | 10:23 | 10:27 | 4 | 2 | ALIVE | A | 184 |
| AP1 | 10:24 | 10:28 | 4 | 2 | ALIVE | A | 180 |
| AP2 | 10:23 | 10:27 | 4 | 2 | ALIVE | A | 183 |
| AP3 | 10:24 | 10:30 | 6 | 2 | ALIVE | A | 170 |
| AP4 | 10:23 | 10:30 | 7 | 2 | ALIVE | A | 193 |
| AP5 | 10:26 | 10:32 | 6 | 2 | ALIVE | A | 177 |
| AP6 | 10:25 | 10:30 | 5 | 2 | ALIVE | A | 174 |
| AP7 | 10:26 | 10:35 | 9 | 2 | ALIVE | A | 181 |
| AP8 | 10:25 | 10:45 | 20 | 2 | ALIVE | AS | 183 |
| AP9 | 10:25 | 10:29 | 4 | 2 | ALIVE | A | 169 |
| AR0 | 11:08 | 11:17 | 9 | 2 | ALIVE | TA | 172 |
| AR1 | 11:09 | 11:17 | 8 | 2 | ALIVE | A | 173 |
| AR2 | 11:09 | 11:23 | 14 | 2 | ALIVE | A | 184 |
| AR3 | 11:08 | 11:12 | 4 | 2 | ALIVE | A | 172 |
| AR4 | 11:08 | 11:14 | 6 | 2 | ALIVE | A | 182 |
| AR5 | 11:10 | 11:21 | 11 | 2 | ALIVE | TA | 167 |
| AR6 | 11:10 | 11:16 | 6 | 2 | ALIVE | A | 164 |
| AR7 | 11:11 | 11:21 | 10 | 2 | ALIVE | AS | 189 |
| AR8 | 11:11 | 11:15 | 4 | 2 | ALIVE | A | 183 |
| AR9 | 11:10 | 11:19 | 9 | 2 | ALIVE | A | 169 |
| AV0 | 14:41 | 14:46 | 5 | 2 | ALIVE | A | 182 |
| AV1 | 14:41 | 14:53 | 12 | 2 | ALIVE | A | 190 |
| AV2 | 14:41 | 14:49 | 8 | 2 | ALIVE | TA | 183 |
| AV3 | 14:40 | 14:45 | 5 | 2 | ALIVE | A | 182 |
| AV4 | 14:40 | 14:46 | 6 | 2 | ALIVE | A | 187 |
| AV5 | 14:43 | 14:50 | 7 | 2 | ALIVE | A | 183 |
| AV6 | 14:43 | 14:50 | 7 | 2 | ALIVE | A | 182 |
| AV7 | 14:43 | 14:49 | 6 | 2 | ALIVE | A | 175 |
| AV8 | 14:42 | 14:54 | 12 | 2 | ALIVE | A | 173 |
| AV9 | 14:42 | 14:51 | 9 | 2 | ALIVE | A | 180 |
| AY0 | 16:21 | 16:24 | 3 | 2 | ALIVE | A | 164 |
| AY1 | 16:20 | 16:26 | 6 | 2 | ALIVE | A | 186 |



APPENDIX TABLE C-5. Continued.

| Fish No. | Time Re- | Time Re- | Time At | No. of | Fish Data Alive/ | Fish Data Condition | Fish Data Total | Fish Data Comments |
|---|---|---|---|---|---|---|---|---|

| | leased | covered | Large (min.) | Turb-N Tags recovered | Dead | Codes | Length (mm) |
|---|---|---|---|---|---|---|---|
| AY2 | 16:19 | 16:23 | 4 | 2 | ALIVE | A | 165 |
| AY3 | 16:20 | 16:24 | 4 | 2 | ALIVE | A | 173 |
| AY4 | 16:21 | 16:26 | 5 | 2 | ALIVE | A | 186 |
| AY5 | 16:23 | 16:31 | 8 | 2 | ALIVE | AS | 183 |
| AY6 | 16:23 | 16:26 | 3 | 2 | ALIVE | A | 183 |
| AY7 | 16:21 | 16:25 | 4 | 2 | ALIVE | A | 167 |
| AY8 | 16:22 | 16:28 | 6 | 2 | ALIVE | A | 197 |
| AY9 | 16:22 | 16:31 | 9 | 2 | ALIVE | A | 158 |

28 September 2000 - Testlot 2 : Control - Water temp=17.0 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| AS0 | 11:47 | 11:53 | 6 | 2 | ALIVE | A | 176 |
| AS1 | 11:48 | 11:57 | 9 | 2 | ALIVE | A | 177 |
| AS3 | 11:48 | 11:58 | 10 | 2 | ALIVE | A | 184 |
| AS4 | 11:48 | 11:52 | 4 | 2 | ALIVE | A | 171 |
| AS5 | 11:49 | 11:52 | 3 | 2 | ALIVE | A | 172 |
| AS6 | 11:49 | 11:56 | 7 | 2 | ALIVE | A | 180 |
| AS7 | 11:51 | 11:59 | 8 | 2 | ALIVE | A | 173 |
| AS9 | 11:51 | 11:54 | 3 | 2 | ALIVE | A | 167 |
| AT0 | 13:03 | 13:09 | 6 | 2 | ALIVE | A | 182 |
| AT1 | 13:03 | 13:08 | 5 | 2 | ALIVE | A | 177 |
| AT2 | 13:03 | 13:14 | 11 | 2 | ALIVE | A | 163 |
| AT3 | 13:02 | 13:27 | 25 | 2 | ALIVE | A | 175 |
| AT4 | 13:02 | 13:27 | 25 | 2 | ALIVE | A | 168 |
| AT5 | 13:04 | 13:26 | 22 | 2 | ALIVE | A | 160 |
| AT6 | 13:04 | 13:07 | 3 | 2 | ALIVE | A | 168 |
| AT7 | 13:04 | 13:08 | 4 | 2 | ALIVE | A | 167 |
| AT8 | 13:05 | 13:12 | 7 | 2 | ALIVE | A | 186 |
| AT9 | 13:05 | 13:09 | 4 | 2 | ALIVE | A | 185 |

28 September 2000 - Testlot 2 : Control - Water temp=17.0 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| AW0 | 15:13 | 15:19 | 6 | 2 | ALIVE | A | 174 |
| AW1 | 15:14 | 15:21 | 7 | 2 | ALIVE | A | 173 |
| AW2 | 15:14 | 15:19 | 5 | 2 | ALIVE | A | 191 |
| AW3 | 15:14 | 15:17 | 3 | 2 | ALIVE | H | 186 |
| AW4 | 15:15 | 15:25 | 10 | 2 | ALIVE | A | 183 |
| AW5 | 15:17 | 15:20 | 3 | 2 | ALIVE | A | 167 |
| AW6 | 15:16 | 15:22 | 6 | 2 | ALIVE | A | 174 |
| AW7 | 15:16 | 15:21 | 5 | 2 | ALIVE | A | 178 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| AW8 | 15:16 | 15:22 | 6 | 2 | ALIVE | A | 176 | |
| AW9 | 15:15 | 15:20 | 5 | 2 | ALIVE | A | 143 | |
| AZ0 | 16:53 | 17:01 | 8 | 2 | ALIVE | A | 186 | |
| AZ1 | 16:51 | 16:57 | 6 | 2 | ALIVE | A | 194 | |
| AZ2 | 16:51 | 17:00 | 9 | 2 | ALIVE | A | 184 | |
| AZ3 | 16:52 | 17:01 | 9 | 2 | ALIVE | A | 177 | |
| AZ4 | 16:52 | 17:00 | 8 | 2 | ALIVE | A | 164 | |
| AZ5 | 16:54 | 17:00 | 6 | 2 | ALIVE | A | 180 | |
| AZ6 | 16:53 | 16:58 | 5 | 2 | ALIVE | A | 186 | |
| AZ7 | 16:54 | 16:57 | 3 | 2 | ALIVE | A | 173 | |
| AZ8 | 16:53 | 17:04 | 11 | 2 | ALIVE | A | 184 | |
| AZ9 | 16:54 | 17:00 | 6 | 2 | ALIVE | A | 160 | |

29 September 2000 - Testlot 3 : Low flow, Bypass Sluice - Water temp=16.5 C

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| AN0 | 13:36 | 13:42 | 6 | 2 | ALIVE | A | 185 | |



APPENDIX TABLE C-5. Continued.

| Fish No. | Time | | | No. of Turb-N Tags recovered | Fish Data | | | |
|---|---|---|---|---|---|---|---|---|
| | Re-leased | Re-covered | At Large (min.) | | Alive/ Dead | Condition Codes | Total Length (mm) | Comments |
| AN1 | 13:36 | 13:41 | 5 | 2 | ALIVE | A | 176 | |
| AN2 | 13:37 | 13:43 | 6 | 2 | ALIVE | TA | 177 | |
| AN3 | 13:37 | 13:46 | 9 | 2 | ALIVE | A | 165 | |
| AN4 | 13:37 | 13:44 | 7 | 2 | ALIVE | A | 187 | |
| AN5 | 13:38 | 13:46 | 8 | 2 | ALIVE | A | 175 | |
| AN6 | 13:38 | 13:42 | 4 | 2 | ALIVE | A | 186 | |
| AN7 | 13:37 | 13:41 | 4 | 2 | ALIVE | A | 172 | |
| AN8 | 13:38 | 13:41 | 3 | 2 | ALIVE | A | 183 | |
| AN9 | 13:39 | 13:46 | 7 | 2 | ALIVE | A | 171 | |
| AP0 | 14:10 | 14:15 | 5 | 2 | ALIVE | A | 182 | |
| AP1 | 14:10 | 14:16 | 6 | 2 | ALIVE | A | 169 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| AP2 | 14:11 | 14:14 | 3 | 2 | ALIVE | A | 173 |
| AP3 | 14:10 | 14:23 | 13 | 2 | ALIVE | A | 191 |
| AP4 | 14:09 | 14:20 | 11 | 2 | ALIVE | GS | 184 |
| AP5 | 14:12 | 14:16 | 4 | 2 | ALIVE | A | 181 |
| AP6 | 14:12 | 14:15 | 3 | 2 | ALIVE | A | 171 |
| AP7 | 14:12 | 14:20 | 8 | 2 | ALIVE | A | 168 |
| AP8 | 14:11 | 14:14 | 3 | 2 | ALIVE | A | 186 |
| AP9 | 14:11 | 14:15 | 4 | 2 | ALIVE | A | 189 |
| AT0 | 16:33 | 16:41 | 8 | 2 | ALIVE | AS | 183 |
| AT1 | 16:32 | 16:36 | 4 | 2 | ALIVE | A | 175 |
| AT2 | 16:32 | 16:36 | 4 | 2 | ALIVE | A | 175 |
| AT3 | 16:31 | 16:42 | 11 | 2 | ALIVE | A | 191 |
| AT4 | 16:32 | 16:37 | 5 | 2 | ALIVE | A | 177 |
| AT5 | 16:34 | 16:40 | 6 | 2 | ALIVE | A | 188 |
| AT6 | 16:34 | 16:40 | 6 | 2 | ALIVE | A | 179 |
| AT7 | 16:33 | 16:36 | 3 | 2 | ALIVE | A | 183 |
| AT8 | 16:34 | 16:43 | 9 | 2 | ALIVE | A | 176 |
| AT9 | 16:33 | 16:44 | 11 | 2 | ALIVE | H | 182 |
| YZ0 | 8:27 | 8:42 | 15 | 2 | ALIVE | AS | 175 |
| YZ1 | 8:26 | 8:30 | 4 | 2 | ALIVE | A | 180 |
| YZ2 | 8:27 | 8:35 | 8 | 2 | ALIVE | A | 172 |
| YZ3 | 8:26 | 8:30 | 4 | 2 | ALIVE | A | 182 |
| YZ4 | 8:27 | 8:34 | 7 | 2 | ALIVE | A | 177 |
| YZ5 | 8:28 | 8:31 | 3 | 2 | ALIVE | A | 186 |
| YZ6 | 8:28 | 8:31 | 3 | 2 | ALIVE | A | 184 |
| YZ7 | 8:29 | 8:32 | 3 | 2 | ALIVE | A | 176 |
| YZ8 | 8:29 | 8:32 | 3 | 2 | ALIVE | A | 166 |
| YZ9 | 8:29 | 8:37 | 8 | 2 | ALIVE | A | 187 |
| Z50 | 9:09 | 9:12 | 3 | 2 | ALIVE | A | 179 |
| Z51 | 9:08 | 9:11 | 3 | 2 | ALIVE | A | 176 |
| Z52 | 9:07 | 9:18 | 11 | 2 | ALIVE | AS | 165 |
| Z53 | 9:07 | 9:18 | 11 | 2 | ALIVE | AS | 162 |
| Z54 | 9:08 | 9:18 | 10 | 2 | ALIVE | AS | 180 |
| Z55 | 9:09 | 9:16 | 7 | 2 | ALIVE | AS | 173 |
| Z56 | 9:10 | 9:14 | 4 | 2 | ALIVE | A | 171 |
| Z57 | 9:10 | 9:21 | 11 | 2 | ALIVE | A | 170 |
| Z58 | 9:09 | 9:14 | 5 | 2 | ALIVE | A | 182 |
| Z59 | 9:10 | 9:36 | 26 | 2 | ALIVE | AS | 135 |

29 September 2000 - Testlot 3 : High flow , Bypass Sluice - Water temp=16.5 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| AM0 | 13:00 | 13:09 | 9 | 2 | ALIVE | A | 174 |
| AM1 | 13:01 | 13:07 | 6 | 2 | ALIVE | A | 180 |
| AM2 | 13:01 | 13:06 | 5 | 2 | ALIVE | A | 181 |
| AM3 | 13:00 | 13:06 | 6 | 2 | ALIVE | A | 165 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| AM4 | 13:00 | 13:08 | 8 | 2 | ALIVE | A | 171 | |
| AM5 | 13:02 | 13:15 | 13 | 2 | ALIVE | A | 180 | |



APPENDIX TABLE C-5. Continued.

| Fish No. | Time | | | No. of Turb-N Tags recovered | Fish Data | | | Comments |
|---|---|---|---|---|---|---|---|---|
| | Re-leased | Re-covered | At Large (min.) | | Alive/ Dead | Condition Codes | Total Length (mm) | |
| AM6 | 13:03 | 13:12 | 9 | 2 | ALIVE | A | 193 | |
| AM7 | 13:02 | 13:12 | 10 | 2 | ALIVE | A | 183 | |
| AM8 | 13:02 | 13:10 | 8 | 2 | ALIVE | AS | 173 | |
| AM9 | 13:01 | 13:06 | 5 | 2 | ALIVE | A | 183 | |
| AU0 | 17:03 | 17:08 | 5 | 2 | ALIVE | A | 183 | |
| AU1 | 17:05 | 17:10 | 5 | 2 | ALIVE | A | 180 | |
| AU2 | 17:04 | 17:07 | 3 | 2 | ALIVE | A | 178 | |
| AU3 | 17:04 | 17:07 | 3 | 2 | ALIVE | A | 181 | |
| AU4 | 17:04 | 17:17 | 13 | 2 | ALIVE | A | 170 | |
| AU5 | 17:06 | 17:13 | 7 | 2 | ALIVE | A | 190 | |
| AU6 | 17:05 | 17:09 | 4 | 2 | ALIVE | A | 174 | |
| AU7 | 17:06 | 17:15 | 9 | 2 | ALIVE | A | 181 | |
| AU8 | 17:07 | 17:11 | 4 | 2 | ALIVE | A | 180 | |
| AU9 | 17:06 | 17:18 | 12 | 2 | ALIVE | AS | 167 | |
| Z40 | 12:26 | 12:37 | 11 | 2 | ALIVE | A | 177 | |
| Z41 | 12:26 | 12:40 | 14 | 2 | ALIVE | A | 172 | |
| Z42 | 12:25 | 12:32 | 7 | 2 | ALIVE | A | 190 | |
| Z43 | 12:26 | 12:31 | 5 | 2 | ALIVE | A | 188 | |
| Z44 | 12:25 | 12:37 | 12 | 2 | ALIVE | AS | 190 | |
| Z45 | 12:27 | 12:30 | 3 | 2 | ALIVE | HE | 181 | |
| Z46 | 12:28 | 12:33 | 5 | 2 | ALIVE | A | 156 | |
| Z47 | 12:27 | 12:43 | 16 | 2 | ALIVE | A | 174 | |
| Z48 | 12:28 | 12:35 | 7 | 2 | ALIVE | A | 133 | |
| Z49 | 12:27 | 12:38 | 11 | 2 | ALIVE | A | 177 | |
| Z60 | 9:48 | 9:56 | 8 | 2 | ALIVE | A | 187 | |
| Z61 | 9:47 | 9:53 | 6 | 2 | ALIVE | A | 185 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Z62 | 9:47 | 9:51 | 4 | 2 | ALIVE | A | 185 |
| Z63 | 9:47 | 9:51 | 4 | 2 | ALIVE | A | 170 |
| Z64 | 9:48 | 9:52 | 4 | 2 | ALIVE | A | 175 |
| Z65 | 9:49 | 9:59 | 10 | 2 | ALIVE | A | 182 |
| Z66 | 9:50 | 9:54 | 4 | 2 | ALIVE | A | 167 |
| Z67 | 9:50 | 9:57 | 7 | 2 | ALIVE | A | 171 |
| Z68 | 9:49 | 9:57 | 8 | 2 | ALIVE | A | 179 |
| Z69 | 9:48 | 9:58 | 10 | 2 | ALIVE | A | 170 |
| Z70 | 10:21 | 10:27 | 6 | 2 | ALIVE | H | 175 |
| Z71 | 10:21 | 10:31 | 10 | 2 | ALIVE | A | 160 |
| Z72 | 10:21 | 10:26 | 5 | 2 | ALIVE | A | 177 |
| Z73 | 10:20 | 10:28 | 8 | 2 | ALIVE | TA | 181 |
| Z74 | 10:22 | 10:24 | 2 | 2 | ALIVE | A | 167 |
| Z75 | 10:24 | 10:35 | 11 | 2 | ALIVE | A | 173 |
| Z76 | 10:23 | 10:38 | 15 | 2 | ALIVE | A | 191 |
| Z77 | 10:22 | 10:31 | 9 | 2 | ALIVE | A | 175 |
| Z78 | 10:23 | 10:28 | 5 | 2 | ALIVE | A | 181 |
| Z79 | 10:23 | 10:41 | 18 | 2 | ALIVE | AS | 192 |

29 September 2000 - Testlot 3 : Control - Water temp=16.5 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| AR0 | 15:00 | 15:04 | 4 | 2 | ALIVE | A | 150 |
| AR1 | 15:00 | . | . | 0 | UNKNOWN | X | 169 |
| AR2 | 14:59 | 15:10 | 11 | 2 | ALIVE | A | 193 |
| AR3 | 14:59 | 15:02 | 3 | 2 | ALIVE | A | 180 |
| AR4 | 14:59 | 15:12 | 13 | 2 | ALIVE | A | 176 |
| AR5 | 15:01 | 15:06 | 5 | 2 | ALIVE | HC | 190 |
| AR6 | 15:01 | 15:14 | 13 | 2 | ALIVE | A | 176 |
| AR7 | 15:01 | 15:10 | 9 | 2 | ALIVE | A | 183 |
| AR8 | 15:00 | 15:08 | 8 | 2 | ALIVE | A | 173 |
| AR9 | 15:02 | 15:10 | 8 | 2 | ALIVE | A | 157 |
| AS0 | 15:52 | 15:57 | 5 | 2 | ALIVE | A | 162 |



APPENDIX TABLE C-5. Continued.

| Fish | Time | Fish Data |
|---|---|---|

| No. | Re-leased | Re-covered | At Large (min.) | No. of Turb-N Tags recovered | Alive/ Dead | Condition Codes | Total Length (mm) | Comments |
|---|---|---|---|---|---|---|---|---|
| AS1 | 15:52 | 16:02 | 10 | 2 | ALIVE | C | 182 | |
| AS2 | 15:52 | 15:59 | 7 | 2 | ALIVE | A | 175 | |
| AS3 | 15:53 | 16:00 | 7 | 2 | ALIVE | A | 176 | |
| AS4 | 15:53 | 15:57 | 4 | 2 | ALIVE | A | 167 | |
| AS5 | 15:54 | 15:59 | 5 | 2 | ALIVE | A | 175 | |
| AS6 | 15:55 | 15:59 | 4 | 2 | ALIVE | A | 180 | |
| AS7 | 15:54 | 15:59 | 5 | 2 | ALIVE | A | 180 | |
| AS8 | 15:55 | 16:05 | 10 | 2 | ALIVE | A | 166 | |
| AS9 | 15:54 | 15:57 | 3 | 2 | ALIVE | A | 177 | |

29 September 2000 - Testlot 3 : Control - Water temp=16.5 C

| No. | Re-leased | Re-covered | At Large (min.) | No. of Turb-N Tags recovered | Alive/ Dead | Condition Codes | Total Length (mm) | Comments |
|---|---|---|---|---|---|---|---|---|
| Z80 | 11:07 | 11:18 | 11 | 2 | ALIVE | A | 180 | |
| Z81 | 11:07 | 11:11 | 4 | 2 | ALIVE | A | 175 | |
| Z82 | 11:07 | 11:15 | 8 | 2 | ALIVE | A | 170 | |
| Z83 | 11:06 | 11:22 | 16 | 2 | ALIVE | A | 180 | |
| Z84 | 11:07 | 11:13 | 6 | 2 | ALIVE | A | 188 | |
| Z85 | 11:09 | 11:15 | 6 | 2 | ALIVE | A | 165 | |
| Z86 | 11:08 | 11:24 | 16 | 2 | ALIVE | A | 170 | |
| Z87 | 11:09 | 11:14 | 5 | 2 | ALIVE | A | 172 | |
| Z88 | 11:08 | 11:12 | 4 | 2 | ALIVE | A | 188 | |
| Z89 | 11:10 | 11:15 | 5 | 2 | ALIVE | A | 179 | |
| Z90 | 11:43 | 11:47 | 4 | 2 | ALIVE | A | 172 | |
| Z91 | 11:44 | 11:55 | 11 | 2 | ALIVE | GS | 171 | |
| Z92 | 11:43 | 11:59 | 16 | 2 | ALIVE | A | 167 | |
| Z93 | 11:43 | 11:52 | 9 | 2 | ALIVE | A | 180 | |
| Z94 | 11:44 | 11:56 | 12 | 2 | ALIVE | A | 185 | |
| Z95 | 11:46 | 11:53 | 7 | 2 | ALIVE | A | 181 | |
| Z96 | 11:45 | 11:51 | 6 | 2 | ALIVE | A | 176 | |
| Z97 | 11:45 | 11:51 | 6 | 2 | ALIVE | A | 143 | |
| Z98 | 11:46 | 11:50 | 4 | 2 | ALIVE | A | 174 | |
| Z99 | 11:46 | 11:59 | 13 | 2 | ALIVE | A | 155 | |

30 September 2000 - Testlot 4 : Low flow, Bypass Sluice - Water temp=17.0 C

| No. | Re-leased | Re-covered | At Large (min.) | No. of Turb-N Tags recovered | Alive/ Dead | Condition Codes | Total Length (mm) | Comments |
|---|---|---|---|---|---|---|---|---|
| AZ0 | 11:26 | 11:30 | 4 | 2 | ALIVE | A | 190 | |
| AZ1 | 11:27 | 11:38 | 11 | 2 | ALIVE | AS | 173 | |
| AZ2 | 11:26 | 11:30 | 4 | 2 | ALIVE | A | 192 | |
| AZ3 | 11:27 | 11:30 | 3 | 2 | ALIVE | A | 165 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| AZ5 | 11:29 | 11:41 | 12 | 2 | ALIVE | A | 185 | |
| AZ6 | 11:28 | 11:39 | 11 | 2 | ALIVE | A | 184 | |
| AZ7 | 11:28 | 11:31 | 3 | 2 | ALIVE | A | 170 | |
| AZ8 | 11:29 | 11:39 | 10 | 2 | ALIVE | A | 172 | |
| AZ9 | 11:29 | 11:32 | 3 | 2 | ALIVE | A | 186 | |
| ZM0 | 12:15 | 12:18 | 3 | 2 | ALIVE | A | 189 | |
| ZM1 | 12:16 | 12:20 | 4 | 2 | ALIVE | A | 174 | |
| ZM2 | 12:16 | 12:21 | 5 | 2 | ALIVE | A | 180 | |
| ZM3 | 12:15 | 12:21 | 6 | 2 | ALIVE | A | 196 | |
| ZM4 | 12:16 | 12:21 | 5 | 2 | ALIVE | A | 189 | |
| ZM5 | 12:17 | 12:22 | 5 | 2 | ALIVE | A | 182 | |
| ZM6 | 12:18 | 12:25 | 7 | 2 | ALIVE | AS | 193 | |
| ZM7 | 12:18 | 12:35 | 17 | 2 | ALIVE | AS | 183 | |
| ZM8 | 12:18 | 12:21 | 3 | 2 | ALIVE | A | 170 | |
| ZM9 | 12:17 | 12:22 | 5 | 2 | ALIVE | A | 176 | |
| ZR0 | 14:07 | 14:19 | 12 | 2 | ALIVE | AS | 192 | |
| ZR1 | 14:07 | 14:11 | 4 | 2 | ALIVE | A | 185 | |
| ZR2 | 14:08 | 14:11 | 3 | 2 | ALIVE | A | 186 | |



APPENDIX TABLE C-5. Continued.

| Fish No. | Time | | | No. of Turb-N Tags recovered | Fish Data | | | |
|---|---|---|---|---|---|---|---|---|
| | Re-leased | Re-covered | At Large (min.) | | Alive/ Dead | Condition Codes | Total Length (mm) | Comments |
| ZR3 | 14:07 | 14:10 | 3 | 2 | ALIVE | A | 192 | |
| ZR4 | 14:06 | 14:12 | 6 | 2 | ALIVE | TA | 170 | |
| ZR5 | 14:08 | 14:14 | 6 | 2 | ALIVE | A | 164 | |
| ZR6 | 14:09 | 14:15 | 6 | 2 | ALIVE | A | 182 | |
| ZR7 | 14:09 | 14:13 | 4 | 2 | ALIVE | A | 196 | |
| ZR8 | 14:10 | 14:20 | 10 | 2 | ALIVE | A | 175 | |
| ZR9 | 14:08 | 14:16 | 8 | 2 | ALIVE | A | 180 | |
| ZS0 | 14:43 | 14:51 | 8 | 2 | ALIVE | A | 174 | |
| ZS1 | 14:44 | 14:47 | 3 | 2 | ALIVE | A | 185 | |
| ZS2 | 14:45 | 14:48 | 3 | 2 | ALIVE | A | 178 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ZS3 | 14:43 | 14:46 | 3 | 2 | ALIVE | A | 181 |
| ZS4 | 14:44 | 14:47 | 3 | 2 | ALIVE | A | 169 |
| ZS5 | 14:45 | 14:53 | 8 | 2 | ALIVE | A | 177 |
| ZS6 | 14:47 | 14:55 | 8 | 2 | ALIVE | HC | 169 |
| ZS7 | 14:46 | 14:52 | 6 | 2 | ALIVE | | 193 |
| ZS8 | 14:45 | 14:48 | 3 | 2 | ALIVE | A | 169 |
| ZS9 | 14:46 | 14:50 | 4 | 2 | ALIVE | A | 180 |

30 September 2000 - Testlot 4 : High flow , Bypass Sluice - Water temp=17.0 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| AV0 | 8:19 | 8:30 | 11 | 2 | ALIVE | A | 173 |
| AV1 | 8:18 | 8:22 | 4 | 2 | ALIVE | HD | 177 |
| AV2 | 8:17 | 8:28 | 11 | 2 | ALIVE | A | 172 |
| AV3 | 8:19 | 8:32 | 13 | 2 | ALIVE | A | 190 |
| AV4 | 8:18 | 8:21 | 3 | 2 | ALIVE | A | 174 |
| AV5 | 8:21 | 8:25 | 4 | 2 | ALIVE | A | 191 |
| AV6 | 8:21 | 8:34 | 13 | 2 | ALIVE | A | 169 |
| AV7 | 8:20 | 8:27 | 7 | 2 | ALIVE | A | 193 |
| AV8 | 8:20 | 8:32 | 12 | 2 | ALIVE | A | 176 |
| AV9 | 8:20 | 8:33 | 13 | 2 | ALIVE | A | 175 |
| AW0 | 9:01 | 9:05 | 4 | 2 | ALIVE | A | 175 |
| AW1 | 9:02 | 9:12 | 10 | 2 | ALIVE | A | 190 |
| AW2 | 9:02 | 9:06 | 4 | 2 | ALIVE | A | 161 |
| AW3 | 9:01 | 9:08 | 7 | 2 | ALIVE | A | 170 |
| AW4 | 9:03 | 9:12 | 9 | 2 | ALIVE | A | 186 |
| AW5 | 9:03 | 9:17 | 14 | 2 | ALIVE | A | 175 |
| AW6 | 9:04 | 9:15 | 11 | 2 | ALIVE | A | 183 |
| AW7 | 9:05 | 9:17 | 12 | 2 | ALIVE | A | 187 |
| AW8 | 9:03 | 9:24 | 21 | 2 | ALIVE | AS | 183 |
| AW9 | 9:04 | 9:09 | 5 | 2 | ALIVE | A | 183 |
| ZN0 | 12:48 | 12:54 | 6 | 1 | ALIVE | GBD | 174 |
| ZN1 | 12:49 | 12:53 | 4 | 2 | ALIVE | A | 172 |
| ZN2 | 12:48 | 12:57 | 9 | 2 | ALIVE | A | 173 |
| ZN3 | 12:47 | 13:02 | 15 | 2 | ALIVE | A | 185 |
| ZN4 | 12:47 | 13:02 | 15 | 2 | ALIVE | A | 192 |
| ZN5 | 12:51 | 13:03 | 12 | 2 | ALIVE | A | 183 |
| ZN6 | 12:50 | 12:55 | 5 | 2 | ALIVE | A | 180 |
| ZN7 | 12:49 | 13:14 | 25 | 2 | ALIVE | A | 195 |
| ZN8 | 12:49 | 13:02 | 13 | 2 | ALIVE | A | 166 |
| ZN9 | 12:50 | 12:55 | 5 | 2 | ALIVE | A | 176 |
| ZP0 | 13:28 | 13:31 | 3 | 2 | ALIVE | A | 179 |
| ZP1 | 13:28 | 13:34 | 6 | 2 | ALIVE | A | 168 |
| ZP2 | 13:29 | 13:37 | 8 | 2 | ALIVE | A | 163 |
| ZP3 | 13:29 | 13:33 | 4 | 2 | ALIVE | A | 188 |
| ZP4 | 13:29 | 13:36 | 7 | 2 | ALIVE | A | 151 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ZP5 | 13:31 | 13:35 | 4 | 2 | ALIVE | A | 174 | |
| ZP6 | 13:32 | 13:39 | 7 | 2 | ALIVE | A | 187 | |
| ZP7 | 13:31 | 13:44 | 13 | 2 | ALIVE | AS | 177 | |



APPENDIX TABLE C-5. Continued.

| Fish No. | Time | | | No. of Turb-N Tags recovered | Fish Data | | | Comments |
|---|---|---|---|---|---|---|---|---|
| | Re-leased | Re-covered | At Large (min.) | | Alive/ Dead | Condition Codes | Total Length (mm) | |
| ZP8 | 13:30 | 13:33 | 3 | 2 | ALIVE | A | 170 | |
| ZP9 | 13:30 | 13:36 | 6 | 2 | ALIVE | A | 172 | |
| 30 September 2000 - Testlot 4 : Control - Water temp=17.0 C | | | | | | | | |
| ZT0 | 15:21 | 15:25 | 4 | 2 | ALIVE | A | 180 | |
| ZT1 | 15:20 | 15:25 | 5 | 2 | ALIVE | A | 184 | |
| ZT2 | 15:21 | 15:25 | 4 | 2 | ALIVE | A | 190 | |
| ZT3 | 15:21 | 15:30 | 9 | 2 | ALIVE | A | 186 | |
| ZT4 | 15:20 | 15:25 | 5 | 2 | ALIVE | A | 191 | |
| ZT5 | 15:22 | 15:34 | 12 | 2 | ALIVE | A | 178 | |
| ZT6 | 15:23 | 15:29 | 6 | 2 | ALIVE | A | 176 | |
| ZT7 | 15:24 | 15:27 | 3 | 2 | ALIVE | A | 171 | |
| ZT8 | 15:22 | 15:27 | 5 | 2 | ALIVE | A | 173 | |
| ZT9 | 15:23 | 15:27 | 4 | 2 | ALIVE | A | 141 | |
| ZU0 | 15:54 | 16:03 | 9 | 2 | ALIVE | A | 185 | |
| ZU1 | 15:53 | 15:55 | 2 | 2 | ALIVE | A | 156 | |
| ZU2 | 15:54 | 15:57 | 3 | 2 | ALIVE | A | 175 | |
| ZU3 | 15:53 | 15:58 | 5 | 2 | ALIVE | A | 172 | |
| ZU4 | 15:53 | 16:01 | 8 | 2 | ALIVE | A | 188 | |
| ZU5 | 15:56 | 16:00 | 4 | 2 | ALIVE | A | 200 | |
| ZU6 | 15:57 | 16:07 | 10 | 2 | ALIVE | A | 180 | |
| ZU7 | 15:55 | 15:58 | 3 | 2 | ALIVE | A | 173 | |
| ZU8 | 15:56 | 15:59 | 3 | 2 | ALIVE | A | 170 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ZU9 | 15:55 | 15:59 | 4 | 2 | ALIVE | A | 166 |

30 September 2000 - Testlot 4 : Control - Water temp=17.0 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| AX0 | 9:42 | 9:50 | 8 | 2 | ALIVE | A | 184 |
| AX1 | 9:41 | 9:47 | 6 | 2 | ALIVE | A | 187 |
| AX2 | 9:41 | 9:51 | 10 | 2 | ALIVE | A | 185 |
| AX3 | 9:42 | 9:47 | 5 | 2 | ALIVE | A | 186 |
| AX4 | 9:42 | 9:47 | 5 | 2 | ALIVE | A | 165 |
| AX5 | 9:44 | 9:49 | 5 | 2 | ALIVE | A | 178 |
| AX6 | 9:44 | 9:49 | 5 | 2 | ALIVE | A | 160 |
| AX7 | 9:44 | 9:50 | 6 | 2 | ALIVE | QA | 180 |
| AX8 | 9:43 | 9:46 | 3 | 2 | ALIVE | A | 192 |
| AX9 | 9:44 | 9:53 | 9 | 2 | ALIVE | A | 178 |
| AY0 | 10:49 | 10:55 | 6 | 2 | ALIVE | A | 187 |
| AY1 | 10:49 | 10:55 | 6 | 2 | ALIVE | A | 180 |
| AY2 | 10:49 | 10:55 | 6 | 2 | ALIVE | A | 181 |
| AY3 | 10:50 | 10:57 | 7 | 2 | ALIVE | A | 175 |
| AY4 | 10:48 | 10:52 | 4 | 2 | ALIVE | A | 195 |
| AY5 | 10:51 | 10:59 | 8 | 2 | ALIVE | A | 176 |
| AY6 | 10:50 | 10:54 | 4 | 2 | ALIVE | A | 187 |
| AY7 | 10:51 | 11:01 | 10 | 2 | ALIVE | A | 170 |
| AY8 | 10:51 | 11:01 | 10 | 2 | ALIVE | A | 181 |
| Z35 | 10:52 | 10:59 | 7 | 2 | ALIVE | A | 137 |

2 October 2000 - Testlot 5 : Low flow, Bypass Sluice - Water temp=17.0 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| AN0 | 12:38 | 12:40 | 2 | 2 | ALIVE | A | 172 |
| AN1 | 12:37 | 12:41 | 4 | 2 | ALIVE | A | 178 |
| AN2 | 12:38 | 12:42 | 4 | 2 | ALIVE | A | 176 |
| AN3 | 12:37 | 12:42 | 5 | 2 | ALIVE | A | 179 |
| AN5 | 12:40 | 12:44 | 4 | 2 | ALIVE | A | 155 |



APPENDIX TABLE C-5. Continued.

| Time | Fish Data |
|---|---|

| Fish No. | Re-leased | Re-covered | At Large (min.) | No. of Turb-N Tags recovered | Alive/ Dead | Condition Codes | Total Length (mm) | Comments |
|---|---|---|---|---|---|---|---|---|
| AN6 | 12:41 | 12:44 | 3 | 2 | ALIVE | A | 182 | |
| AN7 | 12:39 | 12:46 | 7 | 2 | ALIVE | AS | 178 | |
| AN8 | 12:40 | 12:44 | 4 | 2 | ALIVE | A | 188 | |
| AN9 | 12:39 | 12:53 | 14 | 2 | ALIVE | AS | 176 | |
| AP0 | 13:23 | 13:25 | 2 | 2 | ALIVE | A | 174 | |
| AP1 | 13:24 | 13:35 | 11 | 2 | ALIVE | AS | 172 | |
| AP2 | 13:23 | 13:26 | 3 | 2 | ALIVE | A | 186 | |
| AP3 | 13:22 | 13:36 | 14 | 2 | ALIVE | AS | 172 | |
| AP4 | 13:24 | 13:28 | 4 | 2 | ALIVE | A | 187 | |
| AP5 | 13:25 | 13:28 | 3 | 2 | ALIVE | A | 182 | |
| AP6 | 13:26 | 13:32 | 6 | 2 | ALIVE | A | 176 | |
| AP7 | 13:26 | 13:34 | 8 | 2 | ALIVE | A | 172 | |
| AP8 | 13:24 | 13:33 | 9 | 2 | ALIVE | A | 167 | |
| AP9 | 13:25 | 13:29 | 4 | 2 | ALIVE | A | 137 | |
| AW0 | 16:49 | 17:02 | 13 | 2 | ALIVE | A | 182 | |
| AW1 | 16:50 | 17:00 | 10 | 2 | ALIVE | A | 174 | |
| AW2 | 16:50 | 16:58 | 8 | 2 | ALIVE | A | 176 | |
| AW3 | 16:49 | 16:59 | 10 | 2 | ALIVE | A | 183 | |
| AW4 | 16:51 | 16:54 | 3 | 2 | ALIVE | A | 156 | |
| AW5 | 16:50 | 16:58 | 8 | 2 | ALIVE | A | 180 | |
| AW6 | 16:52 | 16:54 | 2 | 2 | ALIVE | A | 152 | |
| AW7 | 16:51 | 16:58 | 7 | 2 | ALIVE | A | 183 | |
| AW8 | 16:51 | 16:54 | 3 | 2 | ALIVE | A | 170 | |
| AW9 | 16:52 | 17:10 | 18 | 2 | ALIVE | AS | 172 | |
| Z36 | 10:52 | 10:56 | 4 | 2 | ALIVE | A | 182 | |
| ZX0 | 10:08 | 10:19 | 11 | 2 | ALIVE | AS | 176 | |
| ZX1 | 10:08 | 10:19 | 11 | 2 | ALIVE | AS | 185 | |
| ZX2 | 10:09 | 10:23 | 14 | 2 | ALIVE | A | 190 | |
| ZX3 | 10:08 | 10:12 | 4 | 2 | ALIVE | A | 167 | |
| ZX4 | 10:07 | 10:21 | 14 | 2 | ALIVE | AS | 166 | |
| ZX5 | 10:10 | 10:14 | 4 | 2 | ALIVE | A | 172 | |
| ZX6 | 10:09 | 10:14 | 5 | 2 | ALIVE | A | 168 | |
| ZX7 | 10:10 | 10:31 | 21 | 2 | ALIVE | AS | 172 | |
| ZX8 | 10:10 | 10:18 | 8 | 2 | ALIVE | A | 195 | |
| ZX9 | 10:11 | 10:16 | 5 | 2 | ALIVE | A | 165 | |
| ZY0 | 10:52 | 10:54 | 2 | 2 | ALIVE | A | 163 | |
| ZY1 | 10:52 | 11:00 | 8 | 2 | ALIVE | A | 172 | |
| ZY2 | 10:51 | 10:58 | 7 | 2 | ALIVE | A | 177 | |
| ZY3 | 10:51 | 10:58 | 7 | 2 | ALIVE | A | 177 | |
| ZY4 | 10:51 | 10:55 | 4 | 2 | ALIVE | A | 168 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ZY5 | 10:54 | 11:01 | 7 | 2 | ALIVE | A | 168 | |
| ZY7 | 10:54 | 10:56 | 2 | 2 | ALIVE | A | 178 | |
| ZY8 | 10:53 | 11:00 | 7 | 2 | ALIVE | A | 175 | |
| ZY9 | 10:53 | 10:55 | 2 | 2 | ALIVE | A | 182 | |

2 October 2000 - Testlot 5 : High flow , Bypass Sluice - Water temp=17.0 C

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| AM0 | 12:06 | 12:14 | 8 | 2 | ALIVE | A | 172 | |
| AM1 | 12:05 | 12:11 | 6 | 2 | ALIVE | A | 176 | |
| AM2 | 12:06 | 12:08 | 2 | 2 | ALIVE | A | 186 | |
| AM3 | 12:06 | 12:09 | 3 | 2 | ALIVE | A | 177 | |
| AM4 | 12:07 | 12:15 | 8 | 2 | ALIVE | A | 175 | |
| AM5 | 12:07 | 12:10 | 3 | 2 | ALIVE | A | 176 | |
| AM6 | 12:07 | 12:11 | 4 | 1 | ALIVE | A | 174 | |
| AM7 | 12:09 | 12:13 | 4 | 2 | ALIVE | A | 177 | |
| AM8 | 12:08 | 12:12 | 4 | 2 | ALIVE | A | 193 | |
| AM9 | 12:08 | 12:14 | 6 | 2 | ALIVE | A | 185 | |
| AT0 | 15:04 | 15:20 | 16 | 2 | ALIVE | AS | 183 | |



APPENDIX TABLE C-5. Continued.

| Fish No. | Time | | | No. of Turb-N Tags recovered | Fish Data | | | |
|---|---|---|---|---|---|---|---|---|
| | Re-leased | Re-covered | At Large (min.) | | Alive/ Dead | Condition Codes | Total Length (mm) | Comments |
| AT1 | 15:05 | 15:13 | 8 | 2 | ALIVE | A | 180 | |
| AT2 | 15:05 | 15:17 | 12 | 2 | ALIVE | AS | 164 | |
| AT3 | 15:06 | 15:16 | 10 | 2 | ALIVE | A | 177 | |
| AT5 | 15:06 | 15:09 | 3 | 2 | ALIVE | A | 188 | |
| AT6 | 15:06 | 15:15 | 9 | 2 | ALIVE | A | 181 | |
| AT7 | 15:08 | 15:18 | 10 | 2 | ALIVE | A | 193 | |
| AT8 | 15:07 | 15:17 | 10 | 2 | ALIVE | AS | 181 | |
| AT9 | 15:07 | 15:19 | 12 | 2 | ALIVE | A | 150 | |
| AU0 | 15:39 | 15:43 | 4 | 2 | ALIVE | A | 172 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| AU2 | 15:39 | 15:42 | 3 | 2 | ALIVE | A | 183 |
| AU3 | 15:39 | 15:51 | 12 | 2 | ALIVE | A | 182 |
| AU4 | 15:38 | 15:44 | 6 | 2 | ALIVE | A | 136 |
| AU5 | 15:41 | 15:43 | 2 | 2 | ALIVE | A | 184 |
| AU6 | 15:41 | 15:46 | 5 | 2 | ALIVE | A | 163 |
| AU7 | 15:40 | 15:46 | 6 | 2 | ALIVE | A | 182 |
| AU8 | 15:40 | 15:44 | 4 | 2 | ALIVE | A | 168 |
| AU9 | 15:40 | 15:47 | 7 | 2 | ALIVE | A | 192 |
| AX0 | 17:25 | 17:33 | 8 | 2 | ALIVE | A | 188 |
| AX1 | 17:27 | 17:33 | 6 | 2 | ALIVE | A | 191 |
| AX2 | 17:26 | 17:39 | 13 | 2 | ALIVE | A | 191 |
| AX3 | 17:26 | 17:36 | 10 | 2 | ALIVE | A | 180 |
| AX4 | 17:26 | 17:41 | 15 | 2 | ALIVE | A | 183 |
| AX5 | 17:28 | 17:38 | 10 | 2 | ALIVE | A | 166 |
| AX6 | 17:28 | 17:40 | 12 | 2 | ALIVE | A | 162 |
| AX7 | 17:28 | 17:38 | 10 | 2 | ALIVE | A | 181 |
| AX8 | 17:29 | 17:42 | 13 | 2 | ALIVE | A | 167 |
| AX9 | 17:27 | 17:41 | 14 | 2 | ALIVE | A | 176 |
| Z37 | 15:05 | 15:11 | 6 | 2 | ALIVE | A | 182 |
| ZZ0 | 11:26 | 11:36 | 10 | 2 | ALIVE | A | 175 |
| ZZ1 | 11:24 | 11:30 | 6 | 2 | ALIVE | A | 182 |
| ZZ2 | 11:25 | 11:32 | 7 | 2 | ALIVE | A | 177 |
| ZZ3 | 11:25 | 11:34 | 9 | 2 | ALIVE | A | 164 |
| ZZ4 | 11:25 | 11:36 | 11 | 2 | ALIVE | A | 178 |
| ZZ5 | 11:27 | 11:38 | 11 | 2 | ALIVE | HS | 141 |
| ZZ6 | 11:26 | 11:30 | 4 | 2 | ALIVE | A | 183 |
| ZZ7 | 11:27 | 11:39 | 12 | 2 | ALIVE | A | 174 |
| ZZ8 | 11:28 | 11:34 | 6 | 2 | ALIVE | A | 175 |
| ZZ9 | 11:26 | 11:32 | 6 | 2 | ALIVE | A | 165 |

2 October 2000 - Testlot 5 : Control - Water temp=17.0 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| AY0 | 18:03 | 18:06 | 3 | 2 | ALIVE | A | 165 |
| AY1 | 18:02 | 18:13 | 11 | 2 | ALIVE | A | 166 |
| AY2 | 18:02 | 18:15 | 13 | 2 | ALIVE | A | 178 |
| AY3 | 18:03 | 18:06 | 3 | 2 | ALIVE | A | 192 |
| AY4 | 18:01 | 18:10 | 9 | 2 | ALIVE | A | 173 |
| AY5 | 18:04 | 18:12 | 8 | 2 | ALIVE | A | 168 |
| AY6 | 18:05 | 18:09 | 4 | 2 | ALIVE | A | 194 |
| AY7 | 18:04 | 18:12 | 8 | 2 | ALIVE | A | 180 |
| AY8 | 18:05 | 18:08 | 3 | 2 | ALIVE | A | 173 |
| AY9 | 18:03 | 18:12 | 9 | 2 | ALIVE | A | 170 |
| ZV0 | 8:30 | 8:40 | 10 | 2 | ALIVE | A | 187 |
| ZV1 | 8:30 | 8:35 | 5 | 2 | ALIVE | A | 170 |
| ZV2 | 8:29 | 8:35 | 6 | 2 | ALIVE | A | 184 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ZV3 | 8:31 | 8:40 | 9 | 2 | ALIVE | A | 173 | |
| ZV4 | 8:31 | 8:39 | 8 | 2 | ALIVE | A | 180 | |
| ZV5 | 8:32 | 8:34 | 2 | 2 | ALIVE | A | 183 | |
| ZV6 | 8:32 | 8:36 | 4 | 2 | ALIVE | A | 174 | |



APPENDIX TABLE C-5. Continued.

| Fish No. | Time | | | No. of Turb-N Tags recovered | Fish Data | | | |
|---|---|---|---|---|---|---|---|---|
| | Re-leased | Re-covered | At Large (min.) | | Alive/ Dead | Condition Codes | Total Length (mm) | Comments |
| ZV7 | 8:33 | 8:36 | 3 | 2 | ALIVE | A | 179 | |
| ZV8 | 8:33 | 8:38 | 5 | 2 | ALIVE | A | 174 | |
| ZV9 | 8:31 | 8:35 | 4 | 2 | ALIVE | A | 167 | |
| ZW0 | 9:05 | 9:08 | 3 | 2 | ALIVE | A | 172 | |
| ZW1 | 9:06 | 9:23 | 17 | 2 | ALIVE | A | 194 | |
| ZW2 | 9:06 | 9:16 | 10 | 2 | ALIVE | A | 183 | |
| ZW3 | 9:05 | 9:13 | 8 | 2 | ALIVE | A | 178 | |
| ZW4 | 9:05 | 9:11 | 6 | 2 | ALIVE | A | 167 | |
| ZW5 | 9:07 | 9:15 | 8 | 2 | ALIVE | A | 172 | |
| ZW6 | 9:07 | 9:17 | 10 | 2 | ALIVE | A | 183 | |
| ZW7 | 9:08 | 9:14 | 6 | 2 | ALIVE | A | 190 | |
| ZW8 | 9:07 | 9:11 | 4 | 2 | ALIVE | A | 188 | |
| ZW9 | 9:08 | 9:14 | 6 | 2 | ALIVE | A | 175 | |
| 2 October 2000 - Testlot 5 : Control - Water temp=17.0 C | | | | | | | | |
| AR0 | 13:56 | 14:01 | 5 | 2 | ALIVE | A | 173 | |
| AR1 | 13:55 | 14:06 | 11 | 2 | ALIVE | A | 174 | |
| AR2 | 13:55 | 14:00 | 5 | 2 | ALIVE | A | 173 | |
| AR3 | 13:56 | 14:03 | 7 | 2 | ALIVE | A | 172 | |
| AR4 | 13:54 | 14:00 | 6 | 2 | ALIVE | A | 167 | |
| AR5 | 13:58 | 14:07 | 9 | 2 | ALIVE | A | 166 | |
| AR6 | 13:57 | 14:02 | 5 | 2 | ALIVE | A | 165 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| AR7 | 13:58 | . | . | 0 | DEAD | Z | 178 |
| AR8 | 13:57 | 14:03 | 6 | 2 | ALIVE | A | 163 |
| AR9 | 13:56 | 14:09 | 13 | 2 | ALIVE | A | 182 |
| AS0 | 14:34 | 14:43 | 9 | 2 | ALIVE | A | 168 |
| AS1 | 14:35 | 14:38 | 3 | 2 | ALIVE | A | 171 |
| AS2 | 14:36 | 14:41 | 5 | 2 | ALIVE | A | 163 |
| AS3 | 14:35 | 14:38 | 3 | 2 | ALIVE | A | 176 |
| AS4 | 14:35 | 14:39 | 4 | 2 | ALIVE | A | 174 |
| AS5 | 14:37 | 14:39 | 2 | 2 | ALIVE | A | 164 |
| AS6 | 14:37 | 14:44 | 7 | 2 | ALIVE | A | 166 |
| AS7 | 14:38 | 14:44 | 6 | 2 | ALIVE | A | 176 |
| AS8 | 14:37 | 14:46 | 9 | 2 | ALIVE | A | 184 |
| AS9 | 14:36 | 14:42 | 6 | 2 | ALIVE | A | 177 |
| AV0 | 16:15 | 16:27 | 12 | 2 | ALIVE | A | 166 |
| AV1 | 16:16 | 16:19 | 3 | 2 | ALIVE | A | 182 |
| AV2 | 16:16 | 16:24 | 8 | 2 | ALIVE | A | 170 |
| AV3 | 16:15 | 16:18 | 3 | 2 | ALIVE | A | 180 |
| AV4 | 16:15 | 16:26 | 11 | 2 | ALIVE | A | 186 |
| AV5 | 16:17 | 16:27 | 10 | 2 | ALIVE | A | 173 |
| AV6 | 16:17 | 16:22 | 5 | 2 | ALIVE | A | 173 |
| AV7 | 16:18 | 16:21 | 3 | 2 | ALIVE | A | 170 |
| AV8 | 16:18 | 16:24 | 6 | 2 | ALIVE | A | 181 |
| AV9 | 16:17 | 16:19 | 2 | 2 | ALIVE | A | 164 |

3 October 2000 - Testlot 6 : Low flow, Bypass Sluice - Water temp=16.0 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CN0 | 12:16 | 12:20 | 4 | 2 | ALIVE | A | 180 |
| CN1 | 12:15 | 12:19 | 4 | 2 | ALIVE | A | 139 |
| CN2 | 12:16 | 12:21 | 5 | 2 | ALIVE | A | 187 |
| CN3 | 12:15 | 12:19 | 4 | 2 | ALIVE | A | 185 |
| CN4 | 12:16 | 12:22 | 6 | 2 | ALIVE | A | 177 |
| CN5 | 12:18 | 12:24 | 6 | 2 | ALIVE | A | 178 |
| CN6 | 12:17 | 12:27 | 10 | 2 | ALIVE | A | 168 |
| CN7 | 12:18 | 12:23 | 5 | 2 | ALIVE | A | 177 |



APPENDIX TABLE C-5. Continued.

| Fish No. | Time | | | No. of Turb-N Tags recovered | Fish Data | | | |
|---|---|---|---|---|---|---|---|---|
| | Re-leased | Re-covered | At Large (min.) | | Alive/ Dead | Condition Codes | Total Length (mm) | Comments |
| CN8 | 12:18 | 12:24 | 6 | 2 | ALIVE | A | 155 | |
| CN9 | 12:17 | 12:23 | 6 | 2 | ALIVE | A | 163 | |
| CP0 | 12:49 | 12:53 | 4 | 2 | ALIVE | A | 188 | |
| CP1 | 12:50 | 12:58 | 8 | 2 | ALIVE | A | 169 | |
| CP2 | 12:50 | 13:00 | 10 | 2 | ALIVE | A | 159 | |
| CP3 | 12:50 | 13:02 | 12 | 2 | ALIVE | A | 184 | |
| CP4 | 12:49 | 12:57 | 8 | 2 | ALIVE | A | 177 | |
| CP5 | 12:52 | 12:56 | 4 | 2 | ALIVE | A | 196 | |
| CP6 | 12:52 | 13:01 | 9 | 2 | ALIVE | A | 187 | |
| CP7 | 12:51 | 13:04 | 13 | 2 | ALIVE | A | 177 | |
| CP8 | 12:51 | 12:55 | 4 | 2 | ALIVE | A | 178 | |
| CP9 | 12:53 | 13:00 | 7 | 2 | ALIVE | A | 181 | |
| CU0 | 15:18 | 15:25 | 7 | 2 | ALIVE | A | 179 | |
| CU1 | 15:17 | 15:22 | 5 | 2 | ALIVE | A | 171 | |
| CU2 | 15:17 | 15:20 | 3 | 2 | ALIVE | A | 169 | |
| CU3 | 15:17 | 15:23 | 6 | 2 | ALIVE | A | 182 | |
| CU4 | 15:18 | 15:32 | 14 | 2 | ALIVE | A | 178 | |
| CU5 | 15:20 | 15:42 | 22 | 2 | ALIVE | A | 198 | |
| CU6 | 15:21 | 15:31 | 10 | 1 | ALIVE | A | 181 | |
| CU7 | 15:20 | 15:28 | 8 | 2 | ALIVE | A | 182 | |
| CU8 | 15:19 | 15:23 | 4 | 2 | ALIVE | A | 173 | |
| CU9 | 15:19 | 15:22 | 3 | 2 | ALIVE | A | 175 | |
| CW0 | 16:48 | 16:53 | 5 | 2 | ALIVE | A | 170 | |
| CW1 | 16:47 | 16:57 | 10 | 2 | ALIVE | A | 153 | |
| CW3 | 16:47 | 16:51 | 4 | 2 | ALIVE | A | 187 | |
| CW4 | 16:49 | 16:57 | 8 | 2 | ALIVE | A | 200 | |
| CW5 | 16:50 | 16:59 | 9 | 2 | ALIVE | A | 168 | |
| CW6 | 16:50 | 17:02 | 12 | 2 | ALIVE | A | 171 | |
| CW7 | 16:49 | 16:55 | 6 | 2 | ALIVE | A | 192 | |
| CW8 | 16:48 | 16:51 | 3 | 2 | ALIVE | A | 181 | |
| CW9 | 16:49 | 16:53 | 4 | 2 | ALIVE | A | 181 | |
| Z39 | 16:46 | 16:50 | 4 | 2 | ALIVE | A | 173 | |
| 3 October 2000 - Testlot 6 : High flow , Bypass Sluice - Water temp=16.0 C | | | | | | | | |
| AZ0 | 10:47 | 10:59 | 12 | 2 | ALIVE | A | 180 | |
| AZ1 | 10:46 | 10:51 | 5 | 2 | ALIVE | A | 163 | |
| AZ2 | 10:45 | 10:53 | 8 | 2 | ALIVE | A | 180 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| AZ3 | 10:47 | 10:58 | 11 | 2 | ALIVE | A | 175 | |
| AZ4 | 10:46 | 10:49 | 3 | 2 | ALIVE | A | 163 | |
| AZ5 | 10:49 | 11:03 | 14 | 2 | ALIVE | A | 164 | |
| AZ6 | 10:48 | 10:55 | 7 | 2 | ALIVE | A | 177 | |
| AZ7 | 10:49 | 11:04 | 15 | 2 | ALIVE | A | 184 | |
| AZ8 | 10:48 | 11:00 | 12 | 2 | ALIVE | A | 170 | |
| AZ9 | 10:48 | 10:54 | 6 | 2 | ALIVE | A | 174 | |
| CM0 | 11:22 | 11:35 | 13 | 2 | ALIVE | A | 175 | |
| CM1 | 11:22 | 11:33 | 11 | 2 | ALIVE | TA | 171 | |
| CM2 | 11:23 | 11:34 | 11 | 2 | ALIVE | A | 182 | |
| CM3 | 11:22 | 11:28 | 6 | 2 | ALIVE | A | 176 | |
| CM4 | 11:25 | 11:26 | 1 | 2 | ALIVE | A | 173 | |
| CM5 | 11:25 | 11:33 | 8 | 2 | ALIVE | A | 170 | |
| CM6 | 11:24 | 11:27 | 3 | 2 | ALIVE | A | 169 | |
| CM7 | 11:24 | 11:34 | 10 | 2 | ALIVE | A | 181 | |
| CM8 | 11:25 | 11:37 | 12 | 2 | ALIVE | A | 182 | |
| CT0 | 14:42 | 14:48 | 6 | 2 | ALIVE | A | 182 | |
| CT1 | 14:42 | 14:49 | 7 | 2 | ALIVE | A | 181 | |
| CT2 | 14:43 | 14:49 | 6 | 2 | ALIVE | A | 183 | |
| CT3 | 14:43 | 14:47 | 4 | 2 | ALIVE | A | 169 | |



APPENDIX TABLE C-5. Continued.

| Fish No. | Time: Re-leased | Time: Re-covered | Time: At Large (min.) | No. of Turb-N Tags recovered | Fish Data: Alive/ Dead | Fish Data: Condition Codes | Fish Data: Total Length (mm) | Comments |
|---|---|---|---|---|---|---|---|---|
| CT5 | 14:45 | 14:52 | 7 | 2 | ALIVE | A | 177 | |
| CT6 | 14:44 | 14:56 | 12 | 2 | ALIVE | A | 187 | |
| CT7 | 14:46 | 14:53 | 7 | 2 | ALIVE | A | 166 | |
| CT8 | 14:45 | 14:49 | 4 | 2 | ALIVE | A | 160 | |
| CT9 | 14:44 | 14:58 | 14 | 2 | ALIVE | A | 179 | |
| CX0 | 17:19 | 17:27 | 8 | 2 | ALIVE | A | 179 | |
| CX1 | 17:20 | 17:25 | 5 | 2 | ALIVE | A | 183 | |
| CX2 | 17:19 | 17:22 | 3 | 2 | ALIVE | A | 186 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CX3 | 17:21 | 17:29 | 8 | 2 | ALIVE | A | 176 |
| CX4 | 17:20 | 17:28 | 8 | 2 | ALIVE | A | 183 |
| CX5 | 17:22 | 17:28 | 6 | 2 | ALIVE | A | 190 |
| CX6 | 17:22 | 17:42 | 20 | 2 | ALIVE | A | 184 |
| CX7 | 17:21 | 17:25 | 4 | 2 | ALIVE | A | 178 |
| CX8 | 17:21 | 17:33 | 12 | 2 | ALIVE | A | 178 |
| CX9 | 17:23 | 17:30 | 7 | 2 | ALIVE | A | 175 |
| Z38 | 14:41 | 14:44 | 3 | 2 | ALIVE | A | 195 |

3 October 2000 - Testlot 6 : Control - Water temp=16.0 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CR0 | 13:34 | 13:40 | 6 | 2 | ALIVE | A | 165 |
| CR1 | 13:36 | 13:42 | 6 | 2 | ALIVE | A | 179 |
| CR2 | 13:34 | 13:39 | 5 | 1 | ALIVE | A | 175 |
| CR3 | 13:35 | 13:46 | 11 | 2 | ALIVE | A | 182 |
| CR4 | 13:34 | 13:42 | 8 | 2 | ALIVE | A | 180 |
| CR5 | 13:36 | 13:45 | 9 | 2 | ALIVE | A | 196 |
| CR6 | 13:38 | 13:47 | 9 | 2 | ALIVE | A | 183 |
| CR7 | 13:38 | 13:45 | 7 | 2 | ALIVE | A | 170 |
| CR8 | 13:37 | 13:47 | 10 | 2 | ALIVE | A | 180 |
| CR9 | 13:37 | 13:41 | 4 | 2 | ALIVE | A | 185 |
| CV0 | 16:04 | 16:12 | 8 | 2 | ALIVE | A | 182 |
| CV1 | 16:05 | 16:08 | 3 | 2 | ALIVE | A | 173 |
| CV2 | 16:04 | 16:15 | 11 | 2 | ALIVE | A | 178 |
| CV3 | 16:03 | 16:08 | 5 | 2 | ALIVE | A | 181 |
| CV4 | 16:04 | 16:08 | 4 | 2 | ALIVE | A | 175 |
| CV5 | 16:05 | 16:20 | 15 | 2 | ALIVE | A | 180 |
| CV6 | 16:05 | 16:09 | 4 | 2 | ALIVE | A | 181 |
| CV7 | 16:07 | 16:17 | 10 | 2 | ALIVE | A | 183 |
| CV8 | 16:06 | 16:13 | 7 | 2 | ALIVE | A | 191 |
| CV9 | 16:06 | 16:19 | 13 | 2 | ALIVE | A | 176 |

3 October 2000 - Testlot 6 : Control - Water temp=16.0 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CS0 | 14:12 | 14:26 | 14 | 2 | ALIVE | A | 168 |
| CS1 | 14:13 | 14:20 | 7 | 2 | ALIVE | A | 170 |
| CS2 | 14:13 | 14:22 | 9 | 2 | ALIVE | TA | 183 |
| CS3 | 14:12 | 14:21 | 9 | 2 | ALIVE | A | 174 |
| CS4 | 14:13 | 14:15 | 2 | 2 | ALIVE | A | 174 |
| CS5 | 14:16 | 14:19 | 3 | 2 | ALIVE | A | 190 |
| CS6 | 14:15 | 14:24 | 9 | 2 | ALIVE | A | 191 |
| CS7 | 14:14 | 14:18 | 4 | 2 | ALIVE | A | 155 |
| CS8 | 14:15 | 14:23 | 8 | 2 | ALIVE | A | 181 |
| CS9 | 14:14 | 14:22 | 8 | 2 | ALIVE | TA | 185 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CY0 | 17:58 | 18:02 | 4 | 2 | ALIVE | A | 179 | |
| CY1 | 17:57 | 18:00 | 3 | 2 | ALIVE | A | 176 | |
| CY2 | 17:58 | 18:07 | 9 | 2 | ALIVE | A | 174 | |
| CY3 | 17:57 | 18:08 | 11 | 1 | ALIVE | A | 182 | |
| CY4 | 17:58 | 18:01 | 3 | 2 | ALIVE | A | 180 | |



APPENDIX TABLE C-5. Continued.

| Fish No. | Time: Re-leased | Time: Re-covered | Time: At Large (min.) | No. of Turb-N Tags recovered | Fish Data: Alive/ Dead | Fish Data: Condition Codes | Fish Data: Total Length (mm) | Fish Data: Comments |
|---|---|---|---|---|---|---|---|---|
| CY5 | 18:00 | 18:08 | 8 | 2 | ALIVE | A | 184 | |
| CY6 | 17:59 | 18:03 | 4 | 2 | ALIVE | A | 188 | |
| CY7 | 17:59 | 18:10 | 11 | 2 | ALIVE | AS | 167 | |
| CY8 | 18:01 | 18:06 | 5 | 2 | ALIVE | A | 195 | |
| CY9 | 18:00 | 18:04 | 4 | 2 | ALIVE | A | 169 | |
| 4 October 2000 - Testlot 7 : Low flow, Bypass Sluice - Water temp=16.5 C | | | | | | | | |
| BM0 | 9:07 | 9:09 | 2 | 2 | ALIVE | A | 189 | |
| BM1 | 9:08 | 9:11 | 3 | 2 | ALIVE | A | 190 | |
| BM2 | 9:06 | 9:09 | 3 | 2 | ALIVE | A | 166 | |
| BM3 | 9:07 | 9:12 | 5 | 2 | ALIVE | A | 168 | |
| BM4 | 9:06 | 9:15 | 9 | 2 | ALIVE | A | 185 | |
| BM5 | 9:08 | 9:15 | 7 | 2 | ALIVE | A | 174 | |
| BM6 | 9:09 | 9:11 | 2 | 2 | ALIVE | A | 167 | |
| BM7 | 9:09 | 9:18 | 9 | 2 | ALIVE | A | 176 | |
| BM8 | 9:10 | 9:13 | 3 | 2 | ALIVE | A | 175 | |
| BM9 | 9:09 | 9:14 | 5 | 2 | ALIVE | A | 194 | |
| BV0 | 13:30 | 13:41 | 11 | 2 | ALIVE | A | 174 | |
| BV1 | 13:30 | 13:34 | 4 | 2 | ALIVE | A | 185 | |
| BV2 | 13:31 | 13:38 | 7 | 2 | ALIVE | A | 187 | |
| BV3 | 13:31 | 13:34 | 3 | 2 | ALIVE | A | 184 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| BV4 | 13:29 | 13:33 | 4 | 2 | ALIVE | A | 191 |
| BV5 | 13:32 | 13:36 | 4 | 2 | ALIVE | A | 176 |
| BV6 | 13:31 | 13:36 | 5 | 2 | ALIVE | A | 185 |
| BV7 | 13:33 | 13:36 | 3 | 2 | ALIVE | A | 196 |
| BV8 | 13:32 | 13:36 | 4 | 2 | ALIVE | A | 195 |
| BV9 | 13:33 | 13:44 | 11 | 2 | ALIVE | A | 185 |
| BW0 | 14:04 | 14:14 | 10 | 2 | ALIVE | A | 192 |
| BW1 | 14:03 | 14:05 | 2 | 2 | ALIVE | A | 181 |
| BW2 | 14:03 | 14:07 | 4 | 2 | ALIVE | A | 183 |
| BW3 | 14:04 | 14:07 | 3 | 2 | ALIVE | A | 165 |
| BW4 | 14:04 | 14:12 | 8 | 2 | ALIVE | A | 187 |
| BW5 | 14:07 | 14:12 | 5 | 2 | ALIVE | A | 180 |
| BW6 | 14:05 | 14:14 | 9 | 2 | ALIVE | A | 180 |
| BW7 | 14:06 | 14:14 | 8 | 2 | ALIVE | A | 191 |
| BW8 | 14:06 | 14:20 | 14 | 2 | ALIVE | A | 187 |
| BW9 | 14:05 | 14:15 | 10 | 2 | ALIVE | A | 135 |
| BZ9 | 8:35 | 8:48 | 13 | 2 | ALIVE | A | 172 |
| CZ0 | 8:33 | 8:44 | 11 | 2 | ALIVE | A | 190 |
| CZ1 | 8:34 | 8:46 | 12 | 2 | ALIVE | A | 174 |
| CZ2 | 8:32 | 8:37 | 5 | 2 | ALIVE | A | 195 |
| CZ3 | 8:33 | 8:46 | 13 | 2 | ALIVE | A | 166 |
| CZ5 | 8:33 | 8:37 | 4 | 2 | ALIVE | A | 190 |
| CZ6 | 8:34 | 8:41 | 7 | 2 | ALIVE | A | 169 |
| CZ7 | 8:35 | 8:42 | 7 | 2 | ALIVE | A | 159 |
| CZ8 | 8:36 | 8:39 | 3 | 2 | ALIVE | A | 178 |
| CZ9 | 8:35 | 8:40 | 5 | 2 | ALIVE | A | 173 |
| ZA0 | 15:55 | 15:58 | 3 | 2 | ALIVE | A | 174 |
| ZA1 | 15:55 | 16:06 | 11 | 2 | ALIVE | A | 166 |
| ZA2 | 15:54 | 16:01 | 7 | 2 | ALIVE | A | 191 |
| ZA3 | 15:56 | 16:04 | 8 | 2 | ALIVE | A | 190 |
| ZA4 | 15:55 | 16:05 | 10 | 2 | ALIVE | A | 184 |
| ZA5 | 15:57 | 16:04 | 7 | 2 | ALIVE | A | 190 |
| ZA6 | 15:58 | 16:06 | 8 | 2 | ALIVE | A | 171 |
| ZA7 | 15:56 | 16:01 | 5 | 2 | ALIVE | A | 181 |
| ZA8 | 15:57 | 16:04 | 7 | 2 | ALIVE | A | 174 |
| ZA9 | 15:57 | 16:02 | 5 | 2 | ALIVE | A | 166 |



APPENDIX TABLE C-5. Continued.

| Fish No. | Time: Re-leased | Time: Re-covered | Time: At Large (min.) | No. of Turb-N Tags recovered | Fish Data: Alive/ Dead | Fish Data: Condition Codes | Fish Data: Total Length (mm) | Fish Data: Comments |
|---|---|---|---|---|---|---|---|---|
| 4 October 2000 - Testlot 7 : High flow , Bypass Sluice - Water temp=16.5 C | | | | | | | | |
| BN0 | 9:50 | 10:01 | 11 | 2 | ALIVE | A | 192 | |
| BN1 | 9:50 | 9:54 | 4 | 2 | ALIVE | A | 187 | |
| BN2 | 9:50 | 9:55 | 5 | 2 | ALIVE | A | 181 | |
| BN3 | 9:51 | 10:02 | 11 | 2 | ALIVE | A | 173 | |
| BN4 | 9:51 | 9:55 | 4 | 2 | ALIVE | A | 170 | |
| BN5 | 9:53 | 9:57 | 4 | 2 | ALIVE | A | 155 | |
| BN6 | 9:51 | 10:05 | 14 | 2 | ALIVE | A | 177 | |
| BN7 | 9:52 | 9:58 | 6 | 2 | ALIVE | A | 176 | |
| BN8 | 9:52 | 9:59 | 7 | 2 | ALIVE | A | 180 | |
| BN9 | 9:53 | 10:04 | 11 | 2 | ALIVE | A | 174 | |
| BP0 | 10:24 | 10:28 | 4 | 2 | ALIVE | A | 178 | |
| BP1 | 10:25 | 10:37 | 12 | 2 | ALIVE | A | 188 | |
| BP2 | 10:26 | 10:31 | 5 | 2 | ALIVE | A | 181 | |
| BP3 | 10:25 | 10:29 | 4 | 2 | ALIVE | A | 187 | |
| BP4 | 10:24 | 10:36 | 12 | 2 | ALIVE | A | 175 | |
| BP5 | 10:26 | 10:36 | 10 | 2 | ALIVE | A | 173 | |
| BP6 | 10:28 | 10:33 | 5 | 2 | ALIVE | A | 182 | |
| BP7 | 10:26 | 10:33 | 7 | 2 | ALIVE | A | 188 | |
| BP8 | 10:27 | 10:40 | 13 | 2 | ALIVE | A | 187 | |
| BP9 | 10:27 | 10:35 | 8 | 2 | ALIVE | A | 181 | |
| BT0 | 12:18 | 12:23 | 5 | 2 | ALIVE | A | 183 | |
| BT1 | 12:17 | 12:24 | 7 | 2 | ALIVE | TA | 192 | |
| BT2 | 12:18 | 12:28 | 10 | 2 | ALIVE | A | 164 | |
| BT3 | 12:18 | 12:23 | 5 | 2 | ALIVE | A | 194 | |
| BT4 | 12:17 | 12:32 | 15 | 2 | ALIVE | A | 198 | |
| BT6 | 12:19 | 12:29 | 10 | 2 | ALIVE | A | 184 | |
| BT7 | 12:20 | 12:29 | 9 | 2 | ALIVE | A | 163 | |
| BT8 | 12:20 | 12:23 | 3 | 2 | ALIVE | A | 184 | |
| BT9 | 12:20 | 12:25 | 5 | 2 | ALIVE | A | 187 | |
| BU0 | 12:59 | 13:05 | 6 | 2 | ALIVE | A | 183 | |
| BU1 | 12:59 | 13:10 | 11 | 2 | ALIVE | A | 177 | |
| BU2 | 12:58 | 13:02 | 4 | 2 | ALIVE | A | 193 | |
| BU3 | 12:59 | 13:03 | 4 | 2 | ALIVE | A | 178 | |
| BU4 | 12:58 | 13:03 | 5 | 2 | ALIVE | A | 183 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| BU5 | 13:01 | 13:06 | 5 | 2 | ALIVE | A | 182 | |
| BU6 | 13:00 | 13:06 | 6 | 2 | ALIVE | A | 192 | |
| BU7 | 13:01 | 13:06 | 5 | 2 | ALIVE | A | 184 | |
| BU9 | 13:01 | 13:09 | 8 | 2 | ALIVE | A | 174 | |
| ZB0 | 16:26 | 16:33 | 7 | 2 | ALIVE | A | 172 | |
| ZB1 | 16:27 | 16:29 | 2 | 2 | ALIVE | A | 200 | |
| ZB2 | 16:28 | 16:37 | 9 | 2 | ALIVE | A | 182 | |
| ZB3 | 16:26 | 16:33 | 7 | 2 | ALIVE | A | 182 | |
| ZB4 | 16:27 | 16:41 | 14 | 2 | ALIVE | AS | 186 | |
| ZB5 | 16:29 | 16:33 | 4 | 2 | ALIVE | A | 178 | |
| ZB6 | 16:29 | 16:35 | 6 | 2 | ALIVE | A | 183 | |
| ZB7 | 16:30 | 16:36 | 6 | 2 | ALIVE | A | 182 | |
| ZB8 | 16:30 | 16:34 | 4 | 2 | ALIVE | A | 175 | |
| ZB9 | 16:28 | 16:34 | 6 | 2 | ALIVE | A | 185 | |
| 4 October 2000 - Testlot 7 : Control - Water temp=16.5 C | | | | | | | | |
| BR0 | 11:00 | 11:04 | 4 | 2 | ALIVE | A | 190 | |
| BR1 | 10:58 | 11:01 | 3 | 2 | ALIVE | A | 189 | |
| BR2 | 11:00 | 11:08 | 8 | 2 | ALIVE | A | 181 | |



APPENDIX TABLE C-5. Continued.

| Fish No. | Time | | | No. of Turb-N Tags recovered | Fish Data | | | |
|---|---|---|---|---|---|---|---|---|
| | Re-leased | Re-covered | At Large (min.) | | Alive/ Dead | Condition Codes | Total Length (mm) | Comments |
| BR3 | 10:59 | 11:03 | 4 | 2 | ALIVE | A | 172 | |
| BR4 | 10:59 | 11:03 | 4 | 2 | ALIVE | A | 176 | |
| BR5 | 11:01 | 11:11 | 10 | 2 | ALIVE | A | 182 | |
| BR6 | 11:02 | 11:11 | 9 | 2 | ALIVE | A | 174 | |
| BR7 | 11:01 | 11:05 | 4 | 2 | ALIVE | A | 173 | |
| BR8 | 11:00 | 11:05 | 5 | 2 | ALIVE | A | 184 | |
| BR9 | 11:02 | 11:13 | 11 | 2 | ALIVE | A | 182 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| BS0 | 11:42 | 11:45 | 3 | 2 | ALIVE | A | 179 |
| BS1 | 11:43 | 11:46 | 3 | 2 | ALIVE | A | 185 |
| BS2 | 11:43 | 11:56 | 13 | 2 | ALIVE | A | 183 |
| BS3 | 11:44 | 11:55 | 11 | 2 | ALIVE | A | 191 |
| BS4 | 11:44 | 11:57 | 13 | 2 | ALIVE | A | 177 |
| BS5 | 11:45 | 11:55 | 10 | 2 | ALIVE | A | 172 |
| BS6 | 11:46 | 11:52 | 6 | 2 | ALIVE | A | 187 |
| BS7 | 11:44 | 11:50 | 6 | 2 | ALIVE | A | 165 |
| BS8 | 11:45 | 11:52 | 7 | 2 | ALIVE | A | 180 |
| BS9 | 11:45 | 11:48 | 3 | 2 | ALIVE | A | 150 |

4 October 2000 - Testlot 7 : Control - Water temp=16.5 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| BX0 | 14:47 | 14:54 | 7 | 2 | ALIVE | A | 188 |
| BX1 | 14:47 | 14:54 | 7 | 2 | ALIVE | A | 179 |
| BX2 | 14:48 | 14:58 | 10 | 2 | ALIVE | A | 164 |
| BX3 | 14:47 | 14:52 | 5 | 2 | ALIVE | A | 187 |
| BX4 | 14:48 | 14:52 | 4 | 2 | ALIVE | A | 155 |
| BX5 | 14:50 | 14:54 | 4 | 2 | ALIVE | A | 169 |
| BX6 | 14:49 | 14:56 | 7 | 2 | ALIVE | A | 182 |
| BX7 | 14:50 | 14:54 | 4 | 2 | ALIVE | A | 182 |
| BX9 | 14:49 | 14:54 | 5 | 2 | ALIVE | A | 184 |
| BY0 | 15:24 | 15:28 | 4 | 2 | ALIVE | A | 186 |
| BY1 | 15:25 | 15:30 | 5 | 2 | ALIVE | TA | 183 |
| BY2 | 15:26 | 15:32 | 6 | 2 | ALIVE | A | 186 |
| BY3 | 15:25 | 15:28 | 3 | 2 | ALIVE | A | 173 |
| BY4 | 15:24 | 15:27 | 3 | 2 | ALIVE | A | 183 |
| BY5 | 15:27 | 15:32 | 5 | 2 | ALIVE | A | 160 |
| BY6 | 15:28 | 15:31 | 3 | 2 | ALIVE | A | 185 |
| BY7 | 15:26 | 15:30 | 4 | 2 | ALIVE | A | 174 |
| BY8 | 15:26 | 15:30 | 4 | 2 | ALIVE | A | 170 |
| BY9 | 15:27 | 15:35 | 8 | 2 | ALIVE | A | 197 |
| ZC0 | 17:01 | 17:06 | 5 | 2 | ALIVE | A | 166 |
| ZC1 | 16:59 | 17:18 | 19 | 2 | ALIVE | C | 179 |
| ZC2 | 17:00 | 17:07 | 7 | 1 | ALIVE | A | 174 |
| ZC3 | 17:00 | 17:05 | 5 | 2 | ALIVE | A | 186 |
| ZC4 | 17:00 | 17:07 | 7 | 2 | ALIVE | A | 188 |
| ZC5 | 17:02 | 17:10 | 8 | 2 | ALIVE | A | 182 |
| ZC6 | 17:02 | 17:16 | 14 | 2 | ALIVE | A | 194 |
| ZC7 | 17:01 | 17:10 | 9 | 2 | ALIVE | A | 188 |
| ZC8 | 17:02 | 17:09 | 7 | 2 | ALIVE | A | 185 |
| ZC9 | 17:03 | 17:07 | 4 | 2 | ALIVE | A | 180 |

5 October 2000 - Testlot 8 : Low flow, Bypass Sluice - Water temp=16.0 C

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| AN0 | 13:30 | 13:36 | 6 | 2 | ALIVE | A | 176 | |
| AN1 | 13:29 | 13:32 | 3 | 2 | ALIVE | A | 172 | |
| AN2 | 13:30 | 13:40 | 10 | 2 | ALIVE | A | 180 | |
| AN3 | 13:30 | 13:41 | 11 | 2 | ALIVE | A | 167 | |
| AN4 | 13:29 | 13:33 | 4 | 2 | ALIVE | A | 180 | |



APPENDIX TABLE C-5. Continued.

| Fish No. | Time | | | No. of Turb-N Tags recovered | Fish Data | | | |
|---|---|---|---|---|---|---|---|---|
| | Re-leased | Re-covered | At Large (min.) | | Alive/ Dead | Condition Codes | Total Length (mm) | Comments |
| AN5 | 13:32 | 13:38 | 6 | 2 | ALIVE | A | 192 | |
| AN6 | 13:31 | 13:38 | 7 | 2 | ALIVE | A | 168 | |
| AN7 | 13:32 | 13:40 | 8 | 2 | ALIVE | A | 170 | |
| AN8 | 13:32 | 13:44 | 12 | 2 | ALIVE | A | 176 | |
| AN9 | 13:31 | 13:36 | 5 | 2 | ALIVE | A | 172 | |
| AP0 | 14:03 | 14:07 | 4 | 2 | ALIVE | A | 188 | |
| AP1 | 14:03 | 14:07 | 4 | 2 | ALIVE | A | 171 | |
| AP2 | 14:03 | 14:14 | 11 | 2 | ALIVE | TA | 185 | |
| AP3 | 14:04 | 14:15 | 11 | 2 | ALIVE | A | 182 | |
| AP4 | 14:04 | 14:17 | 13 | 2 | ALIVE | A | 177 | |
| AP5 | 14:05 | 14:15 | 10 | 2 | ALIVE | A | 180 | |
| AP6 | 14:06 | 14:13 | 7 | 2 | ALIVE | A | 175 | |
| AP7 | 14:06 | 14:10 | 4 | 2 | ALIVE | A | 178 | |
| AP8 | 14:05 | 14:11 | 6 | 2 | ALIVE | A | 177 | |
| AP9 | 14:05 | 14:17 | 12 | 2 | ALIVE | A | 176 | |
| AU0 | 16:35 | 16:41 | 6 | 2 | ALIVE | A | 190 | |
| AU1 | 16:33 | 16:39 | 6 | 2 | ALIVE | A | 190 | |
| AU2 | 16:34 | 16:37 | 3 | 2 | ALIVE | A | 190 | |
| AU3 | 16:34 | 16:45 | 11 | 2 | ALIVE | A | 172 | |
| AU4 | 16:35 | 16:42 | 7 | 2 | ALIVE | A | 183 | |
| AU5 | 16:38 | 16:45 | 7 | 2 | ALIVE | A | 172 | |
| AU6 | 16:37 | 16:42 | 5 | 2 | ALIVE | A | 183 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| AU7 | 16:36 | 16:46 | 10 | 2 | ALIVE | A | 167 |
| AU8 | 16:37 | 16:50 | 13 | 2 | ALIVE | A | 173 |
| AU9 | 16:36 | 16:40 | 4 | 2 | ALIVE | A | 177 |
| ZF0 | 9:15 | 9:18 | 3 | 2 | ALIVE | A | 189 |
| ZF1 | 9:13 | 9:16 | 3 | 2 | ALIVE | A | 177 |
| ZF2 | 9:14 | 9:24 | 10 | 2 | ALIVE | A | 170 |
| ZF3 | 9:14 | 9:23 | 9 | 2 | ALIVE | A | 169 |
| ZF4 | 9:15 | 9:22 | 7 | 2 | ALIVE | A | 185 |
| ZF5 | 9:17 | 9:23 | 6 | 2 | ALIVE | A | 167 |
| ZF6 | 9:16 | 9:19 | 3 | 2 | ALIVE | A | 172 |
| ZF7 | 9:17 | 9:25 | 8 | 2 | ALIVE | A | 173 |
| ZF8 | 9:16 | 9:27 | 11 | 2 | ALIVE | A | 181 |
| ZF9 | 9:16 | 9:20 | 4 | 2 | ALIVE | A | 180 |
| ZH0 | 9:58 | 10:08 | 10 | 2 | ALIVE | A | 158 |
| ZH1 | 9:56 | 10:01 | 5 | 2 | ALIVE | A | 168 |
| ZH2 | 9:57 | 10:02 | 5 | 2 | ALIVE | A | 180 |
| ZH3 | 9:56 | 10:07 | 11 | 2 | ALIVE | A | 169 |
| ZH4 | 9:57 | 10:10 | 13 | 2 | ALIVE | A | 166 |
| ZH5 | 9:59 | 10:09 | 10 | 2 | ALIVE | A | 163 |
| ZH6 | 10:00 | 10:07 | 7 | 2 | ALIVE | A | 186 |
| ZH7 | 9:59 | 10:03 | 4 | 2 | ALIVE | A | 185 |
| ZH8 | 10:00 | 10:06 | 6 | 2 | ALIVE | A | 162 |
| ZH9 | 9:58 | 10:01 | 3 | 2 | ALIVE | TA | 186 |

5 October 2000 - Testlot 8 : High flow , Bypass Sluice - Water temp=16.0 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| AM0 | 12:52 | 13:04 | 12 | 1 | ALIVE | B | 184 |
| AM1 | 12:52 | 12:59 | 7 | 2 | ALIVE | A | 175 |
| AM2 | 12:53 | 13:06 | 13 | 2 | ALIVE | A | 180 |
| AM3 | 12:52 | 13:00 | 8 | 2 | ALIVE | A | 185 |
| AM4 | 12:53 | 12:56 | 3 | 2 | ALIVE | A | 168 |
| AM5 | 12:55 | 13:07 | 12 | 2 | ALIVE | A | 194 |
| AM6 | 12:56 | 13:03 | 7 | 2 | ALIVE | A | 180 |
| AM7 | 12:55 | 13:01 | 6 | 2 | ALIVE | A | 182 |
| AM8 | 12:54 | 13:04 | 10 | 2 | ALIVE | A | 158 |
| AM9 | 12:55 | 12:57 | 2 | 2 | ALIVE | A | 180 |



APPENDIX TABLE C-5. Continued.

| Fish No. | Time | | | No. of Turb-N Tags recovered | Fish Data | | | |
|---|---|---|---|---|---|---|---|---|
| | Re-leased | Re-covered | At Large (min.) | | Alive/ Dead | Condition Codes | Total Length (mm) | Comments |
| AR0 | 14:39 | 14:48 | 9 | 2 | ALIVE | A | 183 | |
| AR2 | 14:38 | 14:44 | 6 | 2 | ALIVE | A | 166 | |
| AR3 | 14:39 | 14:49 | 10 | 2 | ALIVE | A | 192 | |
| AR4 | 14:39 | 14:48 | 9 | 2 | ALIVE | A | 186 | |
| AR5 | 14:40 | 14:56 | 16 | 2 | ALIVE | A | 173 | |
| AR6 | 14:40 | 14:54 | 14 | 2 | ALIVE | A | 182 | |
| AR7 | 14:41 | 14:50 | 9 | 2 | ALIVE | A | 183 | |
| AR8 | 14:42 | 14:50 | 8 | 2 | ALIVE | A | 188 | |
| AR9 | 14:41 | 14:46 | 5 | 2 | ALIVE | A | 192 | |
| AS0 | 15:20 | 15:33 | 13 | 2 | ALIVE | A | 185 | |
| AS1 | 15:20 | 15:22 | 2 | 2 | ALIVE | A | 172 | |
| AS2 | 15:19 | 15:28 | 9 | 2 | ALIVE | A | 183 | |
| AS3 | 15:18 | 15:31 | 13 | 2 | ALIVE | A | 170 | |
| AS4 | 15:19 | 15:26 | 7 | 2 | ALIVE | TA | 191 | |
| AS5 | 15:22 | 15:26 | 4 | 2 | ALIVE | A | 182 | |
| AS6 | 15:20 | 15:24 | 4 | 2 | ALIVE | A | 188 | |
| AS7 | 15:22 | 15:25 | 3 | 2 | ALIVE | A | 170 | |
| AS8 | 15:21 | 15:37 | 16 | 2 | ALIVE | A | 176 | |
| AS9 | 15:21 | 15:34 | 13 | 2 | ALIVE | A | 165 | |
| AV0 | 17:05 | 17:12 | 7 | 2 | ALIVE | A | 172 | |
| AV1 | 17:05 | 17:16 | 11 | 2 | ALIVE | A | 193 | |
| AV2 | 17:06 | 17:23 | 17 | 2 | ALIVE | A | 178 | |
| AV3 | 17:06 | 17:12 | 6 | 2 | ALIVE | A | 176 | |
| AV4 | 17:07 | 17:23 | 16 | 2 | ALIVE | A | 173 | |
| AV5 | 17:08 | 17:12 | 4 | 2 | ALIVE | A | 155 | |
| AV6 | 17:07 | 17:17 | 10 | 2 | ALIVE | A | 173 | |
| AV7 | 17:09 | 17:19 | 10 | 2 | ALIVE | A | 187 | |
| AV8 | 17:08 | 17:11 | 3 | 2 | ALIVE | A | 183 | |
| AV9 | 17:07 | 17:15 | 8 | 2 | ALIVE | A | 177 | |
| ZL0 | 12:13 | 12:26 | 13 | 2 | ALIVE | A | 176 | |
| ZL1 | 12:12 | 12:15 | 3 | 2 | ALIVE | A | 177 | |
| ZL2 | 12:11 | 12:26 | 15 | 2 | ALIVE | AS | 177 | |
| ZL3 | 12:12 | 12:23 | 11 | 2 | ALIVE | A | 166 | |
| ZL4 | 12:13 | 12:19 | 6 | 2 | ALIVE | A | 194 | |
| ZL5 | 12:14 | 12:31 | 17 | 2 | ALIVE | A | 166 | |
| ZL6 | 12:15 | 12:26 | 11 | 2 | ALIVE | AS | 168 | |
| ZL7 | 12:15 | 12:20 | 5 | 2 | ALIVE | A | 187 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ZL8 | 12:15 | 12:30 | 15 | 2 | ALIVE | A | 172 | |
| ZL9 | 12:14 | 12:25 | 11 | 2 | ALIVE | A | 170 | |

5 October 2000 - Testlot 8 : Control - Water temp=16.0 C

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| AT0 | 16:05 | 16:12 | 7 | 2 | ALIVE | A | 179 | |
| AT1 | 16:04 | 16:17 | 13 | 2 | ALIVE | A | 182 | |
| AT2 | 16:05 | 16:15 | 10 | 2 | ALIVE | A | 180 | |
| AT3 | 16:05 | 16:12 | 7 | 2 | ALIVE | A | 179 | |
| AT4 | 16:04 | 16:06 | 2 | 2 | ALIVE | A | 180 | |
| AT5 | 16:07 | 16:15 | 8 | 2 | ALIVE | A | 170 | |
| AT6 | 16:06 | 16:14 | 8 | 2 | ALIVE | A | 160 | |
| AT7 | 16:07 | 16:12 | 5 | 2 | ALIVE | A | 182 | |
| AT8 | 16:06 | 16:12 | 6 | 2 | ALIVE | A | 197 | |
| AT9 | 16:06 | 16:20 | 14 | 2 | ALIVE | A | 169 | |
| ZD0 | 8:03 | 8:16 | 13 | 2 | ALIVE | A | 177 | |
| ZD1 | 8:02 | 8:12 | 10 | 2 | ALIVE | A | 190 | |
| ZD2 | 8:03 | 8:13 | 10 | 2 | ALIVE | A | 174 | |
| ZD3 | 8:02 | 8:12 | 10 | 2 | ALIVE | A | 174 | |
| ZD4 | 8:02 | 8:09 | 7 | 2 | ALIVE | A | 172 | |
| ZD5 | 8:05 | 8:15 | 10 | 2 | ALIVE | A | 182 | |



APPENDIX TABLE C-5. Continued.

| Fish No. | Time Re-leased | Re-covered | At Large (min.) | No. of Turb-N Tags recovered | Fish Data Alive/ Dead | Condition Codes | Total Length (mm) | Comments |
|---|---|---|---|---|---|---|---|---|
| ZD6 | 8:05 | 8:19 | 14 | 2 | ALIVE | A | 180 | |
| ZD7 | 8:04 | 8:14 | 10 | 2 | ALIVE | A | 189 | |
| ZD8 | 8:04 | 8:13 | 9 | 2 | ALIVE | A | 175 | |
| ZD9 | 8:06 | 8:16 | 10 | 2 | ALIVE | A | 194 | |
| ZE0 | 8:42 | 8:54 | 12 | 2 | ALIVE | A | 169 | |
| ZE1 | 8:43 | 8:47 | 4 | 2 | ALIVE | A | 172 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ZE2 | 8:44 | 8:55 | 11 | 2 | ALIVE | A | 177 |
| ZE3 | 8:43 | 8:46 | 3 | 2 | ALIVE | A | 184 |
| ZE4 | 8:44 | 8:53 | 9 | 2 | ALIVE | A | 173 |
| ZE5 | 8:45 | 8:50 | 5 | 2 | ALIVE | A | 178 |
| ZE6 | 8:44 | 8:51 | 7 | 2 | ALIVE | A | 177 |
| ZE7 | 8:46 | 8:55 | 9 | 2 | ALIVE | A | 197 |
| ZE8 | 8:45 | 8:51 | 6 | 2 | ALIVE | A | 170 |
| ZE9 | 8:46 | 8:52 | 6 | 2 | ALIVE | A | 181 |

5 October 2000 - Testlot 8 : Control - Water temp=16.0 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CZ0 | 11:04 | 11:16 | 12 | 2 | ALIVE | A | 152 |
| ZJ0 | 11:02 | 11:12 | 10 | 2 | ALIVE | A | 173 |
| ZJ1 | 11:02 | 11:05 | 3 | 2 | ALIVE | A | 176 |
| ZJ2 | 11:02 | 11:06 | 4 | 2 | ALIVE | A | 173 |
| ZJ3 | 11:01 | 11:15 | 14 | 2 | ALIVE | C | 183 |
| ZJ4 | 11:01 | 11:11 | 10 | 2 | ALIVE | A | 173 |
| ZJ5 | 11:03 | 11:09 | 6 | 2 | ALIVE | A | 162 |
| ZJ6 | 11:05 | 11:17 | 12 | 2 | ALIVE | A | 193 |
| ZJ7 | 11:04 | 11:08 | 4 | 2 | ALIVE | A | 180 |
| ZJ8 | 11:03 | 11:08 | 5 | 2 | ALIVE | A | 199 |
| ZK0 | 11:32 | 11:35 | 3 | 2 | ALIVE | A | 172 |
| ZK1 | 11:32 | 11:47 | 15 | 2 | ALIVE | A | 180 |
| ZK2 | 11:33 | 11:37 | 4 | 2 | ALIVE | A | 182 |
| ZK3 | 11:32 | 11:35 | 3 | 2 | ALIVE | A | 182 |
| ZK4 | 11:33 | 11:54 | 21 | 2 | ALIVE | A | 179 |
| ZK5 | 11:35 | 11:43 | 8 | 2 | ALIVE | A | 182 |
| ZK6 | 11:34 | 11:37 | 3 | 2 | ALIVE | A | 162 |
| ZK7 | 11:35 | 11:40 | 5 | 2 | ALIVE | A | 174 |
| ZK8 | 11:34 | 11:38 | 4 | 2 | ALIVE | A | 172 |
| ZK9 | 11:35 | 11:44 | 9 | 2 | ALIVE | A | 185 |

6 October 2000 - Testlot 9 : Low flow, Bypass Sluice - Water temp=15.5 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| BM0 | 10:15 | 10:21 | 6 | 2 | ALIVE | A | 187 |
| BM1 | 10:17 | 10:21 | 4 | 2 | ALIVE | A | 166 |
| BM2 | 10:15 | 10:25 | 10 | 2 | ALIVE | A | 184 |
| BM3 | 10:16 | 10:30 | 14 | 2 | ALIVE | A | 170 |
| BM4 | 10:16 | 10:36 | 20 | 2 | ALIVE | A | 195 |
| BM5 | 10:19 | 10:22 | 3 | 2 | ALIVE | A | 180 |
| BM6 | 10:18 | 10:29 | 11 | 2 | ALIVE | A | 175 |
| BM7 | 10:18 | 10:31 | 13 | 2 | ALIVE | A | 182 |
| BM8 | 10:17 | 10:43 | 26 | 2 | ALIVE | A | 175 |
| BM9 | 10:17 | 10:23 | 6 | 2 | ALIVE | A | 179 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| BN0 | 10:59 | 11:09 | 10 | 2 | ALIVE | A | 174 | |
| BN1 | 11:00 | 11:14 | 14 | 2 | ALIVE | A | 187 | |
| BN2 | 11:00 | 11:15 | 15 | 2 | ALIVE | A | 173 | |
| BN3 | 10:59 | 11:07 | 8 | 2 | ALIVE | A | 183 | |
| BN4 | 11:00 | 11:11 | 11 | 2 | ALIVE | A | 165 | |
| BN5 | 11:02 | 11:17 | 15 | 2 | ALIVE | A | 175 | |
| BN6 | 11:01 | 11:05 | 4 | 2 | ALIVE | A | 193 | |



APPENDIX TABLE C-5. Continued.

| Fish No. | Time | | | No. of Turb-N Tags recovered | Fish Data | | | |
|---|---|---|---|---|---|---|---|---|
| | Re-leased | Re-covered | At Large (min.) | | Alive/ Dead | Condition Codes | Total Length (mm) | Comments |
| BN7 | 11:01 | 11:08 | 7 | 2 | ALIVE | A | 169 | |
| BN8 | 11:01 | 11:11 | 10 | 2 | ALIVE | A | 184 | |
| BN9 | 11:02 | 11:13 | 11 | 2 | ALIVE | A | 198 | |
| BS0 | 14:00 | 14:11 | 11 | 2 | ALIVE | A | 191 | |
| BS1 | 14:00 | 14:19 | 19 | 2 | ALIVE | A | 170 | |
| BS2 | 14:00 | 14:14 | 14 | 2 | ALIVE | A | 181 | |
| BS3 | 14:01 | 14:09 | 8 | 2 | ALIVE | TA | 160 | |
| BS4 | 14:01 | 14:13 | 12 | 2 | ALIVE | A | 185 | |
| BS5 | 14:02 | 14:08 | 6 | 2 | ALIVE | A | 171 | |
| BS6 | 14:03 | 14:08 | 5 | 2 | ALIVE | A | 184 | |
| BS7 | 14:02 | 14:08 | 6 | 2 | ALIVE | A | 195 | |
| BS8 | 14:03 | 14:22 | 19 | 2 | ALIVE | A | 190 | |
| BS9 | 14:02 | 14:08 | 6 | 2 | ALIVE | A | 195 | |
| 6 October 2000 - Testlot 9 : High flow , Bypass Sluice - Water temp=15.5 C | | | | | | | | |
| AW0 | 7:59 | 8:04 | 5 | 2 | ALIVE | A | 179 | |
| AW1 | 7:58 | 8:06 | 8 | 2 | ALIVE | A | 180 | |
| AW2 | 7:58 | 8:22 | 24 | 2 | ALIVE | A | 176 | |
| AW3 | 7:59 | 8:12 | 13 | 2 | ALIVE | A | 154 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| AW4 | 7:59 | 8:14 | 15 | 2 | ALIVE | TA | 153 |
| AW5 | 8:00 | 8:12 | 12 | 2 | ALIVE | A | 192 |
| AW6 | 8:01 | 8:19 | 18 | 2 | ALIVE | A | 183 |
| AW7 | 8:01 | 8:20 | 19 | 2 | ALIVE | A | 173 |
| AW8 | 8:01 | 8:20 | 19 | 2 | ALIVE | A | 178 |
| AW9 | 8:00 | 8:15 | 15 | 2 | ALIVE | A | 106 |
| AX0 | 8:37 | 8:48 | 11 | 2 | ALIVE | A | 176 |
| AX1 | 8:38 | 8:44 | 6 | 2 | ALIVE | TA | 193 |
| AX2 | 8:38 | 8:59 | 21 | 2 | ALIVE | A | 192 |
| AX3 | 8:38 | 8:45 | 7 | 2 | ALIVE | A | 178 |
| AX4 | 8:37 | 8:44 | 7 | 2 | ALIVE | A | 191 |
| AX5 | 8:39 | 8:43 | 4 | 2 | ALIVE | A | 164 |
| AX6 | 8:40 | 8:51 | 11 | 2 | ALIVE | A | 190 |
| AX7 | 8:39 | 8:48 | 9 | 2 | ALIVE | A | 166 |
| AX8 | 8:40 | 8:53 | 13 | 2 | ALIVE | A | 175 |
| AX9 | 8:39 | 8:44 | 5 | 2 | ALIVE | A | 188 |
| BP0 | 11:35 | 11:44 | 9 | 2 | ALIVE | A | 174 |
| BP1 | 11:35 | 11:39 | 4 | 2 | ALIVE | A | 167 |
| BP2 | 11:36 | 11:45 | 9 | 2 | ALIVE | A | 165 |
| BP3 | 11:35 | 11:38 | 3 | 2 | ALIVE | A | 202 |
| BP4 | 11:34 | 11:41 | 7 | 2 | ALIVE | A | 186 |
| BP5 | 11:36 | 11:46 | 10 | 2 | ALIVE | A | 170 |
| BP6 | 11:37 | 11:49 | 12 | 2 | ALIVE | A | 180 |
| BP7 | 11:37 | 11:42 | 5 | 2 | ALIVE | A | 171 |
| BP8 | 11:38 | 11:51 | 13 | 2 | ALIVE | A | 202 |
| BP9 | 11:37 | 11:47 | 10 | 2 | ALIVE | A | 181 |

6 October 2000 - Testlot 9 : Control - Water temp=15.5 C

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| AY0 | 9:19 | 9:24 | 5 | 2 | ALIVE | A | 174 |
| AY1 | 9:17 | 9:23 | 6 | 2 | ALIVE | A | 187 |
| AY2 | 9:17 | 9:22 | 5 | 2 | ALIVE | A | 187 |
| AY3 | 9:18 | 9:46 | 28 | 2 | ALIVE | A | 175 |
| AY4 | 9:18 | 9:23 | 5 | 2 | ALIVE | A | 179 |
| AY5 | 9:20 | 9:27 | 7 | 2 | ALIVE | A | 166 |
| AY6 | 9:19 | 9:40 | 21 | 2 | ALIVE | A | 186 |
| AY7 | 9:21 | 9:26 | 5 | 2 | ALIVE | A | 175 |

APPENDIX TABLE C-5. Continued.

| Fish No. | Time | | | No. of Turb-N Tags recovered | Fish Data | | | |
|---|---|---|---|---|---|---|---|---|
| | Re-leased | Re-covered | At Large (min.) | | Alive/ Dead | Condition Codes | Total Length (mm) | Comments |
| AY8 | 9:20 | 9:38 | 18 | 2 | ALIVE | A | 187 | |
| AY9 | 9:19 | 9:39 | 20 | 2 | ALIVE | A | 175 | |
| AZ0 | 10:00 | 10:11 | 11 | 2 | ALIVE | A | 183 | |
| AZ1 | 10:00 | 10:03 | 3 | 2 | ALIVE | A | 161 | |
| AZ2 | 10:01 | 10:08 | 7 | 2 | ALIVE | A | 174 | |
| AZ3 | 10:01 | 10:08 | 7 | 2 | ALIVE | A | 181 | |
| AZ4 | 10:00 | 10:08 | 8 | 2 | ALIVE | A | 180 | |
| 6 October 2000 - Testlot 9 : Control - Water temp=15.5 C | | | | | | | | |
| AZ5 | 12:30 | 12:37 | 7 | 2 | ALIVE | A | 177 | |
| AZ6 | 12:29 | 12:34 | 5 | 2 | ALIVE | A | 190 | |
| AZ7 | 12:29 | 12:34 | 5 | 2 | ALIVE | A | 185 | |
| AZ8 | 12:28 | 12:33 | 5 | 2 | ALIVE | A | 192 | |
| AZ9 | 12:28 | 12:35 | 7 | 2 | ALIVE | A | 190 | |
| BR0 | 12:06 | 12:12 | 6 | 2 | ALIVE | A | 185 | |
| BR1 | 12:07 | 12:12 | 5 | 2 | ALIVE | A | 178 | |
| BR2 | 12:06 | 12:11 | 5 | 2 | ALIVE | A | 171 | |
| BR3 | 12:05 | 12:11 | 6 | 2 | ALIVE | A | 190 | |
| BR4 | 12:06 | 12:10 | 4 | 2 | ALIVE | A | 198 | |
| BR5 | 12:07 | 12:18 | 11 | 2 | ALIVE | A | 171 | |
| BR6 | 12:09 | 12:17 | 8 | 2 | ALIVE | A | 176 | |
| BR7 | 12:08 | 12:15 | 7 | 2 | ALIVE | A | 177 | |
| BR8 | 12:08 | 12:17 | 9 | 2 | ALIVE | A | 180 | |
| BR9 | 12:08 | 12:14 | 6 | 2 | ALIVE | A | 185 | |