DISSOLVED GAS BIOLOGICAL EFFECTS MONITORING STUDY PLAN

First Draft

ROCKY REACH HYDROELECTRIC PROJECT
FERC Project No. 2145

February 2, 2001

Public Utility District No. 1 of Chelan County
Wenatchee, Washington

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SECTION 1: INTRODUCTION

1.1 General Description of the Rocky Reach Project and Aquatic Biological Resources

The Rocky Reach hydroelectric project is located at river mile (RM) 473.7 on the Columbia River. This is downstream of Wells Dam and upstream from Rock Island Dam. It is the one project in a series of five hydropower projects built by Chelan, Douglas and Grant County Public Utility Districts (PUDs) between RM 397.1 and RM 515.1 on the mainstem Columbia River. Rocky Reach Dam consists of 11 generating units, producing a total peak capacity of approximately 1,287 megawatts of power, and 12 gated spillway openings. The hydraulic capacity of the Rocky Reach powerhouse is 217,000 cfs (Chelan PUD 1991a). Rocky Reach, as a run-of-river project, has little pondage and no usable storage volume. The project has a small operating range and must pass inflow on a daily average basis.

The Columbia River and its tributaries drain an area of 219,000 square miles in seven western states and 39,500 square miles in British Columbia. In the United States, most of the basin is located in Washington, Oregon, Idaho and Montana. The Columbia River originates at Columbia Lake on the west slope of Rocky Mountain Range in British Columbia and flows west and south, eventually draining into the Pacific Ocean between Washington and Oregon. Total river length is 1,214 miles (Bonneville Power Administration [BPA] et al. 1994a). Rocky Reach Reservoir extends approximately 43 miles upstream to the tailrace of Wells dam. Rocky Reach Reservoir has a surface area of approximately 9,100 acres, a gross storage capacity of 382,000 acre-feet, a mean depth of 42 feet and a shoreline length of approximately 93 miles. The Entiat River is the primary tributary flowing into the reservoir.

The mid-Columbia River reach forms the boundary between the North Cascade Mountains to the west and the Columbia Plateau to the east. In the vicinity of the Rocky Reach Project, the river flows over mainly Paleozoic metamorphic and intrusive rocks. Further south, toward Rock Island Dam, the river passes into the Columbia basalt group (BPA et al. 1994b). In and around Rocky Reach, the Columbia River flows through a gorge interrupted by confluences with several tributary valleys. The Entiat River and a number of intermittent streams with deep "V" shaped valleys flow into the Columbia River from the west (Chelan PUD 1991b).

Anadromous salmonid fish species present in the Rocky Reach Project area include: spring, summer and fall chinook salmon *(Oncorhynchus tshawytscha*), sockeye salmon (*O. nerka*), summer steelhead (*O. mykiss*), and coho salmon (*O. kisutch*). Coho salmon were historically present, but the endemic stock was extirpated from the mid-Columbia region by the 1940s (Mullan 1984). Pacific lamprey is another non-salmonid anadromous fish species present in the project area.

Upper Columbia steelhead (*Oncorhynchus mykiss*) were listed as endangered by the National Marine Fisheries Service (NMFS) on Aug. 18, 1997 (62 FR 43937). Upper Columbia Bull trout (*Salvelinus confluentus*) were listed as threatened on June 12, 1998 (63 FR 111 – pp. 31647-74). Upper Columbia spring chinook salmon were listed as endangered on March 16, 1999 (63 FR

11482). No other aquatic plant or animal species in the mid-Columbia River reach is currently listed as threatened or endangered under either the ESA or Washington state laws or regulations. Summer/fall chinook salmon in the mid-Columbia River were petitioned for listing in 1993. A listing was found to be not warranted by the NMFS in 1994 and reaffirmed in 1998, 63 FR 11482 (March 9, 1998). NMFS has determined that listing of the two sockeye ESUs in the mid-Columbia is also not warranted. The listing of any of these species could substantially affect operation of Rocky Reach and other hydropower facilities throughout the basin.

Native resident fish species include white sturgeon, mountain whitefish, rainbow trout, bull trout, northern pikeminnow, peamouth chub, chiselmouth chub, largescale sucker, bridgelip sucker, redside shiner, sculpins, and threespine stickleback. Common introduced resident species include carp, tench, largemouth and smallmouth bass, pumpkinseed sunfish, walleye, yellow perch, and brown bullhead.

1.2 General Description of the Relicensing Process

The Public Utility District No. 1 of Chelan County (Chelan PUD) owns and operates the Rocky Reach Hydroelectric Project (Project). Chelan PUD is permitted to operate the Project according to terms and conditions contained in an existing Federal Energy Regulatory Commission (FERC) license, No. 2145, that was issue on July 12, 1956. On Sept. 1, 1966, the Chelan PUD filed an application with the Federal Power Commission (FPC) to amend the Project license for the addition of four generating units. The FPC, later FERC, issued the license amendment on May 23, 1968. The existing license expires on June 30, 2006.

Chelan PUD intends to seek a new federal license to operate the Rocky Reach Project and has begun preparation for the process referred to as "relicensing." The FERC relicensing process is based on laws and regulations that require years of extensive planning, including environmental studies, agency consensus and public involvement. The process to obtain a new license has changed considerably since the existing licensee was issued in 1956. The Federal Power Act (FPA) was amended in 1986 by the Electric Consumers Protection Act (ECPA). The amendment requires the FERC, in addition to power and development purposes, to give equal consideration to the purposes of enhancement of fish and wildlife, the protection of recreational opportunities, and the preservation of other aspects of environmental quality.

1.3 Need Statement

Water quality certification for the new license is required by the WDE. Water quality can affect numerous resources including fisheries, recreation, water supply and aesthetics. Studies to provide adequate baseline information for submittal of an application for water quality certification were conducted in 1999 and 2000 (Parametrix, 2000a).

Water quality standards for waters of the state of Washington are addressed in Chapter 173-201 of the Washington Administrative Code (WAC). General water use and criteria classes are established in this regulation. The Columbia River, which includes Rocky Reach Reservoir, has been classified as a "Class A" water. On a scale that ranges from "Class AA" (extraordinary) to "Class C" (fair), "Class A" waters are rated as excellent, meeting or exceeding the requirements for substantially all uses.

Table 1-1 is a comparison of the "Class A" water quality criteria, long-term monthly water quality data from the WDE Columbia River monitoring station located just downstream of Rock Island Dam (Chelan PUD 1991b) and water quality data collected in 1999-2000 specifically for the relicensing of Rocky Reach Dam (Parametrix 2000a). The WDE station, located approximately 20 miles downstream of Rocky Reach Dam, is the nearest mainstem data collection point with a long-term monitoring record that would document water quality pertinent to the Rocky Reach Project. WDE's data is based on an average of all 133 monthly readings collected between October 1977 and January 1989. As illustrated in Table 1-1, on a yearly average the water quality below both hydroelectric projects meets the "Class A" water quality standards. This average of monthly samples is appropriate to demonstrate that water quality standards are met for chemical and biological parameters, such as pH, dissolved oxygen, turbidity and fecal coliform contamination. But for the parameters of total dissolved gas and water temperature, which are dependent on the seasonal effects of river flow and weather, the average of monthly samples is not appropriate. The river temperature, during periods of hot weather, and the level of total dissolved gas, during periods of high river flows, can exceed the water quality standards for periods of time while the causal conditions persist. The water quality data collected in 1999-2000 gives a range of average monthly values for these parameters.

Table 1-1: Comparison of WDE Water Quality Standards and Average Water Quality Data From the WDE Rock Island Monitoring Station and Range of Monthly Data from Rocky Reach Reservoir

Water Quality Criteria	**Class A Standard**	**Rock Island Station**	**Rocky Reach Data**
Fecal Coliform Organisms	<100 organisms	40 organisms	1 – 10 organisms
	<10% exceed 200	6.8% exceed 200	0%
Dissolved Oxygen	>8.0 mg/L	12.2 mg/L	9.0 – 13.6 mg/L
pH	6.5<pH<8.5	8.0 pH	7.8 – 8.1 pH
Turbidity	<5 NTU	4.4 NTU	1.1 – 3.3 NTU
Toxic/Deleterious Material	Public Health Req.	Conforms	---
Aesthetic Values	Unimpaired	Unimpaired	---
Temperature	<18.0 ° C.	11.3 ° C.	3.2 – 18.2 ° C.
Total Dissolved Gas Tailrace Data	Not Exceed 110% saturation	109.9% (COE database)	100% - 113.4%

The water quality standard for Total Dissolved Gas (TDG) for "Class A" waters is not to exceed 110% of saturation relative to atmospheric pressure. The 110% TDG standard does not apply when the stream flow exceeds the seven-day, 10-year frequency flood. In addition, during the downstream migration season for juvenile salmon and steelhead (April – August), the water quality standards include a special fish passage exemption to the TDG standards for sections of the Snake and Columbia rivers (WAC 173-201A-060). The TDG criteria may be adjusted to aid fish passage over hydroelectric dams when consistent with a WDE approved gas abatement plan. When spilling water at dams is necessary to aid fish passage, TDG must not exceed an average of

115% as measured in the forebay of the next downstream dam. TDG must also not exceed an average of 120% as measured in the tailraces of each dam, based on the 12 highest readings in a day. The maximum allowable TDG for a single hour is 125% relative to atmospheric pressure. These special conditions are viewed as interim and are to be reviewed by the year 2003.

The gas abatement plan for Rocky Reach, to be submitted by Chelan PUD to WDE for approval of 2001 operations, includes studies to assess methods for gas abatement. Chelan PUD has conducted extensive monitoring of TDG in the Rocky Reach Dam's forebay and below the tailrace. Data from 1997 – 2000 was analyzed to determine if different spill gate configurations would have different effects on the level of TDG in the tailrace at Rocky Reach Dam (Parametrix, 2000b). During the years of 1998 – 2000, TDG levels increased only slightly during the spill period (1-3% of saturation on average). Average TDG levels during these years remained below 110% saturation, although point estimates ranged from 110% to 120% of saturation (Parametrix, 2000b). During 1997, a year with very high flows in the Columbia River that exceeded the seven-day, 10-year frequency flood, TDG levels were commonly high (110-135% of saturation), but average levels did not increase from the forebay to the tailrace at Rocky Reach Dam (Parametrix 2000b).

The incidence of gas bubble trauma (GBT) in juvenile salmonids at Columbia River hydroelectric projects has been extensively studied and monitored since the 1970s, and a substantial body of literature has developed. GBT is a symptom exhibited by fish that are exposed to TDG levels in excess of 100% saturation. The 1995 FCRPS Biological Opinion, to improve survival of ESA-listed salmon and steelhead, mandated that federal hydroelectric projects spill water for fish passage up to the 120% TDG level allowed in the special fish passage exemption to the 110% TDG standard. To evaluate the effects of the spill requirement and associated 120% TDG levels, a study program was initiated to evaluate the biological effects of the spill operations on the health and survival of juvenile salmon, steelhead and other aquatic organisms. NMFS recently published a risk assessment for the spill program described in the 2000 Biological Opinion for the FCRPS (federal Columbia River power system). Signs of GBT in juvenile salmonids are observed at all gas levels. Even at a relatively low gas supersaturation level of 110%, GBT symptoms can develop if the exposure is long and the water is shallow (NMFS, 2000). NMFS reported that below 120% TDG, few GBT signs are observed, and that only a few juvenile salmon and steelhead with severe GBT signs are detected until TDG approaches 130% (NMFS, 2000). When the in-river TDG level is below 120%, few, or in some case none, of the adult salmon and steelhead were found with signs of GBT. NMFS believes that the 120% tailrace gas cap recommended by the 1995 FCRPS Biological Opinion places no TDG burden on adult salmon and steelhead migrants (NMFS, 2000). NMFS concludes that the lack of harm to juvenile and adult salmon and steelhead resulting from a 10% exceedence of the 110% TDG standard can be explained by an effect of depth compensation in these migrating fish (NMFS, 2000). NMFS states that additional research and monitoring data on other aquatic species and habitat is needed before it would be appropriate to apply the conclusions for salmon and steelhead in justifying a change in national and state water quality standards.

Chelan PUD has also monitored juvenile salmon migrants collected at Rocky Reach and Rock Island dams for evidence of GBT. The incidence of GBT in salmon and steelhead sampled at

Rocky Reach and Rock Island dams comports with the findings at the FCRPS dams. Generally, less than 5% of juvenile salmon and steelhead exhibit GBT symptoms when forebay TDG levels are 115% or less (Murdoch and McDonald, 1997; Hampton et. al, 1988, 1999; Grassell and McDonald, 2000). The severity of GBT symptoms is also minor when forebay TDG is below 115%. Salmon and steelhead migrants examined at Rocky Reach, Rock Island and Priest Rapids dams showed only a few individuals with other than minor signs of GBT, except in 1997 when TDG levels reached over 130% (Weitkamp, 2000).

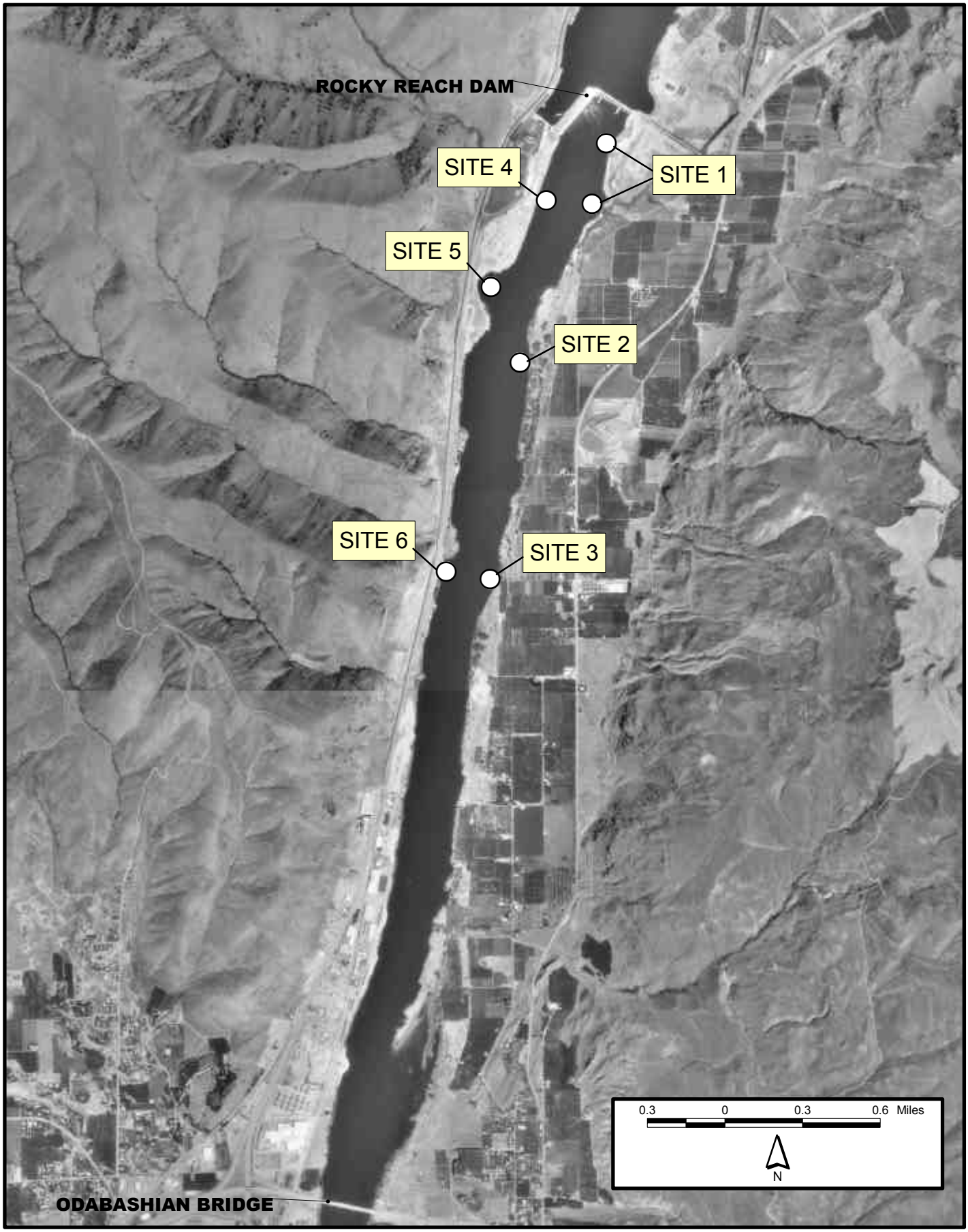

Figure 1. Rocky Reach tailrace sample areas.

SECTION 2: STUDY GOAL

The goal of relicensing water quality studies is to supplement existing information related to meeting the requirements for submitting an application for 401 Water Quality Certification with the Sate of Washington. Management of dissolved gas entrainment and elevated TDG levels at Rocky Reach Dam, along with exploration of options for additional abatement of TDG input from Rocky Reach spill operations and evaluation of biological effects of elevated TDG levels on salmonids and other fish, has been under way for many years. The body of literature regarding biological effects of elevated TDG levels on salmonids is extensive, but the information on other species of aquatic life is more limited. The objective of this study is to supplement existing information on the effect of elevated TDG levels on aquatic invertebrates and non-salmonid fish. This study will document the extent of GBT observed in invertebrates and non-salmonid fish sampled from aquatic habitats affected by dissolved gas supersaturation resulting from spillway operations at Rocky Reach Dam.

SECTION 3: STUDY AREA

The study area will consist of the project tailrace and areas immediately downstream of the tailrace along both the east and west shorelines (Figure 1-1). The highest levels of TDG generated by Rocky Reach Project operations are expected to be in the tailrace on the east shoreline, directly below the spillway. Additional sampling areas along the east and west shoreline below Rocky Reach Dam are representative of TDG levels related to project operations, with varying degrees of TDG reduction from maximum levels expected below the spillway. These downstream sampling sites will have lower TDG due to natural dissipation, over time, of supersaturated dissolved gas from water and mixing with water passing through the powerhouse. However, these sites will be more representative of potential project effects on aquatic species since the high TDG levels immediately below the spillway are localized and limited to a small fraction of aquatic habitat affected by Rocky Reach Project operations. The west shoreline sample location closest to the powerhouse will serve as a control site. That location will have TDG levels caused by other dams upstream from Rocky Reach Dam but little additional TDG input caused by Rocky Reach Dam because mixing with spillway flow will be minimal. Passage of water through the powerhouse neither increases nor decreases the saturation level of air dissolved in the water drawn from the forebay.

SECTION 4: METHODOLOGY

4.1 Aquatic Macroinvertbrate

4.1.1 Sampling Techniques

Aquatic invertebrates will be sampled by two methods, artificial substrates and Ekman dredge. The artificial substrates will be the primary method for collection and evaluation of macroinvertebrates for a number of reasons. First, the tailrace areas of primary interest are composed of hard substrates with swift water velocities, and artificial substrates are the most practical method available for evaluation of macroinvertebrate populations in these areas. Second, the use of artificial substrates provides a means to standardize substrate conditions at different locations, improving ability to isolate the effect of TDG levels from other variables that can affect macroinvertebrate species composition and population density. Third, the artificial substrates will sit on top of the streambed, assuring that TDG-laden water will flow through the substrate and that macroinvertebrates will be uniformly exposed to TDG saturation levels being studied. The artificial substrates will follow the designs and sampling methods used for the benthic macroinvertebrate survey study (DES and RL&L, 1999), allowing comparison with the results of that study. All sampling devices will be a standard size (15×15×15 cm). Macroinvertebrates will be allowed to colonize replicate artificial substrates for at least 32 days before sampling. The Ekman dredge will be used to sample soft substrates, in those locations where it is present, in order to obtain samples of organisms that would not colonize hard substrates.

4.1.2 Analysis Techniques

The study design for the invertebrates consists of two strategies. Macroinvertebrates will be inspected at time of sampling for signs of GBT. Artificial substrates and Ekman samples will be washed, screened and preserved for analysis of changes in species composition and number of organisms to seek evidence of chronic effects of TDG on productivity over time with continuous exposure. To accomplish these objectives, artificial substrates and Ekman dredge samples will be examined for GBT and species composition and abundance immediately before the spring fish spill season, at the end of the spring fish spill season, and at the end of the summer spill season. Samples will be taken at eight locations, shown in Figure 1-1. These locations include four sites with hard substrate and swift to moderate water velocities, two of which will be in the flow from the spillway with high levels of TDG. Two sample locations will be in flow predominately from the powerhouse, with lower levels of TDG. The other four sample sites will be in quieter water areas with substrates having a higher proportion of fine material and organic detritus. Two sites will be on the west shoreline in flows with greater powerhouse influence and two on the east shoreline in predominately spillway flows with expected higher TDG levels.

If an organism is residing above the hydrostatic compensation depth for the ambient level of dissolved gas saturation, bubbles may form. If the organism is below the hydrostatic

compensation depth, bubbles will be reabsorbed (Montgomery Watson 1995). Gas bubbles in fish exposed to supersaturated TDG levels can form in soft tissues with rapid blood exchange within a matter of minutes. If the bubble is in thin tissues exposed to air or water, the bubbles can also collapse within minutes. The tissues with the most rapid formation and loss of bubbles are the lateral line and gills (Montgomery Watson 1995). Bubbles in fins reabsorb much more slowly. When fish were pressurized to the hydrostatic pressure of 100 feet of depth, only 50% of bubbles had reabsorbed following pressurization periods ranging from 5 to 30 minutes (Montgomery Watson 1995).

Relatively few studies of the effects of TDG on invertebrates have been conducted. Shrank et al. (1997) sampled benthic and epibenthic invertebrates and resident non-salmonid fish from the Snake and Columbia rivers. They believed that external gas bubbles may have formed as a result of their sampling procedures, so they documented only observations of internal gas bubbles. They washed samples through a 0.5-mm screen and all invertebrates were retained. Most organisms were examined within 15 minutes of collection using a dissecting microscope with 15- to 40-power magnification. In this study, the use of artificial substrates is intended to provide an opportunity to observe macroinvertebrates without the handling effects of washing samples to separate them from sediments. Artificial substrates will be visually examined for organisms, with incidence of gas bubbles recorded up to 15 minutes following removal of the artificial substrate from the sampling location. Individual rocks in the substrate cages will be examined one at a time, with the remaining rocks held in river water with TDG levels between 100 – 110% until examined. Holding in water will inhibit dissipation of bubbles prior to examination, and use of water that is not excessively saturated, relative to ambient air pressure, will mimic the saturation level, relative to hydrostatic pressure, experienced by the organisms at the depth of the artificial substrate prior to removal.

4.2 Resident Non-Salmonid Fish

4.2.1 Sampling Techniques

Resident fish will be collected in near-shore areas and backwater areas shown in Figure 1-1. Sampling will be conducted once a week beginning in April and continuing on that schedule until the end of the spring spill season, about mid-June. Sampling during the summer spill season will be once every two weeks, continuing until spill ends in August or until TDG levels fall to below 110%. Samples will be collected using a large (300'-500' long by 10'-20' deep), variable-mesh beach seine with a fine mesh bag end. The seine will be set using a small boat with outboard motor, setting one end on shore then encircling an area by playing the net out of the boat and pulling the other end into shore. When the net has been pulled in to the point where the fine mesh bag end has reached the shoreline, the size of the catch will be assessed and the bag drawn in to the point where fish can be removed with a dip net. Fish will be held in the bag, which will be propped up to form a cage, while samples will be dipped, non-salmonids anesthetized and examined for GBT. Any salmonids caught will be released without examination to avoid handling of ESA-listed species.

4.2.2 Analysis Techniques

Non-salmonid fish will be anesthetized, identified, measured to the nearest millimeter (total length) and examined for external injuries and signs of GBT. Examination of the lateral line and gills will be first, followed by a search of the body for subcutaneous bubbles or lesions on the head, roof of mouth, eyes, body surface and in the fins. Examination of the gills will be limited to a non-invasive observation of gill filaments visible by gently lifting the opercle. Exophthalmia (pop-eye) will also be noted when present. Fish will be examined using a magnifying headband and/or field scope. The presence or absence of bubbles, and, when present, the location and proportion of body part covered with bubbles (up to 25%, 25 - 50%, >50%) will be recorded. Up to 100 individuals of each species will be examined, selecting size distribution of fish samples to be representative of the total sample. If two distinct size or age classes of a species are sampled (adult/juvenile), then up to 100 individuals of each class will be examined. Fish will be examined within 15 minutes following removal from the bag end of the seine.

4.3 Dissolved Gas Measurements

Total dissolved gas concentration will be measured at the time of sampling at each location using either Common Sensing tensionometers or Hydrolab sensors. In addition, TDG sampling will be done hourly at the fixed monitoring sites in the Rocky Reach Dam forebay and the downstream site at Odabashian Bridge. During the peak of the spring spill period and TDG levels, a continuous TDG sample will be taken near the most upstream site of the artificial substrates located on the east shoreline below the spillway.

SECTION 5: TASK LIST

Task 1 – Prepare detailed work plan
- 1.1 Natural Sciences Working Group review
- 1.2 Coordinate work with Chelan PUD for scheduling

Task 2 - Preparation for field studies
- 2.1 Benthic Samples
  - 2.1.1 Construct and set artificial substrates
  - 2.1.2 Purchase field equipment, prepare data forms
- 2.2 Fish Samples
  - 2.2.1 Purchase beach seine
  - 2.2.2 Conduct test seine hauls to determine locations where seining feasible and to refine seine setting technique
- 2.3 Dissolved gas measurement
  - 2.3.1 Determine Equipment Requirements and procure/schedule equipment
  - 2.3.2 Coordinate with F&W TDG monitoring program on data collection/exchange, calibration of equipment
- 2.4 Personnel
  - 2.4.1 Schedule personnel training for GBT analysis
  - 2.4.2 Hire personnel/contractor for field work

2.4.3 Contract for invertebrate sample processing

2.5 Field work schedule

2.5.1 Coordinate with Chelan F&W & Hydro Operations on field work schedule

2.5.2 Develop sampling schedule and coordinate spill closures for sampling

2.5.3 Finalize safety procedures and clearance procedures

Task 3 – Conduct field studies

3.1 Conduct fish sampling weekly beginning April and ending June

3.2 Sample artificial substrates and streambed before spill season

3.3 Sample artificial substrates and streambed at end of spring spill season or at peak TDG levels

3.4 Conduct fish sampling every two weeks during summer spill season

3.5 Sample artificial substrates and streambed at end of summer spill season

Task 4 – Report Preparation

4.1 Prepare first draft report

4.2 Natural Sciences Working Group review draft report

4.3 Prepare second draft report

4.4 Natural Sciences Working Group review second draft report

4.5 Prepare final report

SECTION 6: ANALYSIS AND REPORTING

Participating members of the Natural Sciences Working Group need to commit to meeting review comment deadlines and to providing their input to the study plan and field sampling techniques and in the procurement of necessary permits. The intended result of this study is to provide scientific supporting information related to the WDE decision on Clean Water Act 401 certification. The results of this study will be incorporated into the Environmental Assessment for the relicensing of the Rocky Reach Hydroelectric Project.

SECTION 7: STAFFING AND EQUIPMENT NEEDS

Chelan PUD will either hire a consultant(s) or in-house staff to assist in conducting the data-gathering efforts. Chelan PUD staff will oversee contracting and deliverable schedule for the selected consultant(s). Consultant(s) conducting the contracted investigations will be required to provide equipment and staff to conduct the contracted investigations with minimal field support from the PUD. PUD support for consultants will be primarily in the form of study plan development and implementation, project oversight, fine-tuning of field techniques, providing input to the consultant(s) regarding decisions made by parties involved in the relicensing process, and promoting discussion among stakeholders regarding study results.

SECTION 8: SCHEDULE

Feb 5, 2001	Decision on whether to contract or do in-house
Feb 8, 2001	Issue RFP for consultants (depending on decision above)
Feb 8, 2001	Apply for WDFW Scientific Collection Permit
Feb 15-25, 2001	Procurement of equipment and construction of artificial substrates
Mar 1, 2001	Place artificial substrates
Mar 4, 2001	Comments due on First Draft Dissolved Gas Biological Effects Monitoring Study Plan
Mar 7 , 2001	Distribute Final Dissolved Gas Biological Effects Monitoring Study Plan
Mar 29, 2001	Rocky Reach Public/Agency Meeting
Apr 10, 2001	Sample artificial substrates and streambed before spill season; begin weekly fish sampling
May 24, 2001	Rocky Reach Public/Agency Meeting – Report on study progress
May 28, 2001	Schedule date to sample artificial substrates and streambed at end of spring spill season and take samples on that date
Jun 18, 2001	Schedule summer spill season fish sampling
Jun 28, 2001	Rocky Reach Public/Agency Meeting – Report on study progress
Jul 23, 2001	Schedule date to sample artificial substrates and streambed at end of summer spill season and take samples on that date
Jul 26, 2001	Rocky Reach Public/Agency Meeting – Report on study progress
Aug 27, 2001	Issue First Draft of Biological Effects Study Report – (invertebrate samples may not be completely processed by this date)
Sep 26, 2001	Comments due on First Draft of Biological Effects Study Report
Oct 8, 2001	Based on comments, issue Final Report, or issue Second Draft of Biological Effects Study Report, if needed
Nov 7, 2001	Comments due on Second Draft of Biological Effects Study
Dec 2, 2001	Issue Final Biological Effects Study Report

Table 8-1: Schedule for 2001

	ACTIVITIES					
SCHEDULE		Review and comment on study plan Prepare for field study	Take pre-spill season samples	Conduct Spring Study	Conduct Summer Study	Reports: *Progress,1st Draft, 2nd Draft,[1] and Final*
	February – March	×				
	April		×			
	Mid April – Mid June			×		
	July				×	*Study Progress*
	August					*Study Progress*
	Late August					*1st Draft Report*
	Early October					*2nd Draft Report*[1]
	Early December					*Final Report*

[1] If comments are not extensive, the comments on the 1st draft will be addressed and the final report issued.

SECTION 9: BUDGET

To be determined based on contractor selection and decision on in-house work.

SECTION 10: NEXT STEPS

- Review draft study plans in-house for completeness.
- Send draft study plans to the Natural Sciences Working Group for review and comment.
- Incorporate stakeholder comments into detailed study plans.
- Decision on in-house or consultant to conduct field work
- Prepare for the field season.
- Conduct studies

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