

**FINAL LICENSE APPLICATION  
EXHIBIT E**

**APPENDIX N**

**WATER QUALITY MONITORING AND DATA MANAGEMENT PLAN**

**WATER QUALITY MONITORING AND DATA  
MANAGEMENT PLAN  
DRAFT**

**SKAGIT RIVER HYDROELECTRIC PROJECT  
FERC NO. 553**

**Seattle City Light**

**April 2023**

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## List of Acronyms and Abbreviations

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°C.....	degrees Celsius
BMI.....	benthic macroinvertebrate
CFR.....	Code of Federal Regulations
cfs.....	cubic feet per second
City Light.....	Seattle City Light
CWA .....	Clean Water Act
EMAMP .....	Ecosystem Monitoring and Adaptive Management Program
EPA.....	Environmental Protection Agency
EPT .....	Ephemeroptera/Plecoptera/Trichoptera
FERC.....	Federal Energy Regulatory Commission
FPA .....	Federal Power Act
ft .....	foot/feet
LP .....	licensing participant
mg/L.....	milligram per liter
NPS .....	National Park Service
NYSDEC.....	New York State Department of Environmental Conservation
PME .....	protection, mitigation and enhancement
PRM .....	Project River Mile
QAPP .....	Quality Assurance Project Plan
Project .....	Skagit River Hydroelectric Project
RM .....	river mile
SOP .....	Standard Operating Procedure
SRCC .....	Skagit Resource Coordinating Committee
TDG .....	total dissolved gas
TSS.....	total suspended solids
USGS .....	U.S. Geological Survey

## **1.0 INTRODUCTION**

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This document describes Seattle City Light's (City Light) proposed Water Quality Monitoring and Data Management Plan (WQMDMP) for the Skagit River Hydroelectric Project (Project or Skagit River Project), Federal Energy Regulatory Commission (FERC) No. 553. The WQMDMP describes proposed water quality monitoring for implementation during the new Project license term and dissemination of data, i.e., both data collected during the new license term and existing data collected by City Light during and outside the Project relicensing process.

## **2.0 PURPOSE AND SCOPE OF THE PLAN**

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### **2.1 Goals and Objectives**

To ensure compliance with Washington State water quality standards, City Light proposes a Water Quality Monitoring and Data Management Plan (WQMDMP) for FERC and Washington State Department of Ecology (Ecology) approval. The goal of the WQMDMP is to establish protocols for monitoring water quality during the term of the new Project license. In addition, the WQMDMP will also provide for the curation and storage of water quality data so that participating agencies can have the best available information to support their decision-making throughout the term of the new Project license. All monitoring will be implemented pursuant to an Ecology-approved Quality Assurance Project Plan (QAPP). Specific objectives are:

- Provide Ecology reasonable assurance that water quality standards are attained.
- Monitor key water quality variables at index locations to allow for assessment of Project protection, mitigation and enhancement (PME) measures implemented under the new Project license term, by comparing monitoring results to the baseline established by extensive sampling conducted for relicensing and other City Light datasets (City Light 2023a).
- Describe the approach to water quality data management, including the structure and function of the proposed water quality database.
- Provide datasets to inform long-term adaptive management as part of the Ecosystem Monitoring and Adaptive Management Program (EMAMP).

### **2.2 Scope of the Plan**

The spatial scope of water quality monitoring will extend from the three Project reservoirs, Ross, (within the U.S.), Diablo, and Gorge lakes, through the Gorge bypass reach, and to the Skagit River at Project River Mile (PRM) 54.5.

City Light proposes to monitor the following water quality variables during the new Project license term:

- temperature;
- total dissolved gas (TDG);
- dissolved oxygen;
- nutrients and productivity;
- turbidity and total suspended solids (TSS); and
- benthic macroinvertebrate (BMI).

The spatial and temporal scope of sampling constitutes a representative monitoring program that will allow for the detection and assessment of changes to water quality resulting from the implementation of City Light's Proposed Action.

BMI communities can act as indicators of changes in environmental conditions over time. At the request of licensing participants (LP), City Light conducted comprehensive BMI and invertebrate

drift sampling in the Project vicinity, including longitudinal sampling in the Skagit River downstream of the Project, and sampling in the lower Sauk River. Data from this effort will serve as a baseline, to which future data can be compared.

City Light has developed a database to store and manage information it has collected within and outside the relicensing process. This tool, which has the capacity to be expanded to accommodate large datasets for a range of variables, will be used during the new license term to house, query, analyze, and report on water quality data to summarize ongoing information gathering and support the EMAMP.

### **2.3 Jurisdiction and Regulatory Requirements**

The relicensing of non-federal hydroelectric projects by FERC is considered a federal undertaking (36 Code of Federal Regulation [CFR] § 800.16[y]). As such, a license for the Project is subject to regulatory requirements under the Federal Power Act (FPA) and other applicable statutes. The major regulatory and statutory requirements relevant to water quality include a range of authorities under the FPA and, as noted above, compliance with Section 401 of the Clean Water Act (CWA). Under Section 401, a license applicant must obtain certification from Ecology that verifies Project compliance with the CWA. Certification conditions typically include requirements to monitor water quality throughout the term of a new Project license, pursuant to an Ecology-approved QAPP.

## 3.0 PLAN IMPLEMENTATION AND RESOURCE MANAGEMENT PROGRAMS

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### 3.1 Water Quality Monitoring Program

As described above, City Light proposes to monitor the variables identified in the following subsections during the new Project license term. The following sections describe the rationale for the variables selected and the spatial and temporal scopes associated with those variables.

#### 3.1.1 Temperature

Water temperature will be monitored continuously for the duration of the new Project license term at the 15 index locations identified below. Locations were selected to provide a representative set of sampling sites that will be sufficient for detecting potential changes in water quality linked to modifications of Project operation and/or background environmental phenomena (potentially including, over the long term, climate change). Monitoring sites included in this WQMDMP correspond to locations where City Light has already collected abundant data, which will allow for direct comparisons of data collected at the same locations over time. Alphanumeric designations in parentheses are site names assigned during Project relicensing and carried over in this WQMDMP.

The reservoir forebays were selected to provide temperature measurements over a range of depths and document any changes to thermal stratification. The site in Ross Lake at the international border will provide a record of temperatures at the primary inflow to Ross Lake. Sites in the Gorge bypass reach will allow for assessment of potential temperature changes associated with the proposed 100-cfs minimum instream flow release in the Gorge bypass reach. Sites in the Skagit River downstream of the Project are spread out longitudinally to assess river-wide patterns and potential changes in the rate at which Project effects attenuate with increasing distance downstream. In addition to the mainstem sites, temperature will be monitored in two side channels and two off-channel areas. The off-channel sites selected for this WQMDMP represent areas where summer water temperatures diverge from those of the Skagit River mainstem.

- Skagit River at International Border (TRIB1): continuous (30-minute interval) temperature measurement at a target depth of 3 ft.
- Ross Lake forebay (continued measurement at an existing City Light profile): continuous (30-minute interval) temperature measurements along a vertical profile, with measurements taken at 2 ft, 12 ft, 25 ft and then at 25-ft intervals to a depth of 200 ft.
- Diablo Lake forebay (continued measurement at an existing City Light profile): continuous (30-minute interval) temperature measurements along a vertical profile, with measurements taken at 2 ft and then at 10-ft intervals from 10 ft to 85 ft.
- Gorge Lake forebay (continued measurement at an existing City Light profile): continuous (30-minute interval) temperature measurements along a vertical profile, with measurements taken at 2 ft and then at 10-ft intervals from 10 ft to 80 ft.



- Gorge bypass reach below Gorge Dam plunge pool (BYPASS1): continuous (30-minute interval) temperature measurement at a target depth of 3 ft from June through October (the season of concern for coldwater biota) for five (5) years following implementation of the 100-cfs minimum flow in the Gorge bypass reach.
- Gorge bypass reach 0.6 miles upstream of Gorge Powerhouse (BYPASS3): continuous (30-minute interval) temperature measurement at a target depth of 3 ft from June through October (the season of concern for coldwater biota) for five (5) years following implementation of the 100-cfs minimum flow in the Gorge bypass reach.
- Skagit River at PRM 91.6 (SKAGIT2): continuous (30-minute interval) temperature measurement at a target depth of 3 ft.
- Skagit River side channel near PRM 90.0 (SKAGIT2SC): continuous (30-minute interval) temperature measurement at a target depth of 3 ft.
- Skagit River at PRM 75.6 (SKAGIT4): continuous (30-minute interval) temperature measurement at a target depth of 3 ft.
- Skagit River side channel near PRM 75.6 (SKAGIT4SC): continuous (30-minute interval) temperature measurement at a target depth of 3 ft.
- Illabot Slough at approximately PRM 72.8: continuous (30-minute interval) temperature measurement at a target depth of 3 ft.
- Johnson Side Channel at approximately PRM 68.5: continuous (30-minute interval) temperature measurement at a target depth of 3 ft.
- Skagit River at PRM 60.8 (SKAGIT6): continuous (30-minute interval) temperature measurement at a target depth of 3 ft.
- Skagit River at PRM 54.5 (SKAGIT7): continuous (30-minute interval) temperature measurement at a target depth of 1 meter (3 ft).
- Sauk River upstream of Suiattle River at river mile (RM) 13.2 (SAUK2): continuous (30-minute interval) temperature measurement at a target depth of 1 meter (3 ft).

### 3.1.2 Total Dissolved Gas

TDG concentrations exceeded Ecology's criterion of 110 percent saturation at four locations in the Project vicinity during monitoring conducted for relicensing: (1) the upper end of Gorge Lake as the result of air admission during periods of low flow/generation at the Diablo Powerhouse; (2) throughout Gorge Lake as the result of spill at Diablo Dam; (3) in the Gorge bypass reach as the result of spill at Gorge Dam, and (4) at the Gorge Powerhouse outflow. Proposed measures (e.g., Gorge bypass reach minimum instream flows, updated flow management program below Gorge Powerhouse, Ross Lake Summer Variable Reservoir Operations Zone, modifications to the Flood Risk Management operations, etc.) are anticipated to result in changed conditions in the Project vicinity, including areas where TDG has been documented to exceed Ecology's numeric criteria. City Light proposes monitoring at the locations identified above for a period considered by Ecology to be sufficient for documenting TDG over an appropriate, yet to be determined, range of flows. If it is determined that the water quality criterion for TDG is not being met, City Light will develop a TDG attainment plan in consultation with (and if required by) Ecology. The proposed monitoring locations are listed below.

- Upstream end of Diablo Lake at Boathouse (DIABLO1): opportunistic deployment of a data sonde to measure TDG continuously (15-minute interval) during spill at Ross Dam. City Light will attempt to forecast periods when spill is likely and deploy instrumentation accordingly. Spill is rare at Ross Dam, so measurements may be infrequent; no scheduled spill releases will be made in order to measure TDG.
- Gorge Lake across from Diablo Powerhouse outflow (GORGE3): opportunistic deployment of a data sonde to measure TDG continuously (15-minute interval): (1) during spill at Diablo Dam; and (2) when operators project that Diablo Powerhouse will be generating at low levels and the air admission system will be engaged (which has led to localized TDG exceedances). In either case, City Light will attempt to forecast periods when spill or low flow/generation is likely and deploy instrumentation accordingly.
- Gorge Lake forebay (GORGE4): opportunistic deployment of a data sonde to measure TDG continuously (15-minute interval) during spill at Diablo Dam. City Light will attempt to forecast periods when spill is likely and deploy instrumentation accordingly.
- Gorge Dam access bridge (BYPASS4): opportunistic monitoring (measured at 15-minute intervals for 2 hours) during periods of spill at Gorge Dam. City Light will attempt to forecast periods when spill is likely and deploy instrumentation accordingly.
- Gorge Powerhouse access bridge (BYPASS5): opportunistic monitoring (measured at 15-minute intervals for 2 hours) during periods of spill at Gorge Dam. City Light will attempt to forecast periods when spill is likely and deploy instrumentation accordingly.
- Bridge to Trail of the Cedars (CEDARS1): opportunistic monitoring (measured at 15-minute intervals for 2 hours) during periods of spill at Gorge Dam. City Light will attempt to forecast periods when spill is likely and deploy instrumentation accordingly.

### 3.1.3 Dissolved Oxygen

Dissolved oxygen profiles will be measured once per month from June through October in the Ross Lake, Diablo Lake, and Gorge Lake forebays (see below) for the first five (5) years following license issuance and for three (3) years following any subsequent modifications to Project operations. Monitoring will be conducted in Ross and Diablo lakes because dissolved oxygen concentrations in these waterbodies at times fall below 10 milligram per liter (mg/L) in the warmer months. Although there is no apparent link between dissolved oxygen concentrations below 10 mg/L and Project operations, City Light plans to conduct monitoring in these reservoirs to track potential shifts that could occur as the result of possible future operational changes. Although dissolved oxygen concentrations in Gorge Lake exceed 10 mg/L throughout the year, City Light proposes to monitor at this location to extend the existing database into the future and detect and unforeseen changes.

Sites in the Gorge bypass reach will allow for assessment of potential changes in dissolved oxygen concentrations resulting from the proposed 100-cfs minimum instream flow release in the Gorge bypass reach. Dissolved oxygen will be measured continuously from June through October in the Gorge bypass reach for five (5) years following the initiation of minimum flow releases.

Measured dissolved oxygen concentrations in the Skagit River have consistently been at or above 95 percent saturation, and usually above 100 percent saturation. As a result, no dissolved oxygen

monitoring is proposed for the Skagit River mainstem. However, dissolved oxygen will be monitored continuously from June through October in two side channels and two off-channel areas where temperature is being measured (see above) to assess the extent that dissolved oxygen saturation and temperatures are correlated in these areas, particularly off-channel areas where summer water temperatures diverge from those of the Skagit River mainstem, at times exceeding 20°C. Dissolved oxygen will be measured at these sites for the first five (5) years following license issuance.

- Ross Lake forebay log boom (ROSS12): Dissolved oxygen will be measured monthly from June through October in the epilimnion (upper 15 ft of the water column), metalimnion (approximately mid-depth of the water column), and hypolimnion (within about 15 ft of the reservoir bottom).
- Diablo Dam forebay (DIABLO2): Dissolved oxygen will be measured monthly from June through October in the epilimnion (upper 15 ft of the water column), metalimnion (approximately mid-depth of the water column), and hypolimnion (within about 15 ft of the reservoir bottom).
- Gorge Dam forebay (GORGE2): Dissolved oxygen will be measured monthly from June through October in the epilimnion (upper 15 ft of the water column), metalimnion (approximately mid-depth of the water column), and hypolimnion (within about 15 ft of the reservoir bottom).
- Gorge bypass reach below Gorge Dam plunge pool (BYPASS1): continuous (30-minute interval) dissolved oxygen measurement with a single sonde at a depth of 3 ft from June through October (the season when higher temperatures could influence dissolved oxygen concentrations).
- Gorge bypass reach 0.6 miles upstream of Gorge Powerhouse (BYPASS3): continuous (30-minute interval) dissolved oxygen measurement with a single sonde at a depth of 3 ft from June through October (the season when higher temperatures could influence dissolved oxygen concentrations).
- Skagit River side channel near PRM 90.0 (SKAGIT2SC): continuous (30-minute interval) dissolved oxygen measurement with a single sonde at a depth of 3 ft from June through October (the season when higher temperatures could influence dissolved oxygen concentrations); actual depth may vary, contingent upon flows and site conditions.
- Skagit River side channel near PRM 75.6 (SKAGIT4SC): continuous (30-minute interval) dissolved oxygen measurement with a single sonde at a depth of 3 ft from June through October (the season when higher temperatures could influence dissolved oxygen concentrations); actual depth may vary, contingent upon flows and site conditions.
- Illabot Slough at approximately PRM 72.8: continuous (30-minute interval) dissolved oxygen measurement with a single sonde at a depth of 3 ft from June through October (the season when higher temperatures could influence dissolved oxygen concentrations); actual depth may vary, contingent upon flows and site conditions.

- Johnson Side Channel at approximately PRM 68.5: continuous (30-minute interval) dissolved oxygen measurement with a single sonde at a depth of 3 ft from June through October (the season when higher temperatures could influence dissolved oxygen concentrations); actual depth may vary, contingent upon flows and site conditions.

### 3.1.4 Nutrients and Productivity

Nutrients and chlorophyll *a*/pheophytin *a* will be measured monthly from May through September at the locations shown below for the first five (5) years following license issuance and then for three (3) years after any subsequent modifications to Project operations. Nutrients to be monitored include total Kjeldahl nitrogen, ammonium, nitrite-nitrate, total phosphorus, and orthophosphate. The locations and timeframe (May-September) selected correspond to those observed when collecting nutrient and productivity data for the development and calibration of the CE-QUAL-W2 model.

- Ross Dam forebay (ROSS12): Nutrients and chlorophyll *a*/pheophytin *a* grab samples will be collected monthly from May through September in the epilimnion (upper 15 ft of the water column), metalimnion (approximately mid-depth of the water column), and hypolimnion (within about 15 ft of the reservoir bottom).
- Diablo Dam Forebay (DIABLO2): Nutrients and chlorophyll *a*/pheophytin *a* grab samples will be collected monthly from May through September in the epilimnion (upper 15 ft of the water column), metalimnion (approximately mid-depth of the water column), and hypolimnion (within about 15 ft of the reservoir bottom).
- Gorge Lake forebay (GORGE7): Nutrients and chlorophyll *a*/pheophytin *a* grab samples will be collected monthly from May through September in the epilimnion (upper 15 ft of the water column), metalimnion (approximately mid-depth of the water column), and hypolimnion (within about 15 ft of the reservoir bottom).
- Skagit River above Alma Creek (SKAGIT3) (PRM 85.9): Nutrients and chlorophyll *a*/pheophytin *a* grab samples will be collected monthly from May through September at a depth of 3 ft.
- Skagit River upstream of the Sauk River (SKAGIT5) (PRM 69.3): Nutrients and chlorophyll *a*/pheophytin *a* grab samples will be collected monthly from May through September at a depth of 3 ft.
- Skagit River near Concrete (SKAGIT7) (PRM 54.5): Nutrients and chlorophyll *a*/pheophytin *a* grab samples will be collected monthly from May through September at a depth of 3 ft.
- Sauk River Upstream of Suiattle River at RM 13.2: Nutrients and chlorophyll *a*/pheophytin *a* grab samples will be collected monthly from May through September at a depth of 3 ft.

### 3.1.5 Turbidity and TSS

City Light proposes to collect turbidity and/or TSS data at select Ross Lake tributary mouths, in the pelagic zone of Ross Lake, and along the Ross Lake shoreline during summer. To assess the relationship between turbidity and flow in major tributaries to Ross Lake, continuous turbidity measurements will be made for three (3) years at the following locations:

- International Border (reflecting inflow from the upper Skagit River).
- The mouth of Big Beaver Creek.
- The mouth of Ruby Creek.

To expand the dataset for the pelagic zone of Ross Lake—and compare conditions in the main body of the reservoir to those in the tributaries—monthly turbidity and TSS grab samples will be collected for three (3) years at the following locations (monitoring sites during relicensing studies):

- Little Beaver (ROSS3): April-October (weather and reservoir conditions permitting, winter samples may also be collected).
- Skymo (ROSS2): April-October (weather and reservoir conditions permitting, winter samples may also be collected).
- Pumpkin Mountain (ROSS1): April-October (weather and reservoir conditions permitting, winter samples may also be collected).

To assess whether the Proposed Action<sup>1</sup> influences water clarity (i.e., light penetration) in the littoral zone of Ross Lake, City Light proposes to collect near-shore turbidity and TSS data at select locations—sampling locations and periods/duration will be identified in consultation with the Skagit Resource Coordinating Committee (SRCC), based on existing information, including the results of the GE-03 Sediment Deposition in Reservoirs Affecting Resource Areas of Concern Study (City Light 2023b).

### **3.1.6 Benthic Macroinvertebrates**

#### **3.1.6.1 Project Reservoirs**

To monitor potential changes in reservoir BMI communities following implementation of City Light's Proposed Action, seasonal PONAR grab samples will be collected in the lentic zones of Ross, Diablo, and Gorge lakes at the approximate locations identified below. Samples will be collected every six weeks from May through October (4 times per sampling year), three (3), six (6), and nine (9) years following implementation of proposed operations. Samples will be collected according to procedures described in Environmental Protection Agency (2016) and New York State Department of Environmental Conservation (2021). All PONAR samples will be collected in replicate (i.e., two samples at each combination of location and time).

- Ross Lake near Hozomeen, upper varial zone: Every 6 weeks, May – Oct (4 times per year).
- Ross Lake near Hozomeen, lower varial zone: Every 6 weeks, May – Oct (4 times per year).
- Ross Lake near Hozomeen, permanently inundated zone: Every 6 weeks, May – Oct (4 times per year).

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<sup>1</sup> Data collected in shoreline areas will be used to assess littoral zone conditions to understand the effects of City Light's Proposed Action. These data are not appropriate for assessing compliance with Ecology's criteria, which are formulated to base compliance on dominant aquatic habitat (i.e., not conditions in the margins of the reservoir).

- Ross Lake at Pumpkin Mountain, upper varial zone: Every 6 weeks, May – Oct (4 times per year).
- Ross Lake at Pumpkin Mountain, lower varial zone: Every 6 weeks, May – Oct (4 times per year).
- Ross Lake at Pumpkin Mountain, permanently inundated zone: Every 6 weeks, May – Oct (4 times per year).
- Diablo Lake Main Basin, permanently inundated zone: Every 6 weeks, May – Oct (4 times per year).
- Diablo Lake Skagit Arm, permanently inundated zone: Every 6 weeks, May – Oct (4 times per year).
- Gorge Lake Reflector Bar, permanently inundated zone: Every 6 weeks, May – Oct (4 times per year).
- Gorge Lake Stetattle Creek confluence, permanently inundated zone: Every 6 weeks, May – Oct (4 times per year).

#### 3.1.6.2 Skagit and Sauk Rivers

City Light proposes to sample BMI at four locations in the Skagit River and one site in the Sauk River (all sampled during relicensing). Sampling will be conducted once in July and once in September at three times, i.e., five (5), ten (10), and fifteen (15) years after issuance of the new Project license (a total of six sampling events at each sampling location). BMI samples will be collected and processed according to relevant field sampling, preservation, data reporting, records management, and quality assurance and quality control methods described in Ecology's Standard Operating Procedure (SOP) EAP073. Samples will be collected with a D-frame kicknet (with an area of 1 ft<sup>2</sup>) over a site length of 2 bankfull widths or more. Eight 1-ft<sup>2</sup> kicknet samples will be taken in multiple riffles at each location during a given sampling period to obtain a single 8-ft<sup>2</sup> composite sample.

Data collected at these sites in the future can be compared to baseline data collected during the relicensing at the same sites. Metrics to be computed and compared to the baseline include, at a minimum, density, taxa richness, percent Ephemeroptera/Plecoptera/Trichoptera (EPT)<sup>2</sup> taxa, and functional group composition. However, because BMI communities vary in response to an array of environmental factors, it may not be possible to link changes to specific PMEs.

- Skagit River at PRM 91.6 (SKAGIT2X): BMI sampling will be conducted twice per sampling year (i.e., 5, 10, 15 years after license issuance), once in July and once in September, per Ecology protocol.
- Skagit River at PRM 75.6 (SKAGIT4X): BMI sampling will be conducted twice per sampling year (i.e., 5, 10, 15 years after license issuance), once in July and once in September, per Ecology protocol.

<sup>2</sup> Ephemeroptera - mayflies; Plecoptera - stoneflies; Trichoptera - caddisflies.

- Skagit River at PRM 60.8 (SKAGIT6X): BMI sampling will be conducted twice per sampling year (i.e., 5, 10, 15 years after license issuance), once in July and once in September, per Ecology protocol.
- Skagit River at PRM 54.5 (SKAGIT7X): BMI sampling will be conducted twice per sampling year (i.e., 5, 10, 15 years after license issuance), once in July and once in September, per Ecology protocol.
- Sauk River at RM 13.2 (SAUK2): BMI sampling will be conducted twice per sampling year (i.e., 5, 10, 15 years after license issuance), once in July and once in September, per Ecology protocol.

### **3.2 Data Management Program**

As described above, the proposed data management program includes: (1) the process and tools associated with the entry, organization, and storage of water quality data; and (2) a brief description of City Light's proposed EMAMP.

#### **3.2.1 Database Development and Application**

City Light has developed a database to store and manage information collected by it and other entities within and outside (e.g., already established thermistor chains in reservoir forebays) the relicensing process. This tool, which has the capacity to be expanded to accommodate large datasets for a range of variables, will be used during the new license term to house, query, analyze, and report on water quality data and support adaptive management (see below). City Light will establish a user portal, through which other parties will be able to access data files after data are screened for quality assurance.

The database currently in use, and to be used during implementation of the new license requirements, already contains more than 1,000 files housing data collected by City Light and its contractors, as well as the National Park Service (NPS) and U.S. Geological Survey (USGS), between 2001 and 2022. Data are organized by waterbody (i.e., Ross Lake, Diablo Lake, Gorge Lake, and the Skagit River), with data from tributaries grouped with their downstream waterbodies (e.g., data from Thunder Creek, a tributary to Diablo Lake, can be accessed by specifying Diablo Lake as the primary waterbody). Once a waterbody is selected, the user can access data for a site or sites within the water body, select start and end dates of interest, and preview the first 20 records from a specified search before downloading data. Download results generates a newly-created .csv file that contains data that conform to the search parameters.

#### **3.2.2 Adaptive Management**

Data collected in this WQMDMP will be essential to the evaluation of the measures included as part of the Proposed measures (e.g., Gorge bypass reach minimum instream flows, updated flow management program below Gorge Powerhouse, Ross Lake Summer Variable Reservoir Operations Zone, modifications to the Flood Risk Management operations, etc.) and will be applied in the context of the EMAMP, as appropriate. Determinations regarding which water quality data are applicable, and how they are to be used in management of specific license measures, will be made in consultation with the SRCC. As stated earlier, City Light anticipates that any TDG attainment plan (if necessary) would be a good candidate for adaptive management of the proposed measures.

## 4.0 MONITORING, REPORTING, AND COMMUNICATIONS

### 4.1 Implementation and Monitoring Schedule

Implementation of the WQMDMP will begin upon license issuance and continue through the license term. The schedule for specific measures is shown in Table 4.1-1.

**Table 4.1-1. Implementation schedule for WQMDMP measures.**

Measure	Timing and Frequency
Temperature Monitoring	Continuously upon license issuance, for the duration of the new license term.
Total Dissolved Gas (TDG)	Opportunistically (during spill) according to a schedule to be identified in consultation with Ecology.
Dissolved Oxygen	Project reservoirs: upon license issuance, once per month from June through October for first five (5) years and for three (3) years following any subsequent modifications to Project operations.  Gorge bypass reach: continuously upon license issuance from June through October for first five (5) years.  Skagit River side channels: continuously upon license issuance from June through October for first five (5) years.
Nutrients and Productivity	Upon license issuance, monthly from May through September for first five (5) years and for three (3) years following any subsequent modifications to Project operations.
Turbidity and Total Suspended Solids (TSS)	Ross Lake tributary mouths: continuously upon license issuance for first three (3) years.  Ross Lake open-water sites: upon license issuance, once per month from April through October for first three (3) years.
Benthic Macroinvertebrates (BMI)	Ross Lake PONAR sampling: Every six weeks from May through October (4 times per sampling year), three (3), six (6), and nine (9) years following implementation of proposed operations.  Skagit River benthic sampling: June and September (twice per sampling year), five (5), ten (10), and fifteen (15) years after license issuance.
Data Management Program	Upon license issuance, updated quarterly for the duration of the new license.

### 4.2 Reporting Schedule

City Light anticipates that water quality data will be downloaded/entered into the database on a quarterly basis. Verbal updates on observed patterns or trends of interest will be provided to the SRCC during ongoing resource meetings. Written reports will be provided to the SRCC and filed with FERC annually during the first quarter of each year to document compliance with the WQMDMP and to summarize the analysis of monitoring results from the preceding year.



## 5.0 REFERENCES

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