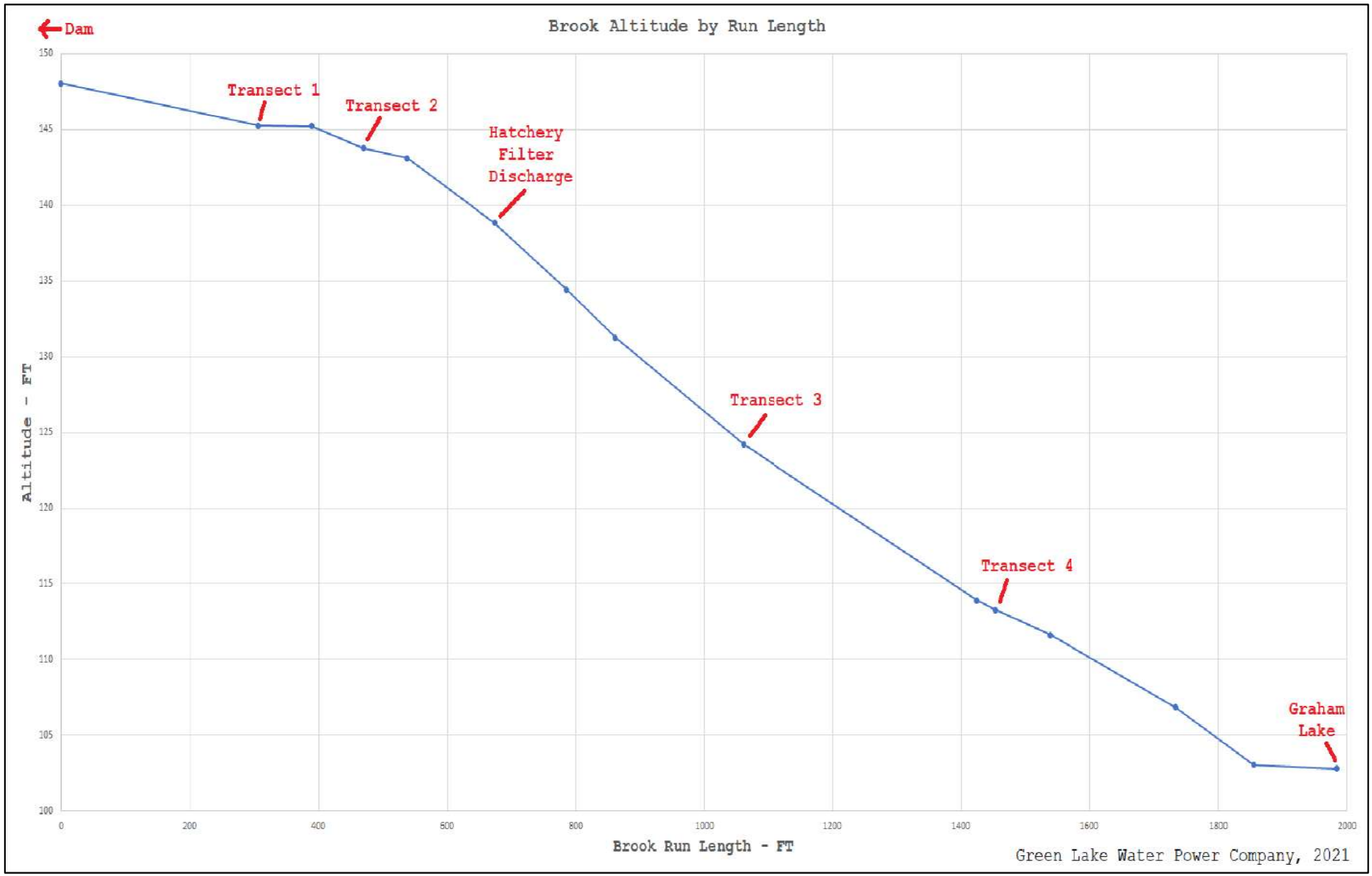
2) Bypass Reach Aquatic Habitat and In-Stream Flow Study

Reeds Brook (the Brook) flows 2000 ft from the Green Lake Dam to Graham Lake:

In the process, it drops 45 feet:

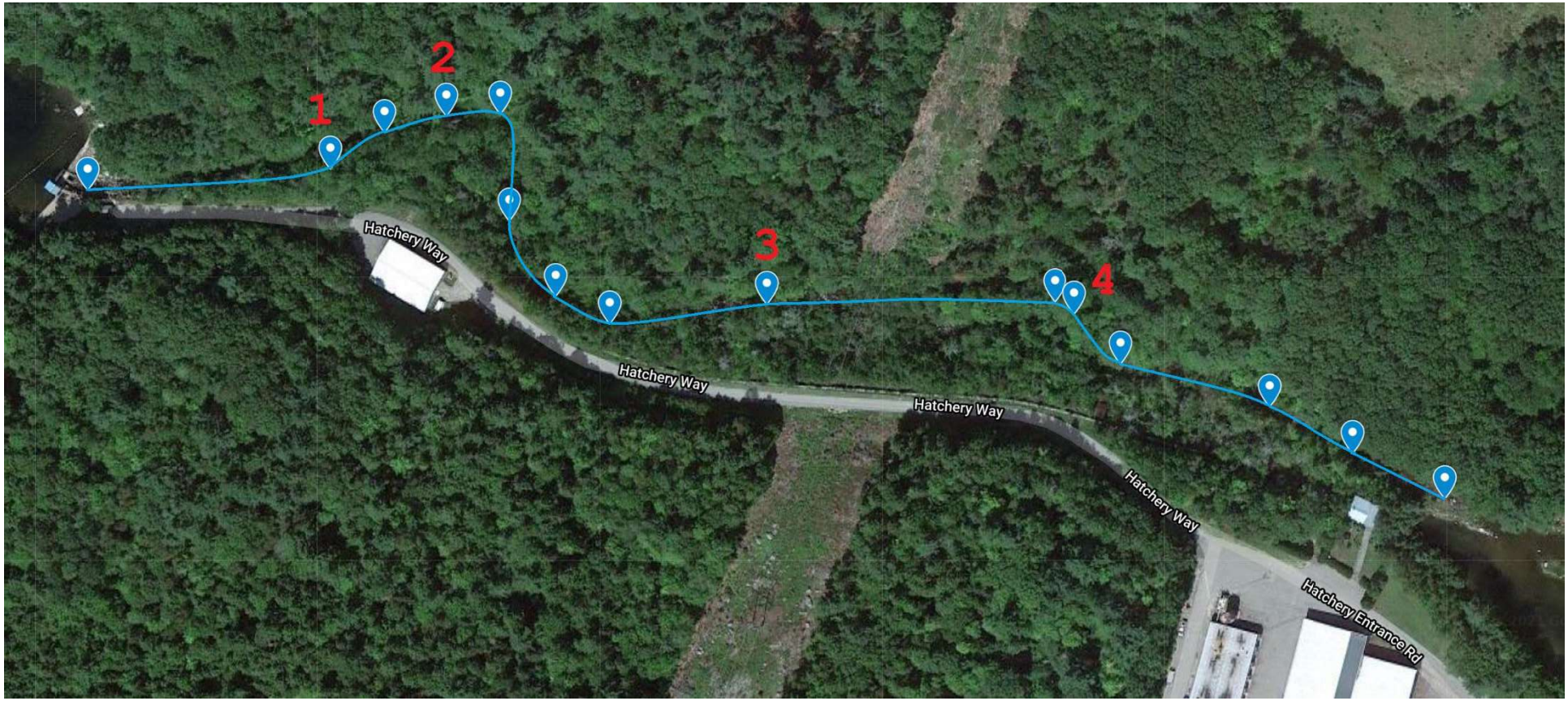


The Brook was field surveyed to determine its characteristics. The Brook is largely riffle with interspersed pools. The upper section is relatively flat:

The middle section is steeper:

The lower section is slightly less steep than the middle, with deeper pools:

Four transects were chosen to represent the different regions of the Brook.



The transect locations were approved by MDEP and NMFS.

Four flows were chosen for the transect flow studies:

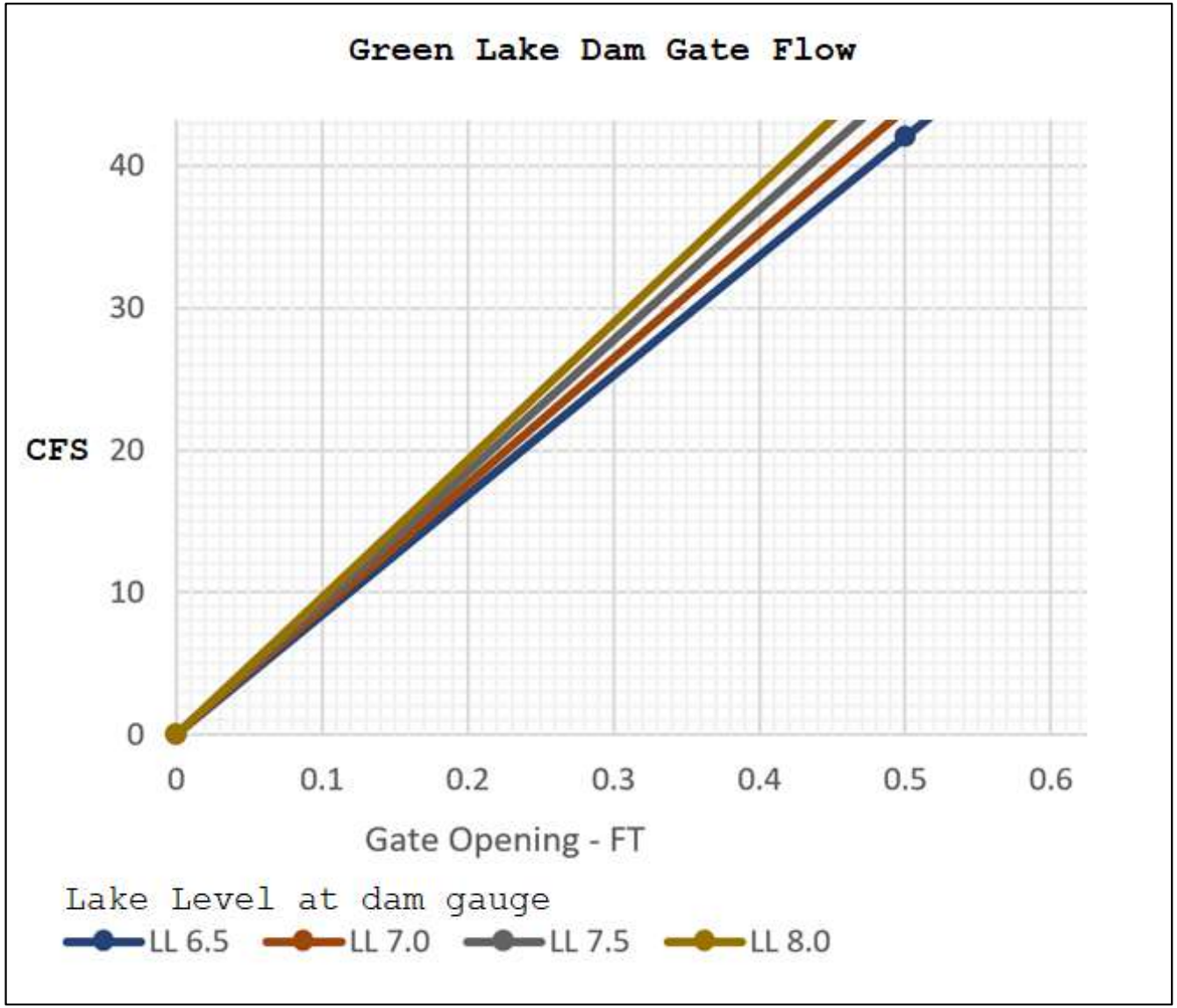
Name	Dam Gate Opening	Approximate CFS
Flow 1	Dam & gate leakage	2
Flow 2	0.75 inches	5.5
Flow 3	1.5 inches	11
Flow 4	3.0 inches	22

Flow 4 was chosen to approximate a flow of one half cfs per square mile of Green Lake drainage area.

Flow 1 is the nominal minimum flow.

Flows 2 and 3 were chosen for a geometric progression from Flow 2 to 4.

Dam gate openings were calculated from an enlarged section of the Green Lake gate discharge curves, with limited opening range and lake level range:



At each transect the bottom contour and substrate type were mapped.

Each of the four flow values was set and then flow and water depth were measured across the Brook on each transect.

The positions of the flow and depth readings were chosen to capture the various flow patterns encountered at a given flow level on the transect.

The transects contained large gravel, cobble and boulder substrates so consistent measuring was challenging.

None of the transects had typical “channel flow” characteristics consistently throughout their cross-sectional area.

Transect 4 was the closest to a “channel flow” situation, but even here significant boulder shadowing and counter flow regions were encountered:


2020/12/24 16:49

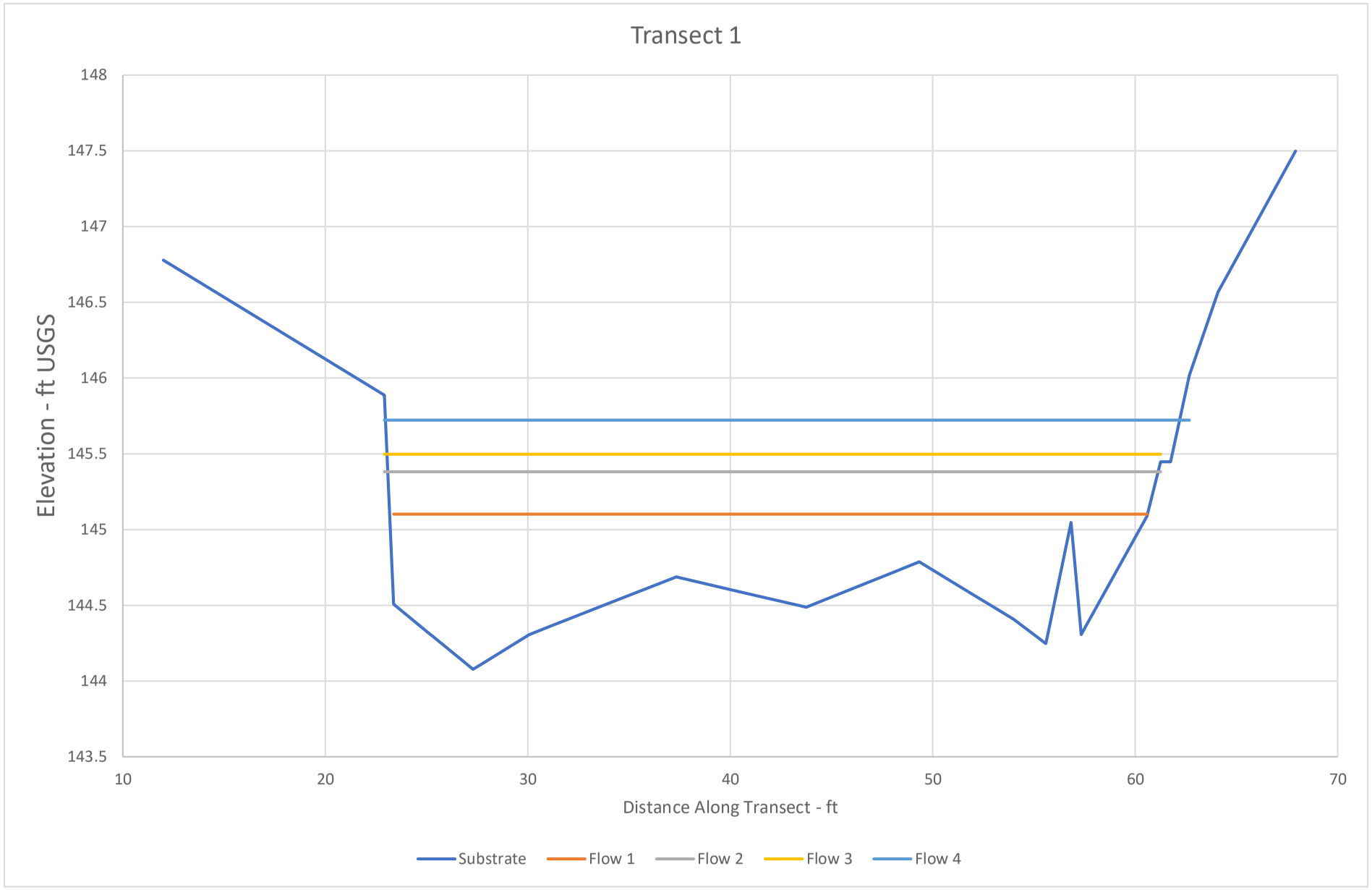
Results:

GLWP concludes the Brook would be classified as Rosgen B3 based on average slope (2.3%), sinuosity (1.1), channel shape, and substrate type.

The wetted substrate of the complete Brook was estimated to be the following:

Type	Area (sq-ft)	Area (%)
Fines	0	0.0%
Small Gravel	4996	11.1%
Medium Gravel	2879	6.4%
Large Gravel	4336	9.6%
Small Cobble	7478	16.6%
Medium Cobble	8431	18.7%
Large Cobble	5677	12.6%
Small Boulder	5907	13.1%
Large Boulder	5337	11.9%
Total	45041	100.0%

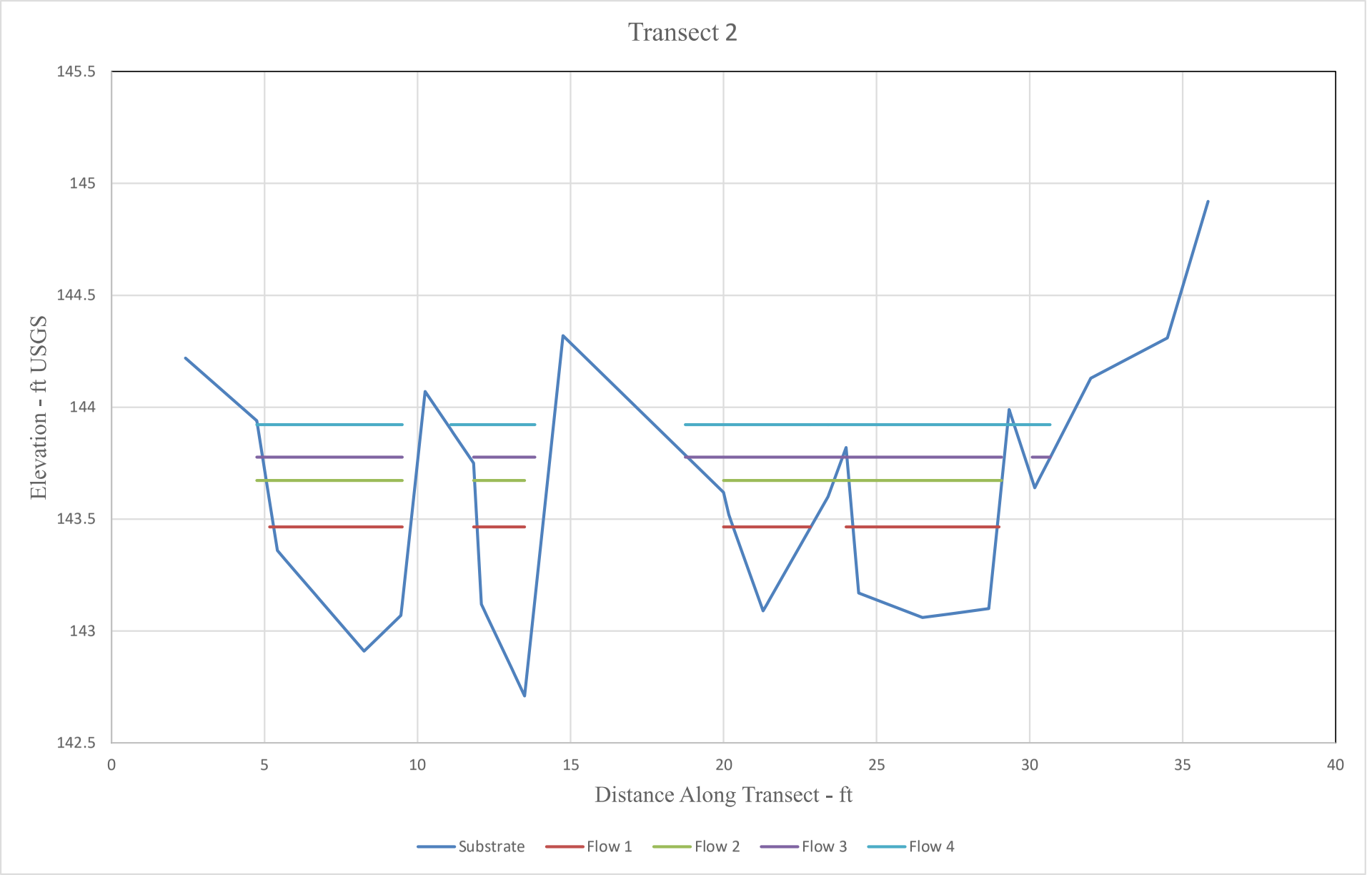
Transect 1:


Transect 1
148
147.5
147
146.5
146
145.5
145
144.5
144
143.5
Elevation - ft USGS
10
20
30
40
50
60
70
Distance Along Transect - ft
Substrate
Flow 1
Flow 2
Flow 3
Flow 4

Transect 1 water measurements for each study flow value:

	Elev - ft USGS	Width - ft	Flow Width - ft	Area - sqft	Flow - cfs	Avg Depth - ft	Avg Flow - ft/s
Flow 1	145.10	37.43	37.43	21.76	2.33	0.58	0.11
Flow 2	145.38	38.04	38.04	29.45	9.07	0.77	0.31
Flow 3	145.50	38.79	38.79	34.59	12.56	0.89	0.36
Flow 4	145.72	39.22	39.22	44.30	23.03	1.13	0.52

Transect 2:


Transect 2
145.5
145
144.5
144
143.5
143
142.5
Elevation - ft USGS
0
5
10
15
20
25
30
35
40
Distance Along Transect - ft
Substrate
Flow 1
Flow 2
Flow 3
Flow 4

Transect 2 water measurements for each study flow value:

	Elev - ft USGS	Width - ft	Flow Width - ft	Area - sqft	Flow - cfs	Avg Depth - ft	Avg Flow - ft/s
Flow 1	143.47	22.83	10.50	4.82	4.15	0.46	0.86
Flow 2	143.67	23.92	12.33	7.81	5.85	0.63	0.75
Flow 3	143.78	26.00	14.92	9.48	12.44	0.64	1.31
Flow 4	143.92	26.83	15.50	11.55	19.17	0.75	1.66

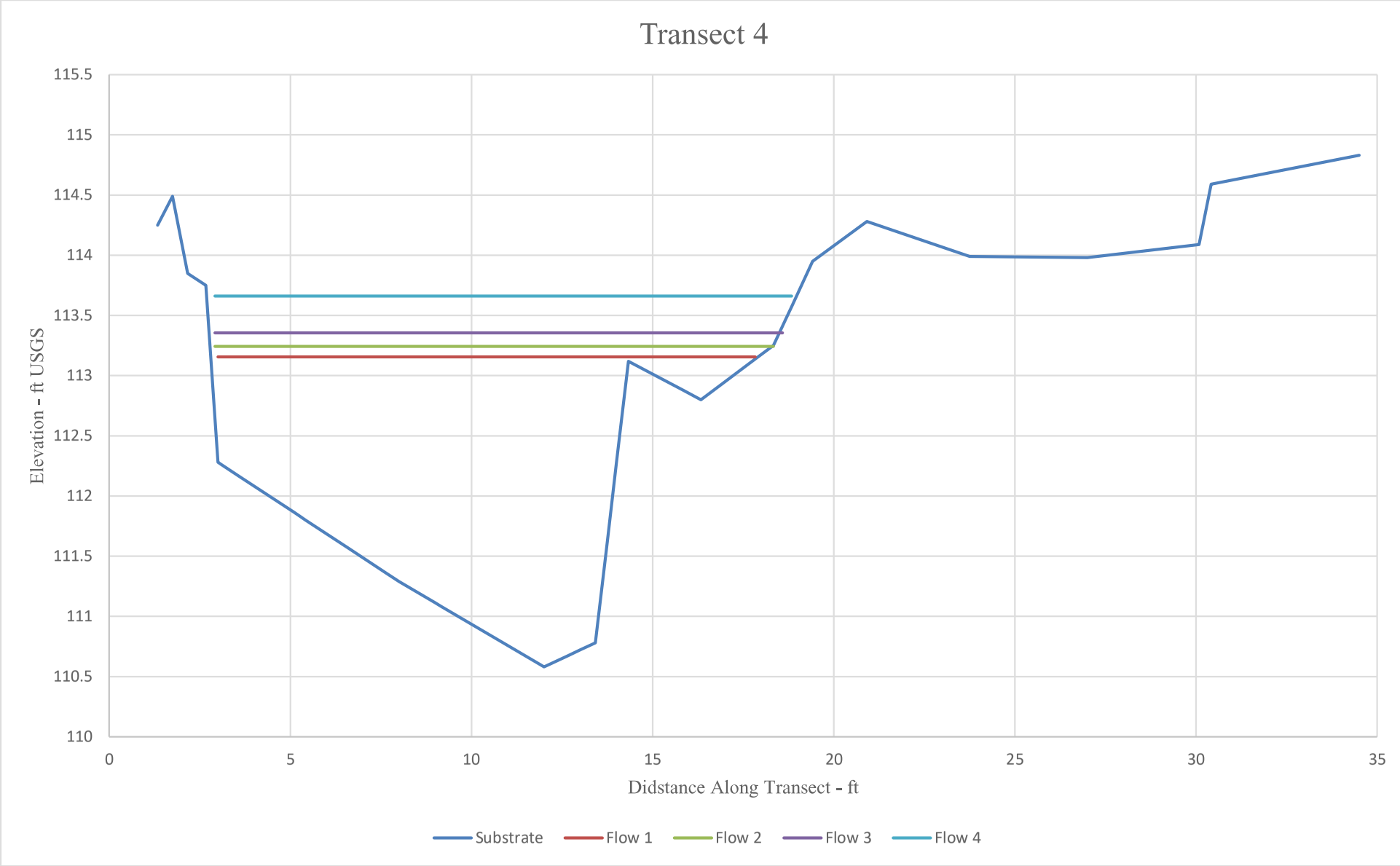
Transect 3:


Transect 3
Elevation - ft USGS
129
128
127
126
125
124
123
5
10
15
20
25
30
35
40
45
50
Distance Along Transect - ft
Substrate
Flow 1
Flow 2
Flow 3
Flow 4

Transect 3 water measurements for each study flow value:

	Elev - ft USGS	Width - ft	Flow Width - ft	Area - sqft	Flow - cfs	Avg Depth - ft	Avg Flow - ft/s
Flow 1	124.23	17.17	15.75	7.51	6.44	0.48	0.86
Flow 2	124.53	17.75	16.75	12.53	15.60	0.75	1.24
Flow 3	124.63	20.25	17.33	14.33	22.33	0.83	1.56
Flow 4	124.86	20.83	17.92	17.39	27.52	0.97	1.58

Transect 4:


Transect 4
115.5
115
114.5
114
113.5
113
112.5
112
111.5
111
110.5
110
Elevation - ft USGS
0
5
10
15
20
25
30
35
Didstance Along Transect - ft
Substrate
Flow 1
Flow 2
Flow 3
Flow 4

Transect 4 water measurements for each study flow value:

	Elev - ft USGS	Width - ft	Flow Width - ft	Area - sqft	Flow - cfs	Avg Depth - ft	Avg Flow - ft/s
Flow 1	113.16	15.12	15.12	21.08	5.82	1.39	0.28
Flow 2	113.24	15.52	15.52	22.49	8.85	1.45	0.39
Flow 3	113.35	15.74	15.74	24.23	14.28	1.54	0.59
Flow 4	113.66	16.28	16.28	28.95	33.02	1.78	1.14

Much of the Brook changes significantly in character with different flows:

Near transect 3 at Flow 1:

Near Transect 3, at flow 4:

Near Transect 2, at Flow 1:

Near Transect 2, at Flow 4:

Questions?

3) Eel Passage Survey

GLWP inspected for eels at the dam shortly after sunset on the following days:

Date	Start	End	Weather
11-May-20	9pm	9:45pm	Light rain.
6-Jun-20	9:12pm	9:56pm	0.47 inch rain earlier in the day.
14-Jun-20	9:17pm	9:57pm	No rain, 57 F
20-Jun-20	9:25pm	9:56pm	No rain, 72 F
29-Jun-20	9:47pm	10:43pm	Light rain, ground is damp, temp 65F wind 3mph NE
5-Jul-20	9:10pm	9:58pm	Overcast, light rain, ground is damp, temp 58F wind 3mph SE
14-Jul-20	9:50pm	10:45pm	Overcast, no rain, ground is dry, temp 63F wind 6mph NE
26-Jul-20	9:16pm	9:50pm	Light rain, ground is damp, temp 76F wind 2mph WNW

Because of the nature of the dam, all structures on the downstream face of the dam, and the brook immediately below the dam, could be observed at arm's length by walking around with a flashlight.

No eels were found during this study.

Questions?

4-1) Architectural Survey

GLWP consulted with Patrick O'Bannon, of Gray & Pape, to do an Architectural Survey of the Project.

GLWP provided all available historical project information to Gray & Pape that was pertinent to the architectural survey.

Gray & Pape concluded that no architectural properties within the project boundary are eligible for listing in the National Register of Historic Places.

MHPC concurred with this conclusion.

MAINE HISTORIC PRESERVATION COMMISSION
55 CAPITOL STREET
65 STATE HOUSE STATION
AUGUSTA, MAINE
04333

JANET T. MILLS
GOVERNOR

KIRK F. MOHNEY
DIRECTOR

September 2, 2020

Ms. Kendal Anderson
Gray & Pape
60 Valley Street
Suite 103
Providence, RI 02909

Project: MHPC# 0155-19 Green Lake Hydroelectric Project; Reed Brook; FERC 7189 Architectural Survey

Town: Ellsworth, ME

Dear Ms.Anderson:

In response to your recent request, the Commission has reviewed the information received August 19, 2020 to continue consultation on the above referenced project in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA).

Our office concurs with Gray & Pape's finding that no architectural properties are eligible for listing in the National Register of Historic Places.

Please contact Megan M. Rideout of our staff if we can be of further assistance in this matter.

Sincerely,

Kirk F. Mohney
State Historic Preservation Officer

Questions?

4-2) Erosion Survey

17 likely erosion sites were identified by GLWP using USGS maps.

Each site was visited by boat on 21-Aug-2020 for field inspection.

At the same time, the complete Green Lake shore was inspected for obvious signs of erosion damage.

Two sites were found to contain erosion damage, one preselected and one new site. Neither site was extensive in size or effect.

Both sites are on the SE end of the lake.

First site:

Second site:

Results:

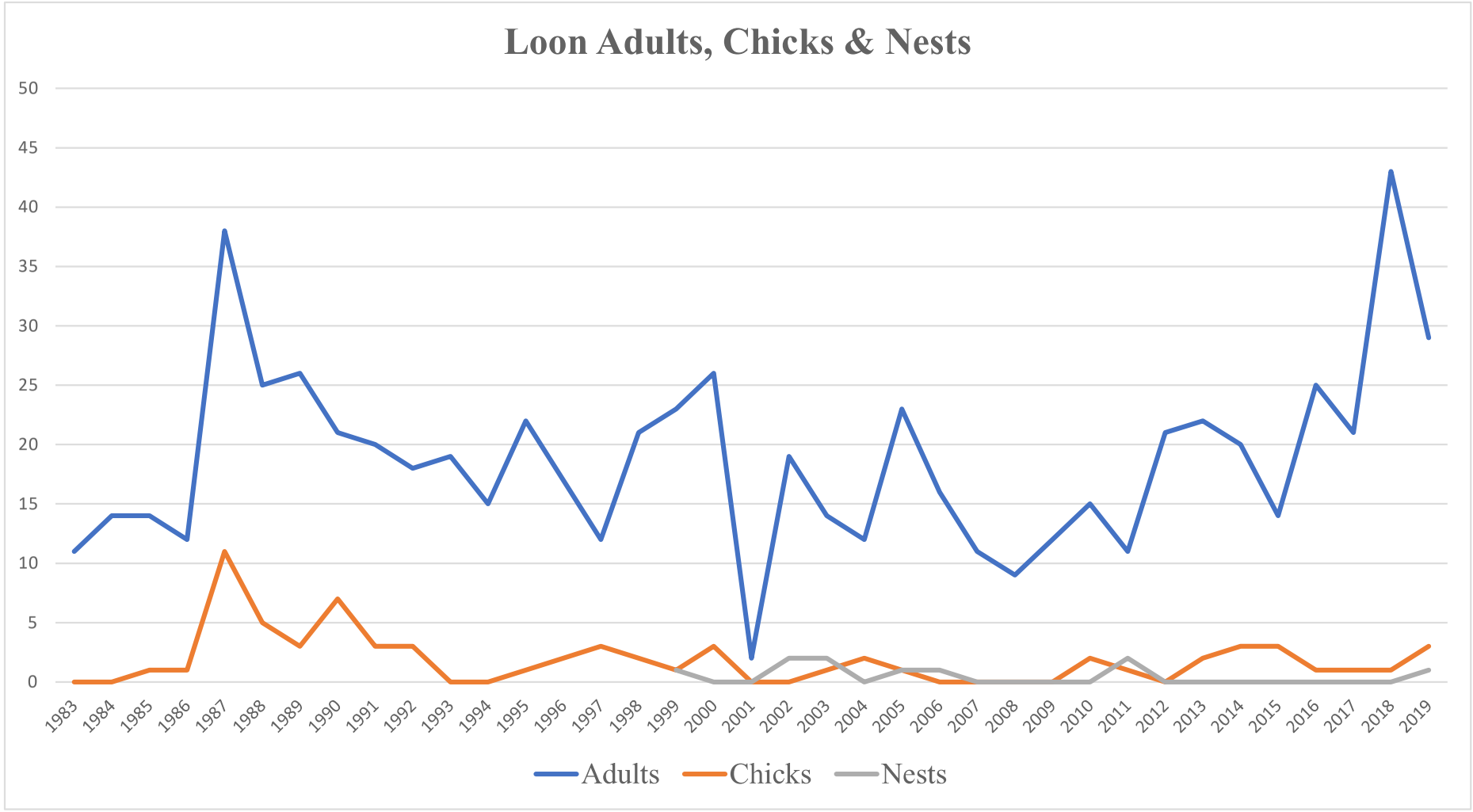
The erosion found did not appear to be caused by Project operation.

No erosion was found that GLWP believes would extend the Area of Potential Effect beyond the Project Boundary.

Questions?

5-1) Loon counts and nests

The GLA reports loon counts annually as part of the Maine Audubon Society's loon census. Loon adult and chick counts are available since 1983, and nest counts since 1999:



The loon information provided by the GLA is available at this location:

https://www.lakesofmaine.org/lake-loons.html?m=4294

Specific information on loon nesting timing is not available for Green Lake.

General timing information from the Maine Audubon web site indicates females usually lay eggs between mid-May and mid-June. Both parents incubate the eggs for about 29 days.

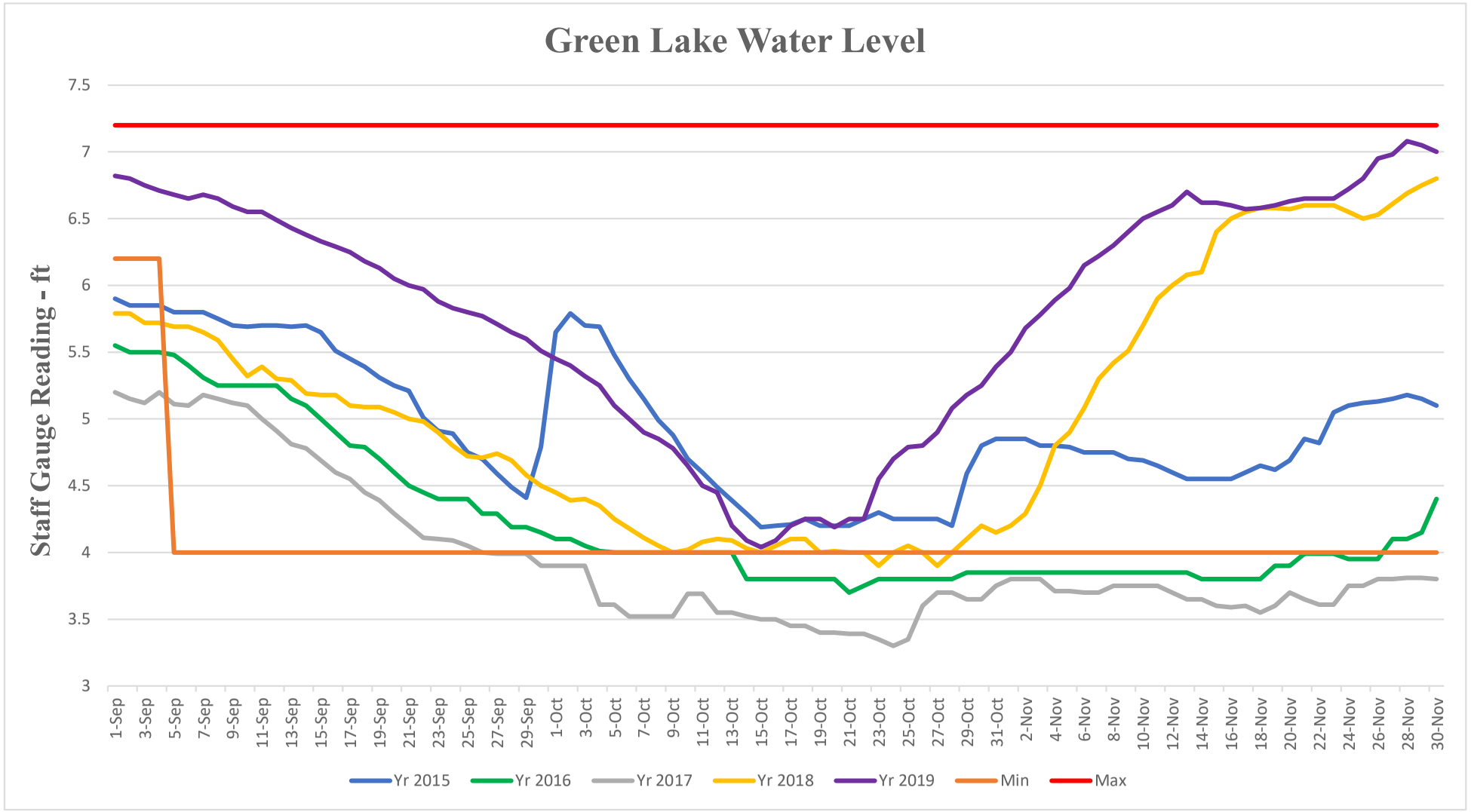
Loon nest locations are not tracked.

We would like to thank the GLA for their assistance collecting loon information.

Questions?

5-2) Impoundment Levels

The Green Lake water levels for September through November for the years 2015 through 2019 were requested by the FERC:



The complete table of readings (that is graphed above) is in the ISR.

Questions?

5-3) Docks and Beaches

Docks:

The GLA sent out a dock survey.

85 responses were received.

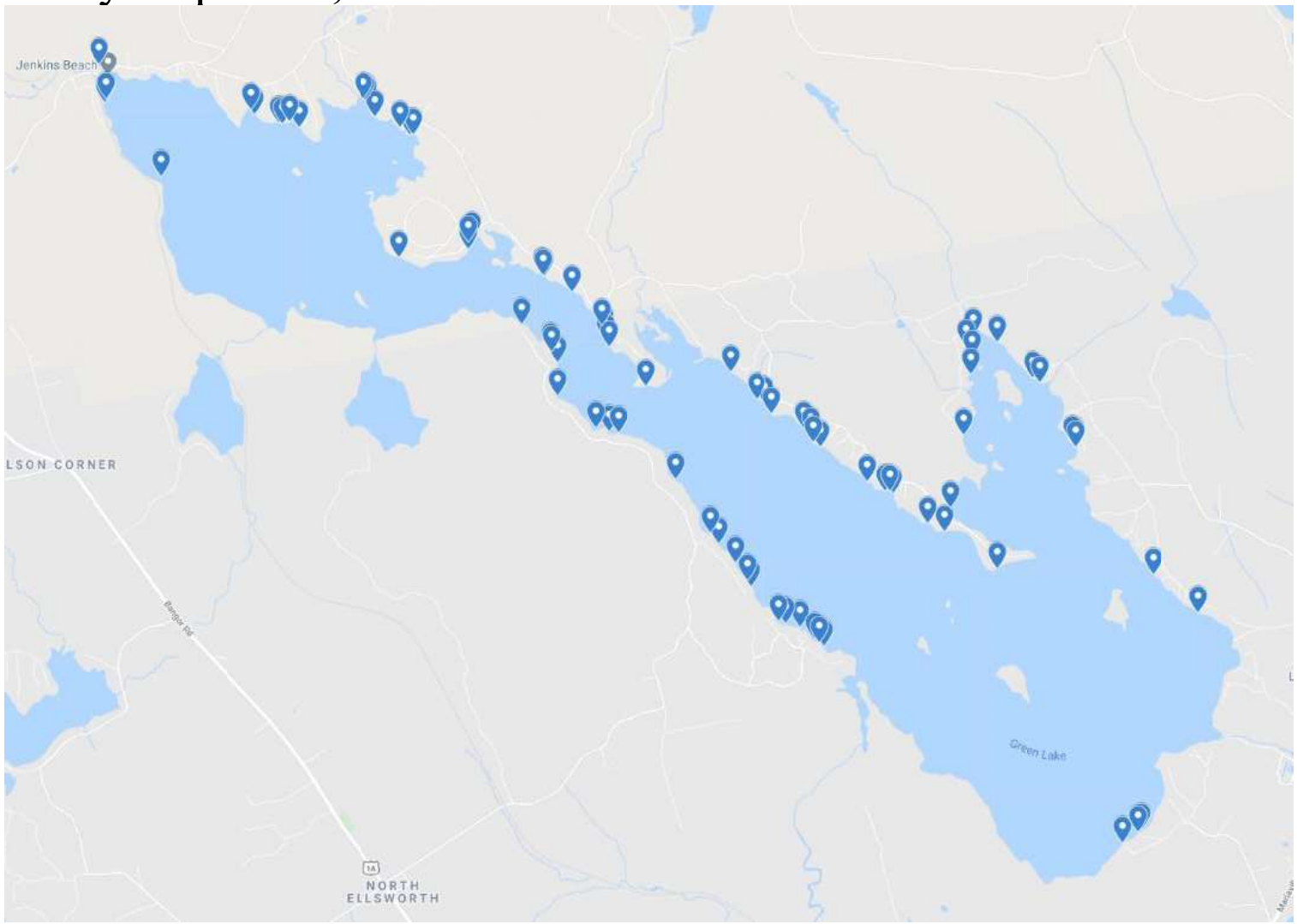
Types of docks:

Total Responses	Permanent	Floating	Lift Out	Removed for Winter
85	15	38	53	76

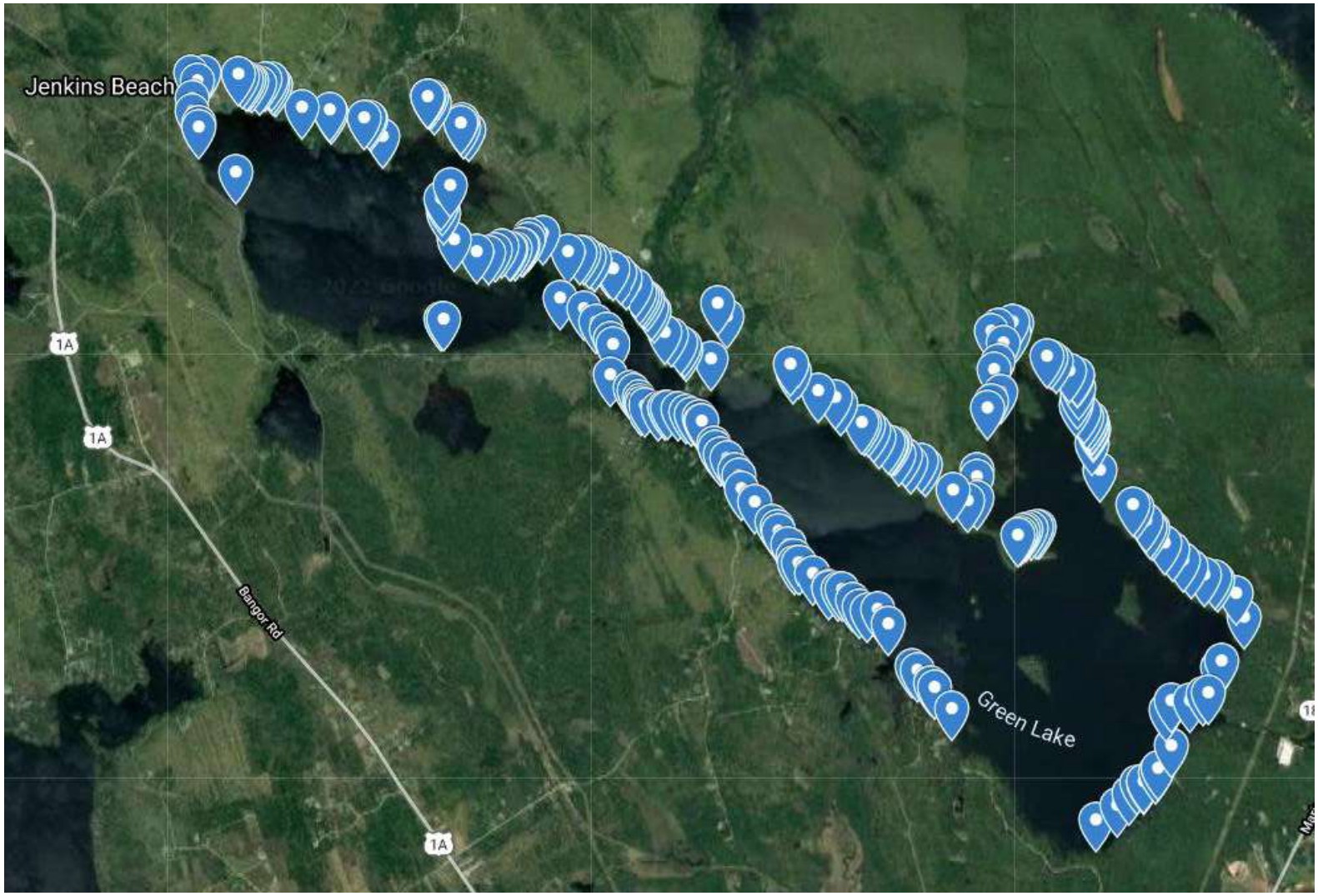
Count of docks by water depth at end (in ft):

1' or less	> 1' <= 2'	> 2' <= 3'	> 3' <= 4'	> 4' <= 5'	> 5' <= 6'	> 6' <=7'	> 7' <= 8'	> 8' <= 9'	> 9'
7	6	9	11	7	16	5	9	1	15

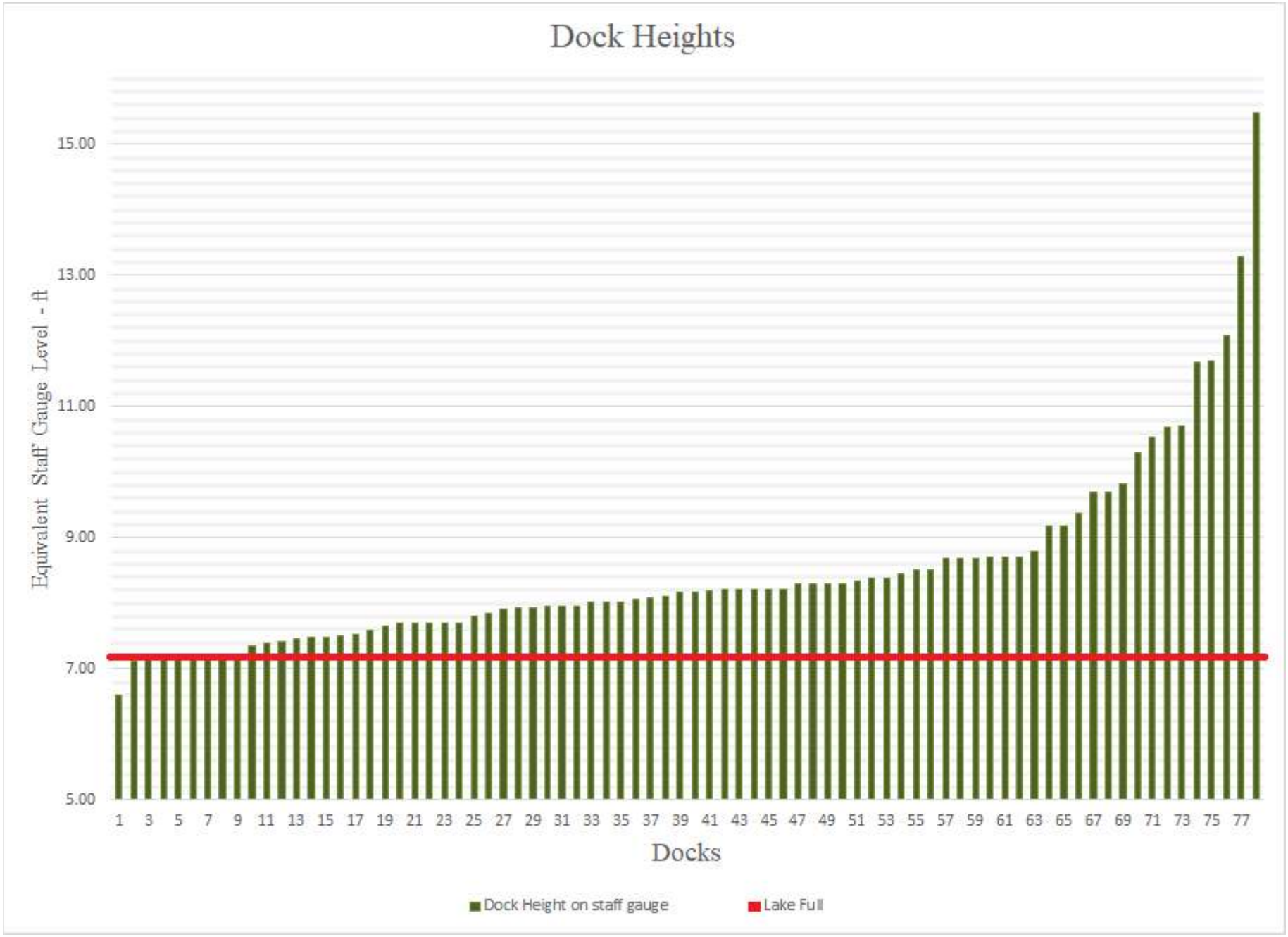
Dock survey responses, 85 locations:



GLWP surveyed the Google Maps aerial image of Green Lake and counted 218 docks:



Survey responses represent 39% of observed docks.


Dock Heights
Equivalent Staff Gauge Level - ft
15.00
13.00
11.00
9.00
7.00
5.00
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77
Docks
Dock Height on staff gauge
Lake Full

Beaches:

The GLA toured the lake to survey for private beaches:

- 145 private beaches were counted
- In addition, there are currently two public beaches on the lake:
  - Jenkins beach
  - Beach at the Ellsworth public dock
- Rocky areas were not surveyed:
  - Boggy Brook
  - Great Brook
  - Mann Brook.

GLWP appreciates the assistance provided by the GLA on the dock and beach surveys.

GLWP Experiences on Green Lake:

GLWP launched and retrieved an 18.5 ft boat at the Ellsworth boat ramp during the summer and into the late fall:

Every two weeks from 17-Jun-2020 through 19-Oct-2020

On 01-Dec-2020

During this work, we encountered water levels ranging from 4.18 to 6.49 on the staff gauge (157.68 to 159.99 ft USGS).

A level of 4.18 is about 2 inches above the target fall drawdown level.

Throughout this range we were able to launch and retrieve the boat successfully.

The major difficulty we experienced was the removal of the finger dock at the launch ramp in October.

Questions?

Questions & Discussion

End of Meeting.

Station 1 DO&T

3/18/2022

DO (mg/L)	Depth (m)	S1-01	S1-02	S1-03	S1-04	S1-05	S1-06	S1-07	S1-08	S1-09	S1-10
	0	9.63	8.54	8.67	8.45	8.30	8.57	9.05	9.30	9.40	10.16
	1	9.63	8.49	8.68	8.48	8.30	8.36	9.04	9.30	9.43	10.17
	2	9.91	8.48	8.67	8.52	8.33	8.34	9.02	9.29	9.44	10.16
	3	10.12	8.48	8.67	8.53	8.32	8.33	9.03	9.27	9.45	10.14
	4	10.28	8.47	8.67	8.84	8.32	8.32	9.02	9.25	9.45	10.13
	5	10.35	8.45	8.66	8.75	8.33	8.28	9.00	9.23	9.46	10.12
	6	9.93	9.45	8.77	8.63	8.27	8.23	8.97	9.20	9.46	10.10
	7	9.84	9.27	8.55	8.30	8.19	7.22	8.96	9.19	9.46	10.09
	8	9.84	9.21	8.47	8.04	7.53	6.82	8.80	9.18	9.45	10.08
	9	10.23	9.30	8.38	7.81	7.33	6.65	8.36	9.17	9.44	10.07
	10	10.29	9.40	8.59	8.09	7.47	6.88	6.68	9.16	9.30	10.07
	11	10.60	9.72	9.29	8.71	7.99	7.22	6.54	6.81	8.52	10.05
	12	11.03	10.08	9.97	9.57	8.76	8.00	7.31	7.37	7.61	10.01
	13	11.20	10.41	10.06	9.79	9.40	8.98	8.51	8.20	8.02	10.00
	14	11.28	10.62	10.08	9.98	9.54	9.22	8.90	8.68	8.44	8.95
	15	11.32	10.84	10.18	10.00	9.76	9.50	9.07	8.97	8.55	8.44
	17	11.37	11.00	10.84	10.49	10.13	10.30	10.09	9.38	9.42	8.61
	19	11.39	11.06	10.91	10.56	10.22	10.40	9.87	9.49	9.35	8.75
	21	11.40	11.05	10.60	10.58	10.15	10.21	9.58	9.42	8.92	8.88
	23	11.33	10.91	10.73	10.50	10.17	9.70	9.52	9.26	8.93	8.87
	25	11.24	10.80	10.64	10.45	9.97	9.78	9.30	9.17	8.93	8.66
	30	11.23	10.84	10.42	10.35	9.90	9.55	9.25	9.01	8.48	8.38
	35	11.18	10.78	10.41	10.22	9.77	9.35	9.04	8.88	8.41	8.20
	40	11.09	10.68	10.38	10.11	9.64	9.20	8.93	8.70	8.29	8.07
	45	11.00	10.62	10.05	9.81	9.40	9.01	8.73	8.60	8.04	7.83
	50	10.90	10.41	9.85	9.67	9.10	8.72	8.67	8.40	7.90	7.60

Water Temp (°C)	Depth (m)	S1-01	S1-02	S1-03	S1-04	S1-05	S1-06	S1-07	S1-08	S1-09	S1-10
	0	21.5	23.6	23.9	26.4	26.9	22.7	21.7	17.8	17.9	14.4
	1	21.5	23.9	23.8	26.2	26.7	23.0	21.5	17.7	17.3	14.1
	2	19.7	23.9	23.8	25.7	26.1	23.0	21.1	17.5	17.2	13.9
	3	18.9	23.9	23.8	25.5	25.9	23.0	20.9	17.4	17.1	13.8
	4	18.0	23.9	23.7	23.8	25.7	23.0	20.6	17.3	17.1	13.8
	5	17.2	23.8	23.6	22.7	25.6	22.8	20.3	17.3	17.0	13.8
	6	17.5	18.0	20.0	20.3	24.8	22.6	20.1	17.2	17.0	13.8
	7	16.9	16.9	17.1	17.7	20.2	17.0	20.0	17.2	17.0	13.7
	8	15.5	15.5	15.2	15.8	16.7	15.7	19.8	17.2	17.0	13.7
	9	13.0	13.8	14.3	14.6	14.8	14.6	19.2	17.2	17.0	13.7
	10	12.1	12.9	13.2	13.2	13.8	13.8	16.7	17.1	16.9	13.7
	11	11.0	11.7	11.7	11.9	12.3	12.9	14.1	15.3	15.5	13.7
	12	9.8	10.5	10.3	10.6	11.5	11.8	12.3	12.0	13.1	13.7
	13	9.3	9.8	9.6	9.7	10.1	10.2	10.3	10.7	10.7	13.7
	14	9.0	9.2	9.2	9.1	9.3	9.4	9.3	9.7	9.6	12.3
	15	8.7	8.8	8.8	8.8	8.6	9.0	9.0	9.0	9.3	9.9
	17	8.4	8.5	8.4	8.4	8.5	8.5	8.4	8.5	8.4	8.8
	19	8.2	8.3	8.2	8.0	8.2	8.3	8.1	8.0	8.0	8.4
	21	7.8	8.0	7.9	7.8	8.0	8.0	7.8	7.8	7.8	7.9
	23	7.7	7.7	7.7	7.7	7.7	7.7	7.6	7.5	7.6	7.6
	25	7.5	7.5	7.5	7.5	7.5	7.5	7.4	7.4	7.4	7.4
	30	7.2	7.2	7.1	7.2	7.2	7.1	7.1	7.2	7.1	7.1
	35	7.0	7.0	7.0	7.0	7.0	6.9	6.9	7.1	7.0	7.0
	40	6.8	6.9	6.8	6.9	6.8	6.9	6.9	7.0	6.9	7.0
	45	6.7	6.8	6.8	6.8	6.8	6.8	6.8	6.9	6.9	6.9
	50	6.7	6.7	6.7	6.7	6.8	6.7	6.8	6.9	6.8	6.9

Event	S1-01	S1-02	S1-03	S1-04	S1-05	S1-06	S1-07	S1-08	S1-09	S1-10
Date	17-Jun	30-Jun	15-Jul	29-Jul	12-Aug	26-Aug	9-Sep	21-Sep	5-Oct	19-Oct
Time	3:00 PM	3:50 PM	3:36 PM	11:38 AM	11:59 AM	11:57 AM	1:22 PM	12:10 PM	12:35 PM	1:01 PM

Station 2 DO&T

DO (mg/L)	Depth (m)	S2-01	S2-02	S2-03	S2-04	S2-05	S2-06	S2-07	S2-08	S2-09	S2-10
	0	9.71	8.87	8.72	8.34	8.30	8.57	8.90	9.46	9.46	10.29
	1	9.75	8.87	8.75	8.37	8.31	8.50	8.90	9.45	9.50	10.29
	2	9.76	8.86	8.76	8.39	8.33	8.48	8.89	9.38	9.50	10.28
	3	9.76	8.86	8.76	8.40	8.33	8.47	8.89	9.35	9.50	10.24
	4	9.84	8.87	8.77	8.42	8.35	8.46	8.82	9.35	9.48	10.20
	5	9.78	9.13	8.77	8.57	8.29	8.45	8.67	9.37	9.46	10.17
	6	9.76	9.46	8.73	8.62	8.29	8.44	8.64	9.34	9.45	10.15
	7	9.65	9.21	8.61	8.60	7.96	8.43	8.42	9.31	9.44	10.15
	8	9.66	9.00	8.30	7.45	9.24	8.43	8.05	9.32	9.43	10.14
	9	9.72	8.81	7.95	7.25	6.72	8.42	6.42	9.33	9.42	10.13
	10	9.70	8.82	7.77	7.01	6.37	5.58	5.64	9.30	9.40	10.12
	11	9.70	8.80	7.79	6.91	6.16	5.04	5.14	8.98	9.31	10.12
	12	9.72	8.78	7.84	6.94	6.14	6.04	4.82	8.66	9.20	10.11
	13	9.72	8.77	7.87	7.01	6.14	5.19	4.72	7.69	8.94	10.11
	14	9.73	8.80	7.83	7.03	6.17	5.24	4.75	4.59	7.87	10.11
	15	9.72	8.84	7.85	7.15	6.24	5.36	4.89	4.55	6.55	10.11
	17	9.74	8.86	7.92	7.27	6.42	5.50	5.01	4.60	4.34	10.11
	19	9.77	8.87	7.93	7.15	6.27	5.34	4.75	4.34		10.11
	21								4.03		10.10

Water Temp (°C)	Depth (m)	S2-01	S2-02	S2-03	S2-04	S2-05	S2-06	S2-07	S2-08	S2-09	S2-10
	0	20.9	22.5	23.5	27.2	26.3	21.5	21.3	18.0	18.0	14.3
	1	20.8	22.5	23.4	27.0	26.1	21.6	21.3	17.7	17.1	14.2
	2	20.7	22.5	23.5	26.8	25.9	21.7	21.2	17.6	16.9	13.9
	3	19.8	22.4	23.4	26.6	25.5	21.7	21.1	17.5	16.8	13.9
	4	18.3	22.4	23.2	26.4	25.1	21.7	20.5	17.4	16.8	13.8
	5	17.8	20.2	23.1	24.6	24.8	21.7	20.2	17.4	16.8	13.8
	6	17.5	18.4	21.3	21.6	24.7	21.7	20.1	17.4	16.8	13.7
	7	16.3	17.0	17.7	18.1	22.7	21.7	19.8	17.3	16.8	13.7
	8	14.6	15.5	15.2	15.5	16.5	21.7	19.4	17.3	16.8	13.7
	9	13.0	13.7	14.1	14.4	15.4	21.7	17.5	17.3	16.8	13.7
	10	12.1	12.7	13.0	13.5	14.4	14.5	16.2	17.2	16.7	13.7
	11	11.8	12.3	12.3	13.0	13.5	13.7	15.3	17.0	16.8	13.7
	12	11.4	12.1	11.9	12.5	13.0	13.1	14.1	16.8	16.7	13.7
	13	11.3	11.5	11.7	12.1	12.6	12.6	13.4	16.2	16.6	13.7
	14	11.0	11.2	11.4	11.8	12.2	12.2	12.6	12.7	15.6	13.7
	15	10.8	11.0	11.2	11.2	11.8	11.8	11.8	11.9	14.3	13.7
	17	10.5	10.7	10.9	10.8	11.1	11.2	11.2	11.2	11.4	13.7
	19	10.3	10.6	10.6	10.7	10.9	10.7	11.0	11.0		13.6
	21								10.8		13.6

Event	S2-01	S2-02	S2-03	S2-04	S2-05	S2-06	S2-07	S2-08	S2-09	S2-10
Date	17-Jun	30-Jun	15-Jul	29-Jul	12-Aug	27-Aug	9-Sep	21-Sep	5-Oct	19-Oct
Time	5:35 PM	5:40 PM	5:14 PM	1:28 PM	2:23 PM	7:08 PM	2:55 PM	2:01 PM	2:25 PM	2:37 PM

Impoundment Levels - 2015-2020

September -- November

	2015	2016	2017	2018	2019	2020	Min	Max
1-Sep	5.90	5.55	5.20	5.79	6.82	5.71	6.20	7.20
2-Sep	5.85	5.50	5.15	5.79	6.80	5.70	6.20	7.20
3-Sep	5.85	5.50	5.12	5.72	6.75	5.70	6.20	7.20
4-Sep	5.85	5.50	5.20	5.72	6.71	5.70	6.20	7.20
5-Sep	5.80	5.48	5.11	5.69	6.68	5.69	4.00	7.20
6-Sep	5.80	5.40	5.10	5.69	6.65	5.65	4.00	7.20
7-Sep	5.80	5.31	5.18	5.65	6.68	5.63	4.00	7.20
8-Sep	5.75	5.25	5.15	5.59	6.65	5.60	4.00	7.20
9-Sep	5.70	5.25	5.12	5.45	6.59	5.59	4.00	7.20
10-Sep	5.69	5.25	5.10	5.32	6.55	5.58	4.00	7.20
11-Sep	5.70	5.25	5.00	5.39	6.55	5.50	4.00	7.20
12-Sep	5.70	5.25	4.91	5.30	6.49	5.47	4.00	7.20
13-Sep	5.69	5.15	4.81	5.29	6.43	5.37	4.00	7.20
14-Sep	5.70	5.10	4.78	5.19	6.38	5.30	4.00	7.20
15-Sep	5.65	5.00	4.69	5.18	6.33	5.28	4.00	7.20
16-Sep	5.51	4.90	4.60	5.18	6.29	5.05	4.00	7.20
17-Sep	5.45	4.80	4.55	5.10	6.25	5.00	4.00	7.20
18-Sep	5.39	4.79	4.45	5.09	6.18	4.90	4.00	7.20
19-Sep	5.31	4.70	4.39	5.09	6.13	4.80	4.00	7.20
20-Sep	5.25	4.60	4.29	5.05	6.05	4.70	4.00	7.20
21-Sep	5.21	4.50	4.20	5.00	6.00	4.65	4.00	7.20
22-Sep	5.01	4.45	4.11	4.98	5.97	4.55	4.00	7.20
23-Sep	4.91	4.40	4.10	4.90	5.88	4.45	4.00	7.20
24-Sep	4.89	4.40	4.09	4.80	5.83	4.40	4.00	7.20
25-Sep	4.75	4.40	4.05	4.72	5.80	4.39	4.00	7.20
26-Sep	4.70	4.29	4.00	4.71	5.77	4.37	4.00	7.20
27-Sep	4.59	4.29	3.99	4.74	5.71	4.35	4.00	7.20
28-Sep	4.49	4.19	3.99	4.69	5.65	4.38	4.00	7.20
29-Sep	4.41	4.19	3.99	4.58	5.60	4.39	4.00	7.20
30-Sep	4.79	4.15	3.90	4.50	5.51	4.43	4.00	7.20
1-Oct	5.65	4.10	3.90	4.45	5.45	4.39	4.00	7.20
2-Oct	5.79	4.10	3.90	4.39	5.40	4.35	4.00	7.20
3-Oct	5.70	4.05	3.90	4.40	5.32	4.32	4.00	7.20
4-Oct	5.69	4.01	3.61	4.35	5.25	4.35	4.00	7.20
5-Oct	5.48	4.00	3.61	4.25	5.10	4.30	4.00	7.20
6-Oct	5.30	4.00	3.52	4.18	5.00	4.30	4.00	7.20
7-Oct	5.15	4.00	3.52	4.11	4.90	4.29	4.00	7.20
8-Oct	4.99	4.00	3.52	4.05	4.85	4.25	4.00	7.20
9-Oct	4.88	4.00	3.52	4.00	4.78	4.22	4.00	7.20
10-Oct	4.70	4.00	3.69	4.02	4.65	4.19	4.00	7.20
11-Oct	4.60	4.00	3.69	4.08	4.50	4.10	4.00	7.20
12-Oct	4.49	4.00	3.55	4.10	4.45	4.05	4.00	7.20
13-Oct	4.39	4.00	3.55	4.09	4.20	4.02	4.00	7.20
14-Oct	4.29	3.80	3.52	4.03	4.09	4.20	4.00	7.20
15-Oct	4.19	3.80	3.50	4.00	4.04	4.10	4.00	7.20
16-Oct	4.20	3.80	3.50	4.05	4.09	4.13	4.00	7.20

Impoundment Levels - 2015-2020

September -- November

	2015	2016	2017	2018	2019	2020	Min	Max
17-Oct	4.21	3.80	3.45	4.10	4.20	4.20	4.00	7.20
18-Oct	4.25	3.80	3.45	4.10	4.25	4.19	4.00	7.20
19-Oct	4.20	3.80	3.40	4.00	4.25	4.18	4.00	7.20
20-Oct	4.20	3.80	3.40	4.01	4.19	4.18	4.00	7.20
21-Oct	4.20	3.70	3.39	4.00	4.25	4.18	4.00	7.20
22-Oct	4.25	3.75	3.39	4.00	4.25	4.19	4.00	7.20
23-Oct	4.30	3.80	3.35	3.90	4.55	4.18	4.00	7.20
24-Oct	4.25	3.80	3.30	4.00	4.70	4.18	4.00	7.20
25-Oct	4.25	3.80	3.35	4.05	4.79	4.15	4.00	7.20
26-Oct	4.25	3.80	3.60	4.00	4.80	4.12	4.00	7.20
27-Oct	4.25	3.80	3.70	3.90	4.90	4.10	4.00	7.20
28-Oct	4.20	3.80	3.70	4.00	5.08	4.10	4.00	7.20
29-Oct	4.59	3.85	3.65	4.10	5.18	4.10	4.00	7.20
30-Oct	4.80	3.85	3.65	4.20	5.25	4.12	4.00	7.20
31-Oct	4.85	3.85	3.75	4.15	5.39	4.10	4.00	7.20
1-Nov	4.85	3.85	3.80	4.20	5.50	4.08	4.00	7.20
2-Nov	4.85	3.85	3.80	4.29	5.68	4.10	4.00	7.20
3-Nov	4.80	3.85	3.80	4.50	5.78	4.20	4.00	7.20
4-Nov	4.80	3.85	3.71	4.80	5.89	4.18	4.00	7.20
5-Nov	4.79	3.85	3.71	4.90	5.98	4.20	4.00	7.20
6-Nov	4.75	3.85	3.70	5.08	6.15	4.20	4.00	7.20
7-Nov	4.75	3.85	3.70	5.30	6.22	4.21	4.00	7.20
8-Nov	4.75	3.85	3.75	5.42	6.30	4.25	4.00	7.20
9-Nov	4.70	3.85	3.75	5.51	6.40	4.23	4.00	7.20
10-Nov	4.69	3.85	3.75	5.70	6.50	4.25	4.00	7.20
11-Nov	4.65	3.85	3.75	5.90	6.55	4.27	4.00	7.20
12-Nov	4.60	3.85	3.70	6.00	6.60	4.28	4.00	7.20
13-Nov	4.55	3.85	3.65	6.08	6.70	4.27	4.00	7.20
14-Nov	4.55	3.80	3.65	6.10	6.62	4.30	4.00	7.20
15-Nov	4.55	3.80	3.60	6.40	6.62	4.32	4.00	7.20
16-Nov	4.55	3.80	3.59	6.50	6.60	4.38	4.00	7.20
17-Nov	4.60	3.80	3.60	6.55	6.57	4.40	4.00	7.20
18-Nov	4.65	3.80	3.55	6.58	6.58	4.42	4.00	7.20
19-Nov	4.62	3.90	3.60	6.58	6.60	4.40	4.00	7.20
20-Nov	4.69	3.90	3.70	6.57	6.63	4.40	4.00	7.20
21-Nov	4.85	3.99	3.65	6.60	6.65	4.40	4.00	7.20
22-Nov	4.82	3.99	3.61	6.60	6.65	4.41	4.00	7.20
23-Nov	5.05	3.99	3.61	6.60	6.65	4.45	4.00	7.20
24-Nov	5.10	3.95	3.75	6.55	6.72	4.60	4.00	7.20
25-Nov	5.12	3.95	3.75	6.50	6.80	4.65	4.00	7.20
26-Nov	5.13	3.95	3.80	6.53	6.95	4.69	4.00	7.20
27-Nov	5.15	4.10	3.80	6.61	6.98	4.87	4.00	7.20
28-Nov	5.18	4.10	3.81	6.69	7.08	4.95	4.00	7.20
29-Nov	5.15	4.15	3.81	6.75	7.05	5.04	4.00	7.20
30-Nov	5.10	4.40	3.80	6.80	7.00	5.01	4.00	7.20

Latitude, Longitude		Location On Green Lake	Permanent	Floating	Lift Out	Removed for Winter	Depth at end of dock in Summer - in feet	Elevation See Note Below	Height of dock above normal summer level
44.64249, -68.47642		Near Scott's Neck			1	1	2.0		1.5
44.647, -68.48487					1	1	6.0		2.0
44.64868, -68.4887					1	1	4.0		0.5
44.64671, -68.50373		1/2 mile north of boat landing		1		1	3.0		2.0
44.66842, -68.53769		west of Chapman Pt on North Shore			1	1	6.0	7.5	1.5
44.63341, -68.48531		Nothern side of Calf Island		1	1	1	12.0		1.5
44.64596, -68.45897						1	6-7		1.5
44.65339, -68.46864		N. East Cove			1	1	4.0		1.0
44.66706, -68.52284		Jellison Cove		1	1	1	3.3		8"
44.66704, -68.52246		Jellison Cove			1	1	2.5		1.5
44.65999, -68.5168		200' south of elephant rocks	1		1	1	10-12		2.5
44.65354, -68.50415		The Narrows			1	1	3.5		1.7
44.6514, -68.50121		Sandy Point				1	5.0	6.0	2.0
44.65281, -68.46632		NE Cove near Big Fish Island		1		1	3.5		1.5
44.66421, -68.54668		Baker's Point			1	1	12-15		2.0
44.63365, -68.48666		Western Side 1/2 mile from Boggy Brook		1		1	9-10		0.5
44.63909, -68.49316		3rd dock down from public boat landing		1	1	1	7.0	4.0	2.0
44.65301, -68.50404		Middle of narrows			1	1	5.0		5.5
44.65635, -68.5072		In Narrows	1				7.5		2.5
44.65635, -68.5072		In Narrows		1	1	1	7.5		1.0
44.66756, -68.53349		Faces south west			1	1	6.0		3.0
44.65148, -68.50863		In the Narrows		1		1	7.0		1.0
44.64798, -68.48806		1/2 mile SE of Great Brook Cove		1	1	1	10.0	158.00	159.00
44.63741, -68.46644		Scott's Neck Beach			1	1	4.0		1.0
44.63781, -68.49159		7th lot south of city boat ramp (6th house)	1				6.0		9.0
44.66784, -68.53542		Midway between Chapman's Point & Paines Point, east side 1/2 mile from Pine Island			1	1	5.5		1.5
44.63256, -68.48396		between boat landing and Boggy Brook	1				8-10	5.5	2.0
44.63384, -68.48736		1 Cow Island			1	1	8.0		1.0
44.64922, -68.50862		West side of Narrows	1		1	1	5.0	7.5	1.5
44.66926, -68.5521				1		1	10.0		2.0
44.6434, -68.47887		On Scott's Neck Way	1				8.0		4.0
44.63994, -68.47147		Last camp before causeway - dock extends straight into small cove		1		1	6.0	5.6	1.8
44.67183, -68.55275		Mann Brook inlet by Jenkins Bridge (to left)			1	1	3.0		5.0
44.65923, -68.51717		Off Green Lake Road, Dedham - In Narrows	1	1	1	1	2.0		3.0
44.65039, -68.46298		NE Cove across from Fish Island		1	1	1	5.5		1.0
44.65733, -68.50991				1		1	5.33	159.86	1.0
44.65756, -68.51013					1	1	3.3	159.86	2.3
44.66917, -68.52689				1		1	2.5		2.0
44.65256, -68.50372						1			3.0
44.65261, -68.46937					1	1	3.8		6-8
44.64669, -68.50286			1	1		1			
44.63442, -68.44707		Northeast Cove across from Black Island, Dam end of lake		1		1			
44.65195, -68.46878		In Northeast Cove near stream			1	1	1.5	3.0	1.0
44.65234, -68.5093		South side of southeast end of Narrows, opposite Sandy Point			1	1	5.0		2.0
44.64656, -68.46958					1	1	1.0		3.5
44.66868, -68.53802					1	1	3.5		2.0

Latitude, Longitude		Location On Green Lake	Permanent	Floating	Lift Out	Removed for Winter	Depth at end of dock in Summer - in feet	Elevation See Note Below	Height of dock above normal summer level
44.66825, -68.52618		Jellison Cove			1	1	4.0		6.0
44.61871, -68.45439			1		1		7.0		2.0
44.637, -68.45139				1	1	1	7.0		2.0
44.64154, -68.47088					1	1	2' 10"		2.0
44.63211, -68.48305		North west of Deer Island, Ellsworth side			1	1	5.5		1.5
44.64351, -68.49734			1	1		1	9-11'		
44.63617, -68.49004		1/4 mile south of city landing		1		1	10.0		1.0
44.63658, -68.49045					1	1	6.0		2.0
44.654, -68.50442		Narrows, Sandy Point	1			1	4.0		1.0
44.65071, -68.46892		Northeast Cove across from Fish Island			1	1	1.0		3.5
44.646, -68.45919		Northeast Cove		1	1	1	8.0		1.5
44.66951, -68.55201		1st point up on right of Jenkins Beach, red camp		1	1	1	8.0		2.0
44.65966, -68.51714			1	1		1	8.0		2.0
44.64571, -68.4588		Northeast Cove N44° 38.718 W068° 27.519		1		1	15.0	167.0	1.5
44.63239, -68.48341		SW shoreline, 300 yds north of Boggy Brook			1	1	8-10		3.0
44.64664, -68.48434					1		1-2		3-5
44.66936, -68.52708		Jellison Cove			1	1	3.0	5.0	2.5
44.66948, -68.52728		Jellison Cove		1			2.0		
44.63981, -68.49396		Next to Ellsworth Landing		1	1	1	7.0		2.0
44.67061, -68.54521		The Narrows	1				8.0		4.0
44.6457, -68.48333		cove at 325 Scott's Neck Way		1		1	3.0	4.0	1.0
44.61953, -68.45257		Periwinkle Way			1	1	4-6	161.5	
44.66748, -68.5238		attached to rock in Jellison Cove		1		1	3.0		1.5
44.64603, -68.48408		beginning of Scott's Neck - approx across from public landing, a little east		1		1	8-9		1.0
		same dock as above		1		1	8-9		1.0
44.64273, -68.47718		in front of camp			1	1	2.0		1.3
44.64899, -68.48952					1	1	6.0		2.0
44.65409, -68.51199				1		1	6.0		
44.64986, -68.50014		off shoreline at Sandy Point Beach		1		1	8.0		1.5
44.65864, -68.52388		Northeast shore, just north of narrows	1	1	1	1			
44.64205, -68.47071					1	1	2.0		26"
44.65224, -68.50916				1			8.0	1.0	1.0
44.66779, -68.53509		Midway between Paines Point & Chapman's Point, east side 1/2 mile from Pine Isl		1		1	5.0		1.3
44.61944, -68.45285		Straight out from Sand Beach			1	1	5.0		1.3
44.64695, -68.50495		Sandy Beach		1	1	1	10.0		3.0
44.64271, -68.47675		Front of cabin		1		1	10.0		
44.65081, -68.492		North side approx 1/2 mile east of Sandy Point			1	1	2.8		1.9
44.66789, -68.53431					1	1	5-6		2.0
44.64053, -68.47304		south side of Scott's Neck Way peninsula	1		1		6.0		2.0
44.65744, -68.51002				1	1	1	6.0		1.5
		Note:Elevations are as reported - the low numbers are likely to be based on the staff gauge at the dam (7.2 = 160.7 USGS)							

Date of elevation check	Notes	Comments
7/7/2020		
7/15/2020		While this dock is located in already shallow water during Summer, if the lake level remained nowmal it would definitely continue to be used
8/14/2020		Our boat is on a boat lift. Some years by the end of August the water level is too low to use the lift forcing us to take the boat out sooner than we would like.
6/1/2020		
		The drop in water has a significant impact on our waterfront. We live in Maine so we would love the water level to stay high longer
6/19/2020	2 docks 2 properties	
6/19/2020	2 docks 2 properties	
8/1/2020	permanent base	I think the lake would be safer for boating if the water level stayed higher. Also better for removing boats for those with larger boats including pontoons.
7/20/2020		Our problem isn't so much a boat mooring; we take the boat out by early Sep due to potential storms. Problem is water intake pipe for domestic use gets high and dry. Adding additional pipe length doesn't work as pump already works hard to move water up steep embankment. We lose water pressure by maybe Sept 20 and have no water for domestic use, so we have to close up earlier than we'd like.
		Dock is 3 piece aluminum
7/20/2020		Water levels are a concern for everyone but in shallow waters, such as Benoit & Keiser Way it's very much exaggerated. I have difficulty pulling my dock without water.
7/26/2020		
8/8/2020		Water level is too low in August. Water level should stay consistent June through August
7/19/2020		
8/1/2020		When we put dock in (usually end June) water level hits bottom of dock. There is no beach area. As summer goes on and water level drops, mid to end of August, I gain more beach (which I prefer!).
8/1/2020	2 docks 1 property	
8/1/2020	2 docks 1 property	
7/24/2020		
		With the Maine summers short and Sept weather usually nice it would be great to extend boating time in the lake.
8/3/2020		
6/20/2020		Water should be regulated and we should be notified as our boats would have been on land after Labor Day weekend. We had some significant damage last several years due to level of water and ice damage.
6/20/2020		Due to elevation of stationary dock and level of water we often have to take our boat out mid to late August because we can no longer get in and out of boat.
8/17/2020		
7/17/2020		
6/21/2020		
6/7/2020		
July		September is beautiful on the lake - would like to use boat through September
7/27/2020		
		Brook goes dry at dock by Sept 15. !5 days more would probably be helpful. The drawdown (October 15th goal) results in moving boat & pwc by week after Labor Day. Having 30 days would be great but 15 would be huge!
8/1/2020	1 dock 1 property - 3 sections of dock	
7/19/2020		
6/30/2020	2 docks 2 properties	
6/30/2020	2 docks 2 properties	
7/20/2020		We have to take our boat and dock out the first week of August or we can't get them out. After first week of September we cannot access lake with Kayaks as we have no water.
7/10/2020		We lose so much water starting around July 4th we need to remove our boat by Labor Day weekend. We see a change in our water level as a result of Climate change as well. We are also seeing uninvasive plant life! Algae. The Audobon Society (Mr & Mrs Rowe) were taking samples.
	1 dock - 2 sections of dock	
		It has been very difficult to bring the float out of the water on to shore the last few years since the water level has been so low on Labor Day weekend. The exposed rocks interfere with moving the float on to land.
6/9/2020		
8/11/2020		
7/5/2020		I just returned from Maine. On July 28th the water was 15 inches lower than it was on Memorial Day. By August I'm going to have to tie my kayak to the end of my 40ft dock to kayak.
8/10/2020		Water is extremely low early this summer. I wish water level wasn't lowered as much in the Spring.

Date of elevation check	Notes	Comments
8/9/2020		Right now by the end of September we don't even have a foot of water at the end of the dock.
7/13/2020	1 dock - 2 sections of dock	We do not limit activities when water level drops.
7/1/2020		
8/16/2020		
6/12/2020		
	1 dock - 5 sections of dock	At minimal recreation level we can just manage to use our pocket beach for 4 floating sections. Anything below that it's impossible and we have to incur significant expense to have them taken out at the public landing and hauled up the road.
6/20/2020		
7/20/2020		My dock is 40' in length from shoreline
6/12/2020		
5/1/2020		At the rate that the lake is dropping I will be unable to have boat at dock by the end of July
		Since the last section floats, we need to remove it before the water drops which is typically Labor Day weekend. Which also means the boat also needs to come out. Sept would be a nice month to continue using the boat.
		I would continue to swim in September. By October I like the lower level to permit work on my seawall. Higher lake level helps with dock removal, however, I am accustomed to taking out dock by Columbus Day.
7/1/2020		
6/18/2020		
Summer 2019		We are seasonal - late June to early September
7/15/2020		I have a 130' dock that still only extends to a water level of 2.5-3.0 (May/June) and then is barely 2ft by August 1st. Water levels of May/June should remain until Oct 1st.
	Dock floats on water.	We live on Green Lake year round - in Jellison Cove - and lowering the water level Labor Day weekend curtails our ability to use the boat at all during the fall as we can't get the boat out of the cove after Labor Day when the water goes down. Really wish the date of lowering was extended !!!
7/3/2020		At least September would be nice. It can be such a great weather month. It is sad we take our docks out when it is still hot. Thank you.
6/1/2020		Have ice damage due to too high water levels in Winter. Dock built in 1960
6/22/2020		
		Property owners need to consider allowing GLWPC to maintain the post Labor Day water level near their optimum efficiency level. I estimate the dam raised the natural level by 2 to 2.5! If not relicensed, who will assume the cost of maintaining the dam?
8/3/2020		
8/1/2020	Same dock as Sighinolfi	Would appreciate not having to take boats & docks out just after Labor Day when the family is usually here. Also, Sept is beautiful and we would love to enjoy the lake for at least another month & even 1 1/2 months.
8/1/2020	Same dock as Sidou	Dropping the water works for the benefit of one company to the detriment of multiple property owners.
6/1/2020	roll out dock	
6/14/2020		
6/14/2020		
	1 dock - permanent piece w	After September weather is less favorable for boating & fishing season ends. Now, however, sometimes I need to get my boat out before 9/30 because water level drops low enough to make it difficult to trailer out AND ramp angle to dock gets too steep. However, I would like to see GLWPC continue & I understand need to be profitable to make that happen.
8/16/2020		
8/17/2020		
6/28/2020		
7/1/2020		
7/16/2020		
6/12/2020		
7/13/2020		
6/14/2020		

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Document Content(s)

Green Lake Water Power Co.
120 Hatchery Way, Ellsworth, ME 04605-3501

March 17, 2021

VIA E-FILING

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N. E.
Washington, DC 20426

Green Lake Hydroelectric Project FERC No. 7189-014
Supplement to Initial Study Report

Dear Secretary Bose:

On February 9, 2021, the Licensee for the Green Lake Hydroelectric Project, Green Lake Water Power Company (GLWP), submitted the Initial Study Report (ISR) for the relicensing of the Green Lake Hydroelectric Project (Project).

At the time the Initial Study Report was filed the results of the **Downstream Benthic Macroinvertebrate (BMI) Study** were not available. Now that we have the results we are submitting a supplemental report.

If you have any questions regarding this report, please contact me by email at caroline@greenlakewaterpower.com or by phone at (425) 553-6718

Sincerely,

Caroline Kleinschmidt
Relicensing Coordinator
Green Lake Water Power Co.

Attachment:
Downstream Benthic Macroinvertebrate Study Professional Report

cc: Distribution List

Green Lake Project Supplement to Initial Study Report – March 2021

Downstream Benthic Macroinvertebrate (BMI) Study 1-4:

Green Lake Water Power (GLWP) consulted with Paul Leeper, a biologist at Moody Mountain Environmental (MME) to conduct the Downstream Benthic Macroinvertebrate Investigation (BMI) of Reeds Brook during the summer of 2020. Details on how this study was conducted are in the Green Lake Hydroelectric Project ISR.

Paul's report on the BMI is included as an attachment with this document. The report concludes that the bypass reach meets Class B requirements. The two BMI sites that were not part of the bypass reach are more problematic:

Site 2:

This site is in the tailrace, at the same location as the temperature and DO sampling site, DO2. There were two problems encountered at this site: 1) the BMI baskets shifted from the current caused by the tailrace outflow, and 2) the site was covered by Graham Lake water from the spring until shortly before the BMI baskets were deployed.

Site 3:

This site is at the confluence of the tailrace and Reeds Brook, at the same location as the temperature and DO sampling site, DO3. There were two problems at this site: 1) the site was continuously covered by Graham Lake water, and 2) the site is downstream of the Green Lake National Fish Hatchery (GLNFH) treatment plant discharge.

GLWP believes that further sampling at these sites is unlikely to result in an increased understanding of Project operations on Reeds Brook. The Reeds Brook bypass reach is shown to meet Class B requirements. The risk to the Brook of discharge from the Project that would be investigated with a BMI study would be from a large increase of filter feeders that affects the other brook aquatic life. The mechanism for this would be the introduction of algae rich water into the brook by the power station tailrace. The power station tailrace flow is from Green Lake—water is input directly from Green Lake and discharged below the power station after a three minute trip down the penstock.

Much data was collected on the trophic state of Green Lake during the summer of 2020 (see the ISR and ISR Meeting Summary). The lake has low chlorophyl-A and phosphorus levels, and high Secchi disk readings. It is unlikely that Green Lake water introduced below the power station would influence Reeds Brook significantly differently than the Green Lake water flowing in the upper reaches of Reeds Brook.

Both the water from the GLNFH treatment lagoons and the Graham Lake water would be expected to contain significantly more nutrients than Green Lake water. Sampling at locations heavily affected by the GLNFH or Graham Lake would not be expected to inform an evaluation of the effects of Project operations on Reeds Brook water quality.

BMI sampling could be done in the power station tailrace flow and in another tributary of Graham Lake at a similar depth. This would provide a comparison of the communities that both exist under lentic, rather than lotic, conditions for part of the year. The two samples could be compared to gain some insight into how tailrace flow affects Reeds Brook as it enters Graham Lake. The effects of the GLNFH treatment lagoons discharge would still be a variable—when Graham Lake is at mid or high levels the GLNFH discharge is likely to affect habitat covered by Graham Lake water even if it is somewhat "upstream" from the discharge.

GLWP does not propose additional BMI studies at this time.

Green Lake Project 7189 ISR Supplement Distribution List March 17, 2021

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2020

Macroinvertebrate Sampling Study

Downstream

of

Green Lake Dam

Ellsworth Maine

FERC No. 7189

Submitted by:

Paul C. Leeper
Moody Mountain Environmental
137 Diamond Str
Searsmont Maine 04973

Submitted to:

Green Lake Water Power Company
Ellsworth, Maine
Date: 3-15-21

Introduction

This macroinvertebrate sampling study was conducted in support of the relicensing of the Green Lake Hydroelectric Project, Federal Energy Regulatory Commission (FERC) Project No. 7189. This report details the 2020 study efforts as part of the Water Quality Certification Process.

Study Objectives

The goal of the macroinvertebrate sampling study was to generate data on the aquatic macroinvertebrate community in Reeds Brook downstream of the Green Lake Dam and assess this community in terms of Maine's Aquatic Life Standards.

Study Area

In 2020 we placed samples at three (3) sites in Reeds Brook to study aquatic macroinvertebrates (Figure 1) after conferring with the Maine Department of Environmental Protection (MDEP). **Site 1** was located approximately 290ft downstream of the existing dam. This site was located upstream of the Green Lake Hatchery discharge. **Site 2** was located approximately 240 ft downstream of the powerhouse and approximately 2240 ft downstream of the dam. Site 3 was located approximately 400 downstream of the confluence of Reeds Brook and the powerhouse tailrace, approximately 2350 ft downstream of the dam.

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Figure 1. Location of aquatic macroinvertebrate sampling site downstream of the Green Lake Dam. Reeds Brook, August, September 2020.

Water Classification

Reeds Brook downstream of the Green Lake Dam is classified Class B ((38 M.R.S.A § 467(7)(A)(7)). With respect to designated uses, the Maine Water Quality Law requires that "Class B waters must be of such quality that they are suitable for the designated uses of drinking water supply after treatment; fishing; agriculture; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation, except as prohibited under Title 12, section 403; navigation; and as habitat for fish and other aquatic life. The habitat must be characterized as unimpaired" (38 M.R.S.A. § 465(3)(A)). The word "unimpaired" is defined to mean "without a diminished capacity to support aquatic life" (38 M.R.S.A. § 466(11)). In addition, for Class B waters, "Discharges to Class B waters may not cause adverse impact to aquatic life in that the receiving waters must be of sufficient quality to support all aquatic species indigenous to the receiving water without detrimental changes in the resident biological community" (38 M.R.S.A. § 465(3)(C). The term "resident biological community" is defined as "aquatic life expected to exist in a habitat which is free from the influence of the discharge of any pollutant" ((38 M.R.S.A. § 466(10)). The

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term “without detrimental changes in the resident biological community” means no significant loss of species or excessive dominance by any species or group of species attributable to human activity” ((38 M.R.S.A. § 466(12)).

Study Methods

The objective of the macroinvertebrate sampling study was to determine if the aquatic life, in this case the macroinvertebrate community, attained these Class B standards. The Maine Department of Environmental Protection (DEP) "Methods for Biological Sampling and Analysis of Maine's Inland Waters" (Davies and Tsomides Revised 2014) were used as the basis of the field and laboratory procedures in the macroinvertebrate sampling study. A summary of these methods is given below.

The DEP standard rock bag samplers were used for this study. These samplers hold approximately 16 lbs. of clean, washed, bank-run cobble, graded to uniform diameter range of 1.5 to 3 inches. Three (3) samplers were placed at the sample sites; samplers were left in the river for approximately 28 days (± 4 days) to allow for invertebrate colonization. Retrieval of the samplers was done using an aquatic D-net. The net was placed directly downstream of a sampler; the sampler was then picked up and placed in the net. The contents of each sampler and the net were washed through a sieve bucket and preserved in labeled jars. Habitat measurements including substrate type, depth, and temperature were collected at sampler collection retrieval.

Samples were collected, preserved, and transported to the Moody Mountain Environmental laboratory. The three (3) samplers (replicates) were sorted, identified, and enumerated.

Results

The samplers were placed in the river on August 27, 2020. Samplers were retrieved on September 24, 2020. Upon retrieval it was evident that samplers at Site 2 had washed downstream and had been disturbed. In addition, samplers at Site 2 were impacted by water levels in Graham Lake and were in a Lentic habitat rather than a lotic habitat in the weeks prior to placement.

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Samplers at Site 3 were also impacted by water levels in Graham Lake and were in a Lentic habitat rather than a lotic habitat during the colonization period. It was decided to not analyze the samples from Site 2 and 3 further. Habitat measurements for Site 1 are shown in Table 1 and Appendix 1. Photos of the areas around the sample site and substrates are included below.

Table 1. Habitat measurements at Site 1 in Reeds Brook downstream of Green Lake Dam for aquatic macroinvertebrate sampling. August, September 2020

Macroinvertebrate Field Data Sheet

Log _____	Directions	Type of Sampler **RB**
Station Number	_____	Date Deployed **8/27/20**
Waterbody **Reeds Brk.**	_____	Number Deployed **3**
River Basin **Unioin R.**	Lat-Long Coordinates	Date Retrieved **9/24/20**
Town **Ellsworth**	**N44.626075**	Number Retrieved **3**
Stream Order **6**	**W68.443577**	Collector(s) **P Leeper MME**

1. **Land Use** (surrounding watershed)		2. **Terrain**	3. **Canopy Cover**
☐ Urban	☐ Upland conifer	☐ Flat	**X** Dense (75-100% shaded)
☐ Cultivated	☐ Swamp hardwood	☐ Rolling	☐Partly open (25-75% shaded)
☐ Pasture	☐ Swamp conifer	**X** Hilly	☐Open (0-25% shaded)
X Upland hardwood	☐ Marsh	☐ Mountains	(% daily direct sun) _____

4. **Physical Characteristics of Bottom** estimate % over 12 m stretch							
[ ]	Bedrock	[40]	Cobble (2.5" – 10")	[]	Sand (<1/8")	[ ]	Clay
[50]	Boulders (>10")	[10]	Gravel (1/8" – 2.5")	[	Silt	[ ]	Muck

5. **Habitat Characteristics** (immediate area)		Temp. Probe # ☐ deployed	7. **Water Samples**
Time **1120h**	Time **0955h**		☐ Standard
Wetted Width **6.4m**	Wetted Width (m)**6.4m**	6. **Observations**	☐ Other
Bank Fl Width	Bank Full Width		Lab Number
Depth **21cm**	Depth **24cm**		8. **Photograph**
Velocity 9cm/s	Velocity 1 cm/s		Put-In Yes
Diss. O_2 (ppm) 7.9	Diss. O_2 (ppm) 8.9		Take-Out **Yes**
Temp (C) 20.6	Temp (C) 17.2		
Turbidity	Turbidity		
DO Meter # YSI Pro 1Cal? **Y**/	DO Meter # YSI Pro 1 Cal? **Y** /		

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Photo 1. View north-northwest, upstream from sample site upstream to dam. Reeds Brk. 8/27/20 PCL

Photo 2. View southeast from sample site. Reeds Brk. 8/27/20 PCL

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Photo 3. Typical substrate at sample site. Reeds Brk. 9/24/20 PCL

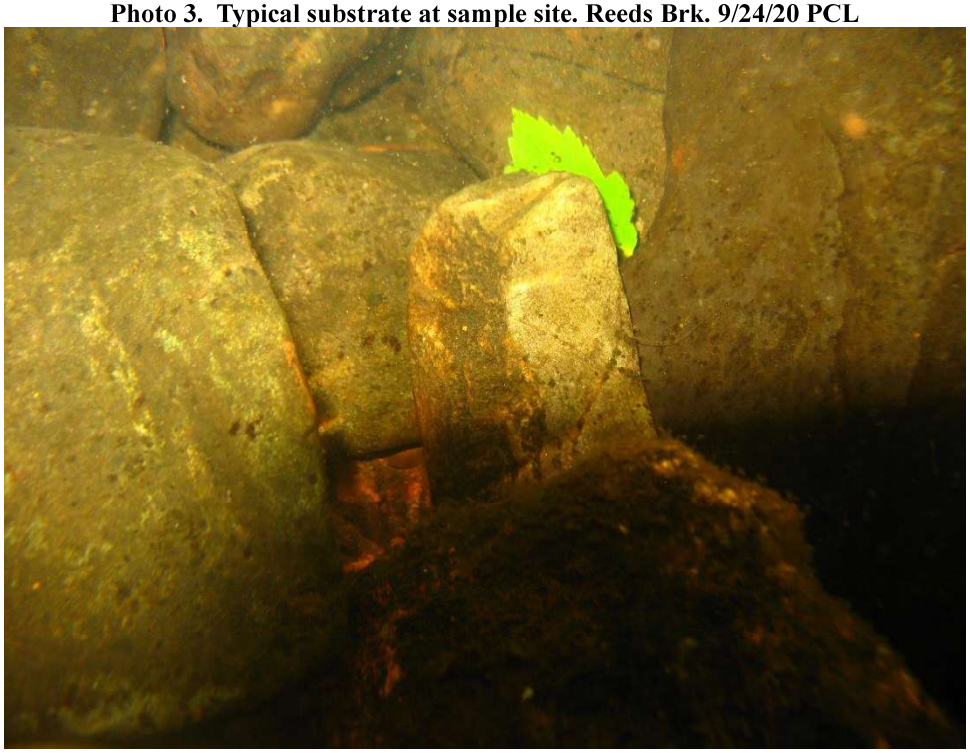
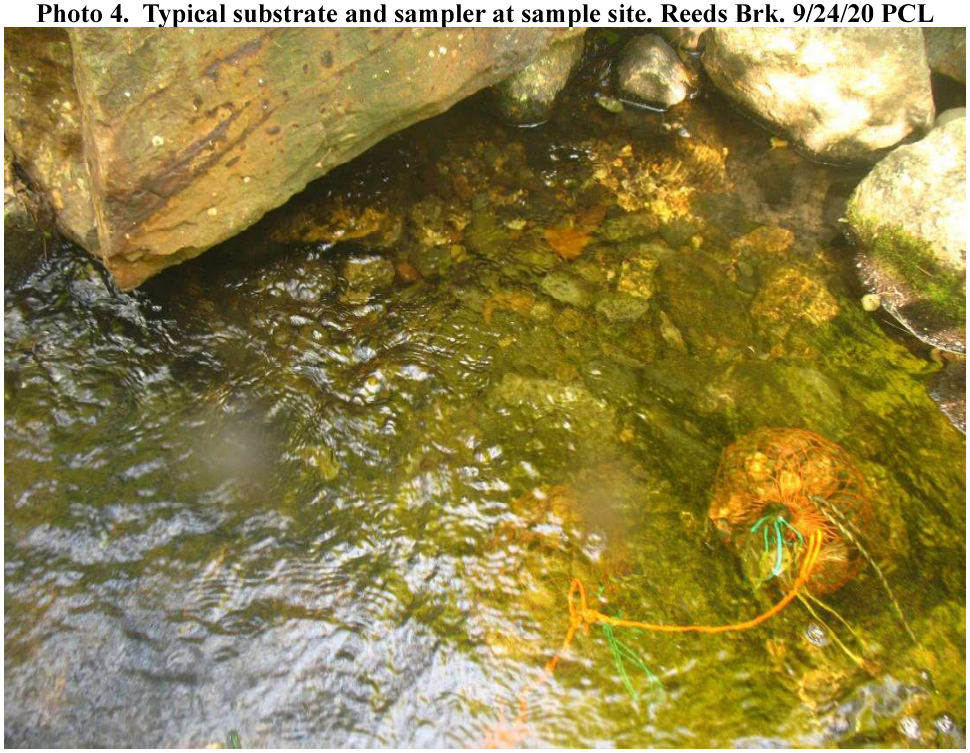


Photo 4. Typical substrate and sampler at sample site. Reeds Brk. 9/24/20 PCL



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LDM Results

The LDM biocriteria results are shown in Table 2 and Appendix 1. To attain a particular class a site must have a 60% or greater score in the test for that class. DEP finds that the community was in attainment of Aquatic Life Class B Standards. The make-up of this community and a discussion of the results are presented below.

Table 2. Results of the DEP linear discriminant model (LDM) for a site on Reeds Brk in Ellsworth Maine downstream of Green Lake Dam in 2020. A score of 60% or greater is needed to attain a particular class.

Site	Probability of Class A	Probability of Class B	Probability of Class C	Probability of Non-Attainment
1	14%	99%	100%	0%

Community Analysis

The macroinvertebrate community sampled downstream of the Green Lake Dam was not abundant but was relatively rich in taxa (Table 3 and Appendix 1). The community was populated with 26 different taxa with a Mean Total Abundance of 99. The community was dominated by sensitive mayflies, representing over 47% of Total Abundance. Structural indices for the sampled community are shown in Tables 3 and 4.

Table 3. Indices of community structure for the aquatic invertebrate community downstream of the Green Lake Dam. Reeds Brook, August, September 2020.

Tot. Abund.	Taxa Richness	S-W Div.	Hils. Biotic Index (HBN)	Water Quality indication from HBN	Mayfly, Stonefly, Caddisfly (EPT) Richness	Mayfly, Stonefly (EP)		Midge	
						Rich	% Ab	Rich	% Ab
99	26	3.37	4.28	Good	13	7	47	6	4

Indexes measuring the tolerance to poor water quality conditions revealed that mayflies, generally considered to be “clean water organisms” sensitive to poor water quality, dominated the community. The EP index of sensitive mayflies and stoneflies showed 7 taxa representing 47% of the community. Sensitive stoneflies were represented by one individual. The Hilsenhoff Biotic Index value, 4.28, indicated good water quality (Hilsenhoff 1987).

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Dominant organisms (representing over 5% of the Total Abundance) in the community are shown in Table 4 arranged from the most sensitive organisms to the organisms most tolerant of poor water quality conditions. The community had five (5) organisms that made up 77% of the total abundance, among these were 3 sensitive organisms representing 61% of the community. No organisms tolerant to poor water quality conditions were dominant in the community.

Table 4. Dominant aquatic invertebrate organisms downstream of the Green Lake Dam. Reeds Brook, July, August 2020.

Sensitivity to Poor Water Quality	Dominant Organism	% of Community
Sensitive	Maccaffertium	25%
	Hydropsyche	25%
	Timpanoga	11%
Intermediate	Cheumatopsyche	9%
	Polycentropus	7%
Tolerant		

The community structure and function found downstream of the Green Lake Dam on Reeds Brook shows little evidence of disturbance from project operations or organic enrichment. It appears that water quality is very good as the dominant genera are predominantly sensitive to poor conditions and tolerant organisms make up a minor proportion of the community. Finally, the community is not dominated by filter-feeders, a common phenomenon below lake outlets and impoundments (Hynes 1970, Spence and Hynes 1970, Parker and Voshell 1983).

Therefore, it is my professional opinion that the community sampled downstream of Green Lake Dam on Reeds Brook attains class B aquatic life standards.

Summary

1. The objective of the macroinvertebrate sampling study was to generate data on the aquatic macroinvertebrate community in Reeds Brook downstream of the Green Lake Dam and

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assess this community in terms of Maine's Aquatic Life Standards. Reeds Brook downstream of the dam is classified Class B.

2. The Maine Department of Environmental Protection (DEP) "Methods for Biological Sampling and Analysis of Maine's Inland Waters" (Davies and Tsomides Revised 2014) were used as the basis of the field and laboratory procedures in this study.

3. Samplers were placed at 3 sites on August 27. Retrieval was on September 24. At retrieval it was found that samplers at sites 2 and 3 had been disturbed and/or been influenced by Graham Lake. These samples were not analyzed. Samplers at site 1, approximately 485 ft downstream of the dam, were collected within an acceptable colonization time frame.

4. The DEP finds that the LDM biocriteria results indicate that the community is in attainment of Class B Aquatic Life Standards.

5. The invertebrate community sampled downstream of the Green Lake Dam was not abundant but was relatively rich in taxa. Mayflies, generally considered to be sensitive to poor water quality conditions, represented 46% of the community. Taxa tolerant to poor water quality conditions make up a minor proportion of the community. This indicates that the water quality is very good, and there is little evidence of disturbance from project operations.

6. The community structure and function found downstream of the Green Lake Dam shows there have been no detrimental changes in the resident biological community; specifically, there has been no significant loss of species or excessive dominance by any species or group of species attributable to human activity.

7. It is my professional opinion that the macroinvertebrate community in the tailwater section of Green Lake Dam on Reeds Brook attains class B aquatic life standards.

References

Davies, S.P. and L. Tsomides. Revised 2014. Methods for biological sampling and analysis of Maine’s rivers and streams. ME Dept. of Env. Prot. Augusta, ME. 31p.

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Spence, J.A., and H.B.N. Hynes. 1971. Differences in benthos upstream and downstream of an impoundment. J. Fish. Res. Bd. Canada 28: 35-43.

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Appendix 1- LDM data files including field data, and individual replicate data.

Maine Department of Environmental Protection
Biological Monitoring Program
Aquatic Life Classification Attainment Report

Station Information

Station Number: S-1190
Waterbody: Reeds Brook - Station 1190
Town: Ellsworth
Directions: GREEN LAKE HATCHERY, DRIVE UP ROAD TO DAM, SITE IS JUST UPSTREAM OF HATCHERY DISCHARGE

River Basin:
HUC8 Name:
Latitude:
Longitude:
Stream Order: 3

Sample Information

Log Number: 2860 Type of Sample: ROCK BAG Date Deployed: 8/27/2020
Subsample Factor: X1 Replicates: 3 Date Retrieved: 8/27/2020

Classification Attainment

Statutory Class: B **Final Determination: B** Date: 2/18/2021
Model Result with P≥0.6: B **Reason for Determination: Model**
Date Last Calculated: 2/16/2021 Comments:

Model Probabilities

First Stage Model			
Class A	0.45	Class C	0.16
Class B	0.39	NA	0.00

C or Better Model	
Class A, B, or C	1.00
Non-Attainment	0.00

B or Better Model	
Class A or B	0.99
Class C or Non-Attainment	0.01

A Model	
Class A	0.14
Class B or C or Non-Attainment	0.86

Model Variables

01 Total Mean Abundance	99.33	18 Relative Abundance Ephemeroptera	0.47
02 Generic Richness	26.00	19 EPT Generic Richness	13.00
03 Plecoptera Mean Abundance	0.33	21 Sum of Abundances: *Dicrotendipes, Micropsectra, Parachironomus, Helobdella*	0.00
04 Ephemeroptera Mean Abundance	46.67		
05 Shannon-Wiener Generic Diversity	3.37	23 Relative Generic Richness- Plecoptera	0.04
06 Hilsenhoff Biotic Index	4.28	25 Sum of Abundances: *Cheumatopsyche, Cricotopus, Tanytarsus, Ablabesmyia*	9.33
07 Relative Abundance - Chironomidae	0.04		
08 Relative Generic Richness Diptera	0.27	26 Sum of Abundances: *Acroneuria, Maccaffertium, Stenonema*	24.33
09 *Hydropsyche* Abundance	24.67		
11 *Cheumatopsyche* Abundance	8.67	28 EP Generic Richness/14	0.50
12 EPT Generic Richness/ Diptera Generic Richness	1.86	30 Presence of Class A Indicator Taxa/7	0.00
13 Relative Abundance - Oligochaeta	0.00		
15 Perlidae Mean Abundance (Family Functional Group)	0.33		
16 Tanypodinae Mean Abundance (Family Functional Group)	0.00		
17 Chironomini Abundance (Family Functional Group)	2.33		

Five Most Dominant Taxa

Rank	Taxon Name	Percent
1	*Hydropsyche*	24.83
2	*Maccaffertium*	24.50
3	*Timpanoga*	11.07
4	*Cheumatopsyche*	8.72
5	*Attenella*	4.70
6	*Oecetis*	4.70

Report Printed: 2/18/2021 Contact: biome@maine.gov or (207)287-7688 Page 1

Maine Department of Environmental Protection
Biological Monitoring Program
Aquatic Life Classification Attainment Report

Station Number: S-1190 Town: Ellsworth Date Deployed: 8/27/2020
Log Number: 2860 Waterbody: Reeds Brook - Station 1190 Date Retrieved: 8/27/2020

Sample Collection and Processing Information

Sampling Organization: PCL

Taxonomist: PAUL LEEPER (MOODY MOUNTAIN ENVIRONMENTAL)

Waterbody Information - Deployment		Waterbody Information - Retrieval
Temperature:	20.1 deg C	
Dissolved Oxygen:	7.9 mg/l	
Dissolved Oxygen Saturation:		
Specific Conductance:		
Velocity:	9 cm/s	
pH:		
Wetted Width:	6.4 m	
Bankfull Width:		
Depth:	21 cm	

Water Chemistry

Summary of Habitat Characteristics

Landuse Name	Canopy Cover	Terrain	
Upland Hardwood	Dense	Hilly	
Potential Stressor	Location	Substrate	
Regulated Flows	Below Dam	Boulder	40 %
		Gravel	20 %
		Rubble/Cobble	40 %

Landcover Summary - 2004 Data

Sample Comments

DOWNSTREAM OF DAM, UPSTREAM OF HATCHERY DISCHARGE

Moody Mountain Environmental 137 Diamond Str Searsmont ME 04973 ph.207-592-8540 moodymtn@tidewater.net

Maine Department of Environmental Protection
Biological Monitoring Program
Aquatic Life Taxonomic Inventory Report

Station Number: S-1190 Waterbody: Reeds Brook - Station 1190 Town: Ellsworth
Log Number: 2860 Subsample Factor: X1 Replicates: 3 Calculated: 2/16/2021

Taxon	Maine Taxonomic Code	Count (Mean of Samplers) Actual	Count (Mean of Samplers) Adjusted	Hilsenhoff Biotic Index	Functional Feeding Group	Relative Abundance % Actual	Relative Abundance % Adjusted
Hyalella	09010203006	2.67	2.67	8	CG	2.7	2.7
Orconectes	09010301008		0.33		CG		0.3
Orconectes limosus	09010301008013	0.33			--	0.3	
Perlidae	09020209	0.33	0.33		--	0.3	0.3
Boyeria	09020301004	1.00	1.00	2	PR	1.0	1.0
Argia	09020309048	0.67	0.67	7	PR	0.7	0.7
Baetidae	09020401	2.33	2.33		--	2.3	2.3
Baetis	09020401001	0.33	0.33	4	CG	0.3	0.3
Maccaffertium	09020402015	24.33	24.33	4	SC	24.5	24.5
Paraleptophlebia	09020406026	4.00	4.00	1	CG	4.0	4.0
Attenella	09020410032	4.67	4.67	3	CG	4.7	4.7
Timpanoga	09020410038	11.00	11.00		CG	11.1	11.1
Chimarra	09020601003	2.00	2.00	2	CF	2.0	2.0
Polycentropodidae	09020603	1.67	1.67		--	1.7	1.7
Cheumatopsyche	09020604015	8.67	8.67	5	CF	8.7	8.7
Hydropsyche	09020604016	24.67	24.67	4	CF	24.8	24.8
Oxyethira	09020607028	0.33	0.33	3	P	0.3	0.3
Oecetis	09020618078	4.67	4.67	8	PR	4.7	4.7
Nigronia	09020701003	0.33	0.33	0	PR	0.3	0.3
Cricotopus	09021011037	0.67	0.67	7	SH	0.7	0.7
Nanocladius	09021011049	0.33	0.33	3	CG	0.3	0.3
Rheotanytarsus	09021011072	1.00	1.00	6	CF	1.0	1.0
Microtendipes	09021011094	1.33	1.33	6	CF	1.3	1.3
Polypedilum	09021011102	0.33	0.33	6	SH	0.3	0.3
Stenochironomus	09021011105	0.67	0.67	5	CG	0.7	0.7
Simulium	09021012047	0.33	0.33	4	CF	0.3	0.3
Hydrobiidae	10010104	0.67	0.67		--	0.7	0.7

Report Printed: 2/18/2021 Contact: biome@maine.gov or (207)287-7688 Page 3

Moody Mountain Environmental 137 Diamond Str Searsmont ME 04973 ph.207-592-8540 moodymtn@tidewater.net

Document Content(s)

United States Department of the Interior

U.S. FISH AND WILDLIFE SERVICE
Maine-New Hampshire Fish and Wildlife Service Complex
Ecological Services
Maine Field Office
P.O. Box A
306 Hatchery Road
East Orland, Maine 04431
207/469-7300 Fax: 207/902-1588

April 8, 2021

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

Re: Green Lake Water Power Company
Green Lake Hydroelectric Project, FERC No. 7189
COMMENTS ON INITIAL STUDY REPORT

Dear Secretary Bose:

This is the U.S. Fish and Wildlife Service's (Service) response to the Initial Study Report (ISR) submitted by Green Lake Hydropower Company (GLHC; Applicant) on February 11, 2021, as part of the relicensing of the Green Lake Hydroelectric Project (Project), located on Green Lake and Reeds Brook in Hancock County, Maine. The Applicant held a meeting to discuss the ISR on February 24, 2021 and filed a meeting summary on March 11, 2021. The Service has reviewed the ISR and the meeting summary and offers the following comments.

COMMENTS

Upstream American Eel Passage Assessment

During the ISR meeting, the Applicant provided a summary of the *Eel Passage Survey*. The Service requested clarification on the type of lights used for eel surveys. The Applicant clarified that standard flashlights were used to detect eels in the tailrace of the Project. Although the coloration of the light source was not defined in the Service's study requests, a standard flashlight could be abrasive to juvenile eels migrating at night, causing them to seek shelter and possibly disrupting their upstream migration. American eels have been documented avoiding strobing blue,

white, and yellow lights.[1,2] However, red light does not appear to elicit deterrence behavior in American eels.[2]

Mr. Dale Jellison (Green Lake Association) asked for confirmation that the results of the survey do not indicate that eels are absent upstream of the Project. GLHC confirmed that eels are upstream of the Project. Given that American eels are known to exist both upstream and downstream of the Project, the Service does not request an additional year of the *Eel Passage Survey*, however, the Service notes that designated upstream eel passage at the Project will be needed after eel passage is implemented at the downstream developments as per the Service's eelway prescriptions for the Ellsworth Hydroelectric Project (FERC No. 2727).[3]

Downstream Eel Passage

During the ISR meeting, the Service asked if there was evidence of eels passing through the penstock. While the initial study meeting summary states, "We do experience things that we suspect may be eels through the penstock at times. While shut down, believe eels tried to pass where water was flowing through penstock leaks or taps" this omits the Licensee's statement that it was necessary to remove deceased outmigrating eels from the Project at times, which required shutting down production. Given that there is evidence of American eels upstream of the Green Lake Hydropower Project, downstream passage protection measures will be needed in the future to improve American eel survival.

Thank you for this opportunity to comment. If you have any questions regarding this letter, please contact Corbin Hilling of this office at corbin_hilling@fws.gov.

Sincerely,

PETER LAMOTHE
Digitally signed by PETER LAMOTHE
Date: 2021.04.07 12:32:28 -04'00'

Peter Lamothe
Program Manager
Maine-New Hampshire FWS Complex

[1] Elvidge et al. 2018. Behavioral guidance of yellow-stage American eel *Anguilla rostrata* with a light-emitting diode device. *Endangered Species Research* 35:159–168.
[2] Patrick et al. 1982. Effectiveness of strobe light eel exclusion scheme. *Hydrobiologia* 94:269–277.
[3] Accession No. 20180410-5059

cc: FERC, Secretary (e-filed)
GLWP, Bert Kleinschmidt, Caroline Kleinschmidt (via email)
Kleinschmidt Associates, Kayla Hopkins (via email)
USFWS, Oliver Cox, Julianne Rosset
NMFS, Dan Tierney
MDEP, Kathy Howatt, Christopher Sferra
MDMR, Casey Clark
MDIFW, John Perry

RO/Engineering, Bryan Sojkowski (via email)
Reading File

ES: CHilling:4-8-21: (207) 401-0995

Document Content(s)

Document Accession #: 20210409-5353 Filed Date: 04/09/2021

JANET T. MILLS
GOVERNOR

STATE OF MAINE
DEPARTMENT OF
INLAND FISHERIES & WILDLIFE
284 STATE STREET
41 STATE HOUSE STATION
AUGUSTA ME 04333-0041

JUDITH CAMUSO
COMMISSIONER

VIA ELECTRONIC FILING

April 9, 2021

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Subject: **Green Lake Dam Project (FERC No. 7189)**
COMMENTS ON INITIAL STUDY REPORT

Dear Secretary Bose:

The Maine Department of Inland Fisheries and Wildlife (MDIFW) has reviewed Green Lake Water Power Company's Initial Study Report for the Green Lake Hydroelectric Project (FERC No. 7189). The Project is located on Green Lake and Reeds Brook in the City of Ellsworth, Hancock County, Maine. The Licensee held a meeting to discuss the ISR on February 24, 2021 and subsequently filed a meeting summary on March 11, 2021. We offer the following comments on the ISR:

2.1.3 Impoundment Temperature Study 1-3 (Arctic Char)

Based on the temperature results of the possible spawning sites for Arctic Char, at this time our Agency has no further comments or concerns with the Project's operations as they pertain to Arctic char. That said, we want to reiterate our concerns that currently there are no upstream fish passage provisions at the Green Lake Dam, and our Agency would be very concerned with the spread of invasive species into Green Lake should upstream passage, without a trapping and sorting facility operated by the Licensee, be considered in the future.

Common Loons

Maine is home to 75% of the territorial pairs of loons in New England and New York, making it the stronghold for the northeast breeding population. Thus, despite the common loon's relatively stable and secure population within the State, Maine holds a high responsibility in the Northeastern United States for the species' continued conservation.

Water level changes as little as 0.5 vertical feet up or 1 vertical foot down occurring within a 28-day period can significantly impact the success of non-floating loon nests (Fair et al. 1999). Due to their physical inability to walk about on land, common loons build their nests directly adjacent to the water's edge; however, the placement of nests immediate to the shore makes them extremely susceptible to fluctuations in water level. Nests may be inundated by increasing water levels or stranded by decreasing water levels; both situations enhance predation and affect

hatching rates (Fair 1979). Water level management was shown to cause 60-70% of nest failure for loons on three lakes in Voyageur's National Park in Minnesota (Reiser 1988). Loons whose territories are characterized by fluctuating water levels may not hatch a sufficient number of young to sustain populations, resulting in an ecological trap (DeSorbo et al. 2007).

The report provides a fair amount of general info on annual loon numbers and nests counts, although the nest counts have not been systematic and thorough. Productivity at Green Lake appears low, but without systematic survey efforts consisting of several survey events over multiple years to determine actual numbers of territorial pairs, territories, egg production, chick fledge surveys, and a determination of causes of annual loon nest failures, it is unknown at this time what the actual annual average productivity of common loons at Green Lake is.

Regardless, it has been well established that breeding loons cannot tolerate water level fluctuations of more than 6 inches rise or 12 inches of drop during the loon nesting season. Current Project operations limit fluctuation of reservoir surface elevations to no more than one foot from June 1 through Labor Day weekend; however, many years of research at lakes in Maine have shown that a water level increase 6 inches can negatively impact common loon nesting success. Therefore, we recommend Project operations under the new license be maintained with no more than 0.5 vertical feet up or 1 vertical foot down occurring within a 28-day period during the loon nesting season (May 15 – July 31).

If you have any specific questions, please feel free to contact me directly by phone at 207-287-5254 or by email at john.perry@maine.gov.

Best regards,

John Perry
Environmental Review Coordinator

Cc: Greg Burr, Steve Dunham--MDIFW Region C
Francis Brautigam, Joe Overlock, Ryan Robicheau--MDIFW Augusta Headquarters
Danielle D'Auria—MDIFW Bangor Headquarters
Casey Clark--MDMR
Kathy Howatt, Christopher Sferra--MDEP
Julianne Rosset, Corbin Hilling--USFWS
Dan Tierney--NMFS

Document Accession #: 20210409-5353 Filed Date: 04/09/2021

Document Content(s)

Document Accession #: 20210412-5769 Filed Date: 04/12/2021

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JANET T. MILLS
GOVERNOR

MELANIE LOYZIM
COMMISSIONER

April 12, 2021

Kimberly D. Bose
Federal Energy
888 1st Street N.E.
Washington, D.C. 20426

RE: Comments on the Initial Study Report for the Green Lake Hydroelectric Project (FERC No. 7189)

Dear Bert and Caroline Kleinschmidt:

The Maine Department of Environmental Protection (Department or MDEP) received and reviewed the Initial Study Report filed with FERC on February 11, 2021, and the supplemental information filed with FERC on March 17, 2021, prepared with assistance from Kleinschmidt Associates on behalf of the Green Lake Water Power Company (Applicant), for the Green Lake Hydropower Project (GLHP, Project) (FERC No. 7189). Department staff attended the Initial Study Report meeting on February 24, 2020 and reviewed appropriate Project documents to prepare the following comments and recommendations.

As identified in Department comments to the Revised Study Plan (RSP) for the Project, the proposed relicensing of the GLHP is subject to water quality certification provisions under Section 401 of the Federal Water Pollution Control Act (a.k.a. Clean Water Act). By Executive Order of the Governor of the State of Maine, the Department is the certifying agency for Projects located wholly or partially in organized towns and cities and, as such, has jurisdiction over the Project.

Comments on the Initial Study Report

The Department appreciates the effort of the Applicant to prepare the Initial Study Report (ISR). Data presented in the ISR must be designed to evaluate the impact of project operations with respect to all of Maine's water quality standards, including designated uses and both narrative and numeric criteria. After review of the available documents, the Department has the following comments on the ISR:

Comments on Study Requests and Proposed Studies

MDEP has reviewed the results of the Impoundment Trophic State Study and the Impoundment Aquatic Habitat Study and found the methods used to conduct these studies and the results presented in the ISR to be acceptable.

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1235 CENTRAL DRIVE, SKYWAY PARK
PRESQUE ISLE, MAINE 04769
(207) 764-0477 FAX: (207) 760-3143

website: www.maine.gov/dep

Downstream Benthic Macroinvertebrate (BMI) Study
The purpose of this study is to demonstrate whether current in-stream flow releases affect attainment of aquatic life and habitat criteria in the waters downstream of the Green Lake Dam. The BMI study will evaluate the current macroinvertebrate community structure and assess any impacts caused by project operations on waters downstream of the Project. In MDEP's RSP comments filed on February 28, 2019, the Department agreed with the Applicant's proposed methodologies for the BMI study and with the three sampling locations proposed; the first in the Reeds Brook bypass reach (site 1), the second in the powerhouse tailrace (site 2) and the third at the confluence of the tailrace and the Reeds Brook bypass reach (site 3).

The supplementary report submitted to FERC on on March 17, 2021, indicated that at Site 2, rock bags deployed were washed out, had been disturbed from where they were deployed, and were in lentic habitat when recovered. The applicant does not indicate the number of samplers per site that were disturbed or washed out. There are several things that are unclear in the Applicants report concerning site 3: (1) it is unclear if there were washout issues; (2) it is unclear if the macroinvertebrate samples from site 3 were collected or discarded. It is stated by the Applicant in their report that both site 2 and 3 were impacted by water levels of Graham Lake, were in lentic habitat when recovered and it was decided not to analyze these BMI samples further.

The Applicant selected these sites through consultation with MDEP while preparing the RSP. Through that consultation, the Department emphasized and Green Lake Water Power Company agreed, that rock bags need to be deployed and data collected and reported from these three locations. MDEP is aware that site 2 and site 3 can be backwatered by Graham Lake and this was previously discussed with the Applicant. In the RSP, the Applicant proposed to consult with Black Bear Hydro, LLC when practical and necessary concerning the level of Graham Lake to ensure that valid data could be collected for studies downstream of the Green Lake Dam. MDEP agreed with and acknowledged this proposal in the RSP comments. The Department requests additional details concerning the sampler issues and environmental conditions at sites 2 and 3, including site photos during sampler placement and retrieval.

MDEP can only make a determination on whether BMI samples influenced by the GLHP project meet water quality standards if BMI data is collected and compiled from the three specified locations in the bypass (Site 1), the tailrace of the powerhouse (Site 2) and the confluence of the two (Site 3). Since BMI samples from at least one of the three stations were compromised during the 2020 sampling, the Applicant must conduct the BMI study again in 2021. The *Methods for Biological Sampling and Analysis of Maine's Rivers and Streams* (April 2014) requires that all BMI data must be collected at once under the same conditions. Rock bags will need to be redeployed at all three stations in 2021 and data must be reported from all stations. Given the Applicants concerns about the backwatering of Graham Lake, during re-sampling, the Department requests additional details to be included in the Applicant's report concerning sampler placement and environmental conditions at sites 2 and 3. Details reported should include site photos, a description of flow and a report on the lake level of Graham Lake during sampler placement and retrieval. MDEP supports the Applicant's proposal in the RSP to consult

with Black Bear Hydro, LLC when practical and necessary concerning the level of Graham Lake to ensure that valid data can be collected.

Downstream Temperature and Dissolved Oxygen Study
Temperature and dissolved oxygen (DO) must be monitored downstream of the Green Lake Dam to demonstrate whether the Project meets Maine's DO numeric criteria. In the ISR meeting held on February 24, 2021, the Applicant incorrectly stated that it did not meet the requirements for DO for five **consecutive** days. MDEP's *Sampling Protocol for Hydropower Studies* (September 2019) states that the calculation (product of flow and water temp >1500) is to ensure that the data collected by hand meets low flow/high temp window when the system is most stressed and DO is predicted to be lowest. The Applicant must meet these criteria a **total** of 5 days, but those days do not need to be consecutive. Here MDEP clarifies this requirement and acknowledges that the Applicant does meet the downstream DO standards.

Downstream Aquatic Habitat Cross-Sectional Flow Study
Assessment of aquatic habitat downstream of the Green Lake Dam is required to determine whether current in-stream flow releases meet Maine habitat and aquatic life criteria. An aquatic habitat cross-sectional flow study will inform whether downstream flows in the bypass reach and in the tailrace provide sufficient riverine habitat for fish and other aquatic organisms. This study requires measuring width and depth at various flows to determine the flow at which at least 75% of the bank full cross-sectional area of the river or stream is continuously watered.

The tables presented in the ISR (Table 2-7, 2-9, 2-11 and 2-13) show the results of the study including stream measurements at four different transects at four different flows. These tables show measurement columns for "Width - ft" and "Flow Width – ft". In the ISR meeting held on February 24, 2021, the Applicant stated that neither of these calculated widths are a measurement of bank full width and this measurement is not reported in the ISR. Further, the ISR does not distinguish between the reported measurements and it is unclear how they differ from one another and how they were calculated.

MDEP requires bank full width measurements to be reported for each of the four transect and at each flow. The applicant should file future documentation with modified tables which report measured bank full width at each transect and additionally clarifies and defines the measurements of "Width – ft" and "Flow Width – ft".

Thank you for the opportunity to comment on the ISR for the GLHP. Please feel free to contact me at (207) 446-1619 or via email at Christopher.Sferra@maine.gov if you have any questions regarding these comments.

Sincerely,

Christopher O. Sferra
Hydropower Program, Project Manager
Maine Department of Environmental Protection

Cc: Bert and Caroline Kleinschmidt (email)

Document Content(s)

Document Accession #: 20210416-5114 Filed Date: 04/16/2021

STATE OF MAINE
DEPARTMENT OF MARINE RESOURCES
21 STATE HOUSE STATION
AUGUSTA, MAINE
04333-0021

JANET T. MILLS
GOVERNOR

PATRICK C. KELIHER
COMMISSIONER

April 12th, 2021

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

RE: Initial Study Report for the Green Lake Hydroelectric Project (Project NO. 7189)

Dear Secretary Bose:

On February 10, 2021, Green Lake Water Power Company (GLWP) filed the *Initial Study* Report for the Green Lake Hydropower Project (Project No. 7189) on Green Lake and Reeds Brook in Hancock County, Maine. Maine Department of Marine Resources (MDMR) has reviewed the draft study report and attended the ISR meeting on February 24, 2021. We submit the following comments on the studies.

Eel Passage Survey
The eel surveys conducted by GLWP were in accordance with the proposed study plan, but the use of a white light is not up to the standards of modern eel surveys. We are not requesting that GLWP repeat the study at this time, but any further eel surveys should be conducted with a red light to accurately detect low densities of eels.

While the eel survey did not document eels below the Project, MDMR does not take this finding to mean there are no eels below the Project. American eels have been documented above the Project in Green Lake. The presence of eels on the upstream side of the Project was confirmed by Bert Kleinschmidt (GLWP) during the ISR meeting on February 24, 2021 (Accession No. 20210311-5107). It is MDMR's understanding that eels migrating upstream in Reeds Brook and into Green Lake are at low densities presently. The abundance of eels will increase in the watershed following the installation of upstream eel passage at the Ellsworth and Graham Lake dams (collectively No. 2727). Upstream eel passage should be operational at Ellsworth and Graham Lake dams two years after the issuance of the new FERC license, which is expected during 2021.

Regarding Mr. Kleinschmidt's comments about eels potentially getting into piping or machinery at the Project. There is no question that eels that get into piping or machinery at the Project are impacted by the project. MDMR requests GLWP expand on the description of this issue so we can fully understand the causes. MDMR would be happy to discuss the issue with GLWP and work to develop solutions as soon as practical in 2021.

If you have any questions regarding this information, please contact Casey Clark at casey.clark@maine.gov.

Sincerely,

Patrick Keliher
Commissioner
Maine Department of Marine Resources

Document Content(s)

Green Lake Water Power Co.
120 Hatchery Way, Ellsworth, ME 04605-3501

May 7, 2021

VIA E-FILING
Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N. E.
Washington, DC 20426

RE: Green Lake Hydroelectric Project (FERC No. 7189)
Response to Comments on the ISR Meeting Summary and Supplemental Reports.

Dear Secretary Bose:

Green Lake Water Power Company (GLWP), submits the following responses to comments on the Initial Study Report (ISR) Meeting Summary and Supplemental Report for the relicensing of the Green Lake Hydroelectric Project.

On February 9, 2021 GLWP submitted the Initial Study Report (ISR) for the relicensing of the Green Lake Hydroelectric Project (Project). Due to formatting issues and some missing data, the ISR was resubmitted on February 11, 2021. GLWP then held a video/phone meeting with relicensing participants and Commission staff on February 24, 2021 (i.e., within 15 days following the filing of the ISR in accordance with 18 CFR § 5.15(c) and the project Process Plan and Schedule) to discuss results/status for all studies contained in the ISR and modifications to the study plans, if necessary. A summary of that meeting, with supplemental data, was filed on March 11, 2021. Additionally, on March 17, 2021, GLWP filed a supplemental report on the Benthic Macroinvertebrate study, after the results came back from the MDEP model.

Comments Concerning the ISR Meeting Summary and Supplemental Reports

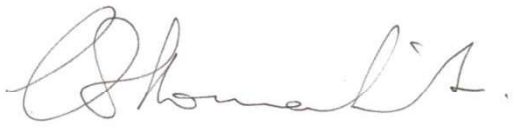
In accordance with 18 CFR 5.15(c)(4) participants in the relicensing were to file any disagreements concerning GLWP's Meeting Summary by April 11, 2021. Any such filing must also include any requested modifications to ongoing studies or requests for new studies.

US Fish and Wildlife Service (USFWS), Maine Department of Environmental Protection (MDEP), Maine Department of Marine Resources (MDMR), and Maine Department of Inland Fisheries and Wildlife (MDIFW) submitted written comments. These entities did not express any substantive disagreements with the ISR Meeting Summary. Some of the comments are regarding eventual licensing requirements; these are not being addressed here.

USFWS, MDMR and MDIFW did not propose any modifications to ongoing studies, or new studies.

MDEP requested clarification on the Downstream Aquatic Habitat study and requested additional study activity on the Downstream Macro Invertebrate study. These concerns are addressed in the attachments to this document.

If you have any questions regarding this report, please contact me by email at caroline@greenlakewaterpower.com or by phone at (425) 553-6718



Sincerely,
Caroline Kleinschmidt
Relicensing Coordinator
Green Lake Water Power Co.

cc: Distribution List

Enclosures:
Attachment A – 20210507-GLWP-MDEP-ISR-Response-Aquatic-Habitat.pdf and
Attachment B – 20210507-GLWP-MDEP-ISR-Response-Downstream-BMI.pdf

Downstream Aquatic Habitat

GLWP Reply to MDEP's *Comments on the Initial Study Report for the Green Lake Hydroelectric Project (FERC No. 7189)* of 12-Apr-2021, Downstream Aquatic Habitat Study

GLWP, 07-May-2021

In MDEP's response, under ***Downstream Aquatic Habitat Cross-Sectional Flow Study,*** MDEP writes:

"The tables presented in the ISR (Table 2-7, 2-9, 2-11 and 2-13) show the results of the study including stream measurements at four different transects at four different flows. These tables show measurement columns for 'Width – ft' and 'Flow Width – ft'. In the ISR meeting held on February 24, 2021, the Applicant stated that neither of these calculated widths are a measurement of bank full width and this measurement is not reported in the ISR. Further, the ISR does not distinguish between the reported measurements and it is unclear how they differ from one another and how they were calculated.

"MDEP requires bank full width measurements to be reported for each of the four transect and at each flow. The applicant should file future documentation with modified tables which report measured bank full width at each transect and additionally clarifies and defines the measurements of 'Width – ft' and 'Flow Width – ft'."

GLWP provided this information in *Appendix A: Study 2 – Supplement for Minimum Flow Proposal* of its ISR Meeting Summary, filed with the FERC on 11-Mar-2021. The data for Flow 4 was inadvertently left off of the table for Transect 4 in that document. The corrected table, with the Flow 4 data included, is the following:

Transect 4:

Bank-full bank to bank width: 16.54 ft

	Bank to Bank Width - ft	Flow - cfs	Average Depth - ft	Channel Depth - ft	Average Speed - ft/s	Percent Bank-full Width
Flow 1	15.12	5.82	1.39	2.56	0.28	91.39%
Flow 2	15.52	8.85	1.45	2.82	0.39	93.84%
Flow 3	15.74	14.28	1.54	3.06	0.59	95.15%
Flow 4	16.28	33.02	1.78	3.3	1.14	98.43%

Downstream Benthic Macroinvertebrates

GLWP Reply to MDEP's *Comments on the Initial Study Report for the Green Lake Hydroelectric Project (FERC No. 7189)* of 12-Apr-2021 –Downstream Benthic Macroinvertebrate (BMI) Study

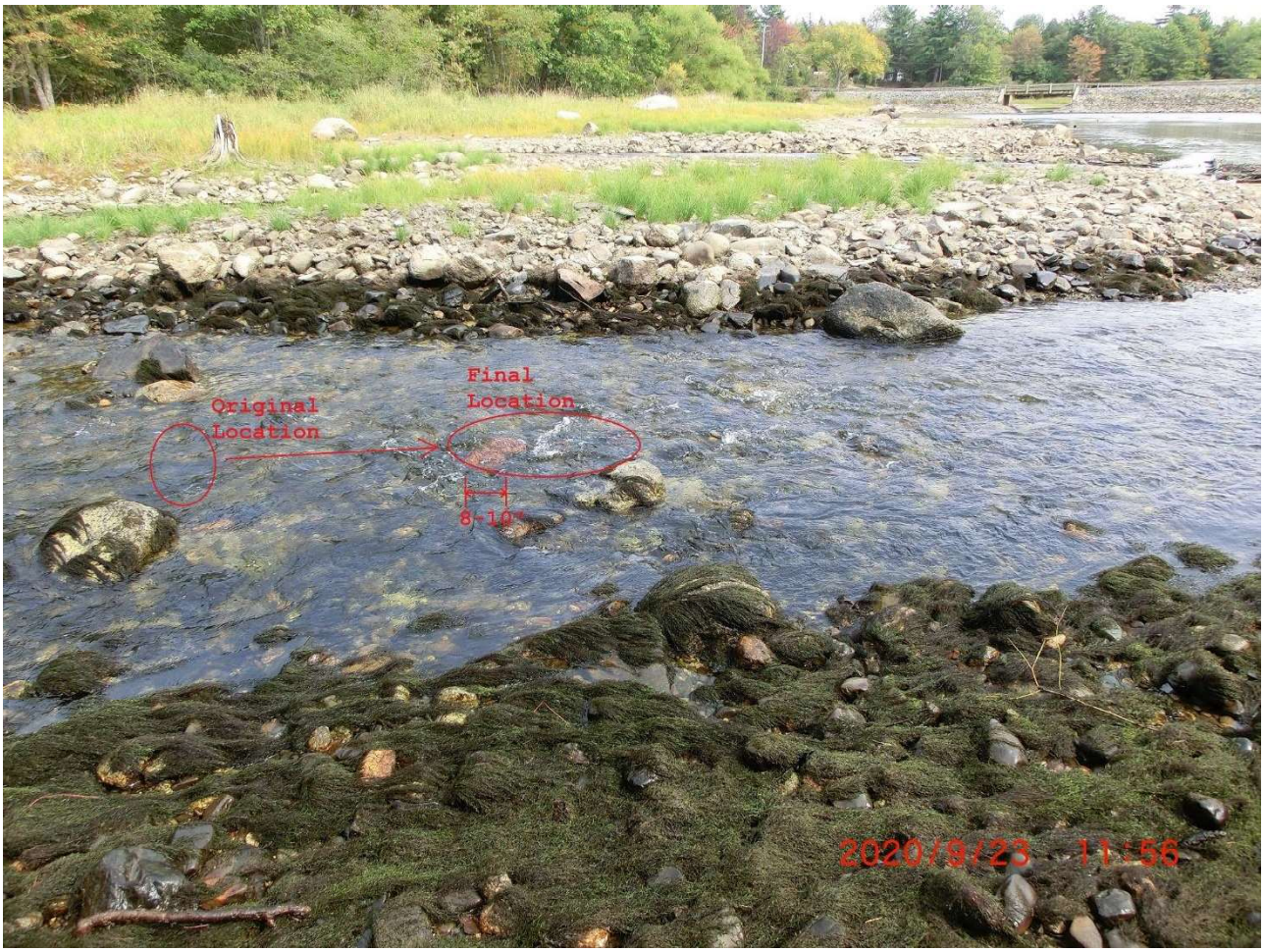
GLWP, 07-May-2021

In MDEP's response, under ***Downstream Benthic Macroinvertebrate (BMI) Study,*** MDEP requests more information on the BMI sites and conditions. This document provides that information, as well as additional information that is useful to understand the BMI study.

At Site 2, all three rock bags, which were tied together, were displaced downstream from their original position by tailrace flow. The displacement was on the order of 6-8 feet.

Site 2 baskets in original position.

Downstream Benthic Macroinvertebrates

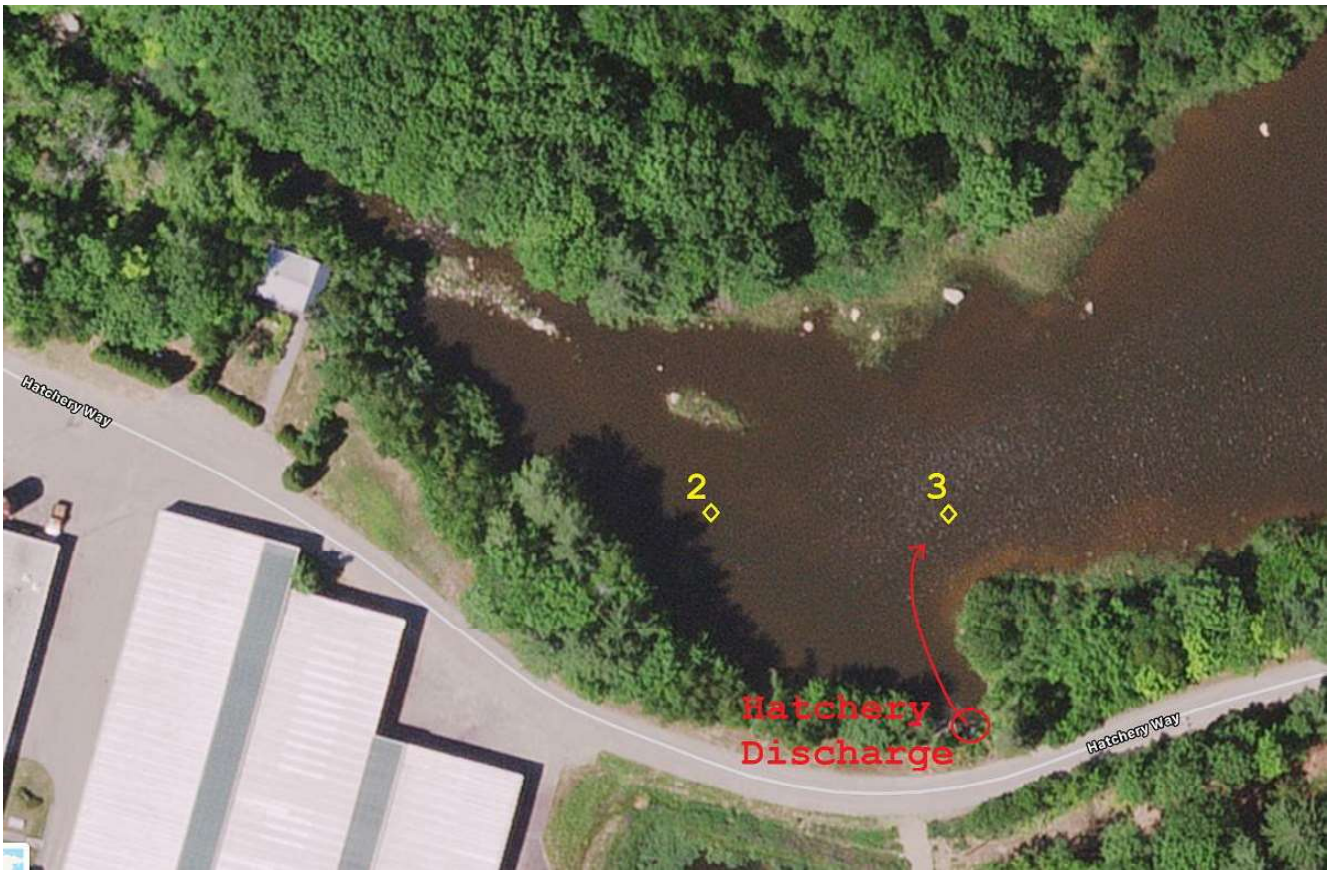


Site 2 baskets displacement.

The sites were selected in consultation with MDEP. A virtual consultation meeting was held with MDEP on 15-Jun-2020. At this meeting it was agreed that BMI sampling at one site, the confluence of Reeds Brook and the Project tailwater, could be sufficient to meet water quality determination requirements. MDEP's *Methods for Biological Sampling and Analysis in Maine's Rivers and Streams* (April 2014) states in Section I-4: "While it is useful to obtain both an upstream and downstream sample to evaluate the effect of a pollution source, classification attainment evaluation does not require data from a matched reference site in order to arrive at a determination of aquatic life class."

All the baskets from all three sites were collected and preserved. Preliminary inspection of the baskets from Site 2 and Site 3, and a comparison with the baskets from Site 1, showed that Sites 2 and 3 had been heavily influenced by Graham Lake water. Additionally, the Green Lake National Fish Hatchery (GLNFH) treatment plant discharge is near both sites. See images below.

Downstream Benthic Macroinvertebrates



BMI Sites 2 and 3, and GLNFH discharge.

MDEP's suggestion that GLWP consulting with Black Bear Hydro, LLC would ensure that valid data was collected is a bit disingenuous. The BMI baskets were placed on 27-Aug-2020 with Graham Lake at a level of 97.57 ft USGS, and retrieved on 24-Sep-2020 with Graham Lake at a level of 95.98 ft USGS. The following pictures were taken on 25-Aug-2020 with Graham Lake at a level of 97.74 ft USGS. They show the conditions 2 days before the baskets were deployed, with the Graham Lake level 0.17 ft (2 inches) above the 27-Aug-2020 level.

Downstream Benthic Macroinvertebrates

BMI Site 2 from downstream 2 days before basket deployment.

Downstream Benthic Macroinvertebrates

BMI Site 2 from upstream, 2 days before basket deployment.

Downstream Benthic Macroinvertebrates

Area of BMI Site 2 from GLNFH discharge.

Clearly Graham Lake water levels affected Site 2 until days before BMI basket deployment. This causes several problems for BMI sampling:

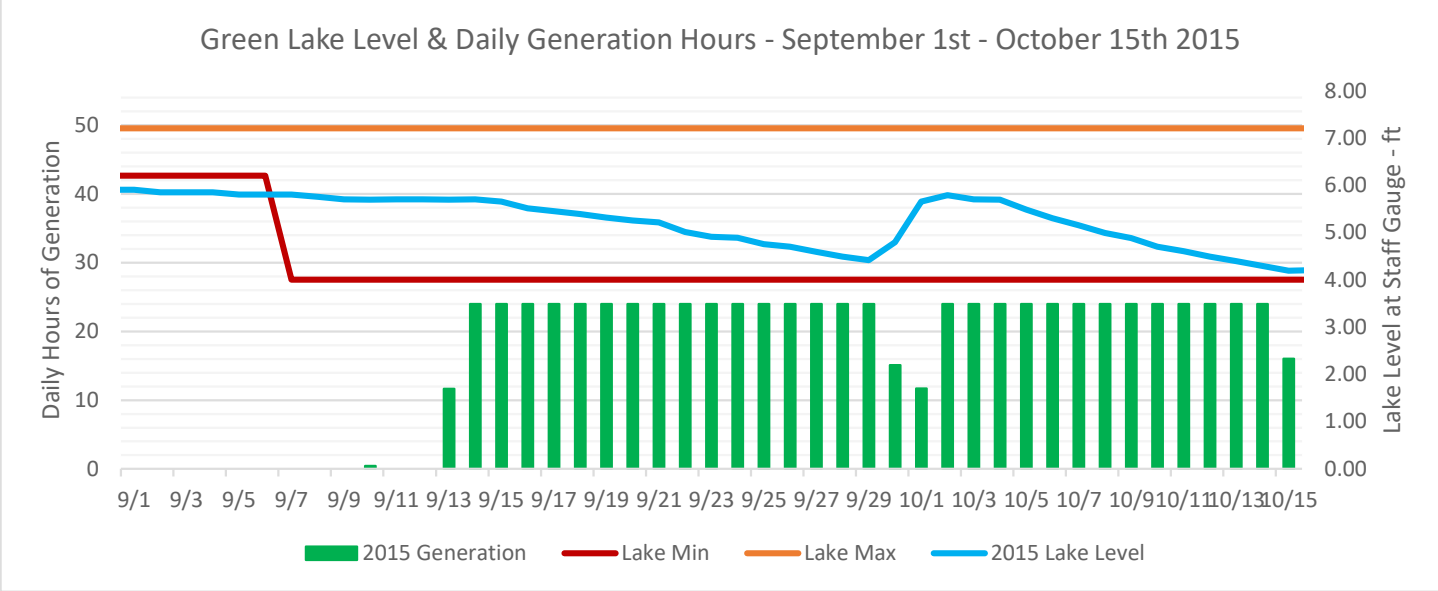
1) MDEP's linear discriminant model (LDM) is based on steady state brook habitats, not lake habitats or habitats transitioning between lake and brook.
2) The brook habitat colonization measured by BMI sampling depends on organisms that are transported downstream by flowing water. Therefore, the habitat upstream and surrounding the sample site is actually being measured, not just the short term conditions in the rock sample.
3) The habitat history of all areas below the Project Power station are heavily influenced by Graham Lake during the summer.

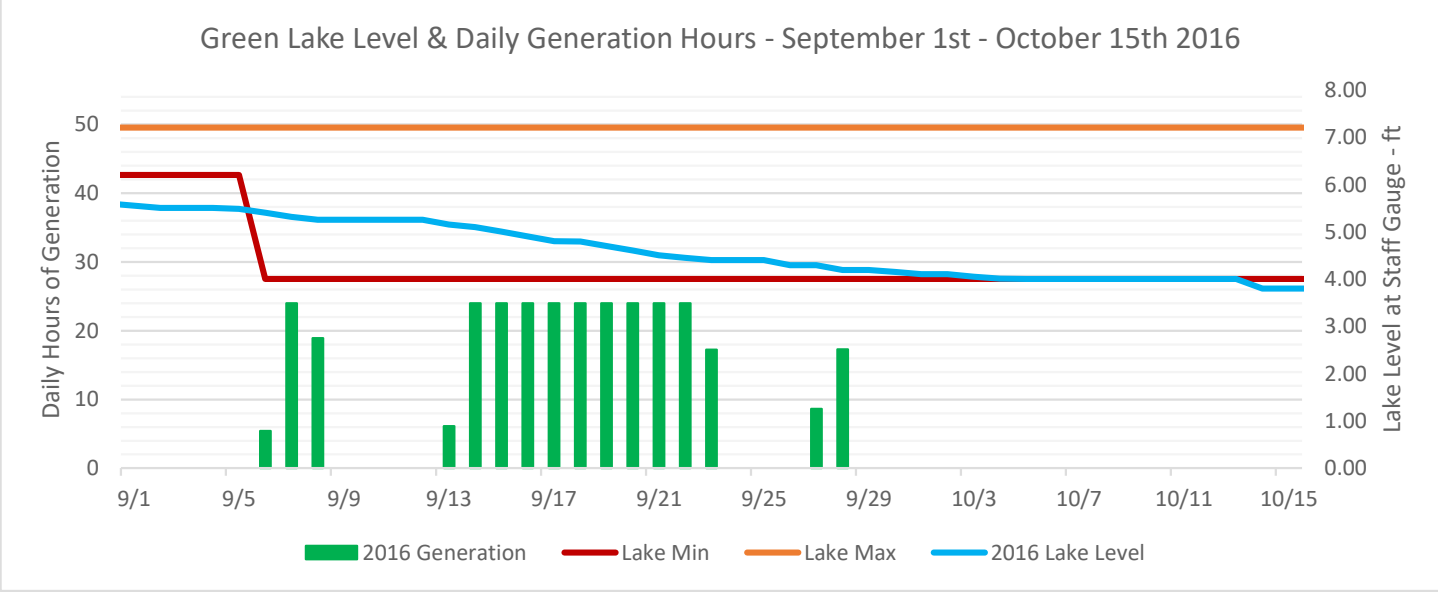
Site 3 is directly affected by Graham Lake at all but the lowest levels (much lower than we saw during the BMI study). Site 3 is always affected by GLNFH discharge flows, as shown in the images above.

Downstream Benthic Macroinvertebrates

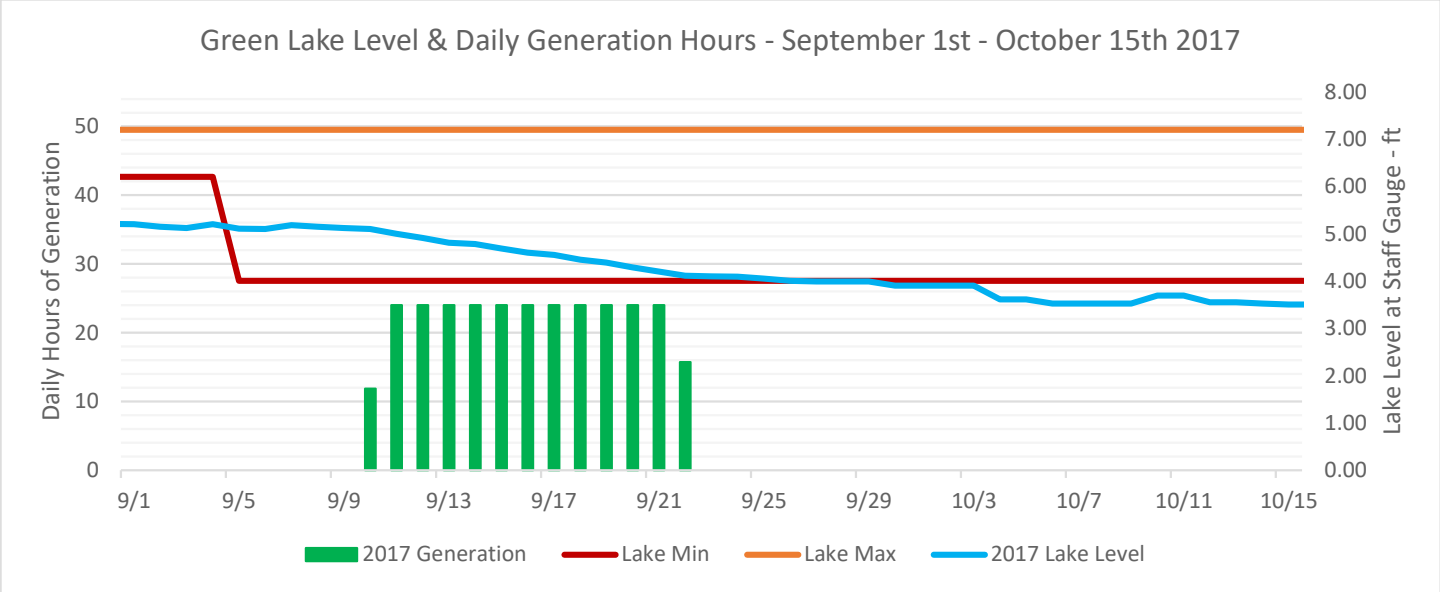
Lake Levels and Generation:

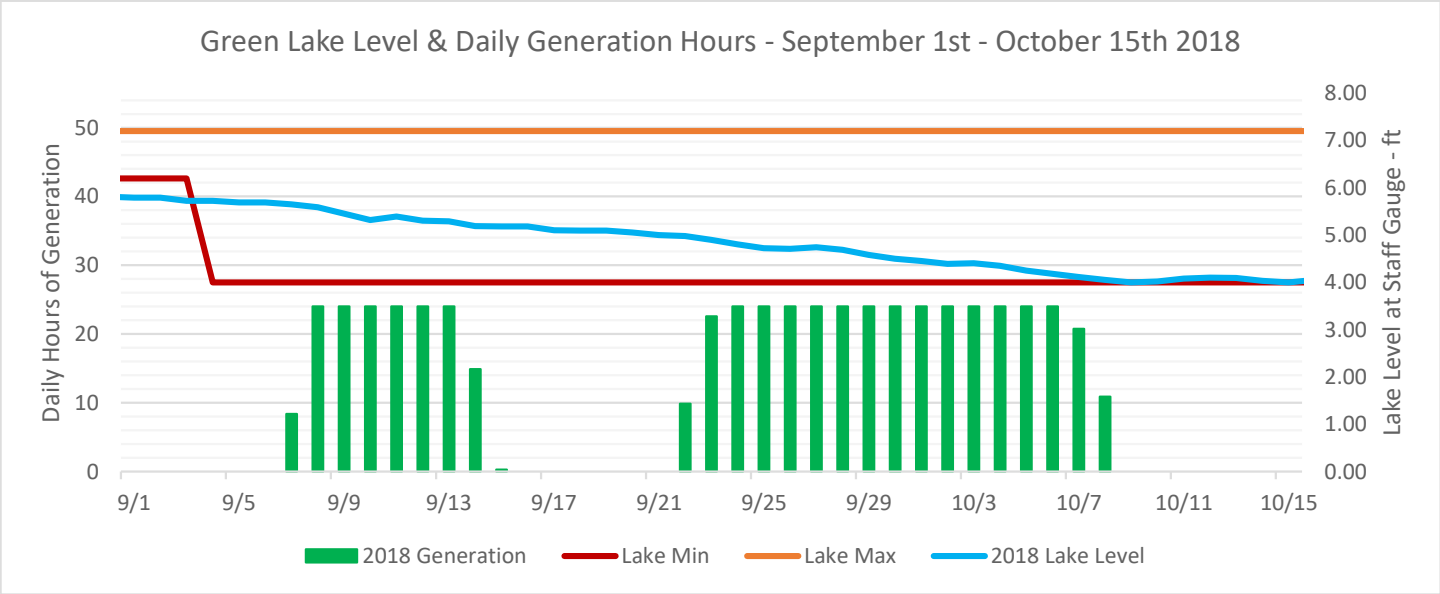
These are the individual year graphs for Green Lake level and daily generation hours:



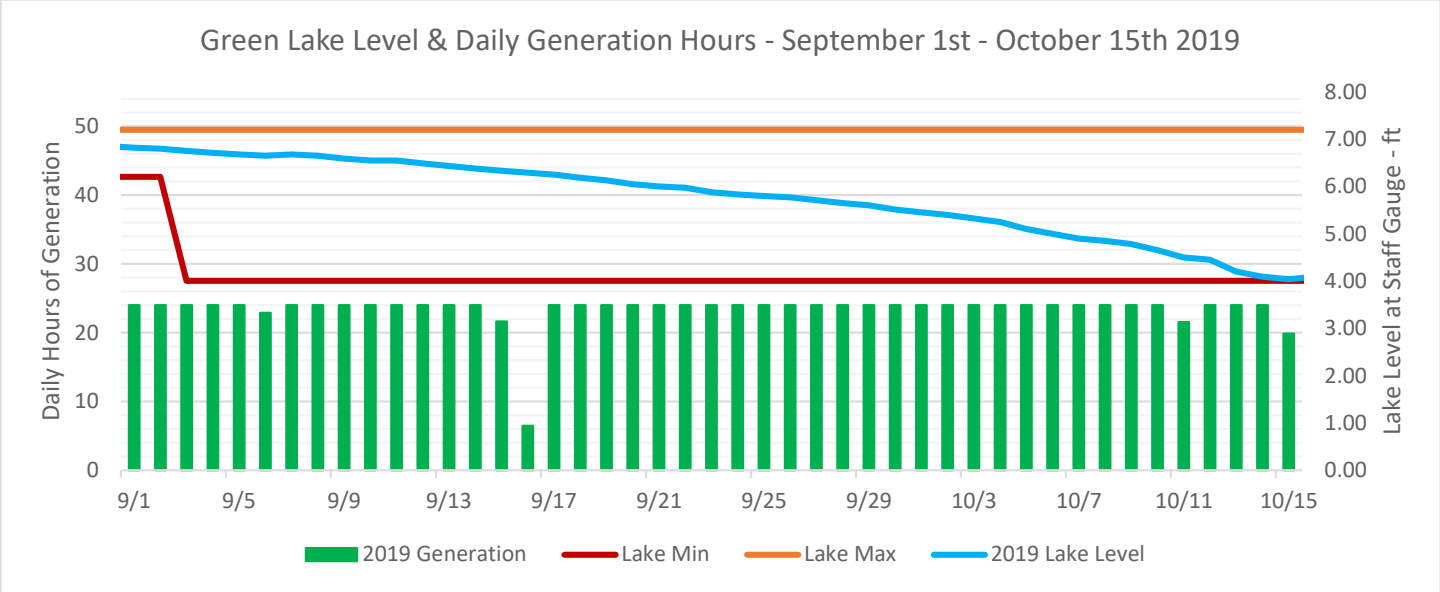


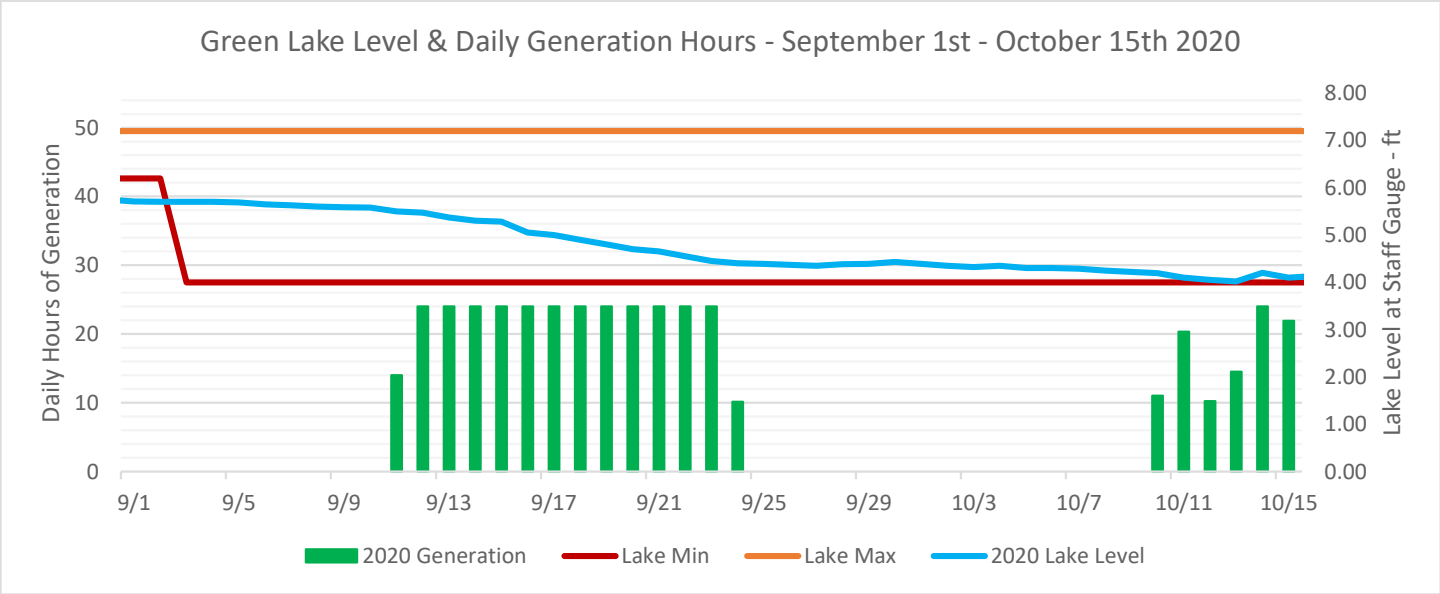
Downstream Benthic Macroinvertebrates





Downstream Benthic Macroinvertebrates

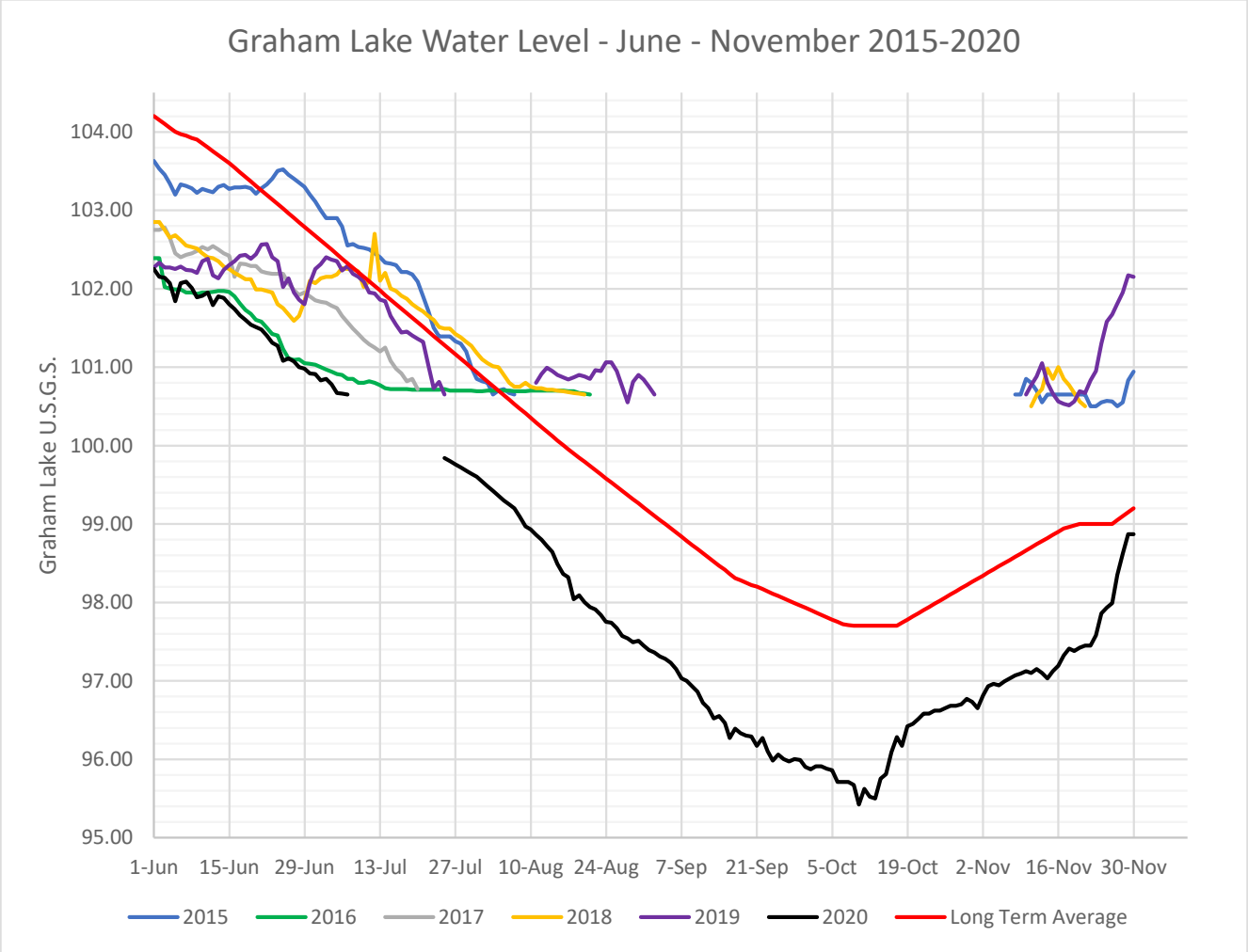




GLWP records the tailwater level daily. Until Aug-2020 this data was recorded using a gauge underneath the GLWP Power Station. This gauge provides GLWP with a reading of Graham Lake levels of 100.65 ft USGS and above. After 16-Aug-2020 the data recorded by GLWP is from the Graham Lake page on the Brookfield website.

The following graph shows the available Graham Lake levels for the past five years, as recorded by GLWP, with the Long Term Average data (provided to GLWP by MDEP on 15-Jun-2020).

Downstream Benthic Macroinvertebrates



The blank areas of the above graph reflect the periods before 16-Aug-2020 when the Graham Lake level was too low to register on the GLWP gauge.

From the above graph it can be seen that the Graham Lake level during the 2020 BMI study was significantly below the long term average level for that time of year. Since, even at this lower than normal level, Graham Lake caused problems for BMI Sites 2 and 3, it is very unlikely that levels would be any better in 2021.

GLWP believes all potential sites below the power station are heavily influenced by both Graham Lake and the GLNFH discharge. Again, it is highly unlikely that results would be any different redoing the BMI study.

The cost to analyze the Site 2 and Site 3 BMI basket results from 2020 and to submit them to MDEP would be about $1500. This work would take about one month plus MDEP LDM turn-around time.

The cost to redo the complete BMI study is estimated at about $10,000.

GLWP does not believe that either of these is warranted. This is because the available sites do not meet MDEP's own pre-requisites for their LDM.

Green Lake Project 7189 ISR Comments Response Distribution List May 7, 2021

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Document Content(s)

Document Accession #: 20210607-3028 Filed Date: 06/07/2021

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426
June 7, 2021

OFFICE OF ENERGY PROJECTS

Project No. 7189-014 – Maine
Green Lake Project
Green Lake Water Power Company

Via Electronic Mail

Ms. Caroline Kleinschmidt
Green Lake Water Power Company
120 Hatchery Way
Ellsworth, ME 04605

Reference: Determination on Request for Study Modification for the Green Lake Project

Dear Ms. Kleinschmidt:

Pursuant to 18 C.F.R. § 5.15 of the Commission's regulations, this letter contains the determination on a request for a modification to the approved study plan for the proposed relicensing of Green Lake Water Power Company's (Green Lake Power) Green Lake Project No. 7189. The determination is based on the study criteria set forth in sections 5.9(b) and 5.15(d) of the Commission's regulations, applicable law, Commission policy and practice, and staff's review of the record of information.

Background

The study plan determination for the project was issued on February 5, 2020 and required Green Lake Power to conduct four studies and file an initial study report on those studies by February 9, 2021. Green Lake Power filed its initial study report on February 10, 2021, held a study report meeting on February 24, 2021, and filed a meeting summary on March 11, 2021.

Comments

Comments on the ISR and meeting summary, including a request for a study modification were filed by the U.S. Fish and Wildlife Service (FWS), the Maine Department of Environmental Protection (Maine DEP), the Maine Department of Inland Fisheries and Wildlife (Maine DIFW), and the Maine Department of Marine Resources (Maine DMR). Green Lake Power filed reply comments on May 10, 2021.

Some of the comments received do not specifically request additional studies or modifications to the approved studies, and are therefore not addressed herein. For example, some of the comments provide or request additional information on results; or recommend protection, mitigation, and enhancement measures. This determination only addresses new comments and requests that would require study modifications or additional studies.

Study Plan Determination

Pursuant to section 5.15(d) of the Commission's regulations, any proposal to modify a required study must be accompanied by a showing of good cause, and must include a demonstration that: (1) the approved study was not conducted as provided for in the approved study plan, or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way.

As discussed in Appendix A, the requested modification to Study 1, *Water Quality Study*, is not required. The basis for not modifying Green Lake Power's study plan is explained in Appendix B. Please note that nothing in this determination is intended, in any way, to limit any agency's proper exercise of its independent statutory authority to require additional studies.

If you have any questions, please contact Dr. Nicholas Palso at (202) 502-8854.

Sincerely,

for
Terry L. Turpin
Director
Office of Energy Projects

Enclosures: Appendix A – Summary of Determination on Requested Modification to Approved Study

Appendix B – Staff Recommendation on Requested Modification to Approved Study

APPENDIX A

SUMMARY OF DETERMINATION ON REQUESTED MODIFICATION TO APPROVED STUDY

Study	Recommending Entity	Adopted	Adopted in Part	Not Adopted
1. Water Quality Study	Maine DEP			X

APPENDIX B

STAFF RECOMMENDATION ON REQUESTED MODIFICATION TO APPROVED STUDY

Study 1: Water Quality Study

Background

The objectives of the study were to collect water quality data in the project impoundment, bypassed reach, and in Reeds Brook downstream of the project to determine: (1) whether certain water quality parameters are consistent with levels stipulated by Maine Department of Environmental Protection (Maine DEP) water quality standards and (2) if project operation, including discharges from the project dam and powerhouse, adversely affects the resident benthic macroinvertebrate community in the approximately 0.3-mile-long bypassed reach and downstream of the powerhouse.[1]

In accordance with the approved study plan, Green Lake Power collected biweekly vertical temperature and dissolved oxygen (DO) profiles from mid-June through mid-October 2020 at the two deepest locations in the impoundment. Thermal stratification occurred at both stations, but DO concentrations at Station 1 never fell below 6.5 milligrams per liter (mg/L). Water temperature at the surface at Station 1 ranged from 57.9 to 80.4 °F during the study. At Station 2, DO concentrations fell below 5 mg/L at depths of 46 to 69 feet during the August 27, September 9, and September 21 sampling events. Surface water temperatures at Station 2 ranged from 57.7 to 81.0 °F during the study.

To determine whether project operation adversely affects benthic macroinvertebrates in the bypassed reach and downstream of the powerhouse, the study design required Green Lake Power to place rock-filled bags (rock bags) at three sites that that could be affected by project operation, in accordance with the study plan and in consultation with Maine Department of Environment Protection (Maine DEP): the bypassed reach approximately 290 feet downstream of the project dam (Site 1); the tailrace approximately 240 feet downstream of the powerhouse (Site 2); and Reeds Brook

[1] Reeds Brook is classified as a Class B stream. *See* Maine Statute, Title 38, § 467(18)(B) (2017). Maine Statute, Title 38, § 465(3)(C) (2017) states that discharges into Class B waters may not cause adverse impact to aquatic life, in that the receiving waters must be of sufficient quality to support all aquatic species indigenous to the receiving water without detrimental changes in the resident biological community. The discharge from a dam or powerhouse sometimes can create conditions that are unsuitable for sensitive species groups, such as mayflies, stoneflies, and caddisflies.

approximately 400 downstream of the confluence of the bypassed reach and tailrace (Site 3). The rock bags remained in place from late August through late September 2020. The approved study plan required Green Lake Power to retrieve the rock bags at the end of the study and sort, identify, and count the benthic macroinvertebrates that colonized the rock bags.

Green Lake Power retrieved all three rock bags but only analyzed the benthic macroinvertebrate data from the rock bag from the bypassed reach (Site 1). Based on the data collected at Site 1, the benthic macroinvertebrate community in the bypassed reach meets Maine's Class B standards. Green Lake Power did not send the rock bags from the tailrace (Site 2) or the confluence (Site 3) to the laboratory to sort and identify the macroinvertebrates, as required by the approved study plan. Green Lake Power states that the rock bag in the project tailrace (Site 2) moved approximately 8 feet downstream from its original location by generation flows. In addition, Green Lake Power reports that Site 2 had been backwatered by the operation of Graham Lake from the spring season until shortly before Green Lake Power deployed the rock bag at Site 2, which created lake-like conditions at the site prior to the study.[2] Similarly, the confluence of the bypassed reach and tailrace (Site 3) was continuously backwatered by Graham Lake during the study. While the backwatering effect at Sites 2 and 3 during the study was reduced compared to previous years because a drought resulted in below-average water surface elevations in Graham Lake, the habitat at Sites 2 and 3 were still lake-like in the weeks prior to the placement of the rock bags. The non-project-related change from river-like to lake-like conditions at Sites 2 and 3 could have adversely affected the species composition and abundance of the benthic macroinvertebrates inhabiting in those locations, which could have been misinterpreted as a project-related operational effect. Lastly, Green Lake Power states that Site 3 was located downstream of the discharge of the Green Lake National Fish Hatchery (hatchery) treatment plant.[3] Therefore, the

[2] Reeds Brook is a tributary of Graham Lake, which is the storage impoundment of the Ellsworth Hydroelectric Project (Ellsworth Project, FERC No. 2727). The current license for the Ellsworth Project allows the water surface elevation of Graham Lake to fluctuate annually by 10.8 feet. The fluctuating water surface elevation of Graham Lake affects the water surface elevation of the last 0.55 mile of Reeds Brook, including the Green Lake Project tailrace. Therefore, the conditions of the tailrace area and the confluence of the tailrace and bypassed reach may transition from lentic (lake-like) habitat to lotic (river-like) habitat during the year depending on the water surface elevation of Graham Lake.

[3] The Green Lake Project is adjacent to the hatchery. The hatchery withdraws water directly from Green Lake, and there is a tap on the project penstock that allows the hatchery to withdraw water from the penstock when necessary. The hatchery discharges

species composition and abundance of the benthic macroinvertebrates that colonized the rock bag at Site 3 could have been affected by the water quality of the hatchery discharge, which could also have been misinterpreted as a project-related operational effect.

Requested Study Modification

Maine DEP states that the study must be repeated in 2021 because the data from Site 2 were compromised when the rock bag at Site 2 was disturbed during the study, which could have dislodged some benthic macroinvertebrates from the rock bag. Maine DEP states that it is aware that Sites 2 and 3 can be backwatered by Graham Lake and discussed this effect with Green Lake Power during study planning. Maine DEP further states that it can only evaluate the effect of the Green Lake Project on the bypassed reach and Reeds Brook benthic macroinvertebrate community if benthic macroinvertebrate data are collected from the three specified sites. Maine DEP requests that Green Lake Power deploy rock bags at the same three sites in 2021 and that Green Lake Power report data from all three sites. In addition to repeating the study in 2021, Maine DEP requests that Green Lake Power include site photos, a description of flow, and a report of the water surface elevation of Graham Lake during rock bag placement and retrieval for the 2021 study.

Comments on Requested Study Modification

Green Lake Power states that the backwatering effects of Graham Lake operation on the water surface elevation at Sites 2 and 3 were still detectable despite the Graham Lake water surface elevations being 1 to 2 feet below the long-term average due to a drought during 2020. Green Lake Power states that because the operation of Graham Lake "caused problems for Sites 2 and 3" when water surface elevations for Graham Lake were below average, it is unlikely that Graham Lake water surface elevations "would be any better in 2021" because the water surface elevation of Graham Lake would likely be higher during 2021, which would increase the backwatering effect at Sites 2 and 3. Green Lake concludes that: (1) analyzing the data collected from the rock bags at Sites 2 and 3 is not worth the $1,500 cost to process the two bags because these sites are affected by conditions unrelated to project operation, and (2) conducting the study again in 2021 is not worth the $10,000 cost because conditions in 2021 are unlikely to be any more conducive to evaluating the effects of project operation on benthic macroinvertebrates than in 2020 because of the previously described factors unrelated to project operation.

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into Reeds Brook at two locations: 670 feet downstream from the dam and 400 feet downstream from the powerhouse.

Discussion and Staff Recommendation

The study design did not account for the potential effects of hatchery discharges and Graham Lake water surface elevations on benthic macroinvertebrates in the tailrace and the downstream reach where Sites 2 and 3 were located. The hatchery discharges and backwatering from the operation of Graham Lake could affect the nutrient concentrations, depth, and velocity of the water at Sites 2 and 3. These factors, in turn, could affect the abundance and species composition of the benthic macroinvertebrate community in at Sites 2 and 3, and therefore, mask any effects caused by the project.

Because the hatchery discharges and backwatering from Graham Lake would mask any project-related effects at Sites 2 and 3, it is unclear how conducting the benthic macroinvertebrate study again in 2021, as requested by Maine DEP, could distinguish the effects of the project from the non-project effects of Graham Lake operation and the hatchery discharges on the benthic macroinvertebrate community. Moreover, the macroinvertebrate data at Sites 2 and 3 could not be reasonably compared to the data at Site 1 for purposes of determining if there is a project-related effect because other non-project activities effect macroinvertebrates at Sites 2 and 3 but not at Site 1. Therefore, repeating the study would not be worth the estimated cost of $10,000 [section 5.9(b)(7)].

Data from the water quality study can be used to evaluate the effects of the project on benthic macroinvertebrates in the bypassed reach and tailrace. The results of the impoundment water quality study provide staff with information about the temperature, DO concentration, and nutrient concentrations of water that enters the bypassed reach and the tailrace. Green Lake Power releases water into the bypassed reach from two gates in the project dam that are located at about the same elevation as the turbine intake.[4] Therefore, the water entering the bypassed reach and turbine intake likely have similar water quality parameters, and the discharge of this water would likely have similar effects on benthic macroinvertebrates, whether in the bypassed reach or downstream of the powerhouse. Because the benthic macroinvertebrate data collected from bypassed reach (Site 1) and the results of the water quality study provide sufficient information to evaluate the effects of the project discharges on benthic macroinvertebrates in the bypassed reach and downstream of the powerhouse, we do not recommend that Green Lake Power conduct the benthic macroinvertebrate study in 2021, as requested by Maine DEP.

[4] The gate sill is approximately 6.7 feet below the impoundment surface at full pond, and the bottom of the intake is approximately 9 feet below the impoundment surface at full pond.

Document Content(s)

Ms. Kimberly D. Bose, Secretary
February 9, 2022

VIA E-FILING
Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N. E.
Washington, DC 20426

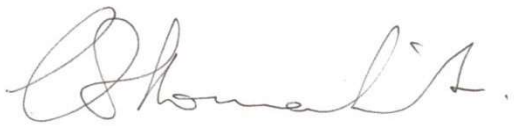
RE: Green Lake Hydroelectric Project (FERC No. 7189)
Updated Study Report

Dear Secretary Bose:

In accordance with 18 CFR § 5.15(f), the Licensee for the Green Lake Hydroelectric Project, Green Lake Water Power Company (GLWP), submits the Updated Study Report (USR) for the relicensing of the Green Lake Hydroelectric Project (Project). The USR includes the results of the Benthic Macroinvertebrate (BMI) study which is the only study that was not completed prior to the filing of the Initial Study Report (ISR) (February 9, 2021).

Consistent with requirements under 18 CFR § 5.15, and in accordance with the Green Lake Project Process Plan and Schedule, within 15 days following the filing of this Updated Study Report (USR) (i.e., by February 24, 2022) GLWP will hold an online meeting with relicensing participants and FERC staff to discuss the 2021 study results and status.

If you have any questions regarding the USR, please contact me by email at caroline@greenlakewaterpower.com or by phone at (425) 553-6718



Sincerely,
Caroline Kleinschmidt
Relicensing Coordinator
Green Lake Water Power Co.

Enclosure:
GLWP Updated Study Report
cc: Distribution List

Green Lake Project 7189 USR Distribution List February 9, 2022

Federal Energy Regulatory Commission

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Green Lake Project 7189 USR Distribution List February 9, 2022

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GREEN LAKE WATER POWER CO.

UPDATED STUDY REPORT
FOR THE GREEN LAKE HYDROELECTRIC PROJECT
(FERC NO. 7189)

Prepared by:

Green Lake Water Power Co.
120 Hatchery Way,
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Assisted by:

Kleinschmidt

Pittsfield, Maine
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February 2022

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GREEN LAKE HYDROELECTRIC PROJECT
FERC NO. 7189
UPDATED STUDY REPORT

1.0 OVERVIEW

Green Lake Water Power Co. (GLWP) hereby files this Updated Study Report (USR) with the Federal Energy Regulatory Commission (FERC) as part of the relicensing of the Green Lake Project.

The Licensee is using FERC's Integrated Licensing Process (ILP) as established in regulations issued by FERC July 23, 2003 (Final Rule, Order No. 2002) and found at Title 18 CFR, Part 5. The current license expires on March 31, 2024.

1.1 Process and Schedule Overview

Consistent with requirements under 18 CFR § 5.15, and in accordance with the Green Lake Project Process Plan and Schedule, within 15 days following the filing of this Updated Study Report (USR) (i.e., by February 24, 2022) GLWP will hold an online meeting with relicensing participants and FERC staff to discuss the 2021 study results and status. Within 15 days following the USR meeting, GLWP will file a meeting summary.

FERC staff, or any relicensing participant, may file a disagreement concerning GLWP's meeting summary within 30 days of its issuance. This filing must set forth the basis of any disagreement with the material content of the meeting summary and propose any necessary alternative modifications to ongoing studies or new studies. GLWP will then have 30 days to respond to the disagreements and possibly propose revised study modifications or new studies. Within 30 days of the GLWP's response, any remaining disagreements will be resolved by FERC, and the study plan will be amended as appropriate.

In accordance with 18 CFR § 5.15(f), any proposal to modify an ongoing study must demonstrate that the study was not conducted as described in the approved Revised Study Plan, was conducted under anomalous environmental conditions, or that environmental conditions have changed in a material way since the Study Plan's approval. The proposal must also explain why the study's objectives cannot be met via the approved methods and why the proposal for modification was not made earlier, or that significant new information has become available that affects the study.

2.0 UPDATED STUDY REPORT

2.1.1 Downstream Benthic Macroinvertebrate (BMI) Study 1-4:

At the time when we did the Initial Study Report and ISR supplement BMI sites 2 and 3 data had not been analyzed. This work is now complete and the report is included below.

2020

Macroinvertebrate Sampling Study

Downstream

of

Green Lake Hydroelectric Project

Ellsworth Maine

FERC No. 7189

Submitted by:

Paul C. Leeper
Moody Mountain Environmental
137 Diamond Str
Searsmont Maine 04973

Submitted to:

Green Lake Water Power Company
Ellsworth, Maine
Date: 2-4-22

Introduction

This macroinvertebrate sampling study was conducted for Green Lake Water Power Company (GLWP) in support of the relicensing of the Green Lake Hydroelectric Project, Federal Energy Regulatory Commission (FERC) Project No. 7189. This report details the 2020 study efforts downstream of the Project as part of the Water Quality Certification Process. A previous report (Leeper 2021) reported on the macroinvertebrate sampling and analysis in Reeds Brook, downstream of the Green Lake Dam.

Study Objectives

The goal of the macroinvertebrate sampling study was to generate data on the aquatic macroinvertebrate community downstream of the GLWP powerhouse and assess this community in terms of Maine's Aquatic Life Standards using the Maine Department of Environmental Protection (MDEP) Linear Discriminant Model (LDM).

Study Area

In 2020 we placed samples at three (3) sites in Reeds Brook to study aquatic macroinvertebrates (Figure 1). The locations of the sites were recommended by the MDEP. Site 1 (see Leeper 2021) was located in Reeds Brook approximately 290ft downstream of the Green Lake dam. This site was located upstream of the Green Lake Hatchery filter overflow discharge into Reeds Brook. Sites 2 and 3 are reported on in this paper. Site 2 was located approximately 240 ft downstream of the powerhouse and approximately 2240 ft downstream of the dam. Site 3 was located approximately 400 downstream of the powerhouse at the confluence of Reeds Brook and the powerhouse tailrace, approximately 2350 ft downstream of the dam. Both of the sites are periodically backwatered by impounded water levels in Graham Lake. In addition, Site 3 is located downstream of the Green Lake National Fish Hatchery treatment plant discharge.

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Figure 1. Location of aquatic macroinvertebrate sampling site downstream of the Green Lake Dam. Sites 2 and 3 are downstream of the powerhouse. Reeds Brook, August, September 2020.

Water Classification

Reeds Brook downstream of the Green Lake Dam is classified Class B ((38 M.R.S.A § 467(7)(A)(7)). With respect to designated uses, the Maine Water Quality Law requires that "Class B waters must be of such quality that they are suitable for the designated uses of drinking water supply after treatment; fishing; agriculture; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation, except as prohibited under Title 12, section 403; navigation; and as habitat for fish and other aquatic life. The habitat must be characterized as unimpaired" (38 M.R.S.A. § 465(3)(A)). The word "unimpaired" is defined to mean "without a diminished capacity to support aquatic life" (38 M.R.S.A. § 466(11)). In addition, for Class B waters, "Discharges to Class B waters may not cause adverse impact to aquatic life in that the receiving waters must be of sufficient quality to support all aquatic species indigenous to the receiving water without detrimental changes in the resident biological community" (38 M.R.S.A. § 465(3)(C). The term "resident biological community" is defined as "aquatic life expected to exist in a habitat which is free from the influence of the discharge of any pollutant" ((38 M.R.S.A. § 466(10)). The

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term “without detrimental changes in the resident biological community” means no significant loss of species or excessive dominance by any species or group of species attributable to human activity” ((38 M.R.S.A. § 466(12)).

Study Methods

The objective of the macroinvertebrate sampling study was to determine if the aquatic life, in this case the macroinvertebrate community, attained these Class B standards. The Maine Department of Environmental Protection (DEP) "Methods for Biological Sampling and Analysis of Maine's Inland Waters" (Davies and Tsomides Revised 2014) were used as the basis of the field and laboratory procedures in the macroinvertebrate sampling study. A summary of these methods is given below.

The DEP standard rock bag samplers were used for this study. These samplers hold approximately 16 lbs. of clean, washed, bank-run cobble, graded to uniform diameter range of 1.5 to 3 inches. Three (3) samplers were placed at the sample sites; samplers were left in the river for approximately 28 days (± 4 days) to allow for invertebrate colonization. Retrieval of the samplers was done using an aquatic D-net. The net was placed directly downstream of a sampler; the sampler was then picked up and placed in the net. The contents of each sampler and the net were washed through a sieve bucket and preserved in labeled jars. Habitat measurements including substrate type, depth, and temperature were collected at sampler collection retrieval.

Samples were collected, preserved, and transported to the Moody Mountain Environmental laboratory. The three (3) samplers (replicates) were sorted, identified, and enumerated. The results were entered on MDEP Excel spreadsheets and sent to MDEP for modelling using the LDM.

Results

The samplers were placed in the river on August 27, 2020. Samplers were retrieved on September 24, 2020. Upon retrieval it was evident that samplers at Site 2 had washed downstream approximately 30 ft and had been disturbed. In addition, Site 2 had been backwatered by impounded water levels in Graham Lake from spring to shortly before the samplers were deployed.

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Therefore, the community being sampled was impacted by water levels in Graham Lake and were in a lentic habitat rather than a lotic habitat in the months prior to sampling. Site 3 was also backwatered by impounded water levels in Graham Lake and was in a lentic habitat rather than a lotic habitat during the colonization period. Habitat measurements for Sites 2 and 3 are shown in Table 1 and Appendix 1. Photos of the areas around the sample sites and substrates are included below.

Table 1. Habitat measurements at Sites 2 and 3 in Reeds Brook downstream of GLWP powerhouse for aquatic macroinvertebrate sampling. August, September 2020

Macroinvertebrate Field Data Sheet

Log _____	Directions	Type of Sampler **RB**
Station Number 2	_____	Date Deployed **8/27/20**
Waterbody **Reeds Brk.**	_____	Number Deployed **3**
River Basin **Union R.**	Lat-Long Coordinates	Date Retrieved **9/24/20**
Town **Ellsworth**	**N 44.624446°**	Number Retrieved **3**
Stream Order **4**	**W 68.437384°**	Collector(s) **P Leeper MME**

1. **Land Use** (surrounding watershed)		2. **Terrain**	3. **Canopy Cover**
☐ Urban	**X** Upland conifer	☐ Flat	☐Dense (75-100% shaded)
☐ Cultivated	☐ Swamp hardwood	**X** Rolling	☐Partly open (25-75% shaded)
☐ Pasture	☐ Swamp conifer	☐ Hilly	**X** Open (0-25% shaded)
X Upland hardwood	☐ Marsh	☐ Mountains	(% daily direct sun) _____

4. **Physical Characteristics of Bottom** estimate % over 12 m stretch							
[ ]	Bedrock	[70]	Cobble (2.5" – 10")	[]	Sand (<1/8")	[ ]	Clay
[10]	Boulders (>10")	[15]	Gravel (1/8" – 2.5")	[	Silt	[5]	Detritus

5. **Habitat Characteristics** (immediate area)		Temp. Probe # ☐ deployed	7. **Water Samples**
Time **1000h**	Time **1000h**		☐ Standard
Wetted Width **5.8m**	Wetted Width (m)**5.8m**	6. **Observations**	☐ Other
Bank Fl Width	Bank Full Width	Attached algae	Lab Number
Depth **23cm**	Depth **43cm**	Aq. Moss	
Velocity 18cm/s	Velocity 91 cm/s	In Tailrace	8. **Photograph**
Diss. O_2 (ppm) 9.3	Diss. O_2 (ppm) 9.3	Samplers Disturbed	Put-In Yes
Temp (C) 19.5	Temp (C) 16.9	Transported downstream by current	Take-Out **Yes**
Turbidity	Turbidity		
DO Meter # YSI Pro 1 Cal? **Y**/	DO Meter # YSI Pro 1 Cal? **Y** /		

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Table 1. Continued

Macroinvertebrate Field Data Sheet

Log _____	Directions	Type of Sampler**RB**
Station Number 3	_____	Date Deployed **8/27/20**
Waterbody **Reeds Brk.**	_____	Number Deployed **3**
River Basin **Union R.**	Lat-Long Coordinates	Date Retrieved **9/24/20**
Town **Ellsworth**	**N 44.624516°**	Number Retrieved **3**
Stream Order **4**	**W 68.436840°**	Collector(s) **P Leeper MME**

1. **Land Use** (surrounding watershed)		2. **Terrain**	3. **Canopy Cover**
☐ Urban	**X** Upland conifer	☐ Flat	☐Dense (75-100% shaded)
☐ Cultivated	☐ Swamp hardwood	**X** Rolling	☐Partly open (25-75% shaded)
☐ Pasture	☐ Swamp conifer	☐ Hilly	**X** Open (0-25% shaded)
X Upland hardwood	☐ Marsh	☐ Mountains	(% daily direct sun) _____

4. **Physical Characteristics of Bottom** estimate % over 12 m stretch											
[ ]	Bedrock	[ ]	Cobble (2.5" – 10")	[**90**]	Sand (<1/8")	[ ]	Clay
[ ]	Boulders (>10")	[ ]	Gravel (1/8" – 2.5")	[**10**]	Silt	[ ]	Detritus

5. **Habitat Characteristics** (immediate area)		Temp. Probe # ☐ deployed	7. **Water Samples**
Time **1045h**	Time **1010h**		☐ Standard
Wetted Width **21m**	Wetted Width (m)	6. **Observations**	☐ Other
Bank Fl Width	Bank Full Width	Confluence of brook and tailrace Downstream of hatchery discharge	Lab Number
Depth **70cm**	Depth **43cm**		8. **Photograph**
Velocity 16cm/s	Velocity 49 cm/s		Put-In Yes
Diss. O_2 (ppm) 9.5	Diss. O_2 (ppm) 9.3		Take-Out **No**
Temp (C) 17.8	Temp (C) 16.9		
Turbidity	Turbidity		
DO Meter # YSI Pro 1Cal? **Y**/	DO Meter # YSI Pro 1 Cal? **Y** /		

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Photo 1. View west-northwest, upstream from Site 2 looking at powerhouse tailrace. 8/27/20 PCL

Photo 2. View east from Site 2. Note GLNFH treatment plant discharge at center right of picture. 8/27/20 PCL

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Photo 3. Typical substrate and deployed samplers at Site 2. 8/27/20 PCL

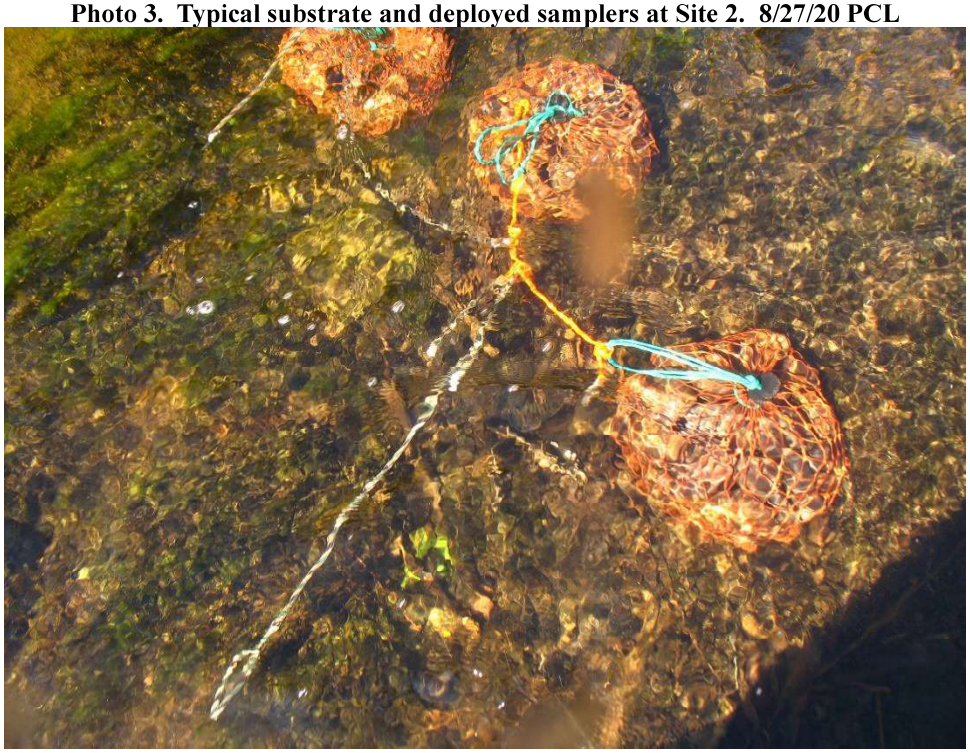
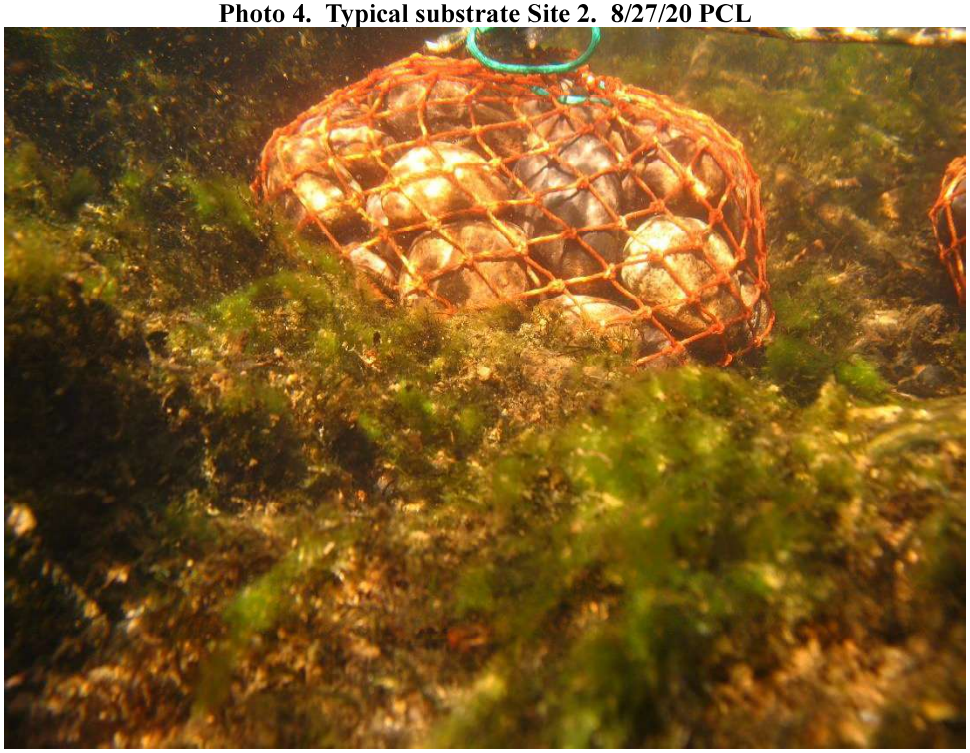


Photo 4. Typical substrate Site 2. 8/27/20 PCL



LDM Results

The LDM biocriteria preliminary results are shown in Table 2 and Appendix 1. To attain a particular class a site must have a 60% or greater score in the test for that class. DEP finds that the communities at Sites 2 and 3 were not in attainment of Aquatic Life Class B Standards. The final determinations are not shown on these reports but are as follows (MDEP email dated 1/26/22 Jeanne DiFranco to Paul Leeper):

Station 1198 (Reeds Brook 2): The model result was NA (non-attainment of any class), but the finding was raised to Class C based on Best Professional Judgement considering the community present and potential habitat issues related to periodic inundation from Graham Lake backwatering.

Station 1199 (Reeds Brook 3): The model result was NA and indeterminant for Class C (in BPJ range). The finding was raised to Class C based on BPJ for similar reasons as above.

The make-up of this community and a discussion of the results are presented below.

Table 2. Results of the DEP linear discriminant model (LDM) for 2 sites downstream of the GLWP powerhouse in Ellsworth Maine in 2020. A score of 60% or greater is needed to attain a particular class.

Site	Probability of Class A	Probability of Class B	Probability of Class C	Probability of Non-Attainment
2	1%	0%	0%	100%
3	1%	0%	52%	48%

Community Analysis

The macroinvertebrate communities sampled downstream of the GLWP powerhouse were abundant and relatively rich in taxa (Table 3 and Appendix 1). The community at Site 2 was populated with 26 different taxa with a Mean Total Abundance of 350. The Site 3 community was less numerous (Total Abundance of 232) but more rich with 30 taxa. The Site 2 community was dominated by filter-feeding caddisflies, representing over 52% of Total Abundance. The Site 3 community was dominated by the Amphipod *Hyalella* and the midge *Cricotopus,* representing over 57%of the community. The Diversity values were moderate at 2.78 (Site 2) and 3.16 (Site 3). Structural indices for the sampled community are shown in Tables 3 and 4.

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Table 3. Indices of community structure for the aquatic invertebrate communities downstream of the GLWP powerhouse. August, September 2020.

Site	Tot. Abund.	Taxa Richness	S-W Div.	Hils. Biotic Index (HBN)	Water Quality indication from HBN	Mayfly, Stonefly, Caddisfly (EPT) Richness	Mayfly, Stonefly (EP)		Midge	
							Rich	% Ab	Rich	% Ab
2	350	26	2.78	5.29	Good	12	4	2%	3	3%
3	232	30	3.16	6.79	Fairly Poor	10	6	7%	7	24%

Indexes measuring the community tolerance to poor riverine water quality conditions at Site 2 were mixed. The community was dominated by net-spinning caddisflies (*Hydropsyche* and *Cheumatopsyche*), generally considered to be "clean water organisms" that are generally sensitive to poor water quality. The Hilsenhoff Biotic Index (HBI) value, 5.29, indicated good water quality (Hilsenhoff 1987). However, the EP index of sensitive mayflies and stoneflies had 4 taxa representing just 2% of the community and no sensitive stoneflies were found in the samples.

The Site 3 community indices indicated a more stressed riverine community. Dominant organisms (representing over 5% of the Total Abundance) in the community are shown in Table 4 arranged from the most sensitive organisms to the organisms most tolerant of poor water quality conditions. The community had four (4) organisms that made up 75% of the total abundance that, when found in stream habitats, are tolerant of poor riverine water quality. The HBI value of 6.8 indicated fairly poor water quality (Hilsenhoff 1987). The EP index of sensitive mayflies and stoneflies had 6 taxa representing just 7% of the community and no sensitive stoneflies were found in the samples. Finally, midge larvae (Chironomidae), organisms generally more tolerant of poor riverine water quality, made up 24% of the total abundance.

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Table 4. Dominant aquatic invertebrate organisms downstream of the GLWP powerhouse. July, August 2020.

	Site 2		Site 3	
Sensitivity to Poor Water Quality	**Dominant Organism**	**% of Community**	**Dominant Organism**	**% of Community**
Sensitive	*Hydropsyche*	28%		
Intermediate	*Cheumatopsyche*	24%	*Polycentropus*	5%
Tolerant	*Hyalella*	23%	*Hyalella*	36%
	Isopoda	8%	*Cricotopus*	21%
	Hydrobiidae	5%	Isopoda	9%
			Planariidae	9%

Summary

1. The objective of the macroinvertebrate sampling study was to generate data on the aquatic macroinvertebrate community in downstream of the GLWP powerhouse and assess this community in terms of Maine's Aquatic Life Standards. Reeds Brook downstream of the powerhouse is classified Class B.

2. The Maine Department of Environmental Protection (DEP) "Methods for Biological Sampling and Analysis of Maine's Inland Waters" (Davies and Tsomides Revised 2014) were used as the basis of the field and laboratory procedures in this study.

3. Samplers were placed at 2 sites on August 27. Retrieval was on September 24. Site 2 had been backwatered by impounded water levels in Graham Lake from spring to shortly before the samplers were deployed. Therefore, the community being sampled was impacted by water levels in Graham Lake and were in a lentic habitat rather than a lotic habitat in the months prior to sampling. Site 3 was also backwatered by impounded water levels in Graham Lake and was in a lentic habitat rather than a lotic habitat during the colonization period. Site 3 is also located downstream of the Green Lake National Fish Hatchery treatment plant discharge. At retrieval it was found that samplers at sites 2 had been disturbed by high flows and washed downstream approximately 30 ft.

4. The DEP finds that the LDM biocriteria results indicate that the community is not in attainment of Class B Aquatic Life Standards rather, the communities attain Class C

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Aquatic Life Standards.

5. The invertebrate communities sampled downstream of the GLWP powerhouse were abundant and relatively rich in taxa. Indexes measuring the community tolerance to poor riverine water quality conditions at Site 2 were mixed. The Site 3 community indices indicated a more stressed riverine community.

References

Davies, S.P. and L. Tsomides. Revised 2014. Methods for biological sampling and analysis of Maine's rivers and streams. ME Dept. of Env. Prot. Augusta, ME. 31p.

Hilsenhoff, W.L. 1987. An improved biotic index of organic stream pollution. The Great Lake Entomologist. Pgs. 31-39.

Leeper, Paul C. 2021. 2020 Macroinvertebrate Sampling Study Downstream of Green Lake Dam, Ellsworth Maine, FERC No. 7189. Report to Green Lake Water Power Company, March 15, 2021. 13p.

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Appendix 1- LDM results and data files including field data, and individual replicate data.

Maine Department of Environmental Protection
Biological Monitoring Program
Aquatic Life Classification Attainment Report

Station Information

Station Number:	**S-1198**	River Basin:	
Waterbody:	Reeds Brook - Station 1198	HUC8 Name:	
Town:	Ellsworth	Latitude:	
Directions:	GREEN LAKE HATCHERY, DRIVE UP ROAD TO POWERHOUSE, SITE IS JUST DOWNSTREAM OF POWERHOUSE OUTLET. REEDS BROOK 2.	Longitude:	
		Stream Order:	

Sample Information

Log Number:	**2927**	Type of Sample:	ROCK BAG	Date Deployed:	8/27/2020
Subsample Factor:	X1	Replicates:	3	Date Retrieved:	9/24/2020

Classification Attainment

Statutory Class:	**B**	**Final Determination:**	Date:
Model Result with P≥0.6:	NA	**Reason for Determination:**	
Date Last Calculated:	1/7/2022	Comments:	

Model Probabilities

First Stage Model				C or Better Model	
Class A	0.00	Class C	0.34	Class A, B, or C	0.00
Class B	0.00	NA	0.65	Non-Attainment	1.00

B or Better Model		A Model	
Class A or B	0.00	Class A	0.01
Class C or Non-Attainment	1.00	Class B or C or Non-Attainment	0.99

Model Variables

01 Total Mean Abundance	350.00	18 Relative Abundance Ephemeroptera	0.02
02 Generic Richness	26.00	19 EPT Generic Richness	12.00
03 Plecoptera Mean Abundance	0.00	21 Sum of Abundances: *Dicrotendipes, Micropsectra, Parachironomus, Helobdella*	0.00
04 Ephemeroptera Mean Abundance	5.33		
05 Shannon-Wiener Generic Diversity	2.78	23 Relative Generic Richness- Plecoptera	0.00
06 Hilsenhoff Biotic Index	5.29	25 Sum of Abundances: *Cheumatopsyche, Cricotopus, Tanytarsus, Ablabesmyia*	93.67
07 Relative Abundance - Chironomidae	0.03		
08 Relative Generic Richness Diptera	0.19	26 Sum of Abundances: *Acroneuria, Maccaffertium, Stenonema*	0.00
09 *Hydropsyche* Abundance	97.33		
11 *Cheumatopsyche* Abundance	85.00	28 EP Generic Richness/14	0.29
12 EPT Generic Richness/ Diptera Generic Richness	2.40	30 Presence of Class A Indicator Taxa/7	0.14
13 Relative Abundance - Oligochaeta	0.00		
15 Perlidae Mean Abundance (Family Functional Group)	0.00		
16 Tanypodinae Mean Abundance (Family Functional Group)	0.00		
17 Chironomini Abundance (Family Functional Group)	1.00		

Five Most Dominant Taxa

Rank	Taxon Name	Percent
1	*Hydropsyche*	27.81
2	*Cheumatopsyche*	24.29
3	*Hyalella*	23.05
4	Isopoda	7.52
5	Hydrobiidae	4.57

Report Printed: 1/7/2022 Contact: biome@maine.gov or (207)287-7688 Page 1

Maine Department of Environmental Protection
Biological Monitoring Program
Aquatic Life Classification Attainment Report

Station Number:	**S-1198**	Town: Ellsworth	Date Deployed: 8/27/2020
Log Number:	**2927**	Waterbody: Reeds Brook - Station 1198	Date Retrieved: 9/24/2020

Sample Collection and Processing Information

Sampling Organization: MOODY MOUNTAIN ENVIRONMENTA

Taxonomist: PAUL LEEPER (MOODY MOUNTAIN ENVIRONMENTAL)

Waterbody Information - Deployment		Waterbody Information - Retrieval	
Temperature:	19.5 deg C	Temperature:	16.9 deg C
Dissolved Oxygen:	9.3 mg/l	Dissolved Oxygen:	9.3 mg/l
Dissolved Oxygen Saturation:		Dissolved Oxygen Saturation:	
Specific Conductance:		Specific Conductance:	
Velocity:	18 cm/s	Velocity:	91 cm/s
pH:		pH:	
Wetted Width:	5.8 m	Wetted Width:	6 m
Bankfull Width:		Bankfull Width:	
Depth:	23 cm	Depth:	43 cm

Water Chemistry

Summary of Habitat Characteristics

Landuse Name	Canopy Cover	Terrain	
Upland Conifer	Open	Rolling	
Upland Hardwood			
Potential Stressor	**Location**	**Substrate**	
Impounded	Above Confluence	Boulder	10 %
Regulated Flows	Below Dam	Detritus	5 %
		Gravel	15 %
		Rubble/Cobble	70 %

Landcover Summary - 2004 Data

Sample Comments

IN TAILRACE PER DEP,ATTACHED ALGAE & MOSS NO BANKFUL MEASUREMENT BECAUSE INUNDATED BY GRAHAM LAKE AT NHW

Maine Department of Environmental Protection
Biological Monitoring Program
Aquatic Life Taxonomic Inventory Report

Station Number: S-1198 Waterbody: Reeds Brook - Station 1198 Town: Ellsworth
Log Number: 2927 Subsample Factor: X1 Replicates: 3 Calculated: 1/7/2022

Taxon	Maine Taxonomic Code	Count (Mean of Samplers) Actual	Count (Mean of Samplers) Adjusted	Hilsenhoff Biotic Index	Functional Feeding Group	Relative Abundance % Actual	Relative Abundance % Adjusted
Planariidae	03010101	8.00	8.00		--	2.3	2.3
Hirudinidae	08030201	0.67	0.67		--	0.2	0.2
Isopoda	090101	26.33	26.33		--	7.5	7.5
Hyalella	09010203006	80.67	80.67	8	CG	23.0	23.0
Orconectes	09010301008		0.33		CG		0.1
Orconectes limosus	09010301008013	0.33			--	0.1	
Boyeria	09020301004	0.33	0.33	2	PR	0.1	0.1
Baetidae	09020401	1.67	1.67		--	0.5	0.5
Stenacron	09020402014	0.33	0.33	7	SC	0.1	0.1
Leptophlebiidae	09020406	1.67	1.67		--	0.5	0.5
Eurylophella	09020410036	1.67	1.67	3	CG	0.5	0.5
Chimarra	09020601003	6.33	6.33	2	CF	1.8	1.8
Polycentropus	09020603010	0.67	0.67	6	PR	0.2	0.2
Cheumatopsyche	09020604015	85.00	85.00	5	CF	24.3	24.3
Hydropsyche	09020604016	97.33	97.33	4	CF	27.8	27.8
Macrostemum	09020604018	0.33	0.33	3	CF	0.1	0.1
Ochrotrichia	09020607027	0.67	0.67	4	P	0.2	0.2
Lepidostoma	09020611064	0.33	0.33	1	SH	0.1	0.1
Oecetis	09020618078	0.33	0.33	8	PR	0.1	0.1
Cricotopus	09021011037	8.33	8.33	7	SH	2.4	2.4
Tanytarsus	09021011076	0.33	0.33	6	CF	0.1	0.1
Pseudochironomus	09021011078	1.00	1.00	5	CG	0.3	0.3
Cnephia	09021012046	10.33	10.33	0	CF	3.0	3.0
Atherix	09021015055	0.33	0.33	2	PR	0.1	0.1
Hydrobiidae	10010104	16.00	16.00		--	4.6	4.6
Physidae	10010202	0.33	0.33		SC	0.1	0.1
Bivalvia	1002	0.67	0.67		CF	0.2	0.2

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Moody Mountain Environmental 137 Diamond Str Searsmont ME 04973 ph.207-592-8540 moodymtn@tidewater.net

Maine Department of Environmental Protection
Biological Monitoring Program
Aquatic Life Classification Attainment Report

Station Information

Station Number: **S-1199**
Waterbody: Reeds Brook - Station 1199
Town: Ellsworth
Directions: GREEN LAKE HATCHERY, DRIVE UP ROAD TO POWERHOUSE, SITE IS JUST DOWNSTREAM OF POWERHOUSE DISCHARGE. REEDS BROOK 3.

River Basin:
HUC8 Name:
Latitude:
Longitude:
Stream Order:

Sample Information

Log Number: **2928** Type of Sample: ROCK BAG Date Deployed: 8/27/2020
Subsample Factor: X1 Replicates: 3 Date Retrieved: 9/24/2020

Classification Attainment

Statutory Class: **B** **Final Determination:** Date:
Model Result with P≥0.6: NA **Reason for Determination:**
Date Last Calculated: 1/7/2022 Comments:

Model Probabilities

First Stage Model			
Class A	0.00	Class C	0.75
Class B	0.00	NA	0.24

C or Better Model	
Class A, B, or C	0.52
Non-Attainment	0.48

B or Better Model	
Class A or B	0.00
Class C or Non-Attainment	1.00

A Model	
Class A	0.01
Class B or C or Non-Attainment	0.99

Model Variables

01 Total Mean Abundance	231.67
02 Generic Richness	30.00
03 Plecoptera Mean Abundance	0.00
04 Ephemeroptera Mean Abundance	17.00
05 Shannon-Wiener Generic Diversity	3.16
06 Hilsenhoff Biotic Index	6.79
07 Relative Abundance - Chironomidae	0.24
08 Relative Generic Richness Diptera	0.30
09 *Hydropsyche* Abundance	1.33
11 *Cheumatopsyche* Abundance	6.67
12 EPT Generic Richness/ Diptera Generic Richness	1.11
13 Relative Abundance - Oligochaeta	0.00
15 Perlidae Mean Abundance (Family Functional Group)	0.00
16 Tanypodinae Mean Abundance (Family Functional Group)	1.33
17 Chironomini Abundance (Family Functional Group)	1.33
18 Relative Abundance Ephemeroptera	0.07
19 EPT Generic Richness	10.00
21 Sum of Abundances: *Dicrotendipes, Micropsectra, Parachironomus, Helobdella*	1.00
23 Relative Generic Richness- Plecoptera	0.00
25 Sum of Abundances: *Cheumatopsyche, Cricotopus, Tanytarsus, Ablabesmyia*	54.33
26 Sum of Abundances: *Acroneuria, Maccaffertium, Stenonema*	2.00
28 EP Generic Richness/14	0.43
30 Presence of Class A Indicator Taxa/7	0.14

Five Most Dominant Taxa

Rank	Taxon Name	Percent
1	*Hyalella*	35.54
2	*Cricotopus*	20.58
3	Isopoda	9.21
4	Planariidae	8.63
5	*Polycentropus*	4.60

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Moody Mountain Environmental 137 Diamond Str Searsmont ME 04973 ph.207-592-8540 moodymtn@tidewater.net

Maine Department of Environmental Protection
Biological Monitoring Program
Aquatic Life Classification Attainment Report

Station Number:	**S-1199**	Town: Ellsworth	Date Deployed: 8/27/2020
Log Number:	**2928**	Waterbody: Reeds Brook - Station 1199	Date Retrieved: 9/24/2020

Sample Collection and Processing Information

Sampling Organization: MOODY MOUNTAIN ENVIRONMENTAL

Taxonomist: PAUL LEEPER (MOODY MOUNTAIN ENVIRONMENTAL)

Waterbody Information - Deployment		Waterbody Information - Retrieval	
Temperature:	17.8 deg C	Temperature:	16.9 deg C
Dissolved Oxygen:	9.5 mg/l	Dissolved Oxygen:	9.3 mg/l
Dissolved Oxygen Saturation:		Dissolved Oxygen Saturation:	
Specific Conductance:		Specific Conductance:	
Velocity:	16 cm/s	Velocity:	52 cm/s
pH:		pH:	
Wetted Width:	21.3 m	Wetted Width:	
Bankfull Width:		Bankfull Width:	
Depth:	70 cm	Depth:	43 cm

Water Chemistry

Summary of Habitat Characteristics

Landuse Name	Canopy Cover	Terrain	
Upland Conifer	Open	Rolling	
Upland Hardwood			
Potential Stressor	**Location**	**Substrate**	
Impounded	Above Confluence	Sand	90 %
Regulated Flows	Below Dam	Silt	10 %

Landcover Summary - 2004 Data

Sample Comments

BELOW CONFLUENCE WITH BYPASS NO BANKFUL MEASUREMENT BECAUSE INUNDATED BY GRAHAM LAKE AT NHW

Maine Department of Environmental Protection
Biological Monitoring Program
Aquatic Life Taxonomic Inventory Report

Station Number: S-1199 Waterbody: Reeds Brook - Station 1199 Town: Ellsworth
Log Number: 2928 Subsample Factor: X1 Replicates: 3 Calculated: 1/7/2022

Taxon	Maine Taxonomic Code	Count (Mean of Samplers) Actual	Count (Mean of Samplers) Adjusted	Hilsenhoff Biotic Index	Functional Feeding Group	Relative Abundance % Actual	Relative Abundance % Adjusted
Planariidae	03010101	20.00	20.00		--	8.6	8.6
Annelida	08	1.33	1.33		--	0.6	0.6
Hirudinidae	08030201	0.67	0.67		--	0.3	0.3
Isopoda	090101	21.33	21.33		--	9.2	9.2
Hyalella	09010203006	82.33	82.33	8	CG	35.5	35.5
Orconectes	09010301008		1.33		CG		0.6
Orconectes limosus	09010301008013	1.33			--	0.6	
Boyeria	09020301004	3.33	3.33	2	PR	1.4	1.4
Hagenius	09020302008	0.33	0.33	1	PR	0.1	0.1
Baetidae	09020401	1.00	1.00		--	0.4	0.4
Stenacron	09020402014	5.00	5.00	7	SC	2.2	2.2
Stenonema	09020402016	2.00	2.00	4	SC	0.9	0.9
Paraleptophlebia	09020406026	5.67	5.67	1	CG	2.4	2.4
Eurylophella	09020410036	3.00	3.00	3	CG	1.3	1.3
Caenis	09020412040	0.33	0.33	7	CG	0.1	0.1
Polycentropus	09020603010	10.67	10.67	6	PR	4.6	4.6
Cheumatopsyche	09020604015	6.67	6.67	5	CF	2.9	2.9
Hydropsyche	09020604016	1.33	1.33	4	CF	0.6	0.6
Ochrotrichia	09020607027	0.67	0.67	4	P	0.3	0.3
Nigronia	09020701003	1.00	1.00	0	PR	0.4	0.4
Tipulidae	09021001	0.33	0.33		--	0.1	0.1
Natarsia	09021011011	1.00	1.00	8	PR	0.4	0.4
Thienemanniyia	09021011020	0.33	0.33	3	PR	0.1	0.1
Cricotopus	09021011037	47.67	47.67	7	SH	20.6	20.6
Nanocladius	09021011049	2.67	2.67	3	CG	1.2	1.2
Psectrocladius	09021011056	1.67	1.67	8	CG	0.7	0.7
Dicrotendipes	09021011085	1.00	1.00	8	CG	0.4	0.4
Polypedilum	09021011102	0.33	0.33	6	SH	0.1	0.1
Cnephia	09021012046	0.33	0.33	0	CF	0.1	0.1
Psephenus	09021108058	0.33	0.33	4	SC	0.1	0.1
Hydrobiidae	10010104	7.67	7.67		--	3.3	3.3
Bivalvia	1002	0.33	0.33		CF	0.1	0.1

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Moody Mountain Environmental 137 Diamond Str Searsmont ME 04973 ph.207-592-8540 moodymtn@tidewater.net

Document Content(s)

Ms. Kimberly D. Bose, Secretary
February 24, 2022

VIA E-FILING
Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N. E.
Washington, DC 20426

RE: Green Lake Hydroelectric Project (FERC No. 7189)
Updated Study Report Meeting Summary

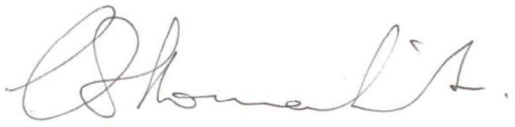
Dear Secretary Bose:

On February 9, 2022, the Licensee for the Green Lake Hydroelectric Project, Green Lake Water Power Company (GLWP), submitted the Updated Study Report (USR) for the relicensing of the Green Lake Hydroelectric Project (Project).

GLWP held a video/phone meeting with relicensing participants and Commission staff on February 17, 2022 (i.e., within 15 days following the filing of the USR in accordance with 18 CFR § 5.15(c) and the project Process Plan and Schedule) to discuss the 2021 study results and status. The USR includes the results of the Benthic Macroinvertebrate (BMI) study, which is the only study that was not completed prior to the filing of the Initial Study Report (ISR) (February 9, 2021).

As required by 18 CFR § 5.15(c), GLWP has prepared a USR Meeting Summary. The Meeting Summary and the Meeting Presentation are included as attachments to this letter. Also attached are the Updated Study Report and the Macroinvertebrate Report for Site 1 (filed in March 2021 as a Supplement to the ISR). These made up the bulk of the presentation.

If you have any questions regarding the USR Meeting Summary, please contact me by email at caroline@greenlakewaterpower.com or by phone at (425) 553-6718



Sincerely,
Caroline Kleinschmidt
Relicensing Coordinator
Green Lake Water Power Co.

Enclosures:
20220224-GLWP-USR-Meeting-Summary.pdf
20220224-GLWP-USR-Meeting-Presentation.pdf
20220209-Green-Lake-Project-USR.pdf
20210317-GLWP-Macroinvertebrates-Report.pdf

cc: Distribution List

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Green Lake Project
USR Meeting
February 2022
FERC P-7189

Introductions and Orientation

Meeting participants

- Name
- Organization or area of interest

Meeting protocol

- Questions and discussion
- Messaging
- If all else fails:
  - Email: Caroline@GreenLakeWaterpower.com
  - Landline: 207-667-3322

This meeting is being recorded to assist us with the meeting summary.

Meeting Agenda

This meeting is part of the relicensing process for the Green Lake Water Power project.

The meeting purpose is to cover studies completed during the 2021 study season.

Study List

1) Downstream Benthic Macroinvertebrate (BMI) Study

Weather

All field work for the 2021 study season was completed in 2020.

The summer of 2020 was dry, so Reeds Brook flows were lower than normal.

We ran the last 13 days of the BMI study period to have tailrace flow during as much of the BMI study as possible.

We shut down because of a lack of water.

Normally, the fall drawdown takes 4-6 weeks.

In 2020, the basic drawdown took just under 2 weeks.

Consistent fall rain started to arrive the end of September.

BMI Site 1 Report

Initial Study Report Supplement – Filed 17-Mar-2021

BMI Site 2 & 3 Report

Updated Study Report – Filed 09-Feb-2022

Questions & Discussion

End of Meeting.

GREEN LAKE WATER POWER CO.
GREEN LAKE PROJECT (FERC NO. 7189) RELICENSING
UPDATED STUDY REPORT MEETING
THURSDAY, FEBRUARY 17, 2022, 10:00 AM

VIA VIDEOCONFERENCE

ATTENDEES: Nick Palso, FERC
Bill Connelly, FERC
Kathy Howatt, MDEP
Jeanne DiFranco, MDEP
Oliver Cox, USFWS & GLNFH
Gregory Burr, MDIFW
Bert Kleinschmidt, Green Lake Water Power (GLWP)
Caroline Kleinschmidt, GLWP

Attachments: 20220224-GLWP-USR-Meeting-Summary.pdf
20220224-GLWP-USR-Meeting-Presentation.pdf
20220209-Green-Lake-Project-USR.pdf
20210317-GLWP-Macroinvertebrates-Report.pdf

GLWP filed the Updated Study Report (USR) with the FERC on February 9, 2022, as part of relicensing the Green Lake Hydroelectric Project (FERC No. 7189). The filing was in accordance with the regulations of FERC's Integrated Licensing Process (ILP) (18 Code of Federal Regulations [CFR] 5) and with the Project's Process Plan and Schedule. The USR includes the results of the Benthic Macroinvertebrate (BMI) study which is the only study that was not completed prior to the filing of the Initial Study Report (ISR) (February 9, 2021).

This summary document presents the proceedings of the meeting held on February 17, 2022 to discuss the 2021 study results and status. A copy of the meeting presentation is included. Also attached are the Updated Study Report and the Macroinvertebrate Report for Site 1 (filed in March 2021 as a Supplement to the ISR). These made up the bulk of the presentation. In accordance with the Process Plan and Schedule contained in FERC's Scoping Document 2 (SD2), this meeting summary must be filed with the FERC no later than March 4, 2022.

WELCOME AND INTRODUCTIONS

Bert Kleinschmidt (GLWP) welcomed those attending the USR meeting and reviewed general meeting logistics. Bert noted that the presentation would include the results of the Benthic Macroinvertebrate (BMI) study, followed by a discussion with any questions or comments.

UPDATED STUDY REPORT REVIEW

This conference call/meeting was to discuss the Updated Study Report (USR). The USR includes the results of the Benthic Macroinvertebrate (BMI) study which is the only study that was not completed prior to the filing of the Initial Study Report (ISR) (February 9, 2021).

GLWP pointed out, near the beginning of the meeting, that the description for Site 3 was incorrect in the report for Site 1 that was filed in March 2021, that description has been fixed in the USR

It was also pointed out by GLWP at the beginning of the meeting that the summer of 2020 was very dry.

The following is a summary of the discussions and questions asked during the meeting.

1-1) <u>Downstream Benthic Macroinvertebrate Study</u>

- Oliver Cox (USFWS) – Suggested the language used to describe the outfall locations at the Hatchery should be amended to clearly identify the filter treatment discharge from the sewage treatment discharge.
    - Kathy Howatt (MDEP) – Says she will confer with others at MDEP and let GLWP know what is needed by MDEP for the record.
- Jeanne DiFranco (MDEP) – Described how DEP makes the determination using their statistical model using the Linear Discriminant Model. The model returns solely based on the biological data (the bugs) whether or not the community is predicted to meet a particular water quality classification and it gives a probability. Then they can have some flexibility to use best professional judgement to raise the finding, which was done with sites 2 and 3, to Class C – the habitat looks like it's periodically inundated, which could have some impact, so it was a little bit atypical in that respect.
    - Oliver Cox (USFWS) – Jeanne mentioned that site 3 was periodically inundated by Graham Lake, it's probably the inverse of that, it's almost always in Graham Lake, usually inundated. He thought it [the model] was just for streams and rivers.
    - Jeanne DiFranco (MDEP) – the model is just for streams and rivers but we had the opportunity to do the sampling because water levels were low and the habitat was appropriate during the summer when it was sampled so the lake was not inundating that site at the time that samplers were in so we wanted to see what we could find out.
    - Oliver Cox (USFWS) – in the report it said that it was a Lentic site that was inundated so that's where it gives him a little pause on drawing conclusions from those samples.
    - Jeanne DiFranco (MDEP) – It was inundated prior to samplers being placed but during the entire 28 day period that the samplers were in place it was not, neither site was inundated and MDEP looked at photos and it looks like typical habitat where we would sample streams using the model so that gives us the best that we could get under this scenario because the water levels were low and we were able to at least go out and sample it.
- Bill Connelly (FERC) – Asked if it's possible to get elevations of the 2 sites so they could be compared to the Graham Lake elevation during the sampling period.
    - Bert Kleinschmidt (GLWP) – Suggested looking at the field sheets for water depth and water flow.
    - Bill Connelly (FERC) – wants the data from prior to the study so he can look at bug potential colonization. If a lot of insects lay their eggs maybe in the Spring, and Graham Lake is higher during that period, it may be possible that you'd have a different community laying eggs there. He will take a look at the field sheets.

The meeting ended at 11:04am

APPENDIX A – STAGE VS. VOLUME

Green Lake

Elevation, USGS	Gage at Dam	Lake Area, Acres	Storage, Acre - Ft	Acre – Ft, Incremental
157.5	4.0	2907	0	0
157.7	4.2	2920	583	583
158.7	5.2	2986	3536	2953
159.7	6.2	3052	6555	3019
160.7	7.2	3118	9640	3085
161.7	8.2	3184	12791	3151
162.7	9.2	3250	16008	3217
163.7	10.2	3316	19290	3282

The reference point for the above table is the lowest Winter Minimum: 157.5 USGS, or 4.0 on the gage.

For reference purposes (gage values):

Summer Minimum: 6.2

Winter Minimum: 4.0 or the level on 15-Oct, whichever is higher

Maximum Year Round: 7.2

Spillway Elevation: 7.2

Source: GLWP

APPENDIX B: INPUT FLOW DURATION SUMMARY

Green Lake Input flow duration summary table.

Month	Mean/Average Daily Flow (cfs)	Median Daily Flow (cfs)	Minimum Daily Flow (cfs)	Maximum Daily Flow (cfs)
January	104	77	9	892
February	84	55	13	862
March	154	110	18	1003
April	252	204	44	1471
May	126	97	15	883
June	74	43	13	704
July	36	19	4	730
August	27	13	3	467
September	27	11	3	809
October	70	30	3	1357
November	125	96	7	1153
December	154	107	9	2358
Annual	102	61	3	2358

Source: GLWP PAD

Additional flow duration values calculated from the flow duration curves for May-October.

Month	Mean/ Average flow (cfs)	Median flow (cfs)	Min. flow (cfs)	5% Flow (cfs)	95% Flow (cfs)	Mean Exceed % (cfs)	GLNFH Flow Average (cfs)	Mean Avail. (cfs)	95% Avail. (cfs)	Min Monthly Average (cfs)	Max Monthly Average (cfs)
May	126	97	15	328	36	34	8	118	28	42	294
Jun	74	43	13	247	18	29	8	66	10	26	225
Jul	36	19	4	119	9	24	9	27	0	12	125
Aug	27	13	3	100	4	26	12	15	-8	3	106
Sep	27	11	3	96	4	21	16	11	-12	4	153
Oct	70	30	3	289	4	28	17	53	-13	6	275

Source: GLWP and Kleinschmidt Group

Mean, Median and Min flow are from the PAD table above.

5% Flow and 95% Flow are the high and low bounds specified for proper operation of fish passage per the USFWS Fish Passage Engineering Design Criteria (USFWS 2017).

Mean Exceed % is the percentage of time that the mean flow is exceeded.

GLNFH Flow Average is the average monthly historical flow discharged from GLNFH waste treatment lagoons. The amount taken from Green Lake would be slightly higher because of the filter backwash water discharged into Reeds Brook from the hatchery treatment plant.

Mean Avail. is the average flow into Green Lake after accounting for water used by the GLNFH.

95% Avail. is the net amount of water flow into Green Lake that is exceeded 95% of the time after accounting for water used by the GLNFH.

Min and Max Monthly Average are the minimum/maximum monthly averages of daily flow values for each month during the flow data period of 1998 through 2018. For example, during 1998-2018 there was at least one May when the average of the daily flow values was as low as 42 cfs and at least one with an average as high as 294 cfs. For comparison, from the upper table, it is seen that there was at least one day with a flow value as low as 15 cfs and at least one with a value as high as 884 cfs.

From the tables, it can be seen that using mean drainage area flow rates during the May-October period could create a misleading idea of the flow available to the Project from Green Lake:

1) Mean flow into the lake does not account for the water used by the GLNFH.
2) The mean flow is at the 21-34% exceed level. Thus, 66 to 79 percent of the time the mean flow is not available.
3) The median flow is less than half of the mean flow during the low flow months of July through October, and by definition the median flow is available only half the time.
4) There is much more potential for unusually large amounts of flow into the lake to affect average flows than unusually small ones. If the typical flow into the lake during a month is 25 cfs then the lowest inflow value of zero is 25 below the typical value. The maximum flow is not similarly bounded—it could be 800 cfs. The 800 cfs, while potentially raising the mean flow considerably for the month, would flow from the lake over a few days and not provide an increased flow potential over an extended period.
5) The Min and Max Monthly Averages in the right two columns of the second table suggest that the high and low flow values that make up the flow duration curves are not evenly distributed. The low flow days are more likely to be grouped in time with other low flow days and high flow days are more likely to be grouped in time with other high flow days, resulting in a large difference between the lowest and highest flow instances of a given month across the years. This further suggests that some of the inherent assumptions about storage being effective to allow sustained mean flows are likely to be impractical.
6) Averaging is used in several places in the derivation of flow duration curves. “mean flow” can refer to any of the following:
    a. The flow averaged across the hours of a day
    b. The flow averaged across the days of a month
    c. The flow averaged across all days in a specific month across a set of years
    d. The flow averaged across the days in a year
    e. Etc.

One must be careful to understand what is being averaged when using a mean flow.

The USFWS Fish Passage Engineering Design Criteria document (USFWS 2017) specifies a minimum downstream attraction flow of 25 cfs (page 9-2), a minimum upstream attraction flow of 50 cfs (page 6-3) and that the operating range for fish passage is bounded by the 95% and 5% exceeded flow values.

Using a typical downstream period of May-June and an upstream period of May-October, results in a requirement for at least 75 cfs during May-June and 50cfs July-October for successful fish passage. None of these months have 95% flows that satisfy these requirements. Only two months, May and October even have mean flows that meet the minimum flow requirements. October has a mean flow that barely meets the 50 cfs requirement, and that mean flow is actually only available 28% of the time in October. These values do not include such factors as evaporation and leakage past the dam so they actually paint a slightly optimistic view of the available flow

Under the current licensing terms, the Project has severely limited storage available in the lake, during the summer, to smooth out precipitation peaks and troughs. The Project is restricted to managing within a one foot range of lake elevation. With the threat of large storms and dry spells, the effective range that can be used for storage of water that is then used by the project (for minimum flows or, rarely during the summer, generation) is 3-6 inches. This amounts to a useful storage amount of about 750-1500 acre-feet (Appendix A), or a flow value of 12-24 cfs across a month. We have recently experience several summers when the lake level has dropped below our allowed minimum despite shutting the turbine down with the lake near the middle of the range and only allowing our required minimum flows past the dam.

S2-10

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WIND DIR. CODES

N = 1 S = 5
NE = 2 SW = 6
E = 3 W = 7
SE = 4 NW = 8
no wind, enter 0

LAKE: GREEN | TOWN: Ellsworth 58F

STATION DESCRIPTION: #2 | COUNTY: Hancock

STATION: LAT 44.62745 LONG -68.45341 | DATUM | ACCURACY | ON TARGET? Y / N

LAKE	MIDAS	STATION	CERTIFIED MONITORS 1 & 2 (Last name, First name)	PROJECT
GREE	4294	2	KLEINSCHMIDT, BERT CAROLINE	EI03

MONTH	DAY	YEAR	MILITARY TIME	WIND VELOCITY	WIND DIRECTION	Sky Condition at Time of Secchi Readings – CIRCLE ONE	Gloeo Category (0 to 6; Refer to Visual Aid)
10	19	2020	1437	5	SSE	B C O (B = Bright (shadows), C = Cloudy Bright, O = Overcast)	6

DIRECTIONS: Use this form when obtaining Temp./D.O. profiles. Please fill out completely. Please indicate missing data by filling spaces with 9s.

PLEASE HELP US AVOID DUPLICATE DATA IN THE DATASET BY ENTERING SECCHI DATA ON ONLY ONE FORM.

SCOPE TYPE CODES:

1 = None
2 = Flat glass, no mask
3 = Slant glass, no mask
4 = Slant glass & mask
5 = Flat glass & mask
6 = 6" diameter, slant glass & mask

SECCHI (meters)	SCOPE TYPE	DISK HIT BOT? Y/N	MONITOR'S QA CERTIFICATION #	READING # (1, 2 etc)
+1 meter 6.34	6	N	BERT	1
.			-	2

On two dates each year, please take two readings and record as Reading #1 & 2.

TEMPERATURE / DISSOLVED OXYGEN PROFILES

CIRCLE DEPTH UNITS: METERS / FEET | CIRCLE TEMP. UNITS: CENT. / FAREN.

PLEASE CIRCLE D.O. METHOD: *Titration:* Hach Kit, Lamotte Kit, Other Kit: | *Meter (enter model):* YSI Meter ProSolo ODO/T, Hach Meter, Other Meter: | METER ID#: GLWP | ✓ Check to indicate D.O. meter was calibrated

DEPTH	WATER TEMP	OXYGEN (mg/l)	DEPTH	WATER TEMP	OXYGEN (mg/l)	DEPTH	WATER TEMP	OXYGEN (mg/l)
0.	14.3	10.29	11.	13.7	10.12			
1.	14.2	10.29	12.	13.7	10.11			
2.	13.9	10.28	13.	13.7	10.11			
3.	13.9	10.24	14.	13.7	10.11			
4.	13.8	10.20	15.	13.7	10.11			
5.	13.8	10.17	17.	13.7	10.11			
6.	13.7	10.15	19.	13.6	10.11			
7.	13.7	10.15	21.	13.6	10.10			
8.	13.7	10.14	23.					
9.	13.7	10.13	25.					
10.	13.7	10.12	30.					

Required QA/QC Dupes (1 for every 10)

BOTTOM: | CORE DEPTH: | CHL. #: | TP #: | AIR TEMP: C / F

COMMENTS: 14:50 10m

SIGNATURE:

DATA PROCESSING STAFF ONLY Please Date & Initial

Checked	-	-	
Entered	-	-	
Proofed	-	-	