

MEMORANDUM FOR THE RECORD

TITLE - 21DET02 MFR Detroit Water temperature and Fish Passage Measure 07**PROJECT** - Detroit Dam**RESPONSE DATE** - 07 May 2021**Description of the problem**

The purpose of this operation (Detroit Interim Measure 07) is to provide downstream fish passage in the spring and water temperature management throughout late spring and summer at Detroit and Big Cliff Dams through strategic use of the spillway, turbines and regulating outlets. Spillway operations will start when the reservoir reaches spillway crest elevation (1541.0 feet; typically, around April/May, depending on hydrology) and continue until the reservoir is drafted below the spillway crest. From there, a combination of turbine and regulating outlet discharges will be implemented through 01 December (or until water temperature management is no longer possible due to reservoir turnover).

This measure will start as soon as feasible this year to mitigate for the Interim Risk Reduction Measure (IRRM) that has recently gone into effect at Detroit Dam due to seismic-related concerns (21DET01). Under the IRRM, refill of Detroit Reservoir will be limited to elevation 1558.5 ft, rather than full pool or 1563.0 ft. This equates to approximately 17,000 acre-feet of loss storage. That means that the reservoir will be drawn down below spillway crest elevation earlier in the summer than in year's past (with similar hydrology), shortening the duration of spill releases.

An analysis of recent operations and temperature management over the last 14 years has revealed a direct relationship between the number of days in which the Detroit spillway is operated (Jun-Aug) and the estimated day in which Spring chinook eggs emergence from gravel in the following winter. Using the Detroit spillway as soon as it is available may improve emergence timing and the survival of early life stages of spring Chinook.

Spill operations should occur at night (between dusk and dawn). The spillway gates will be operated at a minimum gate opening of 1.5 ft. Spill up to a maximum of 60% of the total flow through the spillway in a 24-hour period of time will occur. The turbines should not be operated (no power generation) during this period except for Station Service if needed for emergencies, to mitigate for elevated TDG or to cool water temperatures that are at risk of exceeding the upper temperature target range.

On the first day of implementation, a 25%/75% spill to generation ratio will be used and gradually adjusted to a 60/40 split, to gradually warm water temperatures. Throughout the summer, a spill of approximately a 50/50 split will be provided to meet downstream water temperature targets. Adaptive management will be used reducing the spill ratio if water temperatures (as measured at the USGS gage downstream of Big Cliff) exceed targets.

Once the reservoir is below the spillway crest, the Corps will shift to turbine only releases until

mid- to late October or until outflow water temperatures reach 50 degrees Fahrenheit. The Corps will utilize the upper RO in conjunction with turbine releases into December, or until water temperature management is no longer possible due to reservoir turnover. Dates and duration of spill during summer and fall is dependent on preceding precipitation and stream flow conditions occurring November through May and summer inflows during the operational period. Adjustments may be necessary in spill gate, turbine, and RO releases in order to manage downstream water temperatures.

At no time should operations create TDG that exceeds state water quality standards as measured at the USGS Niagara gage. If exceedances to TDG standards are observed, non-turbine releases out of Detroit Dam and/or Big Cliff Dam will be reduced.

Link to Interim Measure 05: Beginning in the Fall, the Corps will begin implementation of Detroit Interim Measure 05. There will be a separate SOR for Detroit Measure 05 that will be coordinated in late summer. Operational details of Detroit 05 are provided below for additional context.

The intent of Detroit Interim Measure 05 is to modify Detroit Dam operations during the Fall drawdown and winter months when downstream fish passage rates are high by passing all flow through the Upper Regulating Outlet (RO) structure at night, from dusk until dawn, with no turbine operation (no power generation) during this period except for Station Service if needed for emergencies. Once the reservoir elevation is less than 100 feet over the turbine intakes (elevation 1450 -1500 feet), turbines can only be operated at Detroit Dam during the day, between dawn and dusk. The Upper ROs will be prioritized to pass flow with a minimum gate opening of 5.0 ft. Larger gate openings may be used up to 7.9 ft open or full open per recommendations from Engineering staff. One RO may be used to pass this flow. The second RO may be used to pass additional flow. At least 50% of the total daily flow shall pass thru the regulating outlet structure.

Minimum RO gate opening should not be less than 5 feet for safe fish passage (smaller gate openings can injure fish).

The Corps will manage discharge from Detroit and Big Cliff Dams to reduce TDG levels downstream of Big Cliff dam. The State water quality standard of 110% should be considered a hard constraint.

As recommended by Engineering staff, operate the spillway at free flow until the pool reaches 1545 feet, so as not to bounce between free flow and orifice flow. Once above elevation 1545 feet, the following minimum gate opening should be used:

Bays 5 and 6: 0.75 foot gate opening,
Bays 1 – 4: 1.5 feet for gate opening.

Note: When bays 3 and 4 are refurbished, they can go to a 0.75 foot gate opening.

Prioritize flow through bays 5 and 6 as much as possible.

Operational Measure 07 will target the Resource Agency (RA) Temperature Targets listed below.

Discharge water temperatures should follow the upper bounds of these targeted ranges and average daily water temperatures should not exceed the maximum temperature. In other words, hourly water temperature readings may, at times, go above/below maximum water temperature targets, but averages for the day should fall between the RA temperature ranges.

Month	Temperature Maximum/Minimum	
	°F	°F
April	46	42
May	50	46
June	54	48
July	55	52
August	55	52
September	54	48
October	52	46
November	46	42

The Detroit forebay water temperature string was damaged during the 2020 wildfires and is currently out of service. The USGS will be installing a new temperature string as soon as possible, but it may not be operable by the time implementation of this interim measure begins.

Monitoring

The Corps will monitor water temperatures during this operation and summarize them annually in the Willamette Basin Annual Water Quality Report using data from the USGS Niagara gaging station (BCLO/ID 14181500). A rotary screwtrap will be installed and operated below Big Cliff Dam to provide information on juvenile salmonids exiting downstream of Detroit and Big Cliff Dams.

Expected impacts on fish

The purpose is to provide safer passage and/or temperatures for salmonids. Additional insight may be provided by monitoring.

Comments from agencies

-----Original Message-----

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Sent: Wednesday, April 28, 2021 7:51 AM

To: Walker, Christopher E CIV USARMY USACE (USA)

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Subject: RE: WFPOM: 21DET02 Detroit Water temperature and Fish Passage Measure 07

Chris,

Under normal circumstances, I would have no comment on this SOR. However, I have a couple constraints inherent to the state of the spillway gate rehab at Detroit that I need worked into the MFR:

Gates 4-6 are partially refurbished, and are only available for restricted local operations. Do not assume these gates are available for daily temperature control operations.

Gate 3 is out of service and unavailable until approximately March 2022 when new wire ropes are installed.

Gates 1-2 have not been refurbished, and are available for remote operations. Gates 1-2 are the only gates available for daily temperature control operations, and flow out of these gates will be prioritized as much as possible (NOT Gates 5-6).

Please update the below MFR content to reflect this information and operating restrictions

"As recommended by Engineering staff, operate the spillway at free flow until the pool reaches 1545 feet, so as not to bounce between free flow and orifice flow. Once above elevation 1545 feet, the following minimum gate opening should be used:

Bays 5 and 6: 0.75 foot gate opening,

Bays 1 - 4: 1.5 feet for gate opening.

Note: When bays 3 and 4 are refurbished, they can go to a 0.75 foot gate opening.

Prioritize flow through bays 5 and 6 as much as possible."

Sincerely,

Tim Ernster

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Please email or call with questions or concerns.

Thank you,

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