

THOMAS POND DAM & WATER LEVEL MANAGEMENT PLAN



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# THOMAS POND DAM & WATER LEVEL MANAGEMENT PLAN

## 1 Introduction

This document, the Thomas Pond Dam & Water Level Management Plan (TPMP), sets forth the operational practices used by the Thomas Pond Improvement Association (TPIA) to keep Thomas Pond healthy by managing the Thomas Pond dam to maintain seasonally stable pond elevations as agreed to by a vote of the members of TPIA while maintaining water outflows as needed to comply with the conditions contained in the Maine Department of Environmental Protection (MDEP) 1990 Board Order #L-010896-37-A-N<sup>1</sup> (BOARD ORDER).

TPIA has separately prepared a Dam Maintenance Plan and Position Descriptions for the roles charged with implementation of these Plans. Those descriptions flesh out the responsibilities of the individuals who will monitor, manage, and maintain the dam.

Commented [A1]: Add reference to document created after the TPMP

## 2 Setting and Background

Thomas Pond, located in Raymond and Casco Maine, is assigned a Maine Information Display Analysis System (MIDAS) ID number of 3392. Thomas Pond has a drainage area of ~5.5 square miles as measured from the sole outlet into Dingley Brook, where a small privately-owned dam that regulates lake water discharge is operated and maintained by the TPIA. Thomas Pond has a surface area of 533 acres, a perimeter of 7.4 miles, a mean depth of 22 feet, a maximum depth of 64 feet, with good to excellent water quality and both cold and warm water fisheries.<sup>2</sup>

The Thomas Pond watershed is considered most at risk from new development<sup>3</sup>. According to the requirements stated in Chapter 587<sup>4</sup>, Thomas Pond is a Class GPA body of water, while Dingley Brook below the Thomas Pond dam is a Class A body of water.

On April 25, 1990 MDEP, through the BOARD ORDER, declared the Thomas Pond dam abandoned and transferred its ownership of the dam to TPIA. As part of this transaction, certain conditions were placed on TPIA including that *"The association shall develop a written Water Level Management Plan designating who is responsible for operating the dam and describing how the dam is to be operated under a variety of likely water level/meteorological occurrences."* A management plan was developed at the time of the BOARD ORDER and included as part of two easements<sup>5</sup> granted by abutting property owners to provide access to the dam structure without requiring a taking of substantial private property. This document supersedes<sup>6</sup> that management plan document and complies with the operational conditions of the BOARD ORDER as interpreted by MDEP.

<sup>1</sup> A copy of the order may be accessed [here](#)

<sup>2</sup> Sources: <https://www.lakesofmaine.org/lake-overview.html?m=3392#> & USGS StreamStats

<sup>3</sup> Chapter 502: Direct Watersheds of Lakes Most at Risk from New Development, and Urban Impaired Streams

<sup>4</sup> Chapter 587: In-Stream Flows and Lake and Pond Water Levels, effective on August 24, 2007.

<sup>5</sup> A copy of the easements and any amendments may be found by searching online records from the Cumberland County Registry of Deeds

<sup>6</sup> The easements state *"The grantors understand that with the exception of objective 4 (2.4 cfm (sic) minimum flow requirement, the dam management plan may be changed over time..."*

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### 3 Defined Terminology and Values Used in the TPMP

Terminology described in this section will be specified in all capital letters (e.g., MIN FLOW) when used in the narrative of this TPMP.

|   |   |                                   |                              |
|---|---|-----------------------------------|------------------------------|
|   | <b>SEASONAL PERIODS</b>                                     |                                   |                              |
| SPRING  | March 16 – May 15   |                                   |                              |
| SPRING RAISE PERIOD   | March 15 through April 30                                   |                                   |                              |
| IN-SEASON   | May 1 through October 14                                    |                                   |                              |
| FALL DRAWDOWN PERIOD  | October 15 through November 15                              |                                   |                              |
| OFF-SEASON  | November 16 through March 14                                |                                   |                              |
| <b>POND ELEVATION at Dam Crest (inches from top surface of dam)</b> |   |                                   |                              |
| FALL DRAWDOWN TARGET  | -27   |                                   |                              |
| RANGE   | IN-SEASON -17 to -20  | OFF-SEASON -24 to -30             |                              |
| FLOOD DANGER LEVEL  | -13   |                                   |                              |
| <b>Control Capabilities</b>   |   |                                   |                              |
| STOP LOG  | 4x4 Board, 3.5" height (ungrooved), 3" height (grooved)     |                                   |                              |
| HALF STOP LOG   | 2x4 Board, 1.5" height (ungrooved), 1" height (grooved)     |                                   |                              |
| FLOW CONTROL PRECISION  | ± 1.5" (ungrooved 2x4), ± 1.0" (grooved 2x4)                |                                   |                              |
| MEASUREMENT PRECISION   | ± 0.5"  |                                   |                              |
| <b>WATER FLOW (Discharge) at Dam Crest</b>                          |   |                                   |                              |
|   | <b>Cubic feet per second (CF/S)</b>                         | <b>Inches of Flow<sup>7</sup></b> | <b>Pond Water Inches/Day</b> |
| MIN FLOW  | ABF <sup>8</sup> ≅ 1.2                                      | 1.85                              | ~0.05                        |
| LOW NORMAL FLOW <sup>9</sup>  | 2.4   | 2.94                              | ~0.11                        |
| MID NORMAL FLOW   | 8.7   | 7                                 | ~0.39                        |
| MAX NORMAL FLOW   | 19.3  | 12                                | ~0.86                        |
| MAX PRE-FLOOD FLOW  | 34.9  | 18                                | ~1.56                        |
| MAX FLOOD DANGER FLOW   | 72.5  | 30                                | ~3.24                        |
| <b>Precipitation Values</b>   |   |                                   |                              |
| FORECAST PERIOD   | 3 Days  |                                   |                              |
| RECOVERY PERIOD   | 4 Days  |                                   |                              |
| HIGH PROBABILITY  | ≥ 75%   |                                   |                              |
| RAPID WATER LEVEL CHANGE  | ≥ 2.0" in 24 hours  |                                   |                              |
| HEAVY RAINFALL  | ≥ 1.5" in 24 hours or ≥ 3.0" in 3 days                      |                                   |                              |
| 5-YEAR RAINFALL <sup>10</sup>                                       | ~ 4.1" in 24 hours or ~ 4.7" in 2 days or ~ 5.2" in 3 days  |                                   |                              |
| 10-YEAR RAINFALL  | ~ 4.8" in 24 hours or ~ 6.12" in 2 days or ~ 7.5" in 3 days |                                   |                              |

<sup>7</sup> Inches of Flow is used as a surrogate measurement technique in lieu of directly measuring flow in CF/S. See "Thomas Pond Water Flow Calculator.xlsx" tool to translate any flow in inches to CF/S and time to release 1" of pond water. These numbers do not include seepage.

<sup>8</sup> Using USGS StreamStats, MDEP estimates Aquatic Base Flow (ABF) as just under 1.2 CF/S with an Average Standard Error of Prediction (ASEp) of 66.4 as of 2023.

<sup>9</sup> The easements mandate a minimum flow of 2.4 CF/S, DEP requires ABF or Seasonal ABF

<sup>10</sup> Rainfall projections from [https://hdsc.nws.noaa.gov/pfds/pfds\\_map\\_cont.html?bkmrk=me](https://hdsc.nws.noaa.gov/pfds/pfds_map_cont.html?bkmrk=me)

## 4 Monitoring

TPIA shall maintain gauges with 1" demarcations at the dam to measure POND ELEVATION and WATER FLOW. Gauges may be read in person or via a photograph and should be readable from the public right of way. Dam Monitors shall be responsible for monitoring POND ELEVATION and WATER FLOW.

Log entries shall be via online form and made available by TPIA on the TPIA website, [thomaspond.org](http://thomaspond.org). Entries include the date/time, observer ID, WATER FLOW and POND ELEVATION, a link to photograph(s) if available, STOP LOG changes, and notes of actions (including identity of actor(s) if different than the observer), observations or conditions.

Monitoring and logging shall occur a minimum of once per week, and during periods of HEAVY RAINFALL or RAPID WATER LEVEL CHANGE, monitoring shall occur at least once per day. If sufficient Dam Monitor volunteers are available, TPIA will seek to monitor the dam daily in SPRING and IN-SEASON and twice daily during period of HEAVY RAINFALL or RAPID WATER LEVEL CHANGE whenever those conditions occur.

## 5 Dam Operational Practices

Individual(s) responsible for the operations of the dam are referred to by TPIA as Dam Keepers. Only Dam Keepers shall have keys to the dam. Dam Keepers shall visit the dam on an as-needed basis. Dam Keepers shall manage WATER FLOW and influence POND ELEVATION by adjusting STOP LOGS as needed to maintain WATER FLOW above MIN FLOW, and POND ELEVATION within the applicable IN-SEASON or OFF-SEASON RANGE whenever practical and for as much of the relevant period as possible.

POND ELEVATION changes are primarily due to conditions beyond TPIA's control, such as natural increases due to snow melt, precipitation, upwelling springs, and inflow from the drainage basin, and decreases due to evaporation, transpiration, absorption into the underlying groundwater aquifer and water discharge downstream from the dam into Dingley Brook. TPIA cannot directly control POND ELEVATION, rather TPIA's capabilities are limited to influencing POND ELEVATION by adjusting STOP LOGS to control the WATER FLOW over the dam.

Dam Keepers must estimate POND ELEVATION in the FORECAST PERIOD based on their experience, weather forecasts and tools (if any) developed by TPIA. Dam Keepers are encouraged to use TPIA tools and assist in their ongoing refinement.

Dam discharges are controlled by adding or removing STOP LOGS or HALF STOP LOGS. Dam Keepers ability to granularly control WATER FLOW is limited by the smallest STOP LOG size. As a result, periodic short-term deviations in POND ELEVATION and WATER FLOW (above MIN FLOW) of less than FLOW CONTROL PRECISION may occur.

Dam Keepers must put their safety first. They are prohibited from going to the dam alone during storms with high winds or extreme precipitation intensity, and from crossing over the opening of the dam when the top of the dam is, or is in imminent danger of being, submerged.

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### 5.1 Normal Conditions

Whenever POND ELEVATION is within the applicable IN-SEASON or OFF-SEASON RANGE and likely to stay within RANGE, Dam Keepers should use TPIA provided tools and their judgment and experience, taking into account weather forecasts and general conditions of the drainage basin, in making gradual proactive changes to STOP LOGS in order to attempt to keep POND ELEVATION stable within the applicable IN-SEASON or OFF-SEASON RANGE. Typically this will involve allowing flows over the dam of  $\geq$  LOW NORMAL FLOW and  $\leq$  MID NORMAL FLOW.

Whenever POND ELEVATION is likely to, or exceeds, the IN-SEASON or OFF-SEASON RANGE Dam Keepers shall set outflows so that they are  $\geq$  MID NORMAL FLOW and  $\leq$  MAX NORMAL FLOW until POND ELEVATION returns into RANGE, conditions permitting, within  $\leq$  RECOVERY PERIOD.

### 5.2 Low Rainfall & Low Water Conditions

When POND ELEVATION is near the lower end of the applicable IN-SEASON or OFF-SEASON RANGE and dropping, Dam Keepers should attempt to retain water in the pond by reducing outflows to  $\geq$  MIN FLOW and  $\leq$  LOW NORMAL FLOW. When POND ELEVATION is below or at the bottom of the applicable IN-SEASON or OFF-SEASON RANGE, Dam Keepers should reduce outflow to as close to, but not less than MIN FLOW as possible.

If POND ELEVATION continues to drop, Dam Keepers may request a temporary waiver for MIN FLOW when natural conditions alone cause those flows to be less. A waiver may be granted by the Commissioner or staff authorized by MDEP to grant similar waivers to other dam operators. Waivers are valid for the current season unless otherwise specified by MDEP.

When precipitation or other inflows raise the POND ELEVATION to within RANGE, Dam Keepers shall promptly restore WATER FLOW to  $\geq$  MIN FLOW so long as the greater discharge allows the POND ELEVATION to continue to remain within the applicable RANGE.

Commented [A2]: Clarification that flow does not have to be increased until we are back in range (flow will have increased anyway with pond level)

### 5.3 HEAVY RAINFALL & High-Water Conditions

Dam Keepers must be prepared to proactively cope with major inflows of water, for example from a HEAVY RAINFALL, expected at least once/year. To minimize damage to pond-side and Dingley Brook property, Dam Keepers should take precautionary actions when there is a HIGH PROBABILITY of HEAVY RAINFALL in the FORECAST PERIOD. POND ELEVATION will typically rise immediately by the amount of rainfall received, and then may continue to rise over the following 3 – 7 days as an influx of water enters the pond from the drainage basin.

In determining the precautionary actions to be taken in anticipation of a HEAVY RAINFALL, Dam Keepers need to consider many factors, including starting POND ELEVATION, IN-SEASON or OFF-SEASON RANGE, how wet or dry the ground is around the pond, the accuracy of weather forecasts as to probability, duration, intensity, and amount of precipitation, TPIA tool projections, and prior experiences. The table provide guidelines for how Dam Keepers should (**shall in bold**) manage WATER FLOW when precautionary changes may be appropriate. Dam Keepers should gradually increase outflow over the dam by removing STOP LOGS or HALF STOP LOGS starting up to the FORECAST PERIOD in advance of the forecast significant weather event.

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| Starting POND ELEVATION | Projected POND ELEVATION (before adjustments)    | WATER FLOW   |
|-------------------------|--|--|
| Below or in range       | $\leq$ top of range                              | $\geq$ MIN FLOW (below range)<br>$\geq$ LOW NORMAL FLOW (in range)<br>$\leq$ MAX NORMAL FLOW     |
| Below or in range       | $\leq$ top of range + HALF STOP LOG              | $\geq$ LOW NORMAL FLOW (below)<br>$\geq$ MID NORMAL FLOW (above range)<br>$\leq$ MAX NORMAL FLOW |
| Below or in range       | $\geq$ top of range<br>$\leq$ FLOOD DANGER LEVEL | $\geq$ MID NORMAL FLOW<br>$\leq$ MAX PRE-FLOOD FLOW  |
| Below or in range       | $\geq$ FLOOD DANGER LEVEL                        | $\geq$ MAX NORMAL FLOW<br>$\leq$ MAX PRE-FLOOD FLOW  |
| Above range             | $\leq$ FLOOD DANGER LEVEL                        | $\geq$ MAX NORMAL FLOW<br>$\leq$ MAX PRE-FLOOD FLOW  |
| Above range             | $\geq$ FLOOD DANGER LEVEL                        | $\geq$ MAX PRE-FLOOD FLOW<br>$\leq$ MAX FLOOD DANGER FLOW  |

Commented [A3]: Removal of + ½ log to simplify decision making

### 5.3.1 Flood Control for Waterfront Property

In extreme cases, such as may occur in a  $\geq$  10-YEAR RAINFALL due to a hurricane or tropical storm expected to strike the region within the FORECAST PERIOD, Dam Keepers may increase the outflow to the MAX FLOOD DANGER FLOW, and make no further changes until the weather event has passed, prior to the POND ELEVATION reaching FLOOD DANGER LEVEL and regardless of starting level. Dam Keepers should only do this when it is a virtual certainty that POND ELEVATION will significantly exceed FLOOD DANGER LEVEL. Dam Keepers should provide a courtesy notification to MDEP and must promptly notify the TPIA Board whenever water release is above MAX PRE-FLOOD FLOW. Dam Keepers should, if necessary, move the Dam Cam to prevent it from being submerged.

Commented [A4]: Shortened illustrative period to ensure dam keepers are not reluctant to take drastic action to prevent flooding.

## 5.4 Change of SEASON Practices

### 5.4.1 Lowering POND ELEVATION in Fall

TPIA will conduct an annual drawdown of POND ELEVATION each year when POND ELEVATION is above the OFF-SEASON RANGE. For the FALL DRAWDOWN PERIOD, Dam Keepers should adjust STOP LOGS to gradually increase the rate of outflow to allow the POND ELEVATION to drop to the OFF-SEASON RANGE with a goal of reaching the FALL DRAWDOWN TARGET before the end of the FALL DRAWDOWN PERIOD. Barring HEAVY RAINFALL, Dam Keepers should maintain flows  $\leq$  MAX NORMAL FLOW during the drawdown when that will achieve the planned reduction in POND ELEVATION. Once the FALL DRAWDOWN TARGET is reached, Dam Keepers should reduce the outflow as needed, typically  $\geq$  LOW NORMAL FLOW and  $\leq$  MID NORMAL FLOW, and allow POND ELEVATION to fluctuate within the OFF-SEASON RANGE.

### 5.4.2 Raising POND ELEVATION in SPRING

Dam Keepers should manage the STOP LOGS to attempt to cause the POND ELEVATION to rise (or lower) to the top of the OFF-SEASON RANGE by mid-April, and to be at or slightly above the low end of the IN-SEASON RANGE at the start of the SEASON. To ensure compliance with the BOARD ORDER, Dam Keepers must not remove boards to increase outflows to be  $\geq$  MAX NORMAL FLOW, except in the rare instance when there is a HIGH PROBABILITY of a 5-YEAR RAINFALL or greater within the FORECAST PERIOD, in which case Dam Keepers must notify MDEP. Dam Keepers are not required to add additional STOP LOGS

Commented [A5]: Simplification of wording around spring raise "stages"

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to reduce flows to be  $\leq$  MAX NORMAL FLOW when such WATER FLOW is caused by natural conditions beyond our control.

### 6 Routine Dam Maintenance

In addition to managing STOP LOGS to influence WATER FLOW and POND ELEVATION, Dam Keepers are responsible for performing routine maintenance activities on the Dam as needed and described in the Thomas Pond Dam Maintenance Plan. Routine dam maintenance cannot require alteration of WATER FLOW below MIN FLOW.

Commented [A6]: Maintenance activities were moved to this document

### 7 Non-Routine Dam Activities

Any dam repairs, maintenance, modifications, or emergency remedial actions which do not require a federal, state, or local permit, but which constitute a temporary violation of the BOARD ORDER may be performed only with the prior written approval of the MDEP Commissioner.

#### 7.1 Notification

If Dam Keepers determine it is necessary to vary from WATER FLOW or POND ELEVATION contained in the TPMP for any reason, they shall promptly email TPIA Board Members and if appropriate the MDEP, and post an explanatory announcement on the TPIA website.

### 8 TPMP Administration

This TPMP is maintained and updated as needed by the TPIA Board of Directors. The Board may approve most changes to the TPMP and is responsible for ensuring that the TPMP complies with the BOARD ORDER. Cumulative changes of  $\geq 2$  inches to minimum or maximum values for IN-SEASON or OFF-SEASON RANGE shall be voted on by the Membership<sup>11</sup>. The current TPMP and supporting materials shall be posted to the TPIA Website.

Position descriptions for the operational roles for dam management may be updated by the Board as needed. All Dam Keepers must review the TPMP and Position Description and sign an acknowledgement, which the TPIA Secretary shall keep in the organization's records.

The TPIA Board shall ensure there is adequate supervision and separation of duties between dam keeping and monitoring, and ensuring timely comprehensive logging. The TPIA president shall supervise dam operations. In the event that the TPIA president is also responsible for operations, monitoring or logging, then the TPIA Vice President, or other individual appointed by the Board, shall be responsible for ensuring that operations meet or exceed the requirements set forth in the TPMP.

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<sup>11</sup> Aquatic Base Flow (MIN FLOW) is subject to change without TPIA membership approval if updated by competent authority, currently USGS or MDEP. At the time of drafting of this TPMP, one easement still contains language stating that the 2.4 CF/S cannot be changed. If the easement grantor complains in writing to TPIA then the TPIA Board may modify MIN FLOW or take other action as it deems appropriate without member vote.