

## Total Storage Calculations

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This spreadsheet has been designed by Idaho Department of Water Resources to estimate the total seepage, evaporation and fill capacity required for a pond.

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| User Input           |
| Calculated value     |
| Formula Explanations |

|                          |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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| Surface Area (AC.)       | 0.11 | "Surface Area" is automatically carried over from the "Seepage Loss" sheet.                                                                                                                                                                                                                                                                                                                                                                                                            |
| Average Pond Depth (FT.) | 4    | "Average Pond Depth" depicts the actual depth of the pond either measured or estimated. Note: If you know the maximum depth and not the average depth, the Field Examiner's Handbook suggests multiplying the maximum depth by 0.4 to get the average depth, or you can use any method that seems reasonable to attain average depth.                                                                                                                                                  |
| Pond Capacity (AF)       | 0.44 | Pond Capacity is calculated by multiplying the Pond Surface Area by the Average Pond Depth. If you know the capacity, divide the capacity by surface area and enter the average pond depth in the space above.<br><b>Note: If pond capacity is determined using a method shown on the "Pond Capacity" sheet, the user may need to modify the value of "Pond Capacity" (cell B9) manually. Note that if the value is modified manually, the formula will be altered for future use.</b> |

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| Multiple Fill Volume Above Initial Fill to Fulfill From Storage Needs- "Multiple Fills" (AF) | 6.8 | The "Multiple Fill Volume Above Initial Fill" is the acre-feet of water required to meet a <i>from storage</i> component if the <i>from storage</i> component exceeds a one time fill. This section should not include the amount of water needed to fill the pond initially or the amount of water needed to maintain the pond level due to evaporation or seepage. For example: if a pond has a capacity of 5 acre feet and 2.5 acre feet of seepage and evaporation, but the pond is used for irrigation that requires 10 acre feet of from storage for the irrigation use, then you would insert 5 acre feet into this location (10 acre feet needed - 5 acre feet from the initial fill = 5 acre feet of additional storage needed).<br><b>Note: You must have a "From Storage" component exceeding the initial fill on the permit to include a volume in this space.</b> |
| Estimated Seepage Loss (AF)                                                                  | 0.1 | The "Estimated Seepage Loss" is automatically carried over from the "Seepage Loss" sheet.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Estimated Evaporation Loss (AF)                                                              | 0.1 | The "Estimated Evaporation Loss" is automatically carried over from the "Evaporation Loss" sheet.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Total Volume Required (AF)                                                                   | 7.5 | The "Total Volume Required" is calculated by adding the Pond Capacity, Multiple Fills, Seepage Loss, and Evaporation Loss amounts to determine the total amount of storage required.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

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|---------------------------------------------------------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Flow Rate into Pond (CFS)                                     | 1.00 | The "Flow Rate into Pond" depicts the actual flow, either measured or estimated, into the pond. For offstream facilities, this will be equivalent to "diversion to storage" rate.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Highest Daily Evaporation Rate From Evaporation Tab. (mm/Day) | 3.19 | This number is carried over from the "Evaporation Loss" sheet. It is the highest recorded number in the "Precipitation Deficit Table".                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Required Daily Maintenance Volume (AF/Day)                    | 0.00 | "Required Daily Maintenance Volume" is the maximum volume of water needed on any given day during the year to maintain pond volume. It is calculated by adding the highest daily evaporation loss to the average daily seepage loss in acre feet. The average daily seepage loss is calculated by dividing the "Estimated Seepage Loss" by 365 days. This is acceptable, since the seepage rate shouldn't vary throughout the season unless the pond completely freezes over during the winter months. The highest daily evaporation loss is calculated by dividing the Highest Daily Evaporation Rate by the 304.8 conversion factor and multiplying this number by the pond surface area to attain a combined daily acre feet requirement.                                                                                         |
| Minimum Maintenance Flow (CFS)                                | 0.00 | The "Minimum Maintenance Flow" is the minimum amount of flow required to maintain the level of the pond. This number is determined by dividing the "Maximum Required Daily Maintenance Volume" by 1.9835. This flow can be used to determine if the flow rate into the pond is adequate to maintain the pond level.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Days Required to Fill the Pond                                | 0    | The "Days Required to Fill the Pond" is calculated by dividing the "Pond Capacity" by the "Flow Rate" minus "Minimum Maintenance Flow" multiplied by 1.9835. This section will assist you in determining if the flow rate being diverted to the pond is adequate to fill the pond while maintaining the pond level. The length of time to fill the pond will help determine if the flow rate is adequate for the size of pond being proposed. <i>If this number is approximately 6 months (180 days) or more, the reviewer should have a discussion with the applicant to make sure he/she understands that it will take a significant length of time to fill the pond.</i>                                                                                                                                                          |
| Days Required to Fill the Pond at 13,000 Gallons per Day      | 11   | Some water users may want to fill a pond under the 13,000 gallons per day domestic exemption. The "Days Required to Fill the Pond at 13,000 Gallons per Day" is calculated by converting the "Pond Capacity" and the "Required Daily Maintenance Volume" to gallons. The "Pond Capacity" is then divided by 13,000 gallons minus the "Required Daily Maintenance Volume" in gallons to determine the number of days to fill pond. <i>If this number is approximately 6 months (180 days) or more, the reviewer should have a discussion with the applicant to make sure he/she understands that it will take a significant length of time to fill the pond.</i> Negative values indicate that the supply of 13,000 gallons per day is not enough volume to overcome the required daily maintenance volume; the pond will never fill. |