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Technical Memorandum

To: Valley Branch Watershed District Landlocked Basin Comprehensive Planning Study Project Stakeholders
From: Gabby Campagnola, Jennifer Koehler, Jay Hawley
Subject: VBWD Landlocked Basin Flood Mitigation Comprehensive Planning Study Impacted Dwelling and Damage Assessment
Date: October 2023
Project: 23821268.00

1 Background

The Valley Branch Watershed District (VBWD) partnered with the United States Army Corp of Engineers (USACE) through the Planning Assistance to States program (PAS) to perform a comprehensive planning study to understand existing conditions and determine how to manage high-water conditions and flood risk at ten landlocked basins within VBWD.

For this assessment, it was necessary to understand the following:

- Surveyed or estimated low floor and low opening on the lowest homes adjacent to the study basins
- Peak flood elevations for the Atlas 14 100-year, 24-hour storm event
- Changes in groundwater levels relative to the basin water surface levels
- Estimates of potentially impacted dwellings and depth of impact relative to low floor and low opening elevations

This memorandum summarizes the methods and results for potential flood risk and damages from flooding for the ten study basins.

2 Methods to Determine Impacted Dwellings

2.1 Estimating Low Floor and Low Opening of Dwellings

Initially, Barr Engineering Co. (Barr) used a GIS/desktop analysis to estimate the low opening and low floor/basement elevation of the critical structures (dwellings) adjacent to each landlocked basin to determine which homes needed to be surveyed. We used the Microsoft 2018 building footprint data (building outlines) and Minnesota Department of Natural Resources (MnDNR) 2011 LiDAR to estimate the lowest elevation adjacent to each home. The lowest elevation adjacent to each home was assumed to be

the low opening for each dwelling. We initially assumed that all homes had an 8-foot basement below the low opening to estimate the low floor elevation.

Barr compared the estimated low floor elevation with the current VBWD 100-year flood elevation (as outlined in the VBWD Watershed Management Plan and/or more recent modeling studies completed by the VBWD). We identified homes to be surveyed if the estimated low floor elevation was below the 100-year flood elevation plus 2 feet. The initial survey list resulted in 114 homes being flagged as potentially impacted and identified for topographic survey.

In 2022, Barr coordinated several rounds of mailings to the 114 homes. The purpose of the mailings was to request that homeowners allow right-of-entry for USACE survey crew to survey low openings, septic system and drain field locations, and well locations. Additionally, homeowners were provided maps and a questionnaire. They were asked to provide information on their homes by measuring the depth from low opening to low floor elevation and to report if the homes included walkout basements. Copies of these mailings are included in Attachment A. The USACE survey crew completed the survey of 56 properties in the spring and summer of 2022. Fifty-three of the 56 homes surveyed were located around the 10 study basins, as shown in Table 2-1. The remainder of the homes were at the West Lakeland Storage Site, the likely downstream receiving waterbody of any proposed outlet(s) from the study basins. **Appendix 2** includes the survey data collected by USACE survey crews as well as the questionnaires completed by the property owners.

Table 2-1 Critical Dwelling Survey Summary

Basin	Total Number of Estimated Low Homes that Received Survey Mailing Request	Number of Surveyed Low Homes
Cloverdale Lake	17	9
Downs Lake/Eden Park Pond	24	13
Friedrich's Pond	2	2
Goetschel Pond	6	3
Klawitter Pond	16	11
Legion Pond	24	13
McDonald Lake	1	1
Reid Park Ponds	4	1
Sunfish Lake	0	0

For homes not surveyed as part of the project, Barr reviewed the estimated low opening and low floor estimates based on the original GIS/desktop assessment. We reviewed aerial imagery and real estate websites to determine if impacted homes had walkouts or traditional basements (basements at least partially below grade levels) to better refine the initial estimates of the low floor elevations for the dwellings that had not been surveyed.

After preliminary modeling, the number of potentially impacted dwellings was expanded from 114 to 118 for two reasons:

- The definition of an impacted dwelling was expanded to include homes if the 100-year water level was up to 2 feet below a home. This guidance matches the Federal Emergency Management Agency (FEMA) Benefit-Cost Analysis (BCA) tool (Federal Emergency Management Agency, 2011).
- Modeled peak water levels in calibrated models were higher than in prior modeling studies and work.

The additional four potentially impacted dwellings were not surveyed, so the low floor and low opening elevations were based on the desktop analysis methods described previously.

2.2 Design Storm Event Modeling

Barr used the future conditions surface water models (XPSWMM or PCSWMM) to predict surface water elevations of landlocked basins for the Atlas 14 100-year, 24-hour storm event and several other design storm events. The estimated flood elevations for landlocked basins are impacted by the starting water surface elevation in the basin, and significant variability in water surfaces has been observed in the basins throughout the period of record. For these reasons, we ran the 100-year, 24-hour design storm event with each basin's multiple starting water surface elevations. These starting elevations included:

- Peak observed high-water level
- Average high-water level (2014–2021)
- Long-term average water level
- Ordinary high-water level (OHWL, MnDNR regulatory elevation)
- OHWL minus 1.5 feet (MnDNR regulatory elevation for outlets on landlocked basins)

We used multiple water surface elevations for modeling to understand the range in flood elevations and the sensitivity of each basin to the starting water level. To estimate the potential number of dwellings at risk of flooding and damages, we used the 100-year, 24-hour design storm peak elevation assuming a starting elevation as the peak observed high-water level. **Appendix 12** further summarizes the surface water modeling, including a summary of model development, design storm event evaluation, and results of continuous simulations.

The purpose of using a starting water surface elevation that was the peak observed on record was to estimate the potential maximum number of impacted dwellings and damages during a 100-year storm event during a wet climatic period. Although this approach might overpredict the number of dwellings at risk of flooding, the observed water levels remained elevated on several of the VBWD landlocked basins for a long duration in the past due to high annual precipitation as well as elevated groundwater levels.

2.3 Groundwater Levels in Proximity to Basins

When evaluating flood risk and impacts to adjacent dwellings, the flood elevation is often applied as a constant elevation. This may be true for dwellings located directly on the basin. However, the variability of the groundwater levels around each basin should also be considered, especially during a wet climatic period, as was recently experienced in the VBWD when groundwater levels were elevated for a long duration.

Barr used the results of the calibrated groundwater model simulations (U.S Geological Survey MODFLOW model) to understand how the groundwater surface has varied around each basin during two different climatic periods (see **Appendix 10** for more details related to the groundwater modeling). We compared the estimated groundwater elevations in the vicinity of each lake to the estimated lake stage for two different climatic conditions:

- June 2020 (wet conditions: typically, the highest water levels during the model simulation period)
- August 2009 (dry conditions: typically, the lowest water levels during the model simulation period)

In addition to the dry and wet groundwater elevation predicted by MODFLOW, a mid-groundwater elevation factor was calculated. This represents the average of the dry and wet period groundwater elevation.

The difference between the basin stage and the nearby groundwater surface allowed us to estimate a spatially varying groundwater adjustment factor specific to each of the lowest homes near the basins (in circumstances where the dwelling was not located directly on the basin itself). The groundwater adjustment factors take both the spatial variability of the water table and dry/wet antecedent water table conditions into account. In general, the dry groundwater factor demonstrated that during dry conditions, the groundwater elevation was most often lower than the basin's surface water level. However, the groundwater elevation near each basin was most often above the surface water levels during the recent wet conditions.

The calibrated groundwater model is unsuitable for simulating groundwater response during short-duration design storm events. (The model operates on a monthly timestep and is intended for long-term simulation.) The water table response to the 100-year storm will be less rapid than the lake stage response. However, our goal was to estimate the implications of a 100-year design storm event during a wet climatic period. This groundwater factor was intended to estimate the potential response of a basin and surrounding water table following an extreme storm during wet conditions.

2.4 Impacted Dwelling Estimates

For each study basin, Barr estimated the potential number of impacted dwellings using the following information:

- Surveyed and estimated low floor and low opening information for dwellings around each basin.
- For homes directly on the basin, the Atlas 14 100-year, 24-hour design-storm event peak elevations were compared to low floor and low opening on all dwellings.
- For low homes near the basins (but not directly on the basin), the Atlas 14 100-year, 24-hour design-storm event peak elevation plus the spatially varying groundwater adjustment factor for wet conditions was compared to low floor and low opening on all dwellings.

A dwelling was considered potentially impacted by flooding if the estimated peak elevation was within 2 feet of the low floor elevation of the structure. A summary of impacted dwellings for the VBWD landlocked basins is shown in Table 2-2. Again, these estimates assume the starting elevation is the peak observed elevation on each basin. If the other (lower) starting water surface elevation models were used for the damage assessment, the predicted damages would be less than what is reported in this memorandum.

Table 2-2: Summary of Impacted Dwellings by Basin

Basin	Lowest Critical Dwelling Elevation		Atlas 14 100-Year, 24-Hour Storm						
			Constant Water Level			Applying Wet Groundwater Adjustment Factor[3]			
	Walkout Elevation	Basement Elevation	Water Surface Elevation	Number of Impacted Low Openings or Walkout[1]	Number of Impacted Basements[2]	Min. Water Level	Max. Water Level	Number of Impacted Low Openings or Walkout[1]	Number of Impacted Basements[2]
Cloverdale Lake	909.3	909.3	909.06	7 (7)	1	886.95	912.66	7 (7)	1
Downs Lake	893.15	892.2	894.64	3	5	884.71	892.69	3	3
Eden Park Pond[3]	890.31	890.31	894.64	4 (2)	1	894.64	896.41	4 (2)	2
Friedrich's Pond[3]	913.86	913.86	911.28	0	0	N/A	N/A	0	0
Goetschel Pond[3]	909	909	898.08	0	0	N/A	N/A	0	0
Klawitter Pond	954.72	954.72	959.21	1	0	966.65	968.34	1	2
Legion Pond	886.4	886.4	887.94	6 (2)	4	891.63	892.96	6 (2)	10
McDonald Lake[3]	901.4	898.9	895.76	0	1	893.37	N/A	0	0
Reid Park Pond	890.2	887.1	888.52	0	2	888.22	890.26	0	2
Sunfish Lake[4]	912.01	904	906.98	0	1	908.58	N/A	0	1

Basin	Lowest Critical Dwelling Elevation		Atlas 14 100-Year, 24-Hour Storm						
			Constant Water Level			Applying Wet Groundwater Adjustment Factor[3]			
	Walkout Elevation	Basement Elevation	Water Surface Elevation	Number of Impacted Low Openings or Walkout[1]	Number of Impacted Basements[2]	Min. Water Level	Max. Water Level	Number of Impacted Low Openings or Walkout[1]	Number of Impacted Basements[2]
Total Number of Impacted Dwellings				21 (11)	15			21 (11)	21

(1) The first value represents the total number of impacted homes based on the elevation of the low opening (low window or walkout). Values in parenthesis indicate the number of impacted dwellings on basins with walkouts where 100-year flood elevation is within 2 feet of the low floor/low opening elevation.
(2) Basement-impacted dwellings are defined as homes without a walkout where water cannot directly enter the basement through a low opening.
(3) A groundwater adjustment factor was applied to homes not directly on the basin with walkouts.
(4) If a cell contains N/A, the groundwater factor was not applicable due to all or all but one home having a potentially impacted basement.

3 Methods to Estimate Potential Damages/Costs

Barr used three different methods to estimate potential damages to impacted homes, including:

- Federal Emergency Management Agency (FEMA) benefit-cost analysis (BCA) approach
- Threshold analysis (using a combination of the FEMA approach, floodproofing, and acquisition)
- Acquisition of all impacted dwellings

These three different methods are discussed further in the following sections. Results of the damage assessment with FEMA depth-damage curves are summarized in Section 4.

3.1 FEMA Benefit-Cost Analysis (BCA) Damage Estimates

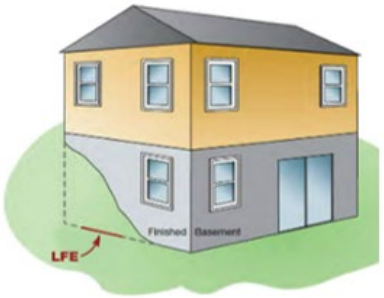
One of the most common ways to estimate building damages due to natural hazards, such as flooding, is with the FEMA benefit-cost analysis (BCA) protocol and software (BCA Version 6). Typically, the software is used to evaluate individual projects for FEMA funding, with funding going to projects with a benefit-cost ratio greater than 1.0. Barr did not perform a complete FEMA BCA for this study because we were not expecting the proposed project to achieve a benefit-cost ratio greater than 1.0 to pursue federal funding. The BCA includes damages to the home, loss of contents, displacement costs, number of residents, and more (Federal Emergency Management Agency, 2011).

For this study, we used the residential flood depth-damage curves in the BCA tool to estimate the damage to impacted homes. Depth-damage curves estimate the damage to a home based on the maximum flood water depth. These depth-damage curves are typically applied under riverine flooding situations in which flood flows and elevations rise and then recede after a period of time. The depth-

damage curves depend on the type of home structure, such as two-story, split-level, and one-story. Depth-damage curves also depend on whether the home has a traditional basement or a walkout (Federal Emergency Management Agency, 2011). As part of the effort to establish low opening and low floor elevations on the low homes around each basin, we classified each dwelling based on the type of home.

If a home has a traditional basement, the curve assumes constant damage, regardless of water depth, until the water reaches the low opening (i.e., a window). However, walkout basements are assumed to have increased damage for every flood depth (Federal Emergency Management Agency, 2011). Figure 1 contains an image and the respective depth-damage curve for two of the most common types of houses for this study: two stories with and without a walkout.

Two floor home with walkout



Flood Depth	Percent Damage
-2	0
-1	3
0	9.3
1	15.2
2	20.9
3	26.3
4	31.4
5	36.2
6	40.7
7	44.9

Two floor home with windows, 2 feet above ground level

Source: FEMA Benefit-Cost Guidance/Toolkit

Flood Depth	Percent Damage
-2	0
-1	3
0	3
1	3
2	20.9
3	26.3
4	31.4
5	36.2
6	40.7
7	44.9

Figure 1: Example FEMA BCA Homes with Respective Depth Damage-Curves (Federal Emergency Management Agency, 2011)

As shown in Figure 1, the depth-damage curve gives damage as a percentage of the home value. Damages begin when water levels reach an elevation within 2 feet of the low floor elevation. The cost of damage is calculated by multiplying the percent of damage by the home's value. For this study, we used Washington County tax record data from 2021 to assess the value of homes. Depth (and associated damages) was defined as the difference between the low floor/low opening and the peak water surface elevation, as shown in Figure 2.

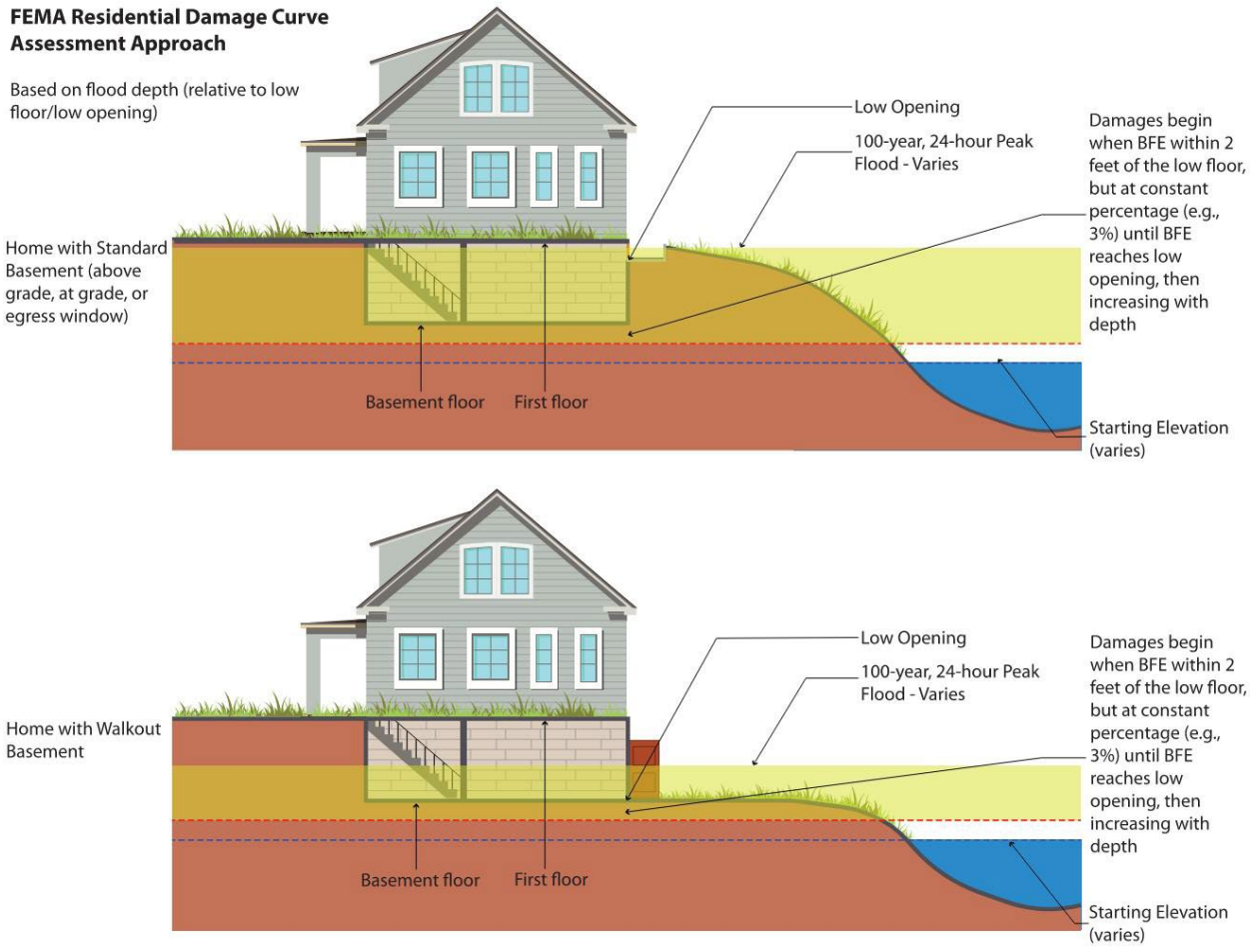


Figure 2: FEMA Depth-Damage Curve Application

For this study, there are two primary drawbacks to using the FEMA depth-damage curves to estimate damage. The first is that the FEMA depth-damage curves assume flood damage is caused by riverine floods. Riverine floods would not act like the type of flooding experienced in the VBWD, driven by high precipitation, long wet cycles, and accompanying high groundwater levels on landlocked basins. Riverine flooding can be assumed to have flood flows and elevations that rise and then recede after a relatively short period. However, the high surface water levels in landlocked basins and elevated groundwater levels adjacent to the landlocked basins can last for extended periods (months to years rather than weeks), resulting in additional costs related to mold and groundwater mounding underneath home foundations.

Additionally, the FEMA depth-damage curves assume minor damage to properties with traditional basements until the water can enter the low opening. Given recent experience in the VBWD, this assumption of basement damage is expected to underestimate potential damages resulting from sustained high groundwater conditions.

3.2 Threshold Approach

Given potential concerns about underestimating damages using the FEMA depth-damage curves, Barr looked for an alternative method to estimate damages/costs resulting from sustained high-water conditions on the landlocked basins in the VBWD. Although there is much discussion and documentation that high water conditions can lead to significant damages and there are floodproofing limitations, there is not a clearly defined methodology to assess the damages in these situations. Correspondence with USACE and review of FEMA and MnDNR flood impact information similarly concluded that there is no guidance similar to the FEMA depth-damage relationships developed for riverine flooding for high groundwater/sustained high water conditions.

Barr developed a second method (called the threshold approach) based on a combination of information, including the following:

- FEMA depth damage curves
- Potential floodproofing (filling of basements and loss in home value)
- Acquisition and demolition of homes

This threshold approach was informed by recent experiences dealing with high groundwater and surface water conditions in the Sunnybrook Lake area of the VBWD. The VBWD worked with nine homeowners to evaluate potential floodproofing options but ultimately acquired these homes in response to sustained high water conditions. This approach was informed by the VBWD purchase policy for dwellings below the 100-year flood level of landlocked basins (Attachment B).

The threshold approach is depicted in Figure 3 and discussed in the following sections.

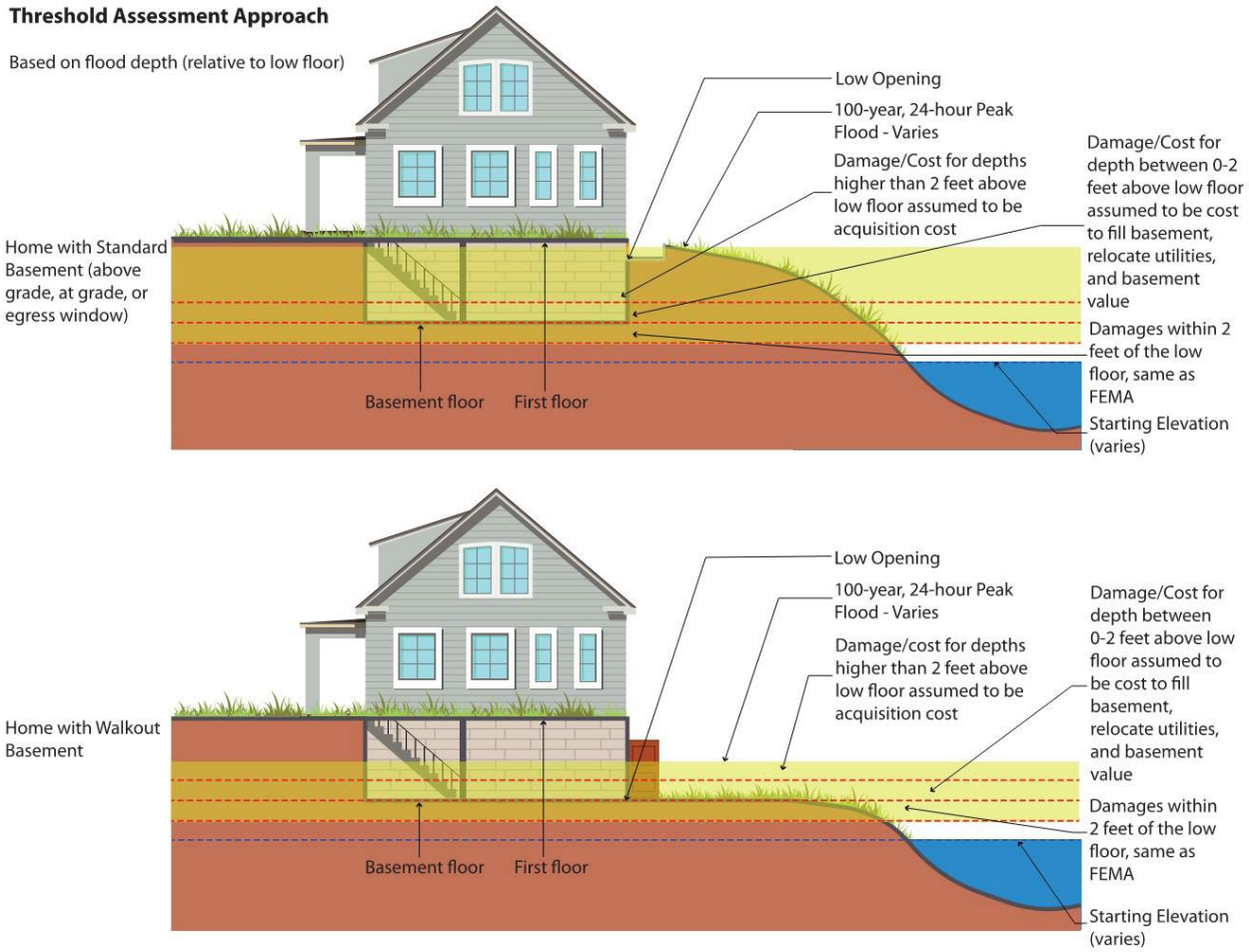


Figure 3: Threshold Analysis Depiction

3.2.1 FEMA Depth Damage Curves

Barr used the FEMA depth damage curves to estimate damages to homes if the peak water level was between 2 feet below and the low floor elevation of the home, rounding to the nearest foot.

3.2.2 Floodproofing and Loss of Home Value

Barr reviewed federal and state guidance as it relates to floodproofing recommendations. Again, this guidance was often developed for riverine conditions where water recedes relatively quickly. Many times, the recommended or allowable depth for floodproofing basements was variable. As part of a flood project in Missouri, the USACE developed a flood-risk-management matrix to help guide decisions about relocation, acquisition, dry floodproofing, and wet floodproofing in various situations depending on dwelling type or flood characteristics (U.S. Army Corps of Engineers, 2020). According to the matrix, dry floodproofing of basements is not typically recommended.

For this VBWD planning level study, Barr assumed that for any homes where the peak water surface elevation was at to 2 feet above the low floor elevation:

- The floodproofing method included filling in basements and relocating utilities.
- The loss of home value was due to the loss of the basement and lower square footage.

Barr estimated the cost of filling in the basement and relocating utilities at $50 per square foot. This estimate was informed by a recent USACE study in Missouri (U.S. Army Corps of Engineers, 2020) and scaled up accordingly. The square footage was estimated as the finished square footage recorded by the county, divided by the number of floors per home.

To estimate the loss in value by filling in the basement, Barr reviewed several real estate and appraisal websites that discussed the values of basements relative to the upper floors of homes in the Upper Midwest. The estimated value of a basement is typically 50–70% of the upper floor values (Zillow, n.d.; 828 Real Estate, n.d.). Based on the Washington County 2021 tax information, we estimated the value of the dwelling ($/SF). We assumed the basement value to be 50% of all other floors. The number of floors for each home was estimated based on a review of aerial images, street view images, and real-estate websites.

This assessment does not consider the value of the long-term lost tax revenue resulting in reduced-value properties due to the floodproofing or acquisition.

3.2.3 Acquisition

We used the acquisition cost for homes with peak water elevations 2 feet or more above the low floor elevation. Barr calculated the acquisition cost as the home and land value multiplied by an acquisition factor cost. The value of the home and land was determined by the Washington County 2021 tax county records. Based on similar recent acquisitions in the VBWD, the acquisition cost for this analysis was assumed to be 35% higher than the total property value. Applying a factor of 1.35 accounts for additional costs associated with acquisition, such as surveying, engineering, legal, relocation, and demolition costs.

This assessment does not consider the value of the long-term lost tax revenue from property acquisition.

3.3 Acquisition Estimates

Barr evaluated a third approach related to damages/costs associated with potentially impacted dwellings. In this method, the focus was on property acquisition, as shown in Figure 4. Often, this is a preferred approach to minimizing flood risk and damages.

Barr used the FEMA depth damage curves to estimate damages to homes if the peak water level was within 2 feet below to the low floor elevation by rounding to the nearest foot.

For any homes where peak water elevations were estimated to be above the low floor elevation, we assumed the acquisition cost (as discussed above in Section 3.2.3).

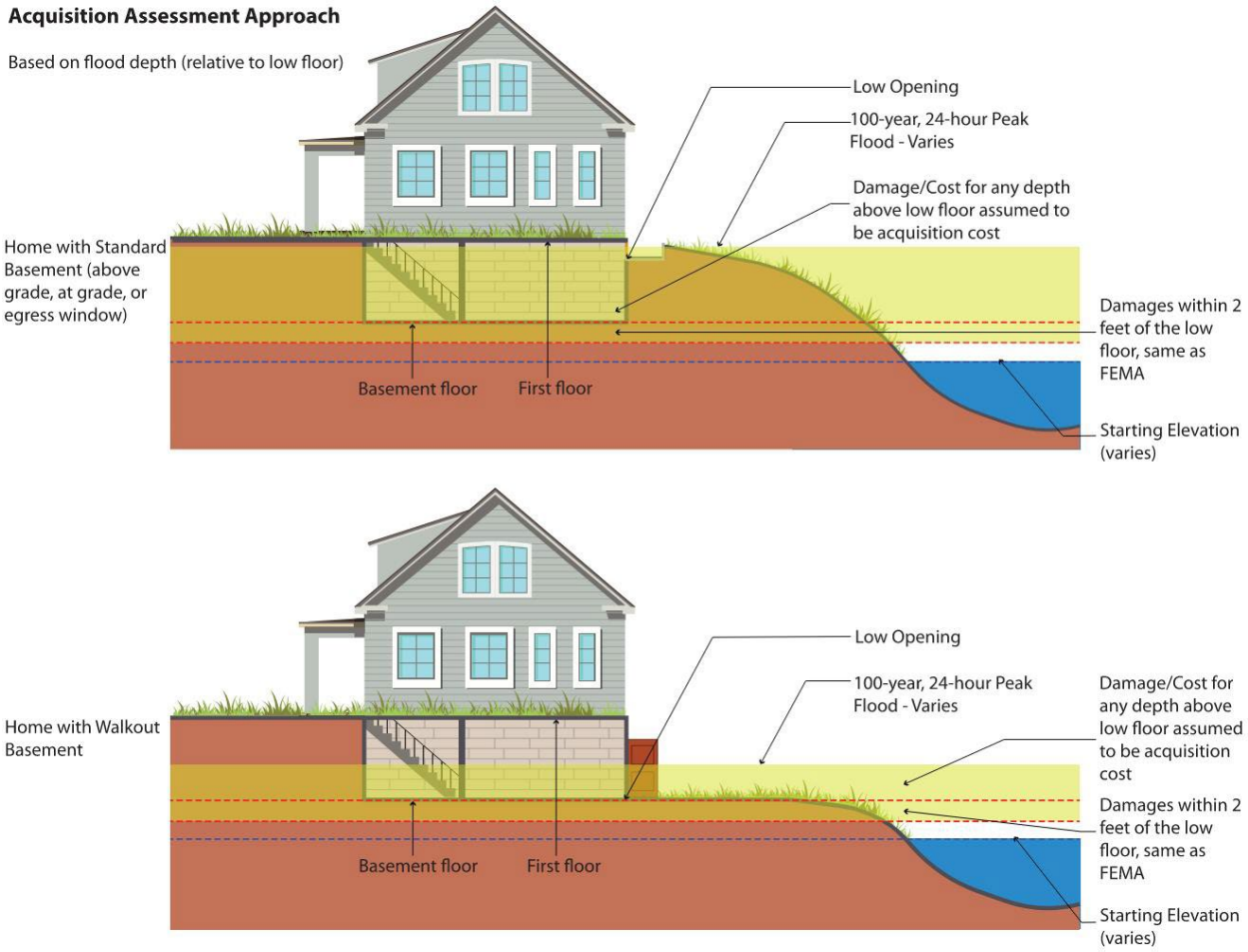


Figure 4: Acquisition Analysis Depiction

4 Summary and Results

The damage assessment was conducted for two scenarios:

- Baseline conditions (without project/no water level management provided)
- With project conditions assuming Alternative 1: Comprehensive Pumped and Gravity Outlets from Select Landlocked Basins, including necessary mitigation measures

4.1 Baseline Conditions Summary

Table 4-1 summarizes the impacted dwellings and the three damage assessment methods for each basin under baseline (without project) conditions. Table 4-1 has a range of costs for the threshold and acquisition damage assessment approach. The presented range of costs represents the following scenarios:

- The elevation of a 100-year, 24-hour storm with a starting elevation at the peak water surface elevation observed and a constant groundwater (groundwater equal to basin elevation)
- The elevation of a 100-year, 24-hour storm with a starting elevation at the peak water surface elevation observed, plus the wet groundwater adjustment factor described in Section 2.3

Barr selected the wet groundwater adjustment factor for assessing the upper end of damages because it will more accurately estimate the high groundwater condition in wet climatic conditions than the dry and mid-groundwater adjustment factor described in Section 2.3.

Table 4-1 Damage and Cost Estimates for Potentially Impacted Homes Under Baseline (without Project) Conditions

Basin	Total Impacted Dwellings[1]	FEMA Residential Depth-Damage Assessment	Threshold Assessment Approach[2,3]	Acquisition Approach [2,3]
Cloverdale Lake	8	$185,000	$185,000–$1.4 million	$185,000–$1.4 million
Downs Lake	6–8	$255,000	$410,000–$1.5 million	$2.2–$5.2 million
Eden Park Pond	5–6	$90,000	$660,000–$710,000	$1.0–$1.6 million
Friedrich's Pond	0	$0	$0	$0
Goetschel Pond	0	$0	$0	$0
Klawitter Pond	1–3	$60,000	$630,000–$1.3 million	$630,000–$1.3 million
Legion Pond	10–16	$180,000	$520,000–$3.6 million	$2.1–$5.3 million
McDonald Lake	0–1	$50,000	$0–170,00	$0–$900,000
Reid Park Pond	2	$30,000	$0–$160,000	$0–$680,000
Sunfish Lake	1	$51,000	$585,000	$585,000
Project Total	33–45	$901,000	$3.0–$9.4 million	$6.7–$17.0 million

(1) The estimated number of impacted dwellings varies, depending on the approach applied and the application of a groundwater proximity factor for the 100-year, 24-hour design storm event.
(2) The range reflects two flood elevation scenarios: 100-year, 24-hour peak, and adjusted elevation using wet groundwater adjustment factor.
(3) Acquisition estimates assumed taxable market value multiplied by 1.35 to account for relocation and demolition costs.

4.2 With Project Conditions Summary

One alternative for managing flooding at the landlocked basins is constructing gravity or pumped outlets to control the water levels. With outlets and pumping, fewer properties would be impacted, reducing potential damages. Table 4-2 compares the number of impacted homes under baseline conditions and two proposed outlet and pumping configurations, along with damage estimates for the proposed outlet and pumping configurations.

Table 4-2 Damage and Cost Estimates for Potentially Impacted Homes under Baseline (without Project) Conditions and Proposed Outlet/Pumping Conditions

Basin	Baseline Total Number of Impacted Dwellings[1]	Alternative 1, Option 1 Total Number of Impacted Dwellings [1,2]	Estimated Damage for Option 1[3]	Alternative 1, Option 2 Total Number of Impacted Dwellings[1,2]	Estimated Damage for Option 2[3]
Cloverdale Lake	8	8	$185,000–$1.4 million	8	$185,000–$1.4 million
Downs Lake	6–8	2-6	$41,000–$260,000	2–6	$41,000–$260,000
Eden Park Pond	5–6	0	$0	1	$21,000–$110,000
Friedrich's Pond	0	0	$0	0	$0
Goetschel Pond	0	0	$0	0	$0
Klawitter Pond	1–3	1–3	$17,000	1–3	$17,000
Legion Pond	10–16	0–8	$0–$330,000	0–8	$0–$330,000
McDonald Lake	0–1	0–1	$0–170,00	0–1	$0–$170,00
Reid Park Pond	2	0–2	$0–$160,000	0–2	$0–$160,000
Sunfish Lake	1	1	$51,000–$585,000	1	$51,000–$585,000
Project Total[4]	**33–45**	**12–29**	**$294,000–$2.9 million**	**13–30**	**$315,000–$3.0 million**
Project Total (No Sunfish, Cloverdale, or McDonald Lake[5]	**24–35**	**3–19**	**$58,000–$767,000**	**4–20**	**$79,000–$877,000**

(1) The estimated number of impacted dwellings varies, depending on the approach applied and the application of a groundwater proximity factor for the 100-year, 24-hour design storm event.
(2) The total number of impacted dwellings includes dwellings that must be acquired.
(3) The range represents FEMA and Threshold damage approach estimates.
(4) Dwellings that must be acquired are removed from this cost estimate. Acquired dwellings are defined as any with estimated water levels 2 feet above the low floor, under constant or wet groundwater factor.
(5) Does not include damages associated with elevated waters in Sunfish, Cloverdale, and McDonald Lakes, due to none of the lakes having an outlet and pumping system proposed.

There are two important notes regarding the number of impacted dwellings and the associated damages with the proposed outlet and pumping configurations. First, we are not currently proposing an outlet and pumping configuration on McDonald Lake, Sunfish Lake, or Coverdale Lake; therefore, the proposed alternative will not reduce impacted dwellings or damages on these basins.

The second caveat to Table 4-2 is that there are additional costs to consider besides damages to impacted dwellings with proposed outlets and pumping. Under the proposed conditions, at least one home will have to be acquired, and the cost of home acquisition is not included in Table 4-2. Another major cost not highlighted in Table 4-2 is the cost to construct the proposed outlet and pumping system.

5 References

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Federal Emergency Management Agency. (2011, June). *Resources to Support Benefit-Cost Analysis.* Retrieved August 3, 2023, from FEMA: https://www.fema.gov/sites/default/files/2020-08/fema_bca_guide-supplement.pdf

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Zillow. (n.d.). *Does a Finished Basement Add Home Value?* Retrieved August 3, 2023, from Zillow: https://www.zillow.com/sellers-guide/does-a-finished-basement-add-value/

Attachment A

Mailings Sent to Potentially Impacted Homes Based on 100-Year Flood Level of Landlocked Basins in VBWD

January 26, 2022

Re: VBWD Landlocked Basin Comprehensive Planning Study: Request for Survey Access

Dear Resident:

For central Washington County and the Valley Branch Watershed District (VBWD), the past decade has been one of the wettest on record, with 2019 being the wettest year since 1891. The extreme precipitation has caused groundwater levels to rise significantly and lake levels to be at record highs. As a result, in 2020, the VBWD and Washington County performed emergency pumping at several landlocked basins to protect homes, septic systems, and roadways.

Emergency pumping is not necessarily the best long-term management option for protecting properties and infrastructure from flooding. Therefore, the VBWD has partnered with the United States Army Corps of Engineers (USACE) to complete a comprehensive planning study to determine how to manage high-water conditions on several landlocked basins in the VBWD (see Figure 1 attached). These basins include:

- Cloverdale Lake (Baytown Township)
- Lake McDonald (Baytown Township)
- Downs Lake/Eden Park Pond (Lake Elmo)
- Reid Park Pond (Lake Elmo)
- Legion Pond (Lake Elmo)
- Friedrich's Pond (Lake Elmo)
- Sunfish Lake (Lake Elmo)
- Klawitter Pond (Lake Elmo)
- Goetschel Pond (Lake Elmo)

To evaluate potential management options, the VBWD and USACE staff will need to perform surveys of the lowest structures near these basins. Surveys (or estimates) will be needed of:

- Low opening elevations for primary structures (e.g., basement window wells, walk-out basement doors, etc.).
- Lowest floor/basement elevations (i.e., depth from the lowest opening to the basement floor).
- Locations and elevations of critical facilities (e.g., septic tanks, drain fields, wells, etc.).

This information will be critical to determining the risk potential and consequences of flooding if nothing is done and to evaluate the costs and benefits of possible high-water management options.

P.O. Box 838 | Lake Elmo, MN 55042-0538 | www.vbwd.org

You are receiving this letter because your property is located near or adjacent to a study basin. These surveys, conducted by USACE survey crews, could begin in mid-February and continue through spring as access is authorized and weather conditions allow. A survey will only occur if you grant permission by signing the attached Right-of-Entry agreement. Crews will conduct all low-opening surveys from the home's exterior; no access to the interior of your home will be needed. The USACE crew will wear identifying clothing and will knock on your door before conducting the survey.

In addition to the Right-of-Entry agreement, a questionnaire is attached to this letter. The questionnaire will help us identify the best way to contact you, locate critical facilities on your property, and estimate your lowest floor/basement elevations in relation to the lowest opening. ***At a minimum, please complete and return the enclosed questionnaire. However, if you are interested in having a survey of your property, please complete the Right of Entry form, the questionnaire, and sketch. Return these to me using the enclosed stamped envelope, or if you prefer, you can also scan or take clear photos of the completed documents and email them to jkoehler@barr.com.***

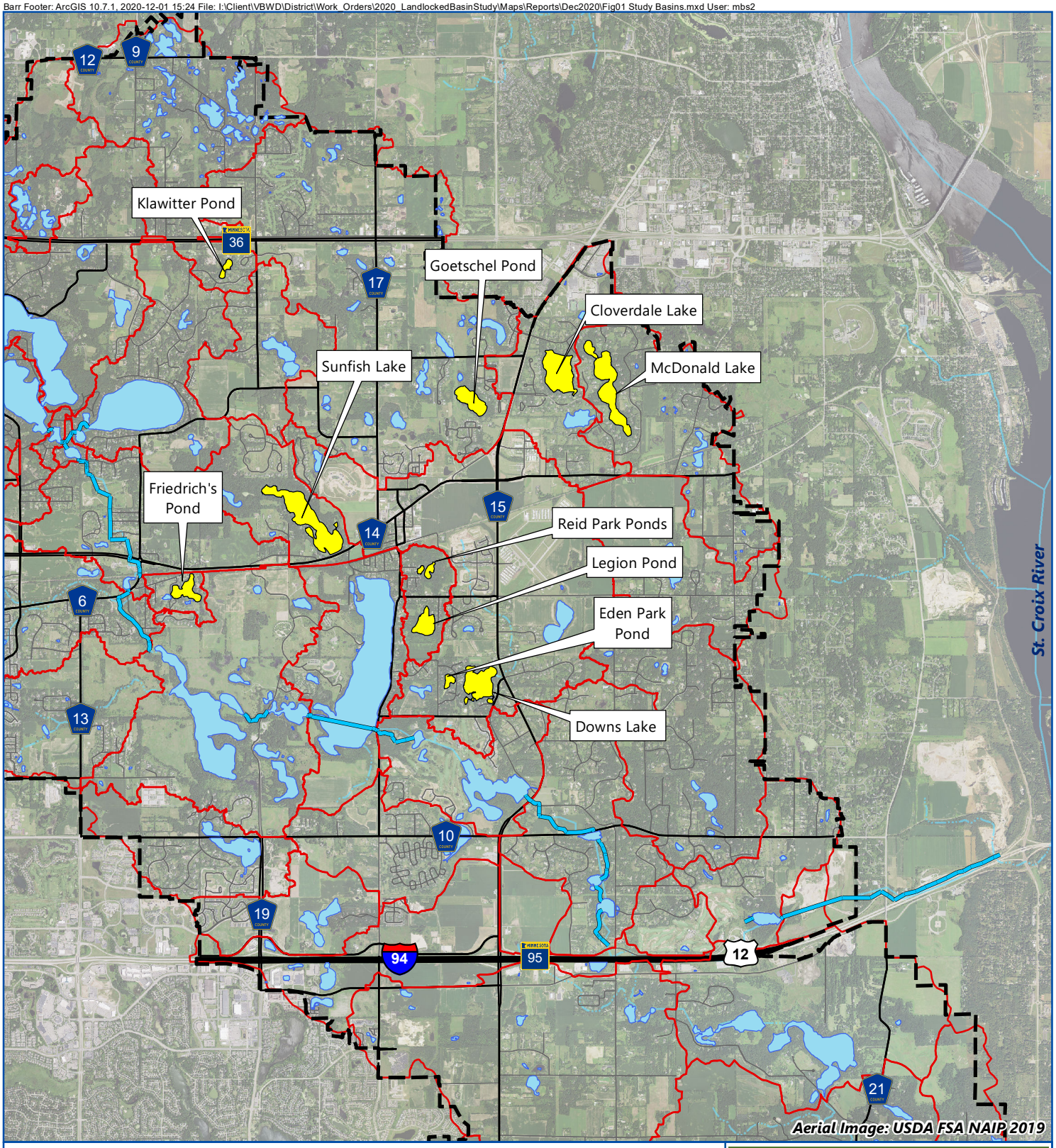
Our study will be the most accurate if we can use actual survey data. If you do not authorize us to survey your property, we will make assumptions using the best available data.

If you have any questions, feel free to reach out to me at jkoehler@barr.com or 952.832.2750 (office) or 612.720.8810 (cell).

Thank you,

Jennifer Koehler, PE
Project Manager, Barr Engineering Co.
Engineers for the VBWD

Attachments:
Figure 1
ROE Form
Questionnaire and Property Sketch Figure
Return Envelope



Project 1007 Alignment
Landlocked Study Basins
Lakes, Ponds, Streams and Rivers
Major Subwatershed Boundary
VBWD Legal Boundary

0 6,000
Feet

STUDY BASINS
Landlocked Basin Study
Valley Branch Watershed District

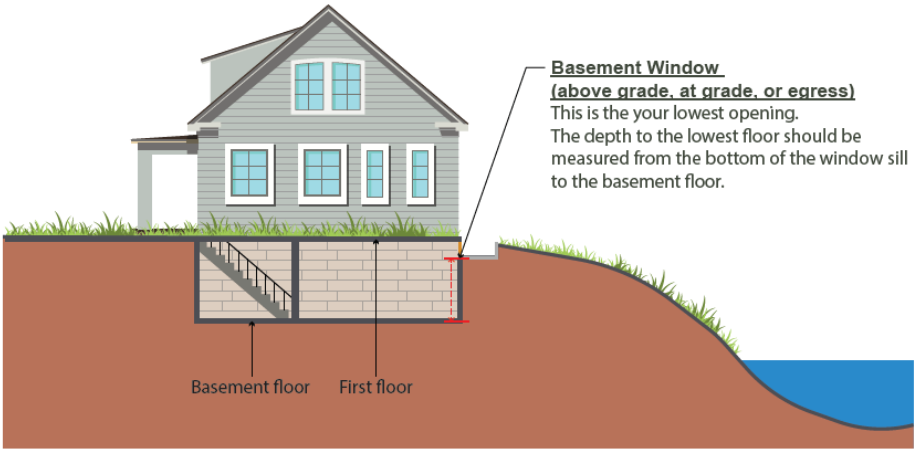
FIGURE 1

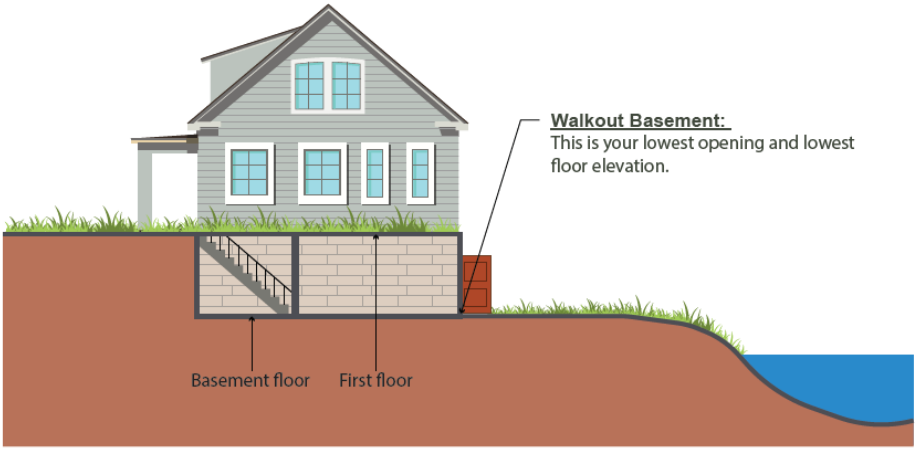
VBWD Landlocked Basin Comprehensive Planning Study:
Critical Infrastructure Questionnaire

Contact Information:
Property owner name: _____
Property address: _____
Phone Number: _____
Email: _____
Preferred method of contact (email/phone): _____

Property Well & Septic Information:
Do you have a private well? (yes/no): _____
Do you have a private septic system/drainfield? (yes/no): _____

Property Basement Information (see graphic below):
Do you have a basement? (yes/no): _____
If yes, do you have a walk-out basement? (yes/no): _____
If not a walkout, do you have at least one window in your basement? (yes/no): _____
How deep is the basement floor below the window sill (bottom of window)? (feet): _____





Sketch of Property:
Attached on the back of this form is an aerial image of your property, as well as property lines and labeled nearby roads. Please sketch the location of any wells or septic systems (septic tank, drainfield). In addition, please identify the location of the lowest opening of your home (i.e., basement walkout, basement window).

DEPARTMENT OF THE ARMY
RIGHT-OF-ENTRY FOR SURVEY AND EXPLORATION

Property Owner(s):
Name(s):
Address:

Telephone:

The undersigned, hereinafter called the "Owner", hereby grants to the **UNITED STATES OF AMERICA**, hereinafter called the "Government", a permit or right-of-entry upon the following terms and conditions:

1. The Owner hereby grants to the Government an irrevocable right to enter upon the lands hereinafter described at any time within a period of **Twelve (12) months** from the date of this instrument, in order to survey and carry out such other exploratory work as may be necessary to complete the investigation being made of said lands by the Government.

2. The permit includes the right of ingress and egress on other lands of the Owner not described below, provided such ingress and egress is necessary and not otherwise conveniently available to the Government.

3. All tools, equipment, and other property taken upon or placed upon the land by the Government shall remain the property of the Government and may be removed by the Government at any time within a reasonable period after the expiration of this permit or right-of-entry.

4. If any action of the Government's employees or agents in the exercise of this right-of-entry results in damage to the real property, the Government will, in its sole discretion, either repair such damage or make an appropriate settlement with the Owner. In no event shall such repair or settlement exceed the fair market value of the fee title to the real property at the time immediately preceding such damage. The Government's liability under this clause is subject to the availability of appropriations for such payment, and nothing contained in this agreement may be considered as implying that Congress will at a later date appropriate funds sufficient to meet any deficiencies. The provisions of this clause are without prejudice to any rights the Owner may have to make a claim under applicable laws for any damages other than those provided for herein.

5. The land affected by this permit or right-of-entry is located in the State of **Minnesota,** County of **Washington,** as shown on Exhibit "A", attached.

Signed and dated this _____ day of _____, 2022

OWNER

_____
BY:

UNITED STATES OF AMERICA

_____
Kevin J. Sommerland
Chief of Real Estate
Real Estate Contracting Officer

Attachment B

Valley Branch Watershed Purchase Policy for Dwellings Below 100-Year Flood Level of Landlocked Basins

VALLEY BRANCH WATERSHED DISTRICT

PURCHASE POLICY
FOR DWELLINGS BELOW 100-YEAR FLOOD LEVEL OF LANDLOCKED BASINS

1. **Purpose and Findings.** The Valley Branch Watershed District ("District") is a special unit of municipal government whose mission includes minimizing negative impacts of flooding in the District. For District-permitted projects, buildings are required to have lowest floor elevations at least 2 feet higher than the adjacent water's 100-year flood level. Several buildings were constructed before the District had its rules and permitting program and were constructed below the 100-year flood level of adjacent water. In some cases, buildings were constructed below the 100-year flood level of an adjacent water after the District's rules and permitting program were adopted.

   Certain circumstances may exist in which it is most consistent with the District's watershed management plan, purposes, and goals to purchase the property containing a dwelling and/or structure with a lowest floor elevation located below the 100-year flood level of landlocked basins of the District. The purpose of this Policy is to articulate those circumstances which warrant purchase and the conditions thereof. Due to the unpredictable nature of floodplain management, including changes in precipitation patterns, this Policy is in no way intended to be the only method available to the District in fulfilling its statutory responsibilities.

2. **Background.** On December 13, 2018, the District adopted two policies: 1) *Home Purchase Policy for Properties Located Below the 20-Year Flood Level of Landlocked Basins,* and 2) *Policy for Homes Below the 100-Year Flood Level and Above the 20-Year Flood Level of Landlocked Basins.* Separate policies allowed the District to prioritize homes below the 20-year flood level needing protection. Since adopting those policies, the District has purchased several homes and no longer intends to distinguish between homes below the 20-year flood level, and those between the 20-year flood level and 100-year flood level. Instead, this Purchase Policy replaces the previous policies in their entirety. The District's intent remains to protect dwellings from flooding in the most technical and cost-effective methods, which is consistent with the District's overall purpose and its Watershed Management Plan.

3. **Application.** This Purchase Policy shall apply to single and multi-family dwellings with lowest floor elevations below the District's-calculated 100-year flood level of the adjacent landlocked basin. On a case-by-case basis, the Managers may also consider its application to commercial, business, industrial, government, mixed-use, and industrial structures with lowest floor elevations below the District-calculated 100-year flood level of the adjacent landlocked basin. The term 'adjacent' means within an area of a landlocked basin where the high groundwater levels affect the lowest floor of the dwelling or structure. The Board of Managers will make the determination of whether a property meets the definition of 'adjacent' after consulting with the District Engineer. If the property is deemed adjacent to

a landlocked basin, then this Purchase Policy applies upon a finding by the District of one or more of the following conditions:

a. The cost to the District of a regional flood protection project is more than the county assessed value of all of the properties with low floor elevations lower than the 100-year flood level;
b. The cost of an individual site flood protection project is more than the assessed value of the property with the low floor elevation lower than the 100-year flood level;
c. Neither a regional nor a site project provides the most prudent measure, in the Board of Managers' sole discretion; or
d. The purchase of said property, dwelling, or structure is the most prudent measure, in the Board of Managers' sole discretion.

This Purchase Policy does not apply to features other than dwellings on the property below the 100-year flood level, including but not limited to septic system tanks, septic system drain fields, community sewage systems, wells, outbuildings, accessory structures, roads, driveways, or vegetation. However, if these features are on a property with a dwelling with a low floor lower than the 100-year flood level, the District may include these features in its review of the best protective measure.

The District shall consider the overall benefit to the District before making a finding as to the application of this Policy. The District may prioritize the properties to which this Policy applies based on the frequency in which the dwelling or structure floods, the funds the District has available, and other factors as determined by the Board of Managers.

4. **Right of First Refusal.** If, in the Board of Managers' sole discretion, the purchase of said dwelling, structure, or property is the best protective measure, then the District may enter into an agreement to have the right of first refusal to purchase said dwelling, structure, dwelling, or property.

5. **District's Purchase of Property.** If the Board of Managers determines that one or more of the criteria outlined in Section 3 of this Policy is met, the Board of Managers may make a purchase offer to the owner(s). The offered purchase price will be: 1) the fair market value of the dwelling(s), structure(s), or parcel(s) as determined by an appraiser hired by the District; or 2) the county's assessed value of the dwelling(s), structure(s), or parcel(s) if the property's condition makes an appraised value unfeasible in the opinion of the District's appraiser. If the owner desires, the owner may hire, at the owner's expense, a certified real estate appraiser to determine a value of the dwelling(s), structure(s), or parcel(s). The District may then average the District's original offer value with the owner's appraisal to arrive at the offer amount. The District may also take into account other factors in its offer value, including but not limited to:
    a. Whether the property was mapped by FEMA as floodplain when owner purchased it;
    b. Whether the owner will receive flood insurance payments; or

c. Whether there are multiple parcels under one deed.

6. **District's Use of the Purchased Property.** Upon purchasing a dwelling(s), structure(s), or parcel(s), the District will determine the best overall use of said property, which may include but is not limited to:
    a. Razing the dwelling(s) and/or structure(s), and/or:
        i. Selling the parcel(s) with restrictions assuring a new building be constructed at the appropriate elevation determined by the District (e.g., sell the lot and concurrently obtaining a conservation easement);
        ii. Selling the parcel(s) with the restriction to not build on said lot (e.g., obtain a conservation easement);
        iii. Continuing to own and maintain the parcel(s) for reasons consistent with the District purposes as outlined in the Statutes of Minnesota;
        iv. Using the parcel(s) for wetland banking purposes;
        v. Using the parcel(s) for a water quality improvement project;
        vi. Using the parcel(s) to reduce flooding to other properties;
        vii. Coordinating with other governments to use the parcel(s) for improved transportation or utility services;
        viii. Subdividing the parcel(s) and implementing the above options;
        ix. Using the parcel(s) in a manner approved by the Board of Managers' at the sole discretion as the Managers.
    b. Modifying the dwelling(s) and/or structure(s) and/or parcel(s) to protect it from the 100-year flood level of the adjacent landlocked basin and selling the dwelling(s) and/or structure(s) and/or parcel(s) as described in Sections 6.a.i and 6.a.ii.

7. **No Obligation to Purchase Dwelling or Property**. Nothing herein shall require the District to purchase any dwelling, structure, or property, or prevent the District from taking other measures, as determined at its sole discretion, to be in the District's best interest.

Dated: _____

VALLEY BRANCH WATERSHED DISTRICT

_____
Its President

_____
Its Secretary

DRAFTED BY:
GALOWITZ ● OLSON, PLLC
10390 39th Street North
Lake Elmo, MN 55042
Telephone: (651) 777-6960