

Technical Memorandum

To: Valley Branch Watershed District Landlocked Basin Comprehensive Planning Study
Project Stakeholders
From: Jay Hawley and Josh Phillips, PE
Subject: VBWD Landlocked Basin Flood Mitigation Comprehensive Planning Study—Opinions of
Probable Cost
Date: October 2023
Project: 23821268.00

1 Cost Estimating

Barr developed engineer's opinions of probable costs for design, permitting, and construction for each alternative and option considered as part of the Landlocked Basin Flood Mitigation Comprehensive Planning Study. These opinions of costs, project reserves, contingency, documentation, and discussion are intended to provide background information for planning-level alternatives assessment, analysis, and budget authorization. The cost of time escalation is not included in the opinions of probable costs. All costs are in 2023 U.S. dollars.

Barr estimated quantities based on the conceptual designs and available information. Field assessments were not performed as part of this study. Dimensions, areas, and volumes for construction were determined using aerial imagery, property and land ownership data, and 2011 Minnesota Department of Natural Resources (MnDNR) LiDAR data (MnDNR, 2011).

We used unit costs—based on recent bid prices, published construction cost-index resources, and similar stormwater management projects, including piping, grading, and restoration projects—and we compared them to similar project prices. Lift station construction costs were based on submersible pump lift-station cost curves and ranges as summarized in "Pumping Station Design," Revised Third Edition, brought to present-day dollars based on the historical construction costs indices published by the Engineering News Record and verified against recently bid lift station projects.

We included a construction contingency in these opinions of probable costs to help identify an estimated construction cost for minor items in the current project scope that have not been quantified or estimated directly during the feasibility evaluation. Stated another way, contingency results from pluses and minuses that cannot be estimated at the existing level of project definition. The contingency includes the cost of ancillary items not currently itemized in the quantity summaries but commonly identified in more detailed design and required for completeness of the work. A contingency of 25 percent was assumed for these cost estimates based on currently unknown design components due to the conceptual level of design.

Costs associated with engineering, design, and permitting were assumed to be 25 percent of the estimated construction costs, which is within a range similar to past projects designed by Barr. This includes costs associated with planning, design, permitting and regulatory approvals, and construction management. The opinions of cost do not include other tasks following construction, such as monitoring, operation, and maintenance.

Easements were assumed to be needed where proposed infrastructure could not be located within the public right-of-way or on public land. Barr assumed a rate of \$30,000 per acre of easement where easements would be required based on recent data from similar easement acquisitions in the watershed.

Where land acquisition would be required, Barr assumed a cost of 110% of the assessed value from 2021 property value records held by Washington County. Where residential property acquisition would be required, Barr assumed a cost of 135% of the assessed value from 2021 property value records held by Washington County for both the land and buildings. This factor is based on similar recent acquisitions in the VBWD and 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.

Where floodproofing would be required, Barr estimated the planning-level costs to fill in the basement and utility relocates as \$50 per square foot (1). The square footage was estimated as the finished square footage recorded by the county, divided by the number of floors estimated per home.

See **Appendix 3** for more details on how acquisitions, floodproofing, and associated costs were determined.

2 Cost Uncertainty

Industry resources for cost estimating provide guidance on cost uncertainty, depending on the level of project design developed (American Society for Testing and Materials, 2019, and Association for the Advancement of Cost Estimating, 2016). The opinions of probable costs for the alternatives evaluated generally correspond to a Class 4 estimate characterized by limited engineering and the use of deterministic estimating methods. As the level of design detail increases, uncertainty is reduced. Figure 1 and Figure 2 provide graphic representations of how uncertainty (or accuracy) of cost estimates can be expected to improve as a more detailed design is developed in two different industries (process and general construction).

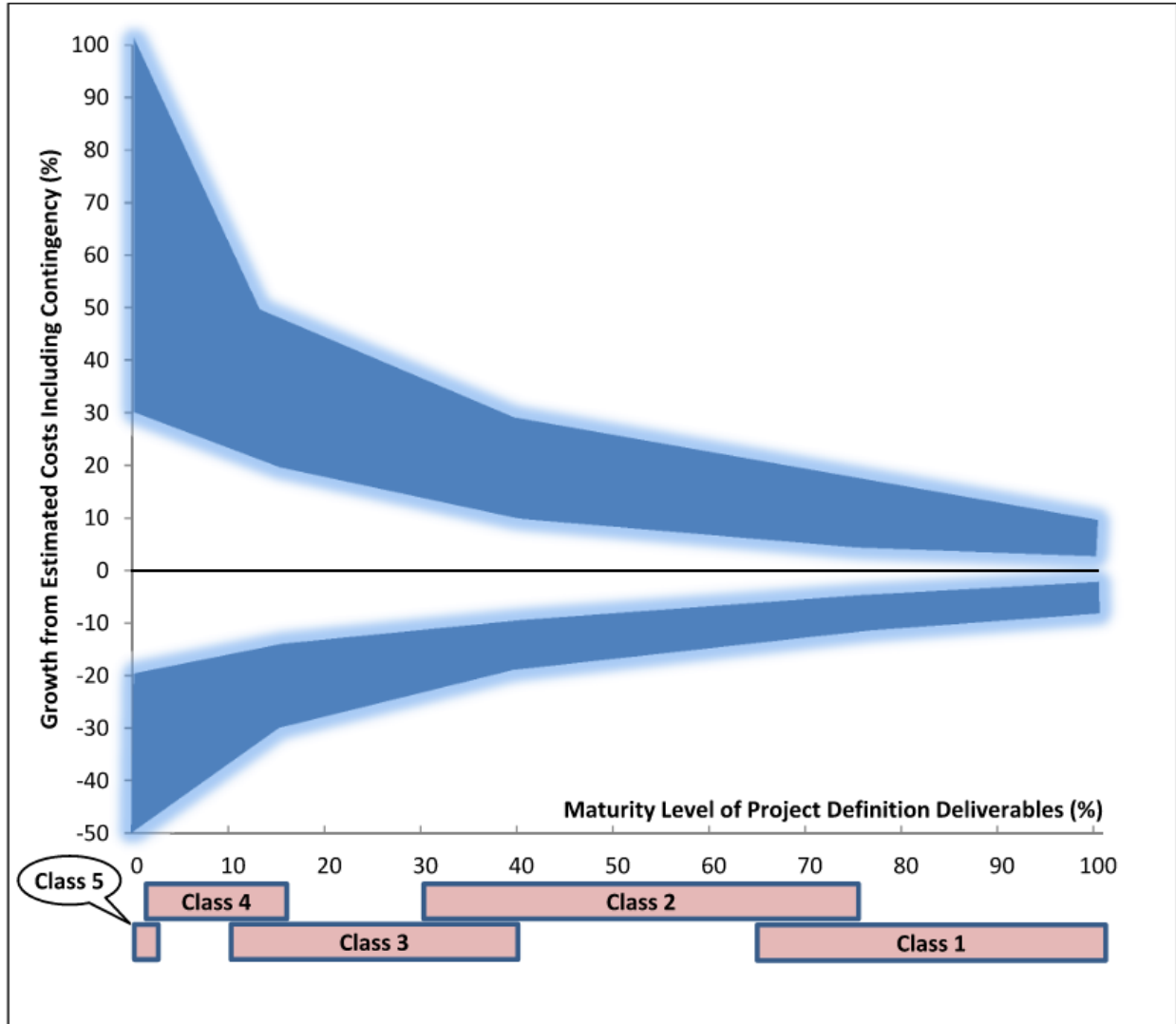


Figure 1 Relationship between Cost Accuracy and Degree of Project Definition in the Process Industry

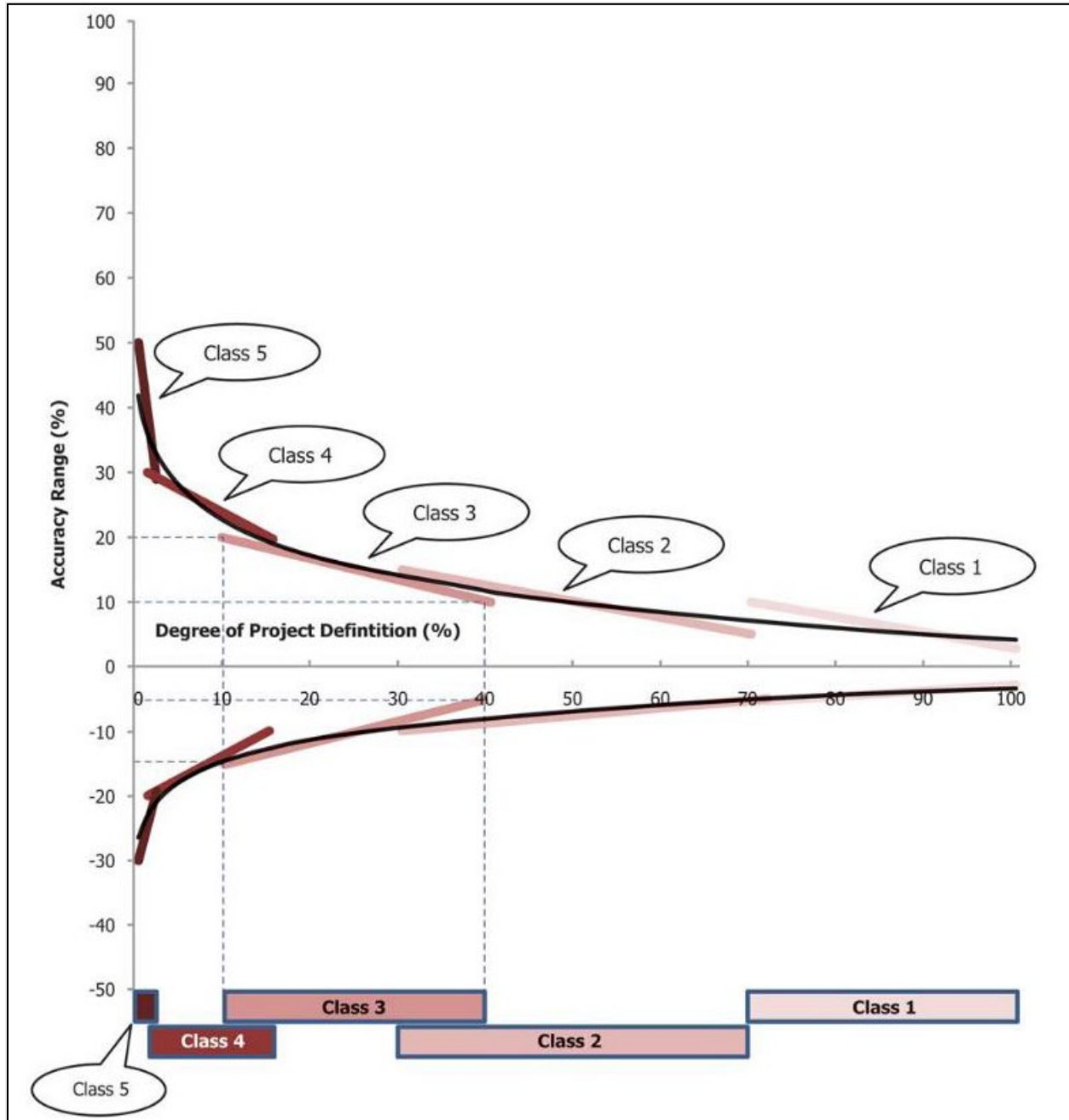


Figure 2 Relationship between Cost Accuracy and Degree of Project Definition in Building and General Construction

At this early design stage, the range of uncertainty of total project cost is high. Due to the early design stage, it is standard practice to place a broad accuracy range around the point cost estimate.

The accuracy range is based on professional judgment considering the level of design completed, the complexity of the project, and the uncertainties in the project scope. The accuracy range does not include costs for future scope changes that are not part of the project as currently defined.

Barr developed Class 4 feasibility-level opinions of costs for the various alternatives and options for this project. These were based on limited engineering and the use of parametric models to calculate estimated costs (i.e., making use of order-of-magnitude costs from similar projects) and uncertainty, with an acceptable range of between -30% and +50% of the estimated project cost.

The opinions of probable costs provided in this memorandum are based on Barr's experience and qualifications and represent our best judgment as experienced and qualified professionals familiar with the project. We acknowledge that additional investigations and site-specific information available in the next design stage may result in changes to the proposed configuration, cost, and functioning of project features.

In addition, because we have no control over (1) the eventual cost of labor, materials, equipment, or services furnished by others, (2) the contractor's methods of determining prices, or (3) competitive bidding or market conditions, Barr cannot and does not guarantee that proposals, bids, or actual costs will not vary from the opinions of probable costs presented in this memorandum. Further investigation and design of selected projects are needed to develop greater assurance about the probable project costs.

3 Alternative Costs

We developed cost estimates for the following alternatives, which are discussed in detail in the report.

- Alternative 1, Option 1: All evaluated pumped or gravity outlets on select landlocked basins, including mitigation measures, acquisitions, and floodproofing as described below:
 - Klawitter Pond pumping to Goetschel Pond
 - Reid Park Pond pumping to Downs Lake
 - Legion Pond pumping to Downs Lake
 - Eden Park Pond pumping to Downs Lake
 - Downs Lake gravity outlet to the proposed regional mitigation basins
 - Regional mitigation basins to the Project 1007 system
- Alternative 1, Option 2: All evaluated pumped or gravity outlets on select landlocked basins, including mitigation measures, acquisitions, and floodproofing as described below:
 - Klawitter Pond pumping to Goetschel Pond (same as Option 1 above)
 - Reid Park Pond pumping to Downs Lake (same as Option 1 above)
 - Legion Pond pumping to Downs Lake (same as Option 1 above)
 - Eden Park Pond pumping to Downs Lake
 - Downs Lake gravity outlet to the proposed regional mitigation basins
 - Regional mitigation basins to the Project 1007 system

- Alternative 2: Acquisition of impacted properties and no construction of new outlets
- Alternative 3: Individual pumped or gravity outlets on select landlocked basins, including mitigation measures, acquisitions, and floodproofing as described below:
 - Option 1: Reid Park Ponds only pumping to proposed regional mitigation basins along the Project 1007 system
 - Option 2: Legion Pond only pumping to proposed regional mitigation basins along the Project 1007 system
 - Option 3: Reid Park Pond and Legion Pond combined pumping to proposed regional mitigation basins along the Project 1007 system
 - Option 4: Downs Lake and Eden Park Pond only to proposed regional mitigation basins along the Project 1007 system

Table 1 provides a summary of the point opinion of probable costs as well as the uncertainty range for each alternative. Project locations are generally listed from upstream to downstream. We have included detailed opinions of probable costs for all considered alternatives and options as an attachment to this memo.

Table 1 Summary of Opinion of Probable Costs

Project Location	Alternative 1: Option 1	Alternative 1: Option 2	Alternative 2: Acquisition Only	Alternative 3: Reid Park Pond Only	Alternative 3: Legion Pond Only	Alternative 3: Reid Park and Legion Ponds Combined	Alternative 3: Downs Lake and Eden Park Pond Only, Option 1	Alternative 3: Downs Lake and Eden Park Pond Only, Option 2
Klawitter Pond	\$7,050,000	\$7,050,000	\$1,285,000	N/A	N/A	N/A	N/A	N/A
Friedrich's Pond	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sunfish Lake	N/A	N/A	\$585,000	N/A	N/A	N/A	N/A	N/A
Legion Pond	\$1,520,000	\$1,520,000	\$5,465,000	N/A	\$3,130,000	N/A	N/A	N/A
Reid Park Pond	\$2,270,000	\$2,270,000	\$680,000	\$3,030,000	N/A	N/A	N/A	N/A
Reid Park and Legion Ponds Combined	N/A	N/A	N/A	N/A	N/A	\$4,220,000	N/A	N/A
Goetschel Pond	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cloverdale Lake	N/A	N/A	\$1,240,000	N/A	N/A	N/A	N/A	N/A
McDonald Lake	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Downs Lake and Eden Park Pond	\$38,560,000	\$14,010,000	\$4,200,000	N/A	N/A	N/A	\$38,560,000	\$13,980,000
Regional Mitigation Upstream of West Lakeland Storage Sites	\$25,990,000	\$7,410,000	N/A	\$3,350,000	\$4,460,000	\$5,720,000	\$25,990,000	\$7,410,000
Total Project Cost	\$75,390,000	\$32,260,000	\$13,500,000	\$6,380,000	\$7,590,000	\$9,940,000	\$64,550,000	\$21,390,000
Total Project Cost, Class 4 Range: -30%–+50%	\$52.8 million– \$113.1 million	\$22.6 million– \$48.4 million	\$9.5 million– \$20.3 million	\$4.5 million– \$9.6 million	\$5.3 million– \$11.4 million	\$7 million– \$14.9 million	\$45.2 million– \$96.8 million	\$15 million– \$32.1 million

4 References

1. **U.S. Army Corps of Engineers.** *Lower Meramec Basin Multi-Jurisdictional Floodplain Management Plan.* 2020.
2. **Zillow.** Does a Finished Basement Add Home Value? *Zillow.* [Online] [Cited: August 3, 2023.] <https://www.zillow.com/sellers-guide/does-a-finished-basement-add-value/>.
3. **828 Real Estate.** Basements: Do They Really Improve Home Value? *828 Real Estate.* [Online] [Cited: August 3, 2023.] <https://828realestate.com/basements-improving-home-value/>.
4. **Federal Emergency Management Agency.** Resources to Support Benefit-Cost Analysis. *FEMA.* [Online] June 2011. [Cited: August 3, 2023.] https://www.fema.gov/sites/default/files/2020-08/fema_bca_guide-supplement.pdf.
5. **American Society for Testing and Materials.** *ASTM E2516-06 Standard Classification for Cost Estimate Classification System.* West Conshohocken, PA : ASTM International, 2019.
6. **Association for the Advancement of Cost Estimating.** *AACE International Recommended Practice No. 18R-97.* s.l. : AACE International, 2016.
7. **Minnesota Department of Natural Resources.** LiDAR Data. Saint Paul, MN : Minnesota Department of Natural Resources, 2011.