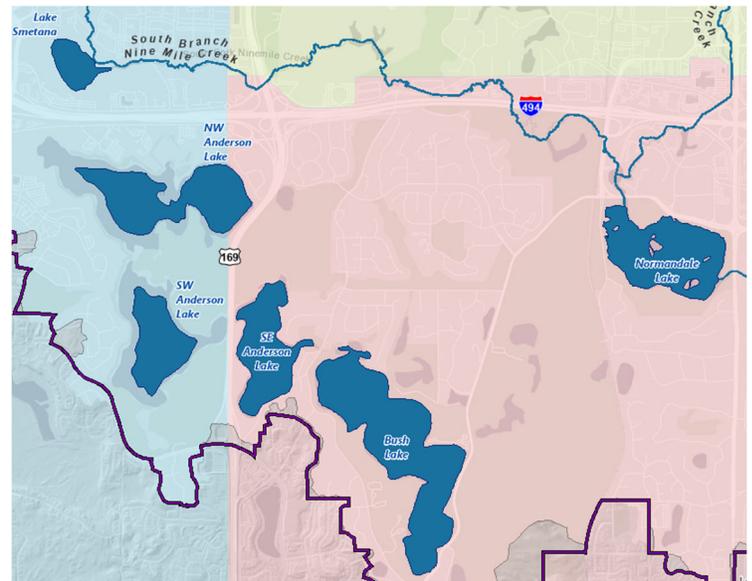


# Memorandum

**To:** Nine Mile Creek Watershed District Board of Managers  
**From:** Janna Kieffer, PE and Evan Christianson, PG  
**Subject:** Groundwater and surface water modeling Scope of Work- Bush Lake and Anderson Lakes  
**Date:** October 28, 2025  
**c:** Erica Sniegowski, Nine Mile Creek Watershed District Administrator

This memo summarizes our proposed scope of work to develop a water balance for Bush Lake and the Anderson Lakes using a loosely coupled groundwater-surface water model. The proposed scope of work will help the NMCWD better understand groundwater and surface water interactions and the effects on water levels in these lakes.

Bush Lake is a land-locked lake in west Bloomington with a pumped outlet. The tributary drainage area to Bush Lake is approximately 1300 acres, with a direct drainage area of approximately 800 acres. Water levels in the 188-acre lake have historically fluctuated based on climatic conditions (see Figure 1). In 2000, a pumped outlet was installed by the Nine Mile Creek Watershed District to provide flood protection during times of high water in Bush Lake. When below the “pump on” elevation (833.5 feet MSL), water levels are controlled by watershed runoff, evaporation, and groundwater interaction (gain or loss).



**Figure 1. Locations of Bush Lake and Southeast Anderson Lake in Bloomington (area shown in pink) and Southwest and Northwest Anderson Lakes primarily in Eden Prairie (area shown in blue).**

The Anderson Lakes is a chain of lakes located northwest of Bush Lake, including Southeast Anderson Lake in Bloomington and Southwest and Northwest Anderson Lakes located primarily in Eden Prairie. Southeast Anderson Lake is connected to Southwest Anderson Lake via a 48-inch diameter culvert under U.S. Highway 169. Southwest Anderson Lake is connected to Northwest Anderson Lake via a surface channel. The control elevation of the three lakes is at 839 feet MSL; water flows from Northwest Anderson Lake to the South Fork of Nine Mile Creek via a gravity outlet at 839 feet MSL.

Water levels in Bush Lake and Southeast Anderson Lake have been low in recent years, following lower-than-normal annual precipitation in 2021-2023 (see Figure 2). Although precipitation has been above normal in 2024 and 2025 (to date), water levels in Bush and Southeast Anderson Lakes have not rebounded significantly. While this is in part due to the relatively small and lightly developed watersheds to these lakes, and associated amount of runoff, there is uncertainty regarding how groundwater interaction impacts the surface water levels.

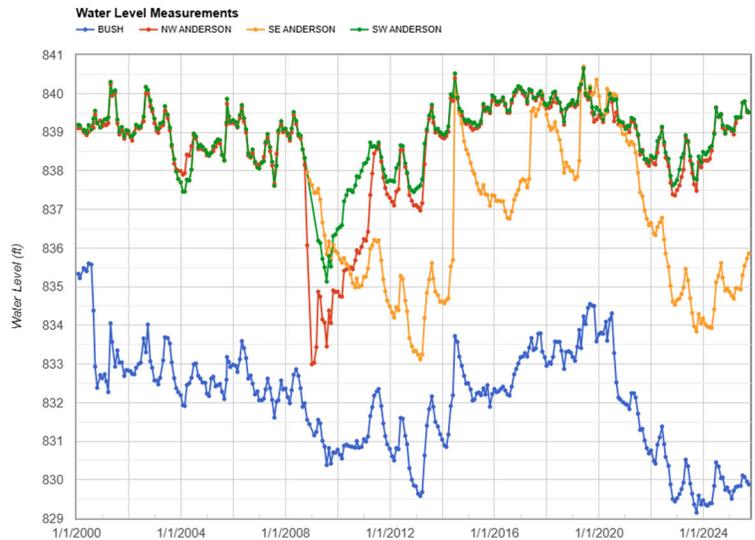
## Scope of Work

### Task 1. Model Development and Calibration

A loosely coupled groundwater-surface water model will be developed for Bush Lake and Anderson Lakes to establish a comprehensive water balance and improve understanding of the factors that drive lake stage variability. The modeling framework will build upon the existing P8 stormwater runoff models for each lake and will be integrated with a subregional MODFLOW-based groundwater model developed by Barr Engineering for the Metropolitan Council in 2023–2024 as part of the West Metro Wellhead Protection Plan pilot project. The groundwater model incorporates the most up-to-date geology and pumping information and was built using MODFLOW6, the most recent version of MODFLOW supported by the United States Geological Survey.

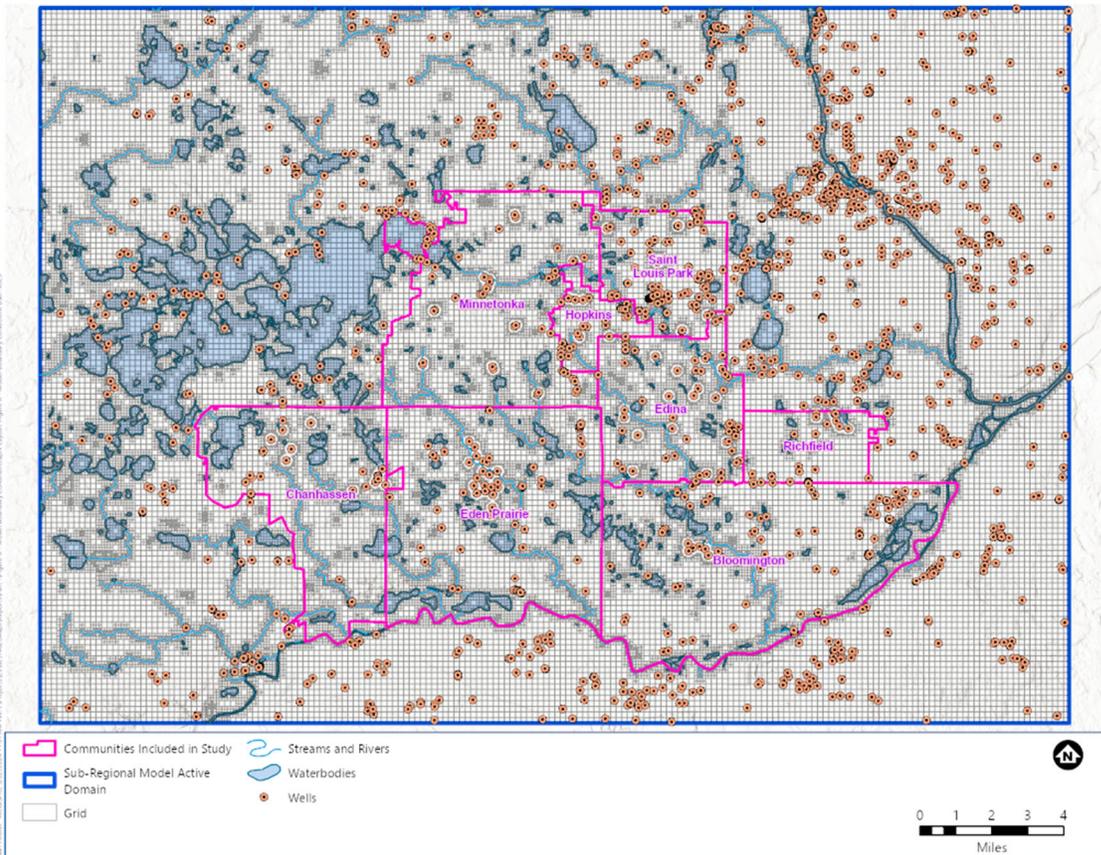
In the existing west metro groundwater model, lakes are simulated with a head-dependent boundary condition (river package). These boundary conditions allow groundwater flow into and out of the boundary, but the water balance is not fully accounted for, and the stage is set at a fixed or specified value. To simulate a more complete water balance, boundary conditions for Bush Lake and Anderson Lakes will be converted to the lake package boundary condition of MODFLOW. The lake package allows dynamic simulation of lake stage by accounting for all major inflows and outflows, including direct runoff, precipitation, evaporation, surface water inflow and outflow, pumped water, and groundwater inflow and outflow. Lake bathymetry will be used to define the stage–area–volume relationships needed to calculate changes in lake storage over time.

Runoff and surface water flows for each of the lakes will be derived from the P8 models. A spreadsheet-based water balance model will be developed to approximate surface water interaction between the three Anderson Lakes. Local climate data will be used to estimate evaporation. Groundwater exchange will be simulated by MODFLOW6 using the hydraulic properties and gradients defined in the regional model.



**Figure 2. Observed surface water levels in Bush Lake, Southeast Anderson Lake, Southwest Anderson Lake, and Northwest Anderson Lake from 2000-2025.**

The coupled groundwater and surface water model will be calibrated based on observed lake water levels from Bush Lake and the Anderson Lakes for the last 10 years, and groundwater data already compiled as part of the original MODFLOW model development. The calibrated model will produce a continuous water balance for each lake, quantifying the relative contributions of surface runoff, groundwater inflow, precipitation, evaporation, and other fluxes. This water balance will provide insight into how climatic variability, watershed inputs, and groundwater conditions collectively influence lake stage changes over time.



**Figure 1. Extent of the west metro groundwater model**

## Task 2. Summary Presentation

Task 2 includes development of a presentation that summarizes high-level model development, results, conclusions, and recommendations (as appropriate). It is anticipated that this presentation will be given at an NMCWD Board meeting.

## Task 3. Technical Memo

Task 3 includes development of a technical memo to summarize the methodology, results, conclusions, and recommendations (as appropriate) from the groundwater-surface water modeling analysis.

## Task 4. Meetings

This scope of work assumes Barr staff will attend up to three meetings to share and discuss results of the modeling analysis, including 1) a meeting with NMCWD staff, 2) a meeting with NMCWD and City of Bloomington staff, and 3) a meeting with the NMCWD board of managers.

### 1 Budget

Task	Hours	Cost
Model Development	250	\$41,500
Presentation	16	\$3,200
Technical Memo	40	\$6,800
Meetings	18	\$3,800
Total	324	\$55,300

### 2 Schedule

The scope of work proposed above is anticipated to be complete by April 2026 assuming a notice to proceed by December 1, 2025.