

Groundwater Recharge (Modeling) for Badger Mill Creek

PROJECT TYPE

Groundwater Recharge – Inset Model

START

Planning: Early 2025

Implementation: TBD

COMPLETION

Planning: 18-24 months

Implementation: TBD

LOCATION

Upper Badger Mill Creek

DESCRIPTION

The purpose of this project is to identify and implement enhanced recharge/infiltration projects in areas determined to be of the highest potential for contributing to increased baseflow within the Badger Mill Creek. The project will entail two distinct phases, including a planning phase to identify and prioritize strategies with the highest recharge potential and an implementation phase. The scope of strategies may include acquisition of high-recharge areas for permanent protection from development, incentive or education programs to encourage new or existing development to infiltration beyond minimum ordinance requirements (i.e., achieve 100% stay-on), subsurface infiltration systems (similar to the Odana Hills Golf Course Recharge System), identification of alternative sources of water for infiltration (such as detained stormwater, landfill leachate, or MMSD effluent), or some combination thereof.

Planning Phase

- The Stakeholder Group determined that further study is needed to identify viable location(s) for potential groundwater recharge project(s). The group agreed that working with the Wisconsin Geological and Natural History Survey (WGNHS) on updating the Dane County regional groundwater flow model to create an inset model for Badger Mill Creek and developing a stream temperature model is a logical first step. WGNHS proposes that this work would be a collaboration between WGNHS and the USGS. The project would entail:
 1. Collecting site-specific field data necessary to refine hydrogeologic and stream conditions near Badger Mill Creek,
 2. Adding detail to the 2016 Dane County regional groundwater flow model near Badger Mill Creek by creating an inset or daughter model and recalibrating the inset model to current conditions,
 3. Developing and calibrating a stream temperature model for the same area, and
 4. Testing different scenarios to investigate the effects of changing effluent discharge or other watershed management strategies on baseflow and temperature in Badger Mill Creek.
- Compile and assess various datasets to identify locations which would have the highest potential for increasing baseflow to BMC—such data may include recharge estimates based on the 2012 WGNHS report *Groundwater Recharge in Dane County Wisconsin, Estimated by a GIS-Based Water-Balance Model* ([link to report](#)); property ownership records to determine locations of existing public lands (e.g., Reddan Soccer Fields, parks, etc.), lands to target for acquisition, or lands which could have projects implemented upon (e.g., Fitchburg Minerals development site, landfill and solar fields, quarries, etc.); modeling from the [Dane County Groundwater Model](#) to identify

the groundwatershed of Badger Mill Creek (currently understood to generally match the surface watershed, larger scale mapping available [here](#)) and zones of baseflow contribution (e.g., 1- and 5-year return periods); and agricultural management practices being employed.

- Investigate the character and volume of leachate generated at the Verona Landfill (currently hauled to MMSD Nine Springs WWTP) to determine feasibility of treating on-site and infiltrating.
- Investigate feasibility of incentive program (likely in combination with an educational campaign) to promote increased infiltration practices in developments (e.g., payments to Developers).
- Investigate feasibility of infiltrating effluent that is currently being returned to BMC.
- Prioritize sites and projects based on various metrics such as feasibility, costs, and baseflow impacts (volume and period of return).
- Public engagement may be warranted for some projects and sites.

Implementation Phase

Using results of planning efforts, implement one or more projects with the goal of achieving a statistically and biologically significant increase in baseflow over the short- to medium-term. Some projects may be implemented quickly, such as an education campaign. Other projects may require detailed site evaluation (borings, monitoring wells, hydraulic testing, etc.), detailed engineering design, public engagement, and permitting, such as a subsurface infiltration system. Timing of implementation may be tied to availability of lands for acquisition as well as development proposals outside of control of MMSD.

BACKGROUND

The Madison Metropolitan Sewerage District, Dane County Land & Water Resources, and Capital Area Regional Planning Commission members of the stakeholder group put forward this project proposal to develop a groundwater recharge project in the Badger Mill Creek Watershed. A similar 50 million gallon per year project has been operating at the Odana Golf Course for 20 years which takes stormwater from Odana Pond, filters it, and pumps it to a subsurface infiltration bed. Existing recharge mapping is available that can be used in the site selection process.

Groundwater flow models and stream temperature models are powerful tools for understanding stream and groundwater dynamics. The 2016 Dane County regional groundwater flow model can simulate regional groundwater flow directions, capture zones, and travel times. For site-specific questions, an inset model is useful for better understanding groundwater flow. Stream temperature models can work in parallel with the groundwater flow model to simulate stream temperature given changes in effluent discharge, groundwater recharge, air temperature, and physical stream characteristics such as shading. By testing different scenarios, the models can inform the likely effects of management strategies on ecosystem health.

PARTICIPATING STAKEHOLDERS

Lead Organization(s): CARPC

Supporting Organization(s): City of Fitchburg, City of Madison, Dane County, MMSD, Town of Verona, USRWA

The planning phase modeling work will be implemented by WGNHS and USGS under contract with the lead organization(s).

FUNDING

It is anticipated that funding for this project would be contributed by MMSD. Certain components could be funded through various grant programs. The range of costs from incentive programs to land acquisition to infrastructure projects (e.g., Subsurface Infiltration System) will vary substantially, however it is assumed the latter would represent the most expensive option and is detailed below:

Planning Phase: Estimated Project Cost of Model Update

\$130,000 (100% paid by MMSD BMC funds)

Implementation Phase: Estimated Project Cost of Subsurface Infiltration System¹

Design Phase: \$200,000 - \$400,000 (Funding sources TBD)

Construction Phase: \$1,000,000 + (Funding sources TBD)

O&M: (Funding sources TBD)

RESOURCE LINKS

WGNHS Preliminary Scope and Budget Estimate (attached)

Interactive recharge map: [Link to Dane Co map](#) or [Link to CARPC map](#)

Modeled Regional Groundwater Contours: [Link to CARPC map](#)

Odana Golf Course Groundwater Recharge Project: [Link to presentation](#)

2012 WGNHS report *Groundwater Recharge in Dane County Wisconsin, Estimated by a GIS-Based Water-Balance Model* ([link to report](#))

CARPC Groundwater Resources webpage, including Groundwater Divides: [Link to CARPC map](#)

2011 UW-Madison WRM: *Nine Springs Recharge Project* ([link to report](#))

¹ Cost estimate based on costs for the Odana Golf Course Recharge Project (\$400,000 design, \$1,000,000 construction)
October 2024