

From: [Kathy Cox](#)
To: [Furman, Keith](#); [Tucker, Matthew](#); [Prusak, Sydney](#); design@udvari-solner.com
Subject: Groundwater Control System for 5454 Lake Mendota Dr .pdf
Date: Friday, October 11, 2019 4:56:36 PM
Attachments: [Groundwater Control System for 5454 Lake Mendota Dr .pdf](#)
[ATT00001.txt](#)

Hi Keith,

As promised, attached please find a letter from Rob Montgomery, a water engineer explaining the impact my build will have on ground water mounding and potential impact on neighboring properties.

Rob was able to meet in person with Amy and Jerry Nickles and examine their basement and crawl space. He worked with Mike Schultz of CGC, LLC to prepare this letter and has given his expert opinion based on his observations and scientific training.

I believe this to be a thorough response and trust this will alleviate any further concerns. Please let me know if you have any questions. Thanks

Kathy

October 11, 2019

Ms. Kathy Cox
5454 Lake Mendota Drive
Madison, WI 53711

Re: Design for construction-time and permanent groundwater control
New residence at 5454 Lake Mendota Dr., Madison, WI

VIA: EMAIL

Dear Kathy

We have developed a design for control of groundwater levels at your proposed home at 5454 Lake Mendota Drive, to respond to concerns that have been raised about groundwater changes that could be produced by construction of the deep foundation.

HYDROGEOLOGIC SETTING

As you know, groundwater flows beneath your property from upland areas to the south and discharges to Lake Mendota near the shoreline and possibly also at discharge points in the lakebed offshore of your property. The regional geology and groundwater system are described in the latest groundwater model and report developed by the Wisconsin Geological and Natural History Survey (WGNHS), illustrated in the attached figures and summarized below:

- The water table elevation map shows that the groundwater flow direction is to the northeast, generally similar to the trend in the ground surface, and essentially directly toward Lake Mendota. Soil materials in the upper glacial aquifer are characterized as sands gravels and silts, which would be expected to have moderate to high permeability.
- The cross-section is taken East-West through the area of 5454 Lake Dr. The Dane County groundwater model shows that the glacial sands, gravels and silts extend approximately 190 feet below the ground surface. The bedrock surface is reported to be sandstone in this area. This data is the result of extensive well and boring data review conducted by the WGNHS in the course of creating the latest Dane County groundwater model and is the best regional geologic and hydrogeologic data available.

Geologic and hydrogeologic conditions on your property have been investigated previously as part of the structural and foundation design. Borings conducted by Soils and Engineering Services (locations shown on the figure below) indicate that the soils beneath the near-surface fill and clay soils are variable, ranging from sands to interbedded sands and silts. These near-surface soils are consistent with the characterization included in the Dane County groundwater model described above. Groundwater levels on your property were measured at several times, with elevations listed in the table below:

Table of monitoring well and Lake Mendota water surface elevation observations (ft., NAVD 88)

Location	Date of Observation		
	7-28-2017	4/23/2019	10/8/2019
Monitoring Well 6	854.5	855.1	855.6
Monitoring Well 7		855.4	856.1
Monitoring Well 8		855.3	856.0
Monitoring Well 9		855.0	855.7
Monitoring Well 10		855.2	856.0
Lake Mendota Water Surface	851.2	850.4	852.1

The data collected shows that water levels near Lake Mendota Drive (wells 7, 8 and 10) have ranged from 855.0 through 856.1, with the highest groundwater elevations observed this week. Data collected further north (wells 6 and 9) showed water levels ranging from 855.0 through 855.7, slightly lower than the water levels near the street, as would be expected with northward trending groundwater flow. The water level in a well sump to the rear of 5450 Lake Mendota Dr. was recently observed be approximately 854.8, also consistent with groundwater gradient trending toward Lake Mendota with current water surface elevation of approximately 852.1. The higher groundwater levels were observed in readings taken this week and are likely due to the effects of the very heavy (very near record) rainfall and associated infiltration that we have experienced this year, combined with high water levels on Lake Mendota. Given the above data, we believe that groundwater elevations adjacent to your proposed home could range from somewhat less than 854 through somewhat above 857 over time.

PERMANENT GROUNDWATER CONTROL SYSTEM

Concern has been expressed regarding the potential for the deep basement in your home to produce a groundwater “mounding” or “damming” effect on the water table in the area. Although this is a theoretical possibility, we believe that it is probably not a significant threat for this project, due to the permeable sandy soils that are present beneath your proposed home, and the fact that the gravel/sand/silty soils have a thickness of approximately 190 feet indicating a significant hydraulic capacity in the overall groundwater system. Nevertheless, we recommend that a groundwater control system be installed at your proposed home, to make sure that mounding does not occur. The objectives of the system would be to:

1. Limit the potential for groundwater to rise above a specified elevation on the south side of your home, and
2. Not create a groundwater “drain” that would lower groundwater significantly below current conditions.

The proposed groundwater control system will consist of a trench filled with high permeability washed stone placed adjacent to your foundation wall as shown on the marked-up drawing inserted below:

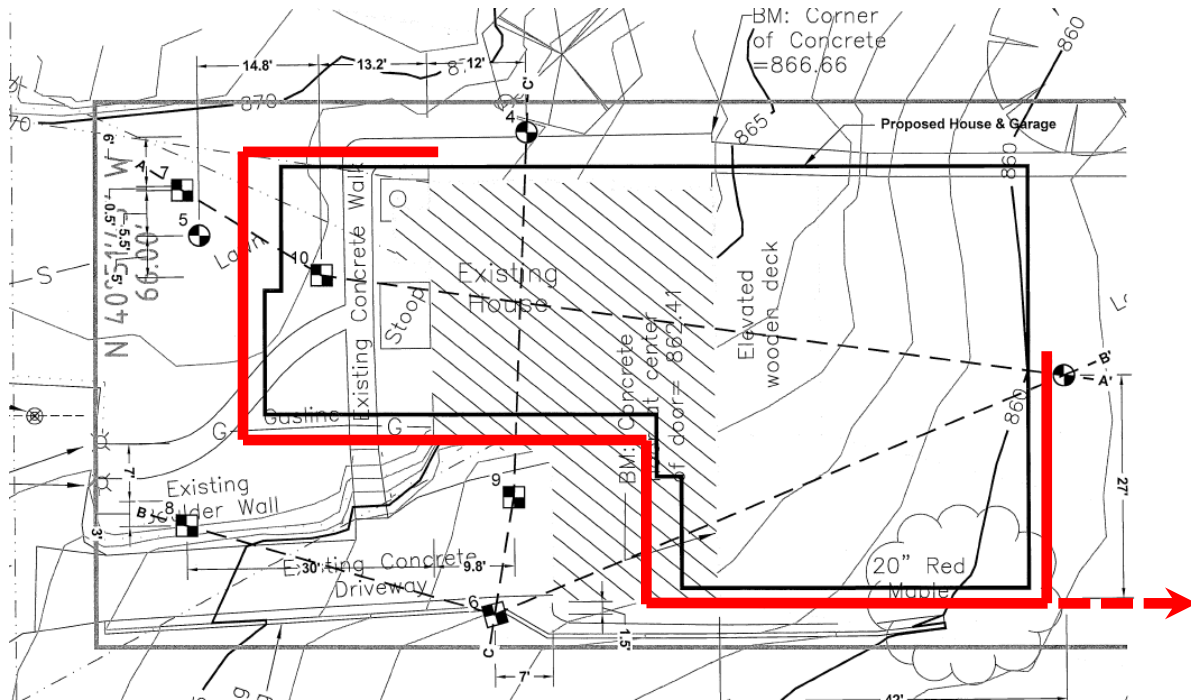


Figure showing schematic layout of proposed groundwater control system. Base map from SES location sketch included in their report dated May 2, 2019.

The high permeability washed stone gravel trench will be 3 to 4 feet wide, to facilitate reliable construction, and will extend from approximately elevation 851 up to 857. The width and height of the stone-filled trench will provide a groundwater flow route with permeability that is orders of magnitude higher than the adjacent silt and sand natural soils, which will allow the system to provide a near-constant groundwater control elevation regardless of the rate of local groundwater inflow. The stone filled trench will be fitted with a permeable conduit at elevation 854, which will limit groundwater rise to very little above elevation 854. The conduit will freely discharge to Lake Mendota and will be routed adjacent to the surface water drainage system that will convey roof downspout flow to the lake. We will provide vertical riser pipes in the trench drain so that it can be monitored to for free-flowing conditions.

This groundwater control system will control any potential groundwater rise that could produce off-site impacts. The maximum elevation of groundwater adjacent to your proposed home will be approximately 854. The home to the west of your property at 5458 Lake Mendota Dr. has as a rear walkout floor elevation of approximately 864, well above local groundwater elevations. The home to the east of your property at 5450 Lake Mendota Dr. has a walkout floor elevation of approximately 856, also above the proposed control elevation.

CONSTRUCTION-TIME GROUNDWATER CONTROL AND SOIL RETAINING SYSTEM

Construction of the home will require temporary dewatering to approximately 1.5 ft below the anticipated lowest basement slab elevation of 847.5. Groundwater control will likely be accomplished using a well point system. An advantage of a well point system is that it could be installed close to (and inside of) the proposed H-pile and wood lagging earth retention system planned for the western edge of the excavation nearest to the 5458 property to the west. A combination of cutback slopes either at a 1H:1V or 1.5H:1V inclination in probable conjunction with a H-pile/lagging system will be used along the east and south portions of the excavation. Use of a well point system will minimize the groundwater cone of depression radiating away from the well points, especially with H-pile/lagging in place. The H-pile/lagging system was selected for retention compared to a driven sheet pile system to minimize vibration during installation.

The construction dewatering will be conducted for the minimum time necessary, until the deep foundation mat and walls including waterproofing elements have attained sufficient strength. These waterproofing measures will allow for the well points to be shut off and allow for the permanent groundwater to rise and return to pre-construction levels. The groundwater control system described in the previous section will be installed as part of the foundation backfill activities as the home basement is being completed.

We anticipate that the risk to adjacent properties from the temporary construction dewatering and the soil retention system will be minor. Many projects have been completed in the Madison area using the combination of soil retention and temporary dewatering via well points as is proposed here. We recommend construction-time monitoring activities to consist of:

- A pre-condition survey of each adjacent property to document existing conditions such as possible concrete cracks prior to site construction.
- Establishing a series of surveying points on the nearest foundation of the 5458 structure to monitor horizontal and vertical position through the construction of the project.

Please contact me at 608-839-6207 (direct) with any questions.

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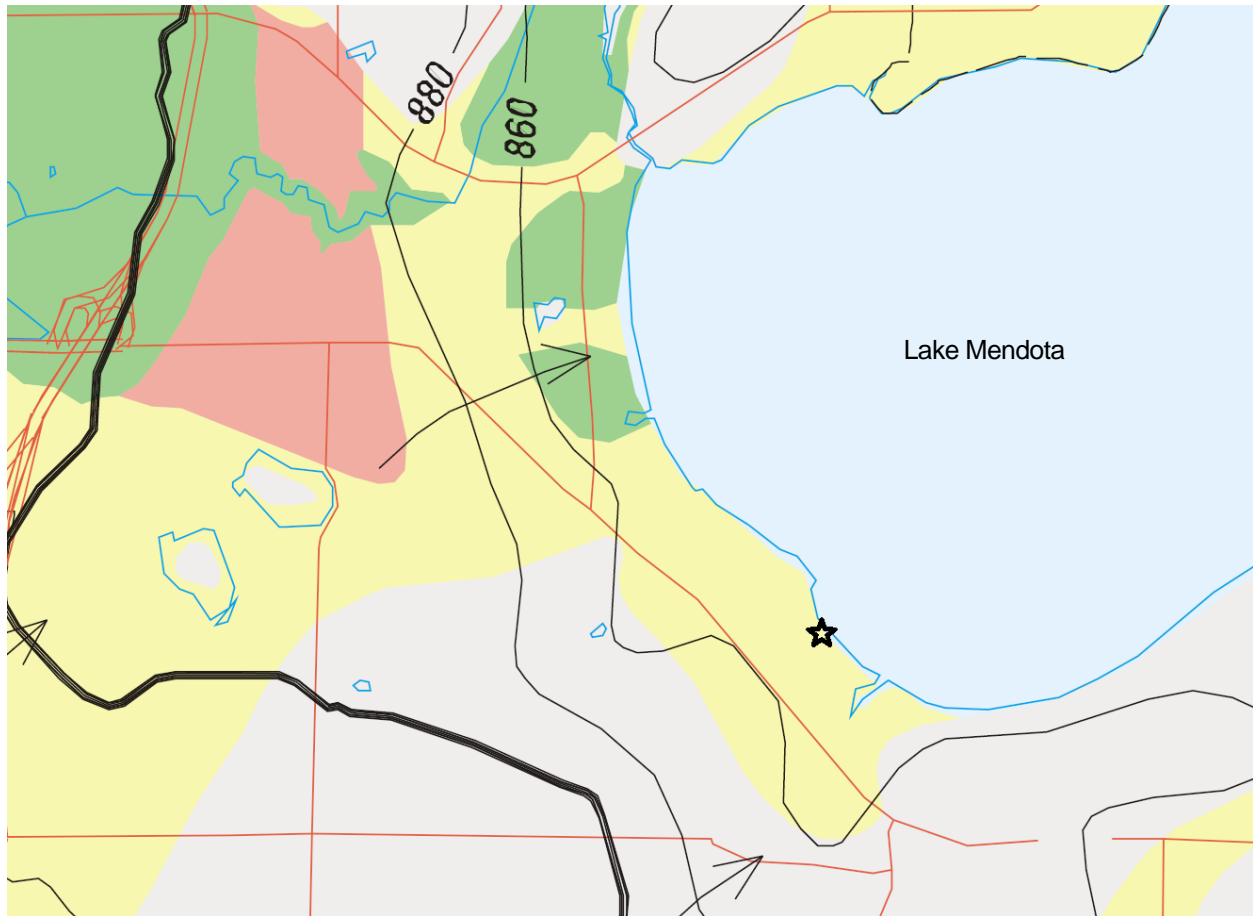


Robert J Montgomery, PE, D.WRE

Principal Water Resources Engineer





Enclosure: Regional geology and water table elevations
 Cross section from Dane County groundwater model

Regional geology and water table elevations



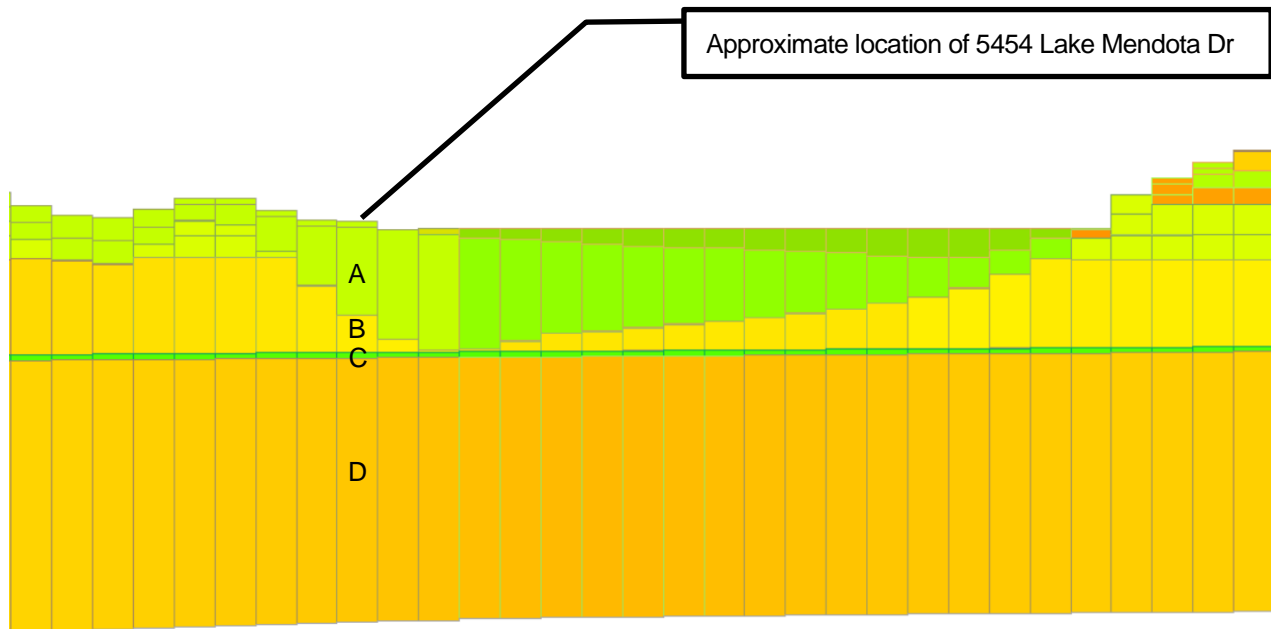
★ Location of 5454 Lake Mendota Drive

Glacial Geologic materials as defined in the Dane County Groundwater Model

-  Type 1 – Unconfined: Well sorted sand and gravel deposited as stream sediment
-  Type 2 – Unconfined: Poorly sorted sand, gravel and silt
-  Type 3 – Confined or partially confined: Well to moderately well sorted sand and gravel overlain by silty or clayey lake sediments
-  Area is not considered an unlithified surficial aquifer

Source: Wisconsin Geological and Natural History Survey

Cross Section from Dane County groundwater model



A: Unlithified – till and meltwater stream deposits	0	–	190 feet
B: Upper bedrock aquifer	190	–	215 feet
C: Eau Claire aquitard	215	–	225 feet
D: Mount Simon aquifer	225	–	690 feet