

Draft Minutes
Metro Model Technical Advisory Group
Thursday, June 19 2008
1:00 PM-3:30 PM

M94 Office Park, Saint Paul, MN

Introductions were made. Chris Elvrum, Metropolitan Council, moderated.

The group briefly discussed the MGS proposal to change the name of the Franconia Formation to the Tunnel City Group and the Ironton and Galesville sandstones to the Wonowoc Formation.

Evan presented an overview of the regional model development process and an example of how a telescopic mesh refinement (TMR) was done to address local conditions in the City of Ramsey.

Randal Barnes, University of Minnesota, asked which aquifers contained transmissivity calibration targets. Evan clarified that most transmissivity targets were provided by the Minnesota Department of Health (MDH) and were generated by wellhead protection projects; therefore, most targets were in the Prairie du Chien and Jordan aquifers.

Bill Olsen, Dakota County, asked if leakage values from aquifer tests were included as calibration targets. Evan responded that, although leakance was a parameter that was allowed to vary within a range constrained by upper and lower bounds, leakance was not used as a calibration target. Hydraulic conductivity (K) was also allowed to vary within upper and lower bounds.

Amal Djerrari, MDH, asked how vertical hydraulic conductivity (K_z) in layer 1 was handled, if recharge was not allowed to vary. Evan responded that hydraulic conductivity (vertical and horizontal) was defined for each layer through the definition of zones. The zone geometry in layer 1 was delineated based on sand content.

Bill, noting that the model represents the Quaternary layer(s) through 65 K zones and that the aerial extent of these zones was delineated based on mapping of sand content, asked 1) if the high sand content areas correspond to areas of high K and 2) if zones of similar sand content have similar K values. Evan clarified that high sand content zones do not necessarily correspond to high K values and that areas with similar sand content do not necessarily have similar K values. The sand content mapping was done solely to break up the Quaternary layers into zones. The values of these zones were established through the calibration process. Bill expressed concern that this method may result in a model that nicely fits the field data but that is not predictive.

Bob Tipping, Minnesota Geological Survey (MGS), asked the approximate K value for western Hennepin County. Evan responded that K in that area is approximately 30 meters/day.

Chris reminded the group that the Council does not intend to use the model to assess the Quaternary as a future municipal supply.

Bob asked how the selection of Quaternary K values affects model calculated fluxes to the units below. Evan agreed that there was some affect. The City of Ramsey is an example of how the model data is refined for local problems. In that case, K values had to be reduced to match transient pump test data.

After reviewing the model values of horizontal and vertical hydraulic conductivity, Randal noted that K_v generally appears to be an order of magnitude less than K_h .

Amal requested a review of the model K zone maps. He does not agree with the K values used in the central cities. He also asked if current model calibration resulted in values that make sense with what we know from aquifer tests. He expressed concern that K values for the Prairie du Chien and Jordan in Ramsey County are unreasonably low.

After details were presented for the City of Ramsey area, Amal asked how river bed conductance was included in the TMR. Were engineering test results included that indicate low river bed conductance? Evan responded that he was aware of the work done to test river bed conductance, but that these results were not included in the Ramsey TMR.

Doug Hanson, Minnesota Pollution Control Agency (MPCA), asked how well the regional model was calibrated in the Ramsey area before the TMR modifications. Did the regional model show boundary affects in the Ramsey area? Evan noted that the regional model produced a reasonable starting fit in the Ramsey area.

Randal asked if the model interpretation included an assessment of whether the river goes from gaining to losing. This type of assessment was not done for the Ramsey area.

Amal commented that the model has too many lakes that the model treats as groundwater input. Ray Wuolo, Barr, responded that they would revisit doing a sensitivity analysis of lake conductance at the local and regional scale.

Randal added his concern that the model may be inaccurately representing the source of the water. Ray Wuolo noted that the amount of water entering the model through lakes should be approximately the same as recharge.

Chris noted that, even if excess water is entering the model through the river, model-predicted drawdown in layer 1 is still significant enough to warrant community monitoring of surface water impacts by pumping. Amal agreed, but responded that the model will be unable to produce an answer in more borderline cases unless river bed conductance values are improved.

The group discussed the value of reviewing global and layer water balance graphs and budgets, and maps of leakage between model layers (Ray agreed to produce). Randal highlighted the graph illustrating that 40-50% of the water entering the Mt. Simon is leaving through wells. Bob asked the location of the constant head boundary for layer 9 (Mt. Simon). Evan responded that layer 9 has constant head boundaries on the south and east; the northwest is a no-flow boundary.

Amal did a back-of-the-envelope calculation of recharge (inches/year) to the Mt. Simon based on data in the regional model's mass balance graph: 0.25 inches/year recharges the Mt. Simon. Bob highlighted the distribution of flux by unit, and pointed out how it highlights the movement of water down through the system. Randal commented that the model should do really well at this type of mass balance calculation/sustainability assessment. Ray responded that he would provide this information on a layer by layer basis to the group and for the model report.

Amal roughly calculated the rate into model layer 1 from recharge and river boundary conditions to be 11 inches per year, which is higher than the group is comfortable with. This indicates that a lot of water is entering and exiting solely through layer 1.

Bob asked if it was possible to illustrate in map view where layers get their water, using different colors to identify where water is entering and exiting each layer. Ray responded that this was possible.

John Frietag, Washington County, noted that he has lake data defining them as perched or groundwater-fed. This data could improve model lake conductance values.

Bill asked how much effort is involved in modifying the model and calibrating. Evan responded that recalibration requires significant effort, particularly in setting up the calibration files. It also takes 4-5 days to run the calibration distributed over a couple of computers.

Bill requested a list of free variables and the constraints imposed on them. He expressed concern over the amount of freedom many variables have.

Randal asked, of all the parameters (~800), how many are hitting the upper and lower bounds? He also requested a correlation plot of sand content and K values for each Quaternary zone.

Lanya Ross introduced the topic of public access to data and models. The Council intends to provide access to the model files through the Water Supply Planning Unit website. Security concerns must be addressed whenever well location data is involved. Any public access to model data and files must include a clear statement of appropriate and inappropriate use. The group discussed possible issues with a model user forum to exchange model data, methods, and issues. The need for a moderator was stressed.

Chris provided a draft monitoring plan for review by the group.

Attendance List
Groundwater Modeling Technical Advisory Group
Metropolitan Council – M94 Office Park
June 19, 2008

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