Groundwater modeling tool for well flow in layered aquifer systems

MLU for Windows is an analytical groundwater modeling tool to compute heads and drawdowns, analyze all sorts of aquifer tests and design well fields in layered aquifer systems.

As a rule present day computer codes for aquifer and slug test analysis still use the same solutions and techniques that were common several decades ago. Each type of aquifer test, characterized by a long list of conditions and assumptions, is associated with a particular analytical solution (e.g. Theis, Hantush) for only one aquifer. The related procedures to determine the aquifer properties (usually two or three) often require straight-line fitting or type curve matching some part of the measured data. Unlike such traditional aquifer test software, MLU uses a single generalized solution technique for well flow.

MLU for Windows is based on:

- An innovative analytical solution technique for well flow in layered aquifer systems
- Stehfest's numerical method to convert the solution from the Laplace into the real domain
- The superposition principle, both in space (multiple wells) and time (variable discharges)
- The Levenberg-Marquardt algorithm for parameter optimization (automated curve fitting).

This unique combination of techniques allows for all tests to be analyzed in a consistent way with a single user interface: recovery tests, variable discharge tests, step-drawdown tests, complex tests in well fields and slug tests. It also handles partially penetrating and large-diameter wells and double-porosity systems. Results are printed in ASCII files and plotted as time-drawdown graphs and animated contour plots.

Theoretical background information on the applied analytical solution techniques for multiple aquifer systems has been published in e.g.: Journal of Hydrology 90, p. 231-249 (1987) and 225: p. 1-18 & 19-44 (1999)
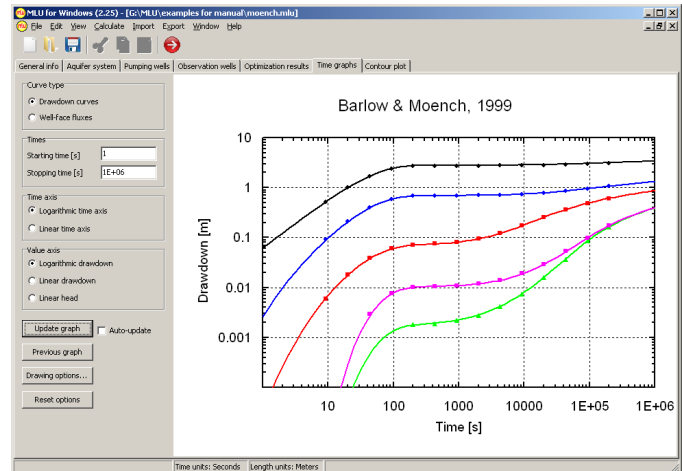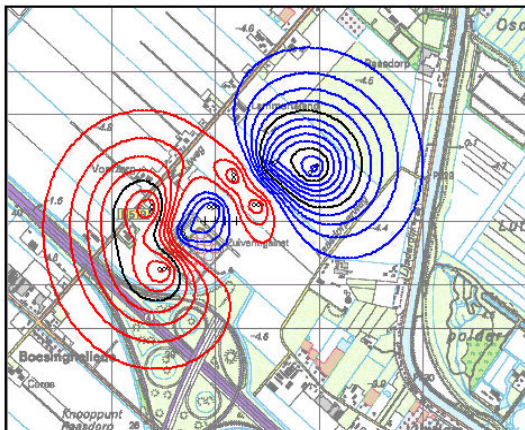
Modeling features

- Layered aquifer systems, i.e. multi-aquifer systems (aquifers and aquitards) and layered (stratified) aquifers
- Confined, leaky and delayed yield aquifers
- Effects of aquifer and aquitard storativities
- Multiple pumping and injection wells
- Variable pumping rates for each well
- Multiple well screens in any selection of aquifer layers
- Finite diameter well screens
- Well bore storage and skin effect for each pumping well
- Delayed observation well response
- Individual and grouped parameters to be determined in one run

MLU capacities

- Up to 80 aquifers (layers) and 81 aquitards
- Up to 1000 pumping and injection wells
- Up to 100 pumping periods per well
- Up to 100 observation wells
- Up to 1000 measured drawdowns per observation well
- Up to 16 parameters to be optimized in one run
- Time conversion: second, minute, hour, day and year
- Length conversion: meters, feet

Input & output

- Data exchange with spreadsheets (copy & paste)
- ASCII data files
- Linear, semi/log-log time graphs of drawdown or head
- Time-variant aquifer discharge at a well screened over multiple aquifers
- Animated contour plots of drawdown and build-up cones
- Clipboard bitmap and vector-based metafile output
- Data files that contain computed heads of displayed time graphs or contour maps
- Conversion to Finite Element Model output file

MLU for Windows

- MLU Lite (2 aquifers)   free

- professional version
- updates and support
- office license   € 490

Further information: www.microfem.com