SCW-B3 Critical Thinking in the Aquifer Test Interpretation

Date and time: Thursday, May 19, 2022, 8:30 AM to 5:00 PM

Location: Dalhousie University

Leader: Christopher Neville, S.S. Papadopulos & Associates, Inc.

Registration cost: Student $100, Professional $500

Topics or sections:

This full-day course is presented is to hone the critical thinking skills of groundwater professionals responsible for interpreting data from aquifer tests in complex natural settings. The course has been presented over 40 times in Canada and around the world. The course is designed to assist groundwater professionals bridge the gap between theory and practice. The course is structured as a set of formal lectures that strike a balance between rigor and practicality, by including coverage of the underlying theory with frequent reference to data and extensive discussion of case studies. The lectures and discussion are designed to go beyond the nuts-and-bolts of pumping test interpretation and address concepts of diagnosis of aquifer response and assessment of the reliability of parameter estimates. The course is not devoted to any particular computer-assisted interpretation package, but the application of these packages will be discussed in the context of more general discussions.

Attendees will not be required to bring anything except a keen desire to improve their interpretations of pumping tests. A comprehensive set of course notes will be provided to all registrants. The course notes are intended to be formal technical documents that will serve for subsequent self-study. In addition to the notes, additional reading materials will be made available for attendees.

Schedule

- 8:30 AM (lectures staring at 9:00 AM) to 5:00 PM (4:30 PM wind-down)
- Two coffee breaks
- Lunch break

Extended Description

It is impossible to exaggerate the importance of reliable interpretations of aquifer tests in groundwater applications. Reliable interpretations are essential for evaluating groundwater resources and predicting the effects of their development, estimating groundwater inflows to underground civil works and mines, and evaluating the migration of solutes and designing remedial measures at contaminated sites. The "gold standard" of aquifer tests is the constant rate pumping test, during which a well is pumped at a constant rate for a sustained period, with water levels monitored in the pumping well and multiple observation wells. These tests require major efforts for planning and execution, and the data from these tests are worthy of careful interpretation.

Aquifer tests are generally interpreted using methods based on highly idealized conceptual models of the subsurface. The theory of these methods and their application in simple settings are treated well in several excellent textbooks and monographs. However, more often than not, analysts charged with interpreting the results of an aquifer test sooner rather than later discover that the data do not resemble those in a textbook. Data are typically noisy, do not approximate theoretical type curves, and frequently yield inconsistent estimates of aquifer properties. The objective of this full-day course is to hone the critical thinking skills of groundwater professionals responsible for interpreting data from aquifer tests in complex natural settings.

The course begins with a discussion of what we actually do when we interpret pumping test data. The course then moves into a detailed discussion of the foundations of pumping test analysis, and how those foundations serve to support the interpretation of pumping tests in real-world settings. The presentation includes a case study on how pumping tests should not be interpreted. The remaining lectures are devoted to specific subjects that should be immediately applicable for practitioners.

- Interpretation of pumping tests in aquifers with linear boundaries
- Interpretation of pumping well drawdowns
- The significance and interpretation of recovery data
- Interpretation of pumping tests in coastal settings

The course is concluded with a discussion of steps that can be taken to maximize the reliability of aquifer test interpretations.