

DATA INPUT FOR AQUIFER TEST INTERPRETATION - WIZARD METHOD

Conceptual model

A constant rate pumping test is conducted in an infinite sedimentary aquifer. The 15-m thick horizontal sand layer is deposited between low-permeable clay layers (Figure 1, left). The fully penetrating well (Pw1) is pumped for one day with the constant rate of $150 \text{ m}^3/\text{day}$, and manual drawdown measurements are conducted in a monitoring well and the pumping well. The monitoring well (Mw1) is located 5 m from the pumping well and screened through the entire thickness of the sand layer.

The pumping test duration was one day (24 hours). After pumping ceased, recovery of groundwater levels was measured during one day (24 hours). Hydraulic heads and drawdowns during pumping and recovery are included in Lesson2.xlsx file that can be [downloaded from our website](#). Drawdown and recovery hydrographs are presented on Figure 1 (right).

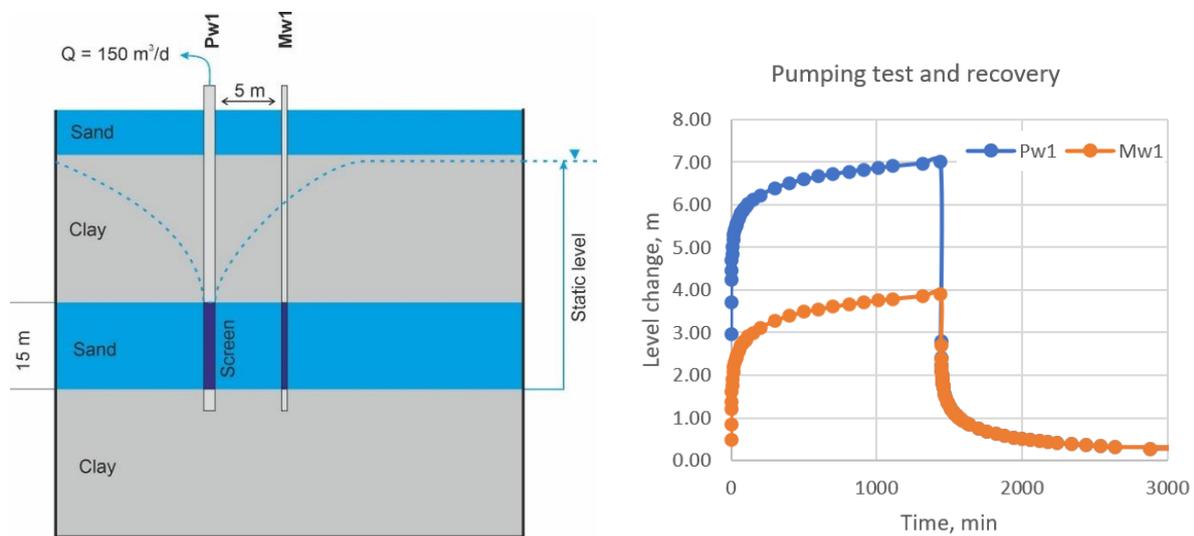


Figure 1. Conceptual model of Lesson 2 pumping test (left) and input data (right)

Input of aquifer test data in ANSDIMAT

There are two ways to enter data into the ANSDIMAT: wizard input and advanced (manual) input. This lesson will show how to input data using the wizard option, which is the recommended method for beginners. The wizard will guide you through the data input process.

The wizard can be used for standard and most situations with simple test conditions. For more complex conditions (e.g. complex shape of boundaries) the user should be using the advanced input mode.

When starting a new interpretation, ANSDIMAT's **wizard mode is by default the primary choice, from which the** user is free to choose the advanced mode at any time.

You do not need to think about which analytical solution to use for pumping test analysis. ANSDIMAT will select a set of suitable solutions based on input data, selected conceptual model and hydrodynamic boundaries.

ANSDIMAT interpretation requires two types of files:

- *.eat file contains original input data, such as borehole design and drawdown measurements;
- *.oat file contains interpretation solutions, matching curves, plots and reports.

To start Lesson 2, you have to create a new ANSDIMAT project. This is done through the menu "Aquifer test analysis>New project". Each project consists of several files and needs to be saved in a different file folder. For this lesson, create a new folder "...\\ANSDIMAT_lesson2" and then save your ANSDIMAT model in this folder under the name "Lesson2". After the project is created, the data input wizard opens automatically.

The wizard leads you through the five consecutive data input steps that are organised through five dialog windows.

Step 1. Selection of conceptual model and boundaries, defining of measurement units

Use the first drop-down list "Aquifer test" to define the type of test. For Lesson 2, you need to select "Pumping/recovery test" as illustrated by Figure 2.

"Aquifer type" field allows us to choose from the three most simple conceptual models: Confined aquifer, Unconfined aquifer and Leaky aquifer. Advanced input mode contains a significantly wider selection of conceptual models. The Lesson 2 conceptual model defines the aquifer as "Confined": select "Confined aquifer" in the "Aquifer type" field.

The "Boundary condition" drop-down list gives a choice between infinite (or unbounded) aquifer, the first kind of boundary (constant head), the second kind of boundary (no-flow) or combination of these boundaries. Select the "Unbounded" type of the aquifer for Lesson 2.

Check the value for the thickness of the aquifer level: this can be entered on the sketch on the right part of the dialog window (Figure 2). For Lesson 2, the aquifer thickness is 15 m.

The next two fields allow selecting the dimensions (i.e. units) for the measurements (time and rate). For Lesson 2, select "minutes" for time and "m³/day" for pumping rate.

Once data input is completed in this window, check that your parameters are correctly entered: the dialog window should look like on Figure 2. When you are satisfied, click on the "Next" button to access the next screen.

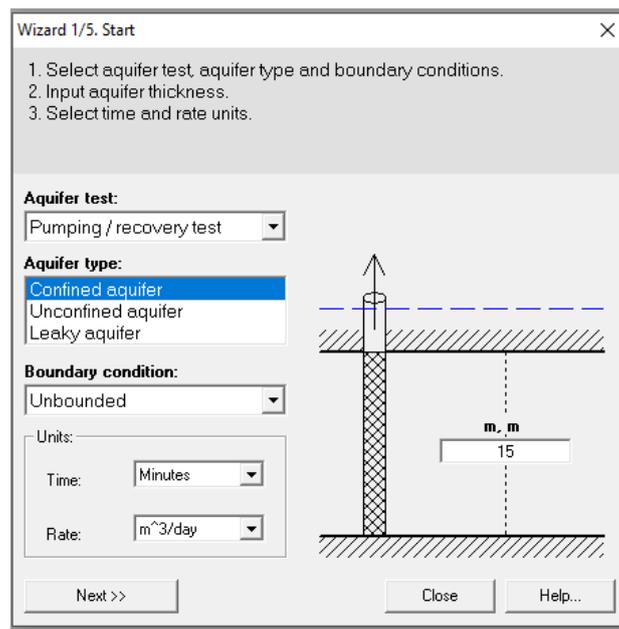


Figure 2. Aquifer test Wizard. Step 1

Step 2. Pumping wells and discharge rates

For Lesson 2, we have only one pumping well with the time-constant pumping rate of 150 m³/day. Type “Pw1” for the “Well name” field and “150” for the “Q” field. Notice, that the unites that were selected for the pumping rate in the previous screen are indicated in the header.

After entering the pumping rate, your dialog window will look like Figure 3.

This dialog window allows you to also input variable discharge rate for a well and a temporary shutdown of the pump.

When required, you can include multiple pumping wells in a project using the button “*New*”. In this case, the program will consider the impact of the combined wells (i.e. the drawdown superposition principle will be used).

Check that your parameters are correctly entered. If you notice a mistake in the parameters entered in a previous window, the “Back” button allows you to navigate to the previous dialogue. When satisfied, click the *Next* button to go to step 3.

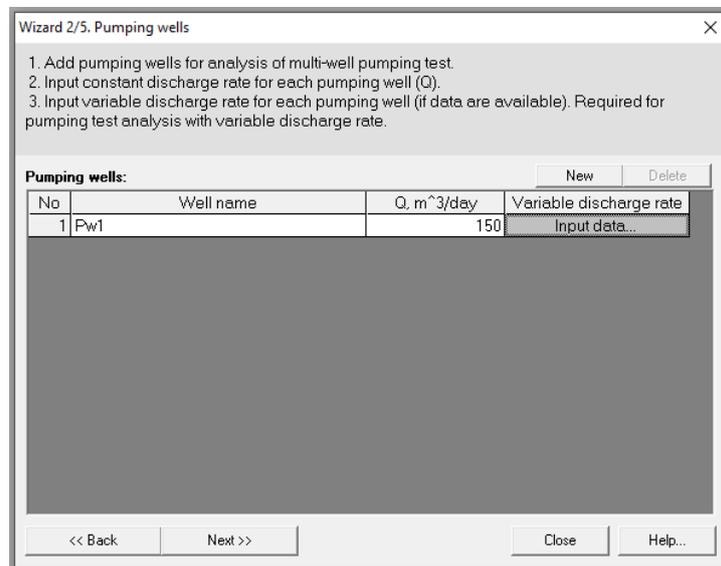


Figure 3. Aquifer test Wizard. Step 2

Step 3. Drawdown measurements

The “Observation wells” dialog window requires you to input drawdown and recovery level measurements for all observation wells, if data are available. In Lesson 2, measurements were taken both, in the Pw1 pumping well and in the Mw1 observation well. This means that the Pw1 well should also be entered as an observation well.

By default, the “Well name” field has just one generic name. Click on this field and enter Pw1 to allow data inputs for Pw1 as an observation well. Then click “*New*” to add an additional observation well Mw1 (see Figure 4). To add drawdown and recovery data, click the “*Input data*” button next to each well.

Recovery is measured from the water level at the end of the pumping observation well: **time and hydraulic head recovery values increase over time.**

The easiest way to input drawdown and recovery data is to copy and paste them from an EXCEL spreadsheets. The excel file “[Lesson2.xlsx](#)” contains the pumping test measurements that were already formatted for ANSDIMAT: for each field (Drawdown, Recovery) and each well, copy the

corresponding table in the excel file and paste it in the corresponding table in ANSDIMAT. You will need to input 4 tables in this dialog window:

- Pw1 time, Pw1 drawdown;
- Pw1 time, Pw1 recovery;
- Mw1 time, Mw1 drawdown;
- Pw1 time, Pw1 recovery,

For each of the four tables, the two columns (time and water level change) must be pasted simultaneously when transferring data from Excel to the ANSDIMAT.

An example of table input for Pw1 drawdown is illustrated by Figure 4. After uploading all measurement data, click “next” to go to step 4.

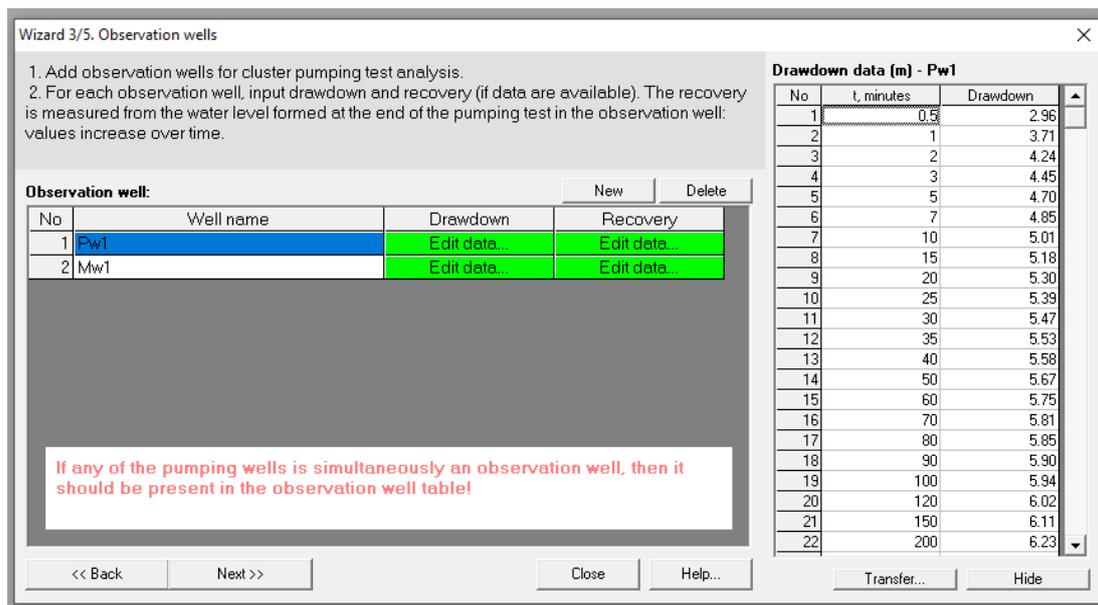


Figure 4. Aquifer test Wizard. Step 3

Check that the correct measurements are copied in the corresponding table. When satisfied, click the “Next” button.

Step 4. Distances

Distances between pumping and observation wells should be input in the fields on the left part of the dialog window (Figure 5). There are two ways of inputting distances: as distances from the pumping well or using coordinates. The “Distance” option is selected by default. The other option is to enter well coordinates (“Coordinates” mode) and allow the program to calculate distances automatically. Note, that coordinates must be entered in meters (not degrees).

For Lesson 2, the distance between Pw1 and Mw1 is 5 meters, while the distance between the pumping well Pw1 and the observation well Pw1 equals to the well radius 0.075 meters.

By default, the program assumes that pumping and observation wells are fully penetrating and screened through the entire thickness of the aquifer. This assumption coincides with the conceptual model for this lesson. There are no hydrodynamic boundaries present, so the right part of the dialog window can be left empty, and your window should look like Figure 5.

In the case that one or several wells are not fully penetrating or fully screened, the “Well” button enables including details of well design.

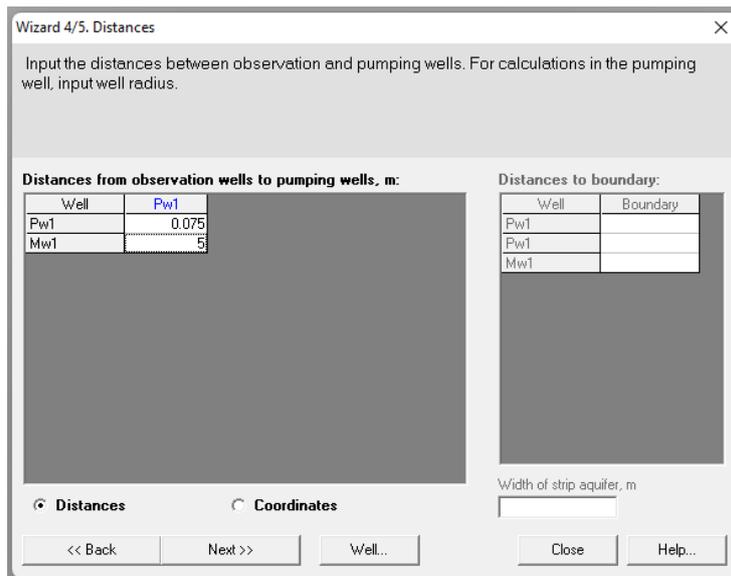


Figure 5. Aquifer test Wizard. Step 4

The well screen design can be specified in two ways, as illustrated in Figure 6. You can set the depth $Z1$ from the top of the confined aquifer (or initial groundwater level of unconfined aquifer) to the bottom of the screen and $Z2$ from the top of the confined aquifer (or initial groundwater level of unconfined aquifer) to the top of the screen in the " $Z1, Z2$ " mode. Alternately, you may use the "Screen length" mode to specify the screen's length and the distance from the top of the aquifer to the screen's center.

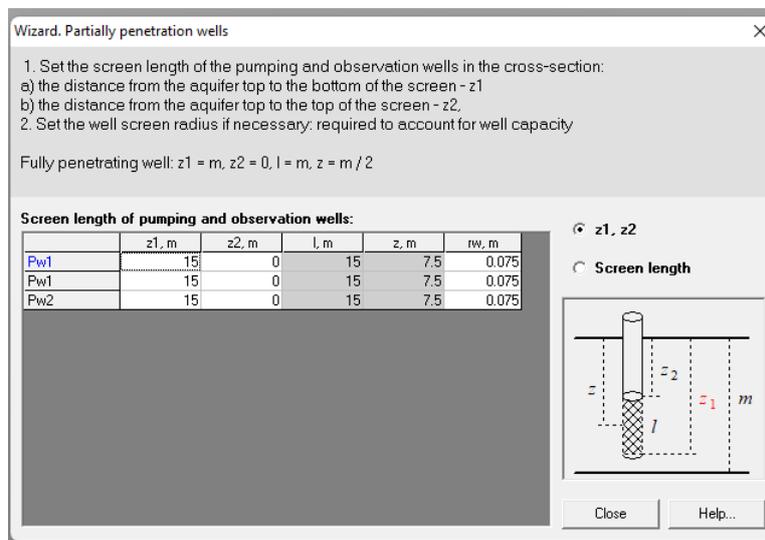


Figure 6. Example of partially penetration well inputs on Step 4

Setting the distances from each well to the hydraulic boundary is a requirement, when hydraulic boundaries are defined in Step 1. For Lesson 2 (unbounded aquifer) this option is disabled.

Check your data input. When satisfied, click the "Next" button and go to the last step.

Step 5. Saving the project

You can now click the "Ready" button to complete the process (Figure 7). ANSDIMAT will then save a pumping test data file in *.eat format, create an interpretation file in *.oat format and open it in the Aquifer test interpretation module.

The "Go to advanced editor" checkbox is used to enter the editor's advanced mode. We won't go into the advanced mode's features in this tutorial.

Click the "Ready" button.

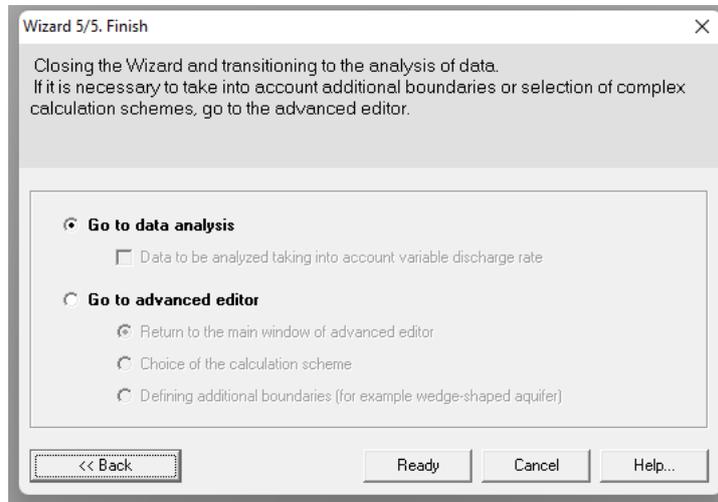


Figure 7. Final steps

Upon pressing the "Ready" button, ANSDIMAT automatically checks the input data for errors. If errors are detected, ANSDIMAT will open directly the dialogue window where the error was entered and where it can be corrected.

When all entries are correct, ANSDIMAT proceeds with data analysis and interpretation. The input data are automatically opened in the Aquifer Test Interpretation module, a copy of the dialog window is presented on Figure 8.

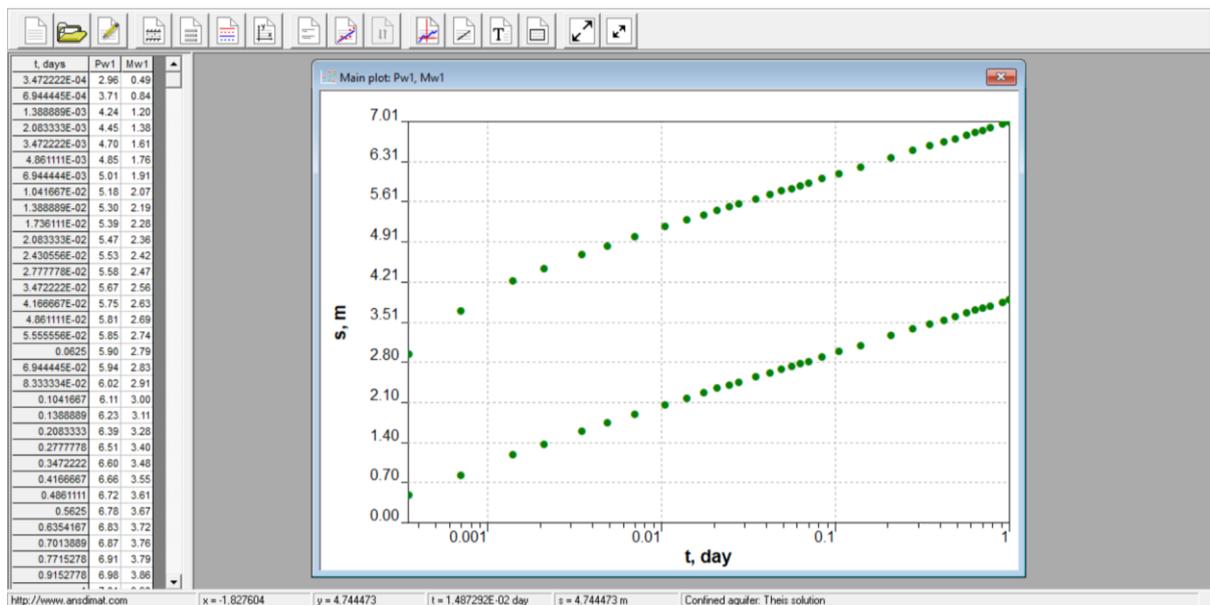


Figure 8. Dialog window in Aquifer Test Interpretation model that contains Lesson 2 data

How to open a project with saved data for edits

When further data edits are required, you can open a saved project data file (Figure 9) using the main menu: *Aquifer test analysis – Open project*. Then specify file location (Don't forget to select the file

type "Editor *.eat"). During the analysis of the pumping test, the initial data can also be corrected (Figure 10). To do this, select the Editor toolbar icon.

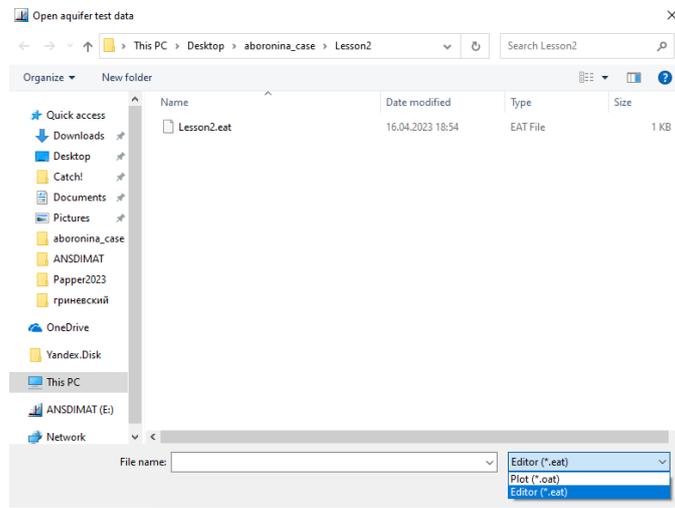


Figure 9. How to open a project with saved data for an analysis of aquifer tests

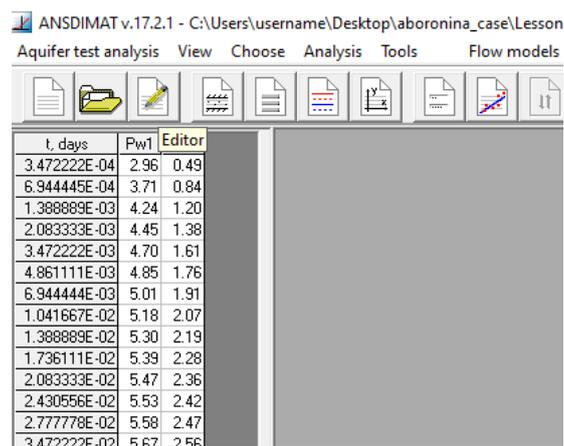


Figure 10. Editing test data

If you got lost during this exercise, you can download the Lesson 2 (*.eat) eat file from [our website](#).