



1.1 Water release module

The *Water release module* links with the *Water administration* and *Water order modules* and it is used to:

- Minimise water distribution losses on canal networks and in river systems.
- Calculate water releases for the main canal including all branches allowing for lag times and water losses such as seepage and evaporation.
- Determine operational procedures for a dam with varying downstream inflows and abstractions in a river allowing for lag times, accruals and water losses such as seepage and evaporation.

A schematic layout of the total canal network or river system is captured with details such as the cross-sectional properties, position of sluices or pumps, canal/river slope, measuring structures and canal capacities. Every reach can be analysed and calibrated on its own and global changes to the canal or river data are simplified by means of built in tools.

The module has the following functionality:

- Calculate water releases on a weekly or two weekly basis. Water distribution on canal networks is normally done on a weekly basis and river system calculations are done on a two weekly basis.
- Discharges are converted to the corresponding measuring plate readings where needed.
- Calculated water releases can be viewed on screen or printed.
- Graphical output of all inflows, outflows can be viewed on the screen or printed.
- Water release graphs, calculated with different settings, can be superimposed for comparison purposes.
- Handles any type of cross-section including:
 - Rectangular

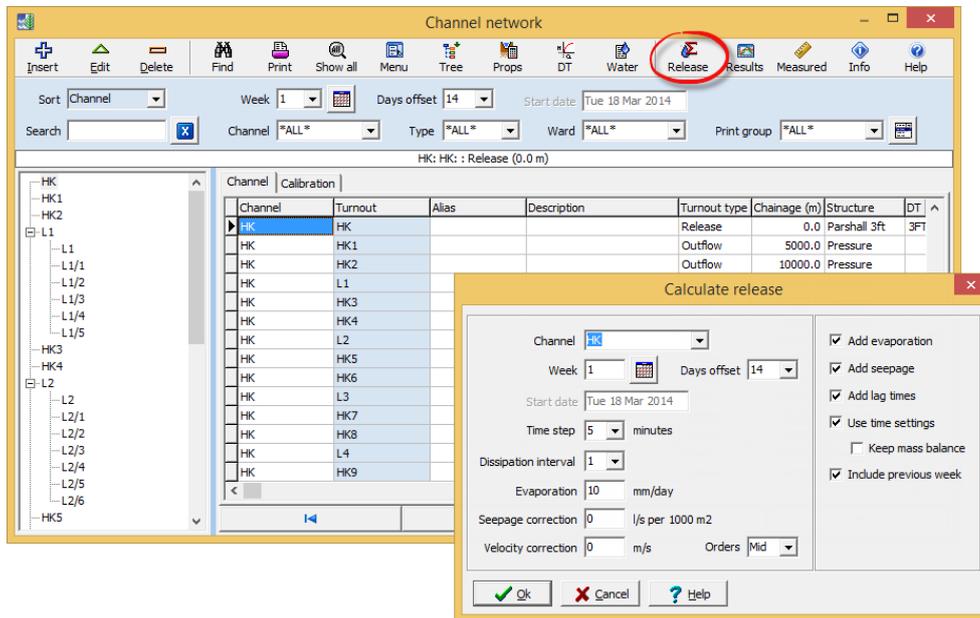


Figure 1.1: Calculate release form

- Trapezoidal
- Parabolic
- Parabolic sides with a flat bottom
- Circular
- User defined sections using XY-coordinates (used for river cross-sections)

Release calculation procedure

The release calculation procedure starts at the end of the last reach in the main canal or river. From there it will move back towards the source processing every reach by adding the abstraction and losses and calculate the lag time for the specific reach. If it encounters a branch the solution is temporarily saved. The procedure is repeated for the branch, the saved solution is added and the procedure continues its path back to the source. A flow diagram of the water release calculation procedure is shown in Figure 1.2

The solution handles branches on branches up to 6 levels deep. The operator can also specify any number of arbitrary points on the canal or river where the solution must be saved for later viewing. There is no limitation on the number of reaches that can be included.

Calculation of lag times

The lag time in a reach is calculated with the following equation:

$$\text{Lag time} = \frac{\text{Reach length}}{\text{Average velocity}}$$

Calculation of seepage losses

The seepage loss in a reach is calculated using:

$$\text{Seepage} = \text{Seepage rate} \times \text{Reach length} \times \text{Wetted perimeter}$$

The seepage rate is specified in l/s per 1000m² wetted area.

Calculation of evaporation losses

The evaporation loss in a reach is calculated using:

$$\text{Evaporation} = \text{Evaporation rate} \times \text{Reach length} \times \text{Water surface width}$$

The evaporation rate is specified in mm/day.

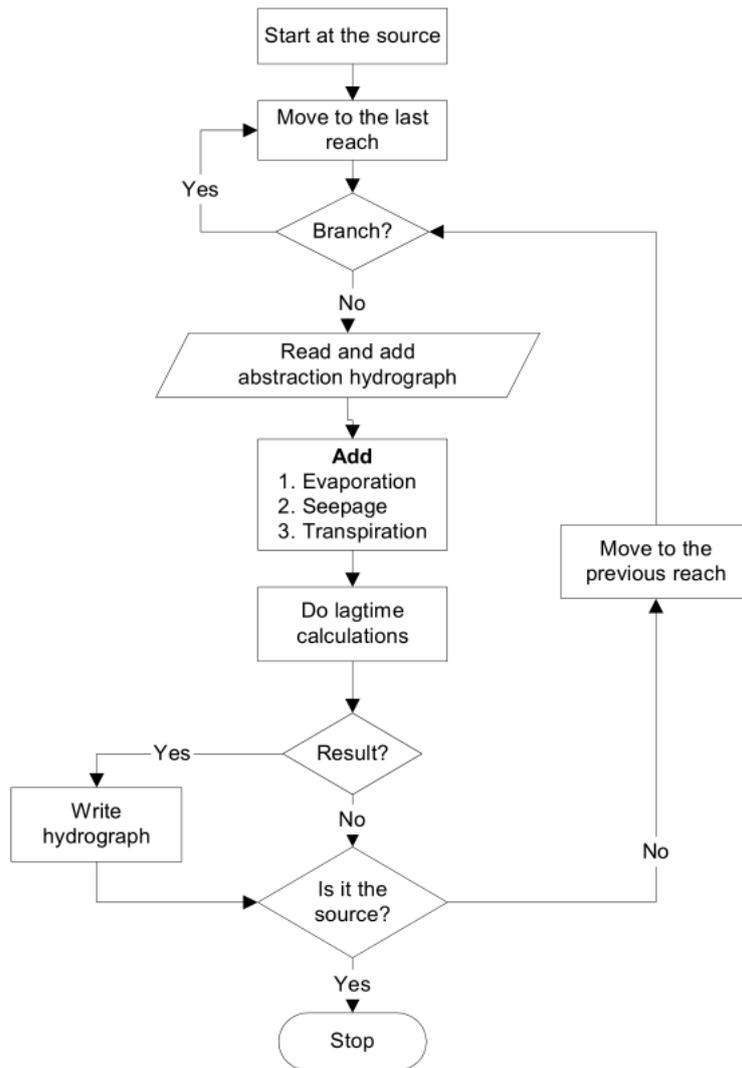


Figure 1.2: Water release calculation procedure

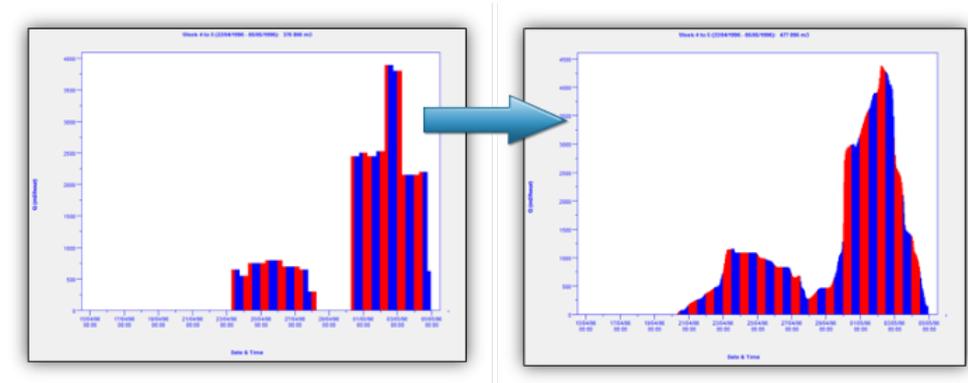


Figure 1.3: Sum of water orders compared to calculated release over a two week period