User's manual
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Contents of DC-Dewatering

The DC-Dewatering program calculates multi-well systems.

This program may calculate a layer system with different permeability for unstressed, half-stressed or stressed ground water situations. The construction pits indicating the preferred lowering aim may have any form and may consist of different sectors at various depths.

You may place any number of wells with various diameters and of different depths. Several well series with lowering aim of their own are possible. You may predefine the lowering depth, or adapt it to the different depths of the construction pit sectors.

The analysis determines the required pumped water quantity and the capacity of each well. You may thus take into account the interdependence of the wells upon their spacing. The program displays both the required number of wells and the critical lowering point.

Optionally, you may automatically arrange wells with predefined diameters and depths, and a selected distance from the construction pit edge. You may also arrange wells around inner construction pit sectors (deeper areas). First, the number of wells is determined in a way that the program places a new well at the critical point until the required pumped water quantity has been reached. Second, the position of the single wells may be optimized. In case of several construction pit sectors and many wells, this optimization may be very time-consuming, because if there are $n$ wells $2 \times n$ shifts and calculations are carried out in each step.

Finally, the well depth may be optimized in order to keep the required pumping capacity as precise as possible. In this way you may arrange at best the wells fully automatically. However, if you start with a different well depth, another total pumping capacity may follow as a result, as fewer wells and total pumping capacity result with deeper wells.

You may obtain the following results:
- Graphical lowering display with elevation lines or color areas
- Section graphic along any section drawn through the system
- Text output with pumped quantities, capacities, wetted filter height, etc.

The program may interactively display the water level at any point.
Approach

Having created a new project with [ ] or opened an existing one with [ ], you may enter the main project parameters with [ ]: ground water depth, depth of the deep tight layer, storage coefficient, ground water-situation type (free, stressed or half-stressed) as well as the precipitation inflow for waterproof enclosed construction pits and the under-pressure for vacuum well points.

You may define any number of layers for a free ground water situation, and determine the inflow by layers. You should define two layers for stressed ground water, i.e. one impermeable (damming-up) layer, and one water-bearing layer, where the stressed ground water is located. Three layers are required for half-stressed ground water, where the water-bearing layer is watered by a half-permeable layer from above. There is another permeable layer above the half-permeable layer.

You may enter the layers, which are situated above the deep tight layer, with their permeability and specific weight with [ ]. The porous component is necessary for the analysis if the enclosed construction pits are pumped dry, and the unevenness coefficient for the vacuum method of drainage.

The DC-Dewatering program enables you to calculate any number of construction pit sectors, which may have any polygonal shape and various depths. You may use sectors inside a construction pit with another depth (deeper areas, for instance). You may input the construction pit sectors with [ ]. When a polygon is closed, the program prompts you to choose the depth of the construction pit sector. In addition, you may predefine the following:

- **Waterproof enclosure** with its depth: if the wells are inside the construction pit, the waterproof enclosure offers inflow quantity reduction that depends on the distance from the bottom enclosure edge to the deep tight layer.
- **Tight base**: if a tight base additionally closes the construction pit, you may enter residual inflow quantities through the construction pit wall and the base too. If the wells are inside the construction pit, the program calculates the necessary time to pump it dry. To do this, you will need the layer porous component and, if required, the precipitation inflow (s. Terrain – Subsoil).

You may input wells along with their position, diameter and depth with [ ]. You may enter only one well, for example, and estimate the necessary number of wells with the analysis afterwards. This will give only a rough estimation, because depending on the well position and the distance between the wells, other ranges and thus possibly another number of wells would result from it. You may arrange wells in different series that are separately calculated. You may position new wells, until you cancel the action with a right mouse-click.

If you have to enter many wells, you may select several wells by clicking on them with pressed Ctrl-key or by dragging an area with pressed left mouse button. Then you may copy and paste them with Copy [ ] and Paste [ ] and drag them with the mouse to the preferred destination.
You may make any polygonal sections through the ground surface and display the lowering in the graphics along them with \[ \text{sections} \]. With a left-click, a section gets additional points, until you cancel this action by a right mouse-click.

You may display the analysis on the screen with \[ \text{analysis} \], i.e. first the required pumped quantity, the capacity of the single wells, the required number of wells and the total quantity estimation. Here you should enter the preferred lowering which, by default, may be determined from the distance between the groundwater level and the bottom edge of the deepest construction pit + the freeboard dimension. If there are several construction pit sectors with different depths, you may also enter „adapted“; thus the program will not calculate the total area from the depth of the deepest sector, but will be adapted to the respective depth + the freeboard dimension. You may see the preferred reserve (the freeboard dimension) and the additions for the pumped quantities, as well as for the imperfect wells (well depth < deep tight layer depth) in Settings – Configuration. When you delete the „Lowering by (m)“- box contents, the program inputs the default lowering again.

The analysis dialog box has additional parts for the analysis:
With „Range“, you may determine a time-dependent range, depending on the admissible residual lowering on the area edge concerned, or on an edge inflow, measured in % of the pumped quantity (in case of residual lowering 0 or edge inflow 0, the range would theoretically be infinite).
When the wells are situated inside the construction pit, you may calculate the construction pit sectors with waterproof enclosure and tight base through the „Trough-construction method“.
Considering the residual inflows, you may determine the time needed to pump the construction pit dry.

The icon \[ \text{arrangement} \] enables the automatic arrangement and optimization of the wells. You may delete already existing wells first. First, you should give the initial parameters, such as the preferred lowering, diameter and depth of the wells. Second, the program arranges the wells at a specific distance from the construction pit edge (negative = inside the construction pit) until you have reached the required pumped quantity. The well arrangement around inner sectors (deeper areas) may be admissible or inadmissible here. This number of wells would not be the optimum yet, if the required pumped quantity was just not reached with one well less, for example.

Optionally, the program may optimize the position of the single wells afterwards. In case of several construction pit sectors and many wells, this optimization may be very time-consum ing, as for n wells you should carry out 2 x n shifts and calculations in each step.

Finally, you may optimize the well depth in order to keep the required pumping capacity as precise as possible. Thus, you may arrange the wells at best and fully automatically. However, if you start with a different well depth, another total pumping capacity may follow as a result, as fewer wells and total pumping capacity result in deeper wells.

You may interactively display the lowering with \[ \text{lowering} \] at any point until you deactivate the indicator with a right mouse-click. You may thus check the lowering distribution very quickly.

The results may be viewed by simple moving with the commands (Image Down / Image Up).

Furthermore, the button \[ \text{graphic} \] displays the first graphic, and with \[ \text{results} \] you may switch to the results. Optionally, the graphic may be produced on an extra page, or embedded in the text results, see Settings – Configuration. For each series you may display graphics of the area
concerned, with lowering indications as elevation lines or color areas, as well as lowering indication along each section.

As the arrangement and the page distribution (according to the scale) are constant for the selected output range (you should paginate the same number, when you print only elevation lines for a series, for example), you may determine the output range with Settings – Configuration. The elevation lines and the sections may be on or off here, and the program will not create elevation lines any longer.

With the button , you may switch from the results back to the input window, with , you may activate the printout of the results.
Analysis Fundamentals

The analysis fundamentals for the multi-well systems are the Darcy's Filter Law, the Dupuit-Thiem Well Formulas and the Forchheimer Multi-Well Formulas. The Herth, Arndts' book: Theorie und Praxis der Grundwasserabsenkung (3rd edition), Berlin: Ernst & Sohn 1995, is also used as a resource.

Further down, we describe a standard case when the ground water is lowered with filter wells situated inside or outside one or several construction pit sectors, without disturbing the ground-water flow. In the respective further chapters, we describe the special cases of:

- Vacuum method of drainage
- Waterproof enclosure with sheet piling considering the ground-water flow reduction, for example, and
- Trough-Construction Method method with a tight base: pumping-dry through wells inside the construction pit.

Based on the Dupuit-Thiem Well Formulae, the single lowering funnels are overlayed for several wells according to Forchheimer, and the water surface course may be described by the analogy of a membrane.

Thus, determining the pumped quantity and the capacity of the single wells depends heavily on the position of the wells and the distance between them. Eventually, you may obtain the required pumped quantity by a better (more uniform) well arrangement, which otherwise would not be mathematically obtained.

DC-Dewatering determines the following results, which are explained in the next chapters in detail:

- Required pumped water quantity
- Well capacity and pertaining wetted filter height
- Required number of wells
- Analysis of the overall construction (sufficient pumped quantity available?)
- Lowering range after a definite time
- Critical point for the lowering determination
- Ground-water level depth at any point (Graphic)
Required Pumped Water Quantity

The pumped water quantity required for the ground-water lowering is determined at the construction pit critical point as follows

Unstressed ground water

\[
Q = \frac{\pi \cdot k \cdot (H^2 - h^2)}{\ln R - \frac{1}{\Sigma q} \cdot \Sigma \ln x^q}
\]

In case of big construction pits, i.e. when \(\ln(R/A_{re})\) is less than 1, you have to multiply with the value \((2 \cdot A_{re}/R + 0.25)\) instead of dividing by the denominator above. If, according to Weyrauch, this correction becomes effective, then the used pumped quantity available in the analysis of the lowering depths is calculated back with the factor \(Q\) with \(Q\) without correction in order to obtain realistic lowering values.

Stressed ground water

\[
Q = \frac{\pi \cdot 2 \cdot m \cdot s \cdot k}{\ln R - \frac{1}{\Sigma q} \cdot \Sigma \ln x^q}
\]

Half-stressed ground water

\[
Q = 2 \cdot \pi \cdot k \cdot m \cdot s \cdot \frac{A_{RE}}{\lambda} \cdot \frac{K_i \left( \frac{A_{RE}}{\lambda} \right)}{K_0 \left( \frac{A_{RE}}{\lambda} \right)}
\]

Combined situation

(Stressed ground water with lowering down to the permeable layer)

\[
Q = \pi \cdot k \cdot (H^2 - h^2) - (H - m)^2
\]

\[
\ln R - \frac{1}{\Sigma q} \cdot \Sigma \ln x^q
\]

with

- \(k\) = Permeability coefficient
- \(H\) = Ground-water level height above the deep tight layer
- \(h\) = \(H - s\) = Ground-water level height below the lowering aim
- \(R\) = Lowering range = \(3000 \cdot s \cdot \sqrt{k}\)
- \(q\) = Capacity of the single wells
- \(x\) = Distance of the regarded point from the single wells
- \(m\) = Water-bearing layer capacity
s = Lowering aim depth below the static ground-water level

\[ A_{RE} = \text{Equivalent radius of the stand-by well with the area of the construction pit region enclosed by wells} \]

\[ \lambda = \sqrt{\frac{k^* m^* m'}{k'}} \]

\[ K_0, K_1 = \text{Coefficients (Bessel-Function) according to Herth, Arndts, p. 21/22} \]

\[ m' = \text{Capacity of the slightly permeable layer} \]

\[ k' = \text{Permeability coefficient of the slightly permeable layer} \]

By default, you may obtain the lowering aim from the static ground-water level to a safety distance below the construction pit base (standard 0.50 m, see Settings - Configuration). The program may display another lowering aim or, in case of several construction pit sectors with different depths, prompt adapted depths.

The pumped quantity that is mathematically required results from the formulae above. Generally, for the \( Q_{\text{max}} \) determination, it should be increased by an addition to the preparation time in order to pump dry more quickly. You may adjust this addition (10%) in Settings - Configuration.

**Please note:**

The pumped water quantity is determined (by the distances \( x \) from the wells) for a particular point, i.e. the maximum pumped quantity for the critical point of the construction pit. Depending on the number, position and distances between the wells, the critical point will vary, so slightly different pumped water quantities may result. Thus, the initial value for analysis with one well should be assumed as a nominal value only.

If you have defined an additional precipitation inflow in Terrain - Construction pit, an addition to the required pumped quantity will be determined.

\[ q_{\text{Rain}} = q_k * 0.001 * A \]
Well Capacity

You may determine the well capacity as follows

\[ q = d \times \pi \times h' \times \sqrt{\frac{k}{15}} \]

with the components

- \( d \) = Well diameter
- \( h' \) = Wetted filter height
- \( k \) = Permeability coefficient

The wetted filter height is initially unknown. It depends heavily on the well range. Here we use range not as the theoretic range of a single well, but the range as half the distance to the next wells.

If there are already several wells available, the program will determine the distances between them and will use half the average value of the distances to the next two wells.

If you have input only one well in order to determine the required estimated number first, the circumference of the construction pit region, enclosed by the wells, will be determined by the default distance of the wells to the construction pit (see Settings - Configuration). It has to be divided by the expected number of wells. You may estimate the range in this way.

The wetted filter height results from the formula above and

\[ h' = \sqrt{h^2 - \frac{1.5 \times q \times (\ln b - \ln r)}{\pi \times k}} \]

for free ground water and combined flow respectively

\[ h' = h - \frac{1.5 \times q \times (\ln b - \ln r)}{\pi \times k \times 2 \times m} \]

for stressed and half-stressed ground-water.

- \( h \) = Ground-water level height below the lowering aim
- \( b \) = Well range
- \( r \) = Well radius
- \( m \) = Water-bearing layer capacity

The program interprets the interdependence in the adjustment of a lowering funnel and thus of the wetted filter height as iteration.

In case of construction pit layers, the permeability coefficient \( k \) is determined by the wetted filter height as follows

\[ k_m = \frac{\sum k_i \times d_i}{\sum d_i} \]

with \( d_i \) = proportionate layer widths and \( k_i \) = permeability coefficients of the single layers.

As the wetted filter height is specified from \( k \), \( k \) and \( h' \) have to be specified by iteration.
Please note:

To calculate the capacity and the wetted filter height, you have to apply the water level height $h = H - s$. If you calculate with adapted lowering in case of construction pit sectors at different depths, a different lowering aim would be defined for each construction pit sector. Thus, you use the value $s$ of the nearest construction pit to calculate a well.

If a well is situated near the boundary between two construction pit sectors at different depths, it should be placed nearer to the deeper construction pit. It would be anyway more favorable for the preferred lowering. The higher $s$ is applied for the well, and the analysis may be secure then.

Tip:

As it became evident from the Forchheimer's multi-well equation, we assume for $h'$ in the formulae that exactly the lowering aim i.e. the water level $h$ is available at the distance $b$ (= well range) from the well. The formulae in Herth-Arndts are based on this condition. However, if it is not pumped with exactly $Q_{eq}$ (the actual pumped quantity is usually bigger), this condition is not fulfilled. DC-Dewatering uses improved formulae, which take into account that the water level is initially unknown. Thus, we obtain more precise values for the water level if $Q > Q_{eq}$.

Required Number of Wells

The presumed (estimated) required number of wells results from the required pumped water quantity $Q_{max}$ and the capacity of one or several wells. In case of several wells, you may sum up the single capacities and thus determine the required factor for obtaining $Q_{max}$.

As for another number and position of the wells, the required pumped water quantity may vary, and it is mostly the well capacity that changes depending on the arrangement, and you may alter the required number of wells by another well arrangement. You may also obtain the pumped water quantity with a lower number of wells than the displayed one by a good well arrangement.

You may increase the capacity with a larger depth of the wells, and thus the required number will be reduced.

Analysis of the Overall Construction

In the analysis of the overall construction the program compares the required pumped water quantity $Q_{max}$ with the capacity amount of the single wells, and indicates, whether the pumped quantity is enough or the number of the wells should be increased.

If you have not fully obtained the required pumped quantity, you may do this by a better arrangement of the wells. You may easily make the estimation using the water level display with color areas (see Start – Graphic). In the zones where the lowering funnels overlap, you may set the wells apart in order to better cover the critical zones (see Critical point).

Optionally, you may optimize the well depths, if possible, in order to obtain the required pumped water quantity as precise as possible. Here the program makes wells depths uniformly longer maximum to the deep tight layer.
Critical Point

The critical point of the overall construction is this one, at which the value
\[
\frac{1}{\Sigma q} \sum \ln x^q
\]
becomes maximum.

The distance \(x\) from the point concerned to all wells is raised to the respective capacity. The sum of the logarithm values is divided by the capacity sum. Thus, we also take into account wells with different diameters, depths etc.

The point on the construction pit edge, where this „weighted distance“ becomes maximum, is the critical point, at which we should keep the lowering aim.

Ground-Water Level Depth

The ground-water level depth at an arbitrary point \((x,y)\) is required for the graphical display with elevation lines or color areas for the section representation and for the interactive display of water depths (see Start - Lowering).

At first, we know the static water level \(H\) in the distance \(R\) (lowering range). You may determine the water level height \(y\) with distances \(x\) from the wells as follows

Unstressed ground water

\[
H^2 - y^2 = \frac{Q}{\pi k} \left( \ln R - \frac{1}{\Sigma q} \sum \ln x^q \right)
\]

Stressed ground water

\[
H - y = \frac{Q}{2 \pi k m} \left( \ln R - \frac{1}{\Sigma q} \sum \ln x^q \right)
\]

Half-stressed ground water

\[
s = \frac{Q}{2\pi k m} \frac{\lambda}{A_{RE}} \left( \frac{\Sigma x}{\lambda} \right)
\]

with

\[
Q = \text{Pumped water quantity}
\]

\[
k = \text{Permeability coefficient}
\]
\[ H = \text{Ground-water level height above the deep tight layer} \]
\[ R = \text{Lowering range} = 3000 \times s \times \sqrt{k} \]
\[ q = \text{Capacity of the single wells} \]
\[ x = \text{Distance of the respective point from the single wells} \]
\[ m = \text{Water-bearing layer capacity} \]
\[ A_{eq} = \text{Equivalent radius of a stand-by well with the area of the construction pit region enclosed by wells} \]
\[ \lambda = \sqrt{\frac{k \times m \times m'}{k'}} \]
\[ K_0, K_1 = \text{Coefficients (Bessel-Functions) according to Herth, Arndts, p. 21/22} \]
\[ m' = \text{Capacity of the slightly permeable layer} \]
\[ k' = \text{Permeability coefficient of the slightly permeable layer} \]
\[ n = \text{Number of the wells} \]

In case of several layers, you may determine the permeability coefficient as follows:

\[ k_m = \frac{\sum k_i \times d_i}{\sum d_i} \]

with \( d_i \) = proportional layer widths and \( k_i \) = permeability coefficients of the single layers.

In the pumped water quantity \( Q \), you have to use this value without any possible addition for imperfect wells (see Settings - Configuration). You may also exclude the addition to the pumped quantity for the preparation time in order to pump dry more quickly (10%) from the available \( Q \) (capacity amount of the single wells), as otherwise too large water depths may result. So to get realistic water depths the „net pumping quantity“ is used which is available for the calculatory horizontal flow.

However, for stressed ground water realistic water depths are only resulting if these additions are NOT excluded, i.e. the full value of available \( Q \) is used. This approach has to be proved in the special case.

For half-stressed ground water this approach is done analogous.

**Tip:**

As it became evident from the Forchheimer's Multi-wells equation, we assume for the formulae for \( h' \) that exactly the lowering aim, i.e. the water level \( h \), is situated at a distance \( b \) (= well range) from the well. The formulae in Herth-Arndts are based on this condition. However, if it is not pumped with exactly \( Q_{\text{req}} \) (the actual pumped quantity is usually bigger), this condition is not given. DC-Dewatering uses improved formulae, which take into account that the water level is initially unknown. Thus, you may obtain exact values for the water level if \( Q > Q_{\text{req}} \).

**Different permeabilities**

If there are several layers with different permeability for a free ground-water level, DC-Dewatering determines not only the permeability, but also the pumped quantities in sectors (see Herth-Arndts). However, values that do not correspond to the expected ones may result in the calculation of the water level heights. Thus, we cannot exactly obtain the lowering aim \( h \) at the characteristic point, when it is pumped exactly with \( Q_{\text{req}} \). You may see this in the examples, for instance example 7 a, in the Herth-Arnotts' book, where the water depths are calculated for the case concerned. Distinctly bigger water depths than the required ones would
determine this example. Evidently, the formulae concerned do not result in exact values for several layers with different permeability, so these results should be concerned very carefully.

**Lowering Range**

It may be determined for the temporal range if the admissible residual lowering or edge inflow in % of the pumped quantity is predefined as a boundary condition.

**Admissible residual lowering**

The inclination of the spatial lowering straight lines results from

\[ \alpha = \frac{0.366 \times Q}{k \times H} \]

From the value

\[ W(u) = \frac{sR}{0.217 \times \alpha} \]

of the well function results the value u. Thus, through

\[ c_R = 2 \times \sqrt{u} \]

you may obtain the range as follows

\[ R = c_R \times \sqrt{\frac{k \times H \times t}{p}} \]

**Edge inflow**

If you predefine a edge inflow in %

\[ c_R = 3.035 \times \sqrt{\log \frac{Q}{Q_R}} \]

where \( Q/Q_R = 100/\text{edge inflow} [%] \)

\[ R = c_R \times \sqrt{\frac{k \times H \times t}{p}} \]

**Symbols:**

- \( Q \) = Lowering pumped quantity
- \( k \) = Permeability coefficient
- \( H \) = Ground-water level height above the deep tight layer
- \( sR \) = Admissible residual lowering
- \( \alpha \) = Inclination of the spatial lowering straight lines
- \( W(u) \) = Well function
The formulae above are valid for the calculation of a range depending on a definite time. Setting too long or too short a time, you may calculate almost every low or high value. In addition, DC-Dewatering displays the range according to Sichardt following the formula

\[ R = 3000 \times s \times \sqrt{k} \]

**Vacuum Method of Drainage**

In the case of vacuum method of drainage (with vacuum well points), we increase the pumping capacity of the well \( q \) by the under-pressure. At the same time, the inflowing water quantity \( Q \) increases too.

The following additional data are necessary for the analysis of the vacuum method of drainage:

- Under-pressure \( p_u \) in bar in the dialog box Terrain - Subsoil
- Unevenness coefficient \( U \) for the soil layers (menu item Terrain - Layers Terrain)

The water quantities in the vacuum method of drainage are calculated as follows:

\[
Q_v = Q \times \frac{s + m_D}{s} \\
q_v = q \times \left(1 + \frac{\nu^3}{U} \times p_v\right)
\]

with

\[ m_D = \frac{p_0 - p}{\gamma_W} \]

\[ Q_v \] = Water quantity in the vacuum method of drainage
\[ Q \] = Water quantity without vacuum (gravity method)
\[ s \] = Ground-water lowering
\[ m_D \] = Influence of the air-pressure differences
\[ q_v \] = Pumping capacity in the vacuum method of drainage
\[ q \] = Pumping capacity without vacuum (gravity method)
\[ \nu \] = Empirical influence factor = 15
\[ U \] = Unevenness coefficient of the layer (calculated for several layers)
\[ p_v \] = Under-pressure in the well = \( p_0 - p \) = input value under-pressure
\[ p_0 \] = Air-pressure, normal value 1.013 bar
\[ p \] = Vacuum pressure = \( p_0 - p_v \)
\[ \gamma_W \] = Specific weight of the water = 10 kN/m\(^3\)
The pressure is converted from bar in kN/m²: 1 bar = 100 kN/m² for the calculation of \( m_D \).

You should observe the following, and the formulae mentioned above should be valid:
- The formula for the water quantity \( Q_V \) results in usable results when the lowering depth is about 4 – 5 m (see Kramer: Bemessung von Grundwasserabsenkungsanlagen mit Vakuumtiefbrunnen. Tiefbau, Ingenieurbau, Straßenbau 21 (1979), issue 1). If the lowering is smaller, the actual water quantities will decrease, if it is larger they will increase.
- The formula for the pumping capacity \( q_V \) is valid for the initial water quantities respectively for the short-term running systems. In case of longer operation term, the actual \( q_V \) will approximate to \( q \) without vacuum.

**Waterproof Enclosure**

In case of a waterproof enclosure of a construction pit, e.g. with a sheet piling, the inflowing ground water will be reduced. If the wells are situated inside the construction pit, the inflowing water quantity decreases through the enclosure and so does the required pumped quantity, depending on the reduction of the free region between the sheet piling edge and the deep tight layer position.

When the depth of the bottom edge of the sheet piling below the static ground-water level is indicated with \( t \) and the deep tight layer depth below the ground-water level with \( H \), we may reduce the inflow in accordance to the ratio \( t/H \) in the range from 0 with \( t/H = 0 \) to 100% with \( t/H = 1 \). The curve of this reduction is shown in Herth, Arndts: Theorie und Praxis der Grundwasserabsenkung (3. edition 1994), chapter 3.1.8.

When you input a construction pit you may also enter a waterproof enclosure with its depth. The residual inflow through the enclosure becomes effective only in the analysis of the Trough-Construction Method.

To calculate a construction pit with enclosure, all wells should be situated inside the enclosed construction pit sector. The analysis of a lowering with outer wells may be done irrespectively of this, when these wells are assigned to another series. A combined analysis with inner and outer wells is not possible with the present formulae. The graphical display of the lowering with color areas, elevation lines and sections is not possible either, as we cannot determine the water level depth at any arbitrary point.

The program reduces the required pumped water quantity by a factor depending on the \( t/H \) ratio, and fewer wells or more shallow wells are required. The reduction factor is indicated in the resulting output.

**Trough-Construction Method**

According to the trough-construction method the construction pit is closed at the bottom by a tight base and the water in the construction pit is pumped out by inner wells. With the construction pit enclosure and the tight base you may take into account a residual inflow. Furthermore, you have to consider a precipitation inflow, which increases the residual water quantity.

For the lowering inside the construction pit you may consider different layer permeability, which is caused by the soil disturbed through the placement of the tight base. The water volume inside the construction pit depends on the porous value \( n \) of the soil.
Thus, the following additional data are required for the trough-construction method:

- Precipitation inflow $q_R$ in l/s per 1000 m² for the construction pit parameters.
- Permeability of the soil disturbed and the porous component $n$ for the layer parameters.
- Waterproof enclosure with residual inflow $q_W$ in l/s per m² wall area for the construction pit.
- Tight base with depth $t_D$, width $d_D$, and permeability $k_D$ of the tight base (m/s) or optionally with flow through the tight base $q_D$ in l/s per 1000 m² tight base for the construction pit.

In the analysis of the trough-construction method you may select the preferred construction pit sectors (only those with a tight base). You may determine the required time for the pumping dry as follows:

$$t = \frac{V_W}{q_{Well} - q_{Inflow}}$$

where

- $V_W =$ Quantity of the water in the construction pit
- $q_{Well} =$ Pumping capacity of the wells inside the construction pit
- $q_{Inflow} =$ Inflow quantity

You may determine the total inflow quantity as follows:

$$q_{Inflow} = q_{Enclosure} + q_{Base} + q_{Rain}$$

The program displays the flow through the construction pit wall for the construction pit sector in l/s per m² wall area and multiplies it by the circumference $U$ of the construction pit and the depth of the preferred lowering $s$:

$$q_{Enclosure} = q_{Wall} * U * s$$

The flow through the base is determined either from the base permeability $k_{Base}$ and its width $d_{Base}$

$$q_{Base} = k_{Base} * A * \frac{s}{d_{Base}}$$

($s =$ lowering = hydraulic head at the bottom base edge)

or – if indicated – from the flow through the tight base in l/s per 1000 m²

$$q_{Base} = q_B * 0.001 * A$$
The precipitation inflow is determined from the displayed quantity in l/s per 1000 m²:

\[ q_{\text{Rain}} = q_r \times 0.001 \times A \]

We obtain the pumping capacity of the wells by the usual analysis (see chapter Well Pumping Capacity) considering the permeability of the layers disturbed.

In addition, the program indicates the ground-water lowering at the construction pit edge after a definite period of time, which is caused by the residual inflow. This is determined as follows:

\[ s = H - h \]

with

\[
\frac{H^2 - h^2}{2H} = \frac{Q}{4 \times \pi \times k \times H} \ln \left( \frac{2.25 \times k \times H \times t}{A_{RE}^2 \times p} \right)
\]

for free ground-water level and

\[
\frac{s}{4 \times \pi \times k \times m} = \frac{Q}{4 \times \pi \times k \times m} \ln \left( \frac{2.25 \times k \times H \times t}{A_{RE}^2 \times p} \right)
\]

for stressed ground water

with

- \( s \) = Lowering
- \( H \) = Ground-water level height above the deep tight layer
- \( h \) = Height of the lowered water above the deep tight layer
- \( Q \) = Pumped water quantity (> residual inflow)
- \( k \) = Permeability of the layer(s)
- \( t \) = Time (construction period, for instance) in hours
- \( p \) = Storage coefficient
- \( A_{RE} \) = Equivalent radius of the sub soil pit

You have to make a spatial-temporal analysis for the lowering range (see chapter Lowering Range). The inflow through wall + tight base is applied for \( Q \) here.

To calculate a construction pit with a tight base all wells should be inside the enclosed construction pit sector. The analysis of a lowering with outer wells may be done irrespectively of this, when these wells are assigned to another series. A combined analysis with inner and outer wells is not possible with the present formulae. The graphical display of the lowering with color areas, elevation lines and sections is not possible either, as we cannot determine the water level depth at any arbitrary point.
Analysis Results

The program outputs the analysis results in a text form:

- Subsoil and ground-water situation
- Layer structure
- Construction pit sectors

for each well series:
- Lowering aim
- Wells with positions, diameters and depths
- Water level, lowering funnel, wetted filter height and pumping capacity of the wells
- Used additions
- Required and available pumped quantity
- Number of the required wells
- Maximum pumping performance and required filter length
- Range, if needed
- Water level at the critical points:
  for each construction pit sector at each vertex, in the center and at the critical point.

The program calculates all well values (water level in the well, lowering funnel, wetted filter height and capacity) for the preferred lowering aim, and the number of the required wells may be determined.

If the available pumped quantity is insufficient or too big, the program determines the water levels for the actual pumped quantity graphically, and the lowering aim will not be reached, for instance. Eventually, these depths do not correspond to the well data as displayed in the result listing!
Menu

The menu bar at the top of the screen contains the program commands. Click on a menu item to activate the respective command.

If no project is open yet, the menu bar looks as follows:

```
File  Settings  View  ?
```

After opening an existing project or creating a new one the menu bar appears as follows:

```
File  Edit  Project  Terrain  Well  Section  Start  Settings  View  Window  ?
```
The toolbar contains buttons providing the most important tools of the program DC-Dewatering.

If no project is open yet, only a part of the tools is available. Inactive buttons are gray and cannot be activated:

The following tools are available:

- **File new**: Create a new project file
- **File open**: Open an existing project file
- **File save**: Save the current project file
- **Print**: Print system and/or result graphics
- **Cut**: Remove a selected element
- **Copy**: Copy a selected element
- **Paste**: Paste a copied element
- **Full view**: Display the entire system on the screen
- **Zoom in**: Enlarge the system
- **Zoom out**: Reduce the system
- **Zoom to**: Enlarge a selected system part
- **Coordinate display**: Display current cursor coordinates, rounded if grid is on
- **Help**: Information about the program
- **What's this?**: Help tips about a selected menu item etc.
Function Bar

The function bar contains the essential drawing tools for the input of the system and the analysis parameters. If the cursor is positioned on an icon for more than a second, an explanation appears.

Icons of inactive tools are displayed in gray. In this way you may only start an analysis when you input at least one layer with the permeability coefficient, one construction pit sector with its depth, and one well with a depth and a diameter. Thus, you may determine the result values such as the pumped water quantity, capacity, and the number of the required wells.

If all tools are inactive (all icons gray except the last one), this means that you are working in the result graphic (see display in the window header). You may switch then to the window input with the keys „Page Up“ or Ctrl-Home, or with the „Input Window“ button.

For all tools (functions) that may input several elements (wells, several section lines, etc.), you may draw further elements until you cancel this input action with the right mouse-button. The button remains activated in this time.

The following tools are available:

- **Subsoil**: Input the depth of the ground-water and the deep tight layer as well as the ground-water situation
- **Layers**: Input layers
- **Subsoil pit**: Input construction pit sectors
- **Well**: Input wells
- **Section**: Define the section lines
- **Analysis**: Start the analysis
- **Lowering**: Prompt the water level at arbitrary points
- **Graphic**: Switch to the first graphic in the results
- **Results**: Activate the results
- **Input Window**: Switch to the input window (active only in the results)
- **Snap on/off**: switch snap tool on or off

Coordinate Display

The coordinate display \( x=8.00, \ y=25.00 \) of the toolbar contains the current cursor coordinates. If a grid is on, only rounded-up coordinates will appear.
File Menu

The File Menu is always available, regardless of whether a project is open or not. However, the menu commands in the File Menu may vary.

The following commands are always available:
- New: Create a new project
- Open: Open an existing project
- Printer Setup: Set up the used printer
- <Recently Used Projects List>: Lists the projects you have most recently opened
- Exit: Close the program

The following menu commands are available if a project is open:
- Close: Close a project
- Save: Save a project
- Save as: Save a project with a new name
- Delete: Delete a project
- Print: Output system and/or result graphics
- Print Preview: Show how graphics will look when you print them
- Export: Export graphic data
- Import: Import graphic data
The command New may be also activated with on the toolbar or with the shortcut key Ctrl-N.

A new (empty) project will be created.

You may save the edited project (see Function bar) with „Save“, or save and name it with „Save as“. 
**File - Open**

The command Open may also be activated with on the toolbar or with the shortcut key Ctrl-O.

DC-Dewatering displays the project data in the defined data directory. You may open the preferred project file by a double click or a click and selecting „Open“. The program displays the project in the window and you may edit or calculate it further.

![Open project dialog box](image)

**File - Close**

You may close the current project with the command Close. If any modifications have been made (and no result graphics displayed yet), the program prompts you to save the project. If you click „Yes“, the program will save the current data, if you click „No“, the last unchanged version will remain.

You may save the modified project with a new name through „Save as“, and the previous data will remain too.

**File - Save**

The command Save may also be activated with on the toolbar or with the shortcut key Ctrl-S. The current project data are saved with an already existing name. If a new project is not named yet, the program prompts you to name it.

If result graphics are displayed, the project will be saved automatically.
File - Save As

The program saves the current project data with a new name, by default in the defined data directory. You may define any name, and the extension .dba for the DC-Dewatering program will be placed automatically.

File - Delete

This command deletes existing project files. Existing projects, by default in the predefined data directory, will be displayed. You may select a project file by clicking on it. Several single files may be selected by clicking while pressing the Ctrl-key down, files in a range 'from - to' may be selected by clicking a file and another one after that, while pressing the Shift-key. After an additional prompt to make sure that you want to delete them, the files will be deleted by confirming with „Delete“.

File - Print

The command Print may also be activated with on the toolbar or with the shortcut key Ctrl-P.

The following results are available:
- system graphics, optionally with section lines
- input data, i.e. layers, construction pits and wells,
and for every series of wells:
- the analysis results
- lowering graphics, optionally with elevation lines or color areas,
- for every section - section display of the system with water level course

Optionally, the program may display the graphics on an extra page or within the result texts - see Configuration. However, only a small scale is possible if you display them within the text in DIN A4 Portrait – Page format (see Settings - Scale). The page format set in Page Setup is used for graphics on an extra page.

The printout may be in color or black/white mode. The predefined option is the one selected in the configuration.
In addition, you may set the following in Details:

- the output range through the maximum construction pit dimensions (given next to "Output range") +/- selected margins or with absolute coordinates
- the value range for the water depths, and the deep lowering levels in the well may be sectioned, for example, in order to obtain a better color distribution
- the number of colors for elevation lines or color areas. The lines in the color area may be switched off, and the gradation may have a better visibility in case of many colors.
Having selected the preferred print options, you will be prompted to choose the scale. The program will display the admissible maximum scale for the defined paper size and will suggest the next even scale.

File - Print Preview

With the Print Preview, you may see the image onscreen and how it would appear on the page when you print it.
File - Printer Setup

With the command File – Printer Setup, you may set a printer for the output. The set printer is valid for the program DC-Dewatering only. If another printer has to be set for all programs together, you should do this in Print Setup in Windows.

The available properties and respective options depend on the printer, or respectively on the installed printer driver.

File - Export

You may export the graphic output of the program in the following formats:

- DXF: DXF-Format (if DC-Dewatering DXF-option purchased)
- JPEG: JPEG-Format (included in the program by default)

DXF Export

With Export DXF, you may output the image of the result graphics in DXF-Format to files in order to transfer them to CAD programs (AutoCAD of AutoDesk, for example). The DXF-Format is a so-called vector format i.e. it contains the graphic lines and texts.

This menu item is available only when you purchase the DC-Dewatering - DXF-Option.

You may select which graphics should be required: the system graphics, as well as the result graphics of the elevation lines and each section for every series are available. In case of DXF-Export, the program also exports the graphics on extra pages with the setting „Graphics in Text“. The following file names with extension .DXF are used:
- Project file name for the system graphic
- Name_SeriesNo_EL for the elevation lines
- Name_SeriesNo_SectionName for the sections

As the DXF file contains the entire page, the units in page coordinates are dimensioned in m in the sheet (page 0.20 x 0.27 m, for example).

The created DXF-files contain two layers:
- one layer named „frame“ with the enclosure and the title block
- one layer named "DC", which comprises the actual image.
Thus, the frame and the title block may simply be hidden.

Please note: if you transfer DXF-files to CAD-systems that function in DOS you should set the DOS character set in Configuration.

JPEG Export

The menu item Export JPEG enables the graphic export in JPEG-Format. This is a raster format that may be embedded in Microsoft WinWord, for instance. The JPEG-Format compresses the data, and the image files are considerably smaller than Bitmap (BMP)-files. However, a certain resolution reduction is made internally, as otherwise each image file would need a memory space of several MBs.

You may select which graphics should be drawn: the system graphics, as well as the result graphics of the elevation lines and each section for every series are available. In case of JPEG-Export, the program also places the graphics on extra pages with the setting „Graphics in Text“. The following file names with extension JPEG are used:
- Project file name for the system graphic
- Name_SeriesNo_EL for the elevation lines
- Name_SeriesNo_SectionName for the sections

The JPEG-Export is based on the „MST Image Library“ of Yurij S. Musatenko (Copyright).

File - Import

You may import Bitmap-images, i.e. pictures in Windows-Format .BMP as background with File - Import. In order to scale an image according to the precise latitude coordinates, the image in the input window contains a scale line that is displayed as a dark red diagonal from the left bottom to the right top.

You may move both endpoints of the scale line to any position in the image by dragging with the left mouse button. The coordinates of both points \((x_1, y_1)\) and \((x_2, y_2)\) appear with a double click on the image edge (inside the bounding lines). The value \(y_2\) is defined by the aspect ratio, when \(x_1, y_1\) and \(x_2\) are defined. The image may thus be exactly adjusted, and you may input the construction pits with the correct sizes in a plan, for example.

In addition, you may set the image in active or passive mode, and the program would not display it any more.
If the program cannot find the image file pertaining to an open project, the image will automatically be set to passive mode, and only the frame will be displayed.

**File - <Recently Used Projects List>**

If you already have edited projects with DC-Dewatering, up to nine recently opened projects will be displayed in a list. You may open a project through one of these items at once.

**File - Exit**

You may close the program DC-Dewatering with Exit. If modified projects are still open, the program asks you whether the changes should be saved.
**Edit Menu**

The Edit Menu is available only when a project is open.

Following commands are available:
- **Undo**: Reverse an edit action (not available now)
- **Properties**: Edit properties of selected elements
- **Cut**: Remove selected elements (wells, sections, etc.)
- **Copy**: Copy selected elements
- **Paste**: Paste copied elements.

<table>
<thead>
<tr>
<th>Command</th>
<th>Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undo</td>
<td>Ctrl+Z</td>
</tr>
<tr>
<td>Properties</td>
<td></td>
</tr>
<tr>
<td>Cut</td>
<td>Ctrl+X</td>
</tr>
<tr>
<td>Copy</td>
<td>Ctrl+C</td>
</tr>
<tr>
<td>Paste</td>
<td>Ctrl+V</td>
</tr>
</tbody>
</table>

(The Edit Menu)

**Edit - Undo**

The command Undo is intended to reverse a previous edit action, e.g. to reset deleted elements.
This command is not supported yet.

**Edit - Properties**

This command edits properties of the selected elements. You may modify the parameters of a well such as diameter, depth, etc. This may also be done by a double-click on an element.

First, you have to select an element by clicking on it. The selected element is displayed in red. By selecting Edit – Properties the program will display the dialog box with the element properties.

When different elements are placed very closely together, and you cannot find the respective element by clicking, you may select it with the Lasso-Function. A lasso is defined by pressing the left mouse-button at a vertex and dragging while holding the mouse-button pressed. In this way a rectangle may be selected, which will contain only the respective element.
**Edit - Cut**

The command Cut may also be activated with ☰️ on the toolbar or with the short key Ctrl-X. In addition, the delete-command is possible with the Del-key.

The command Cut removes selected elements. First, you have to select the respective elements by a left mouse-click (several elements are selected by clicking with pressed Ctrl-key or Shift-key). Then you may remove the elements with „Cut“.

If different elements are placed very closely together, and the respective element cannot be found by clicking on them, you may select it with the Lasso-Function. A lasso is defined by pressing the left mouse-button at a vertex and dragging while holding the mouse-button pressed. In this way a rectangle may be selected, which will contain only the respective element.

**Edit - Copy**

The command Copy may also be activated with ☑️ on the toolbar or with the shortcut key Ctrl-C.

With the command Copy, you may copy selected elements. First, you have to select the preferred elements by a left mouse-click (by clicking with pressed Ctrl-key or Shift-key you may select several elements). The elements are copied then to the clipboard and may be pasted into the project with „Paste“. They appear in blue and may be placed on the respective position by dragging with the mouse.

**Edit - Paste**

The command Paste may also be activated with ☐️ on the toolbar or with the shortcut key Ctrl-V.

With the function Paste, you may paste into the project elements, copied preliminary. The elements appear in blue and may be dragged to the respective position.
Project Menu

The Project Menu is available only when a project is open. It is used to input general project parameters.

The following functions are available:
- **Name**: Project name, appears in the graphic title block and in the header of the result printouts
- **Title Block**: Inputs texts for additional title block lines, if defined in Settings – Headers
- **Output**: First page number for the output

**Project - Name**

Enters the project name, which appears both in the graphic title block and in the Header of the result output. In addition, you may select to automatically display the current date, the date with the time or optionally a fixed text, e.g. a fixed date in the results:

Please note: both project lines appear automatically in the title block of the results. In the graphics only the first line is displayed by standard. The attributes „Project name“ and „2. Name line“ should be assigned to the project lines in Settings – Header to show both lines in the graphics. A title block line may be assigned to the attribute „Date“, and the current date appears in the title block.
Project - Title Block

You may input title block data here, if the respective lines have been defined in Settings - Title Block. The lines content may be predefined here for the project name, the section name, the series and the scale. This data is automatically defined in the corresponding lines, so a free input is not possible here. If further lines are defined without their predefined contents (e.g. „Modified:“), the input may be carried out here:

Project lines

person responsible: 
record office no.: 

Back  Forward  Close
Terrain Menu

The Menu Terrain is available only when a project is open. It is used to input the ground surface situation and the construction pits.

The following menu items are available:

- **Subsoil**: Input up to two slopes behind the wall
- **Layers**: Input layers in the ground surface
- **Subsoil pit**: Input construction pits
- **Split**: Split edges
- **Join**: Join edges
- **Split area**: Split areas (construction pits)

Terrain - Subsoil

The menu item Subsoil may also be activated with on the function bar.

You may enter the following parameters:

- Depth of the (not lowered) ground water below surface
- Depth of the deep tight layer below surface
- Storage coefficient $p$ to define the time-dependent range
- Analysis Fundamentals: instead of the available pumped quantity $= \text{sum of the available pumping capacities of all wells}$, you may define to apply the required pumped quantity, a fixed predefined pumped quantity, or a single pumping capacity, to each well. However, normally you should use the possible maximum Q. Otherwise, you may calculate e.g. existing pump systems with known pumping capacities. To do this, the program uses here improved formulae compared to the Herth-Arndts book, see also the tip in the chapter Ground-Water Level Depth.
- Precipitation inflow in l/s per 1000 m² base area as an addition to the pumped quantity
  
  The precipitation inflow may be both fixed, i.e. given by the indicated value during the whole operation time of the lowering, and converted as 15 min.-rainfall for any arbitrary period of time. Example: if the value is predefined for a 15 min.-rainfall, this (maximum) rain does not flow constantly into the construction pit. The water quantity in l/(s*1000m²) may be converted from a quarter of an hour e.g. in 12 hours then, and an inflow of 1/48 of the water quantity will result.
- Ground-water situation: free, stressed or half-stressed ground water.
- Vacuum well points: if you click on the usage of vacuum well points, you may predefine the under-pressure in the well in bar.

Tip: the maximum mathematical under-pressure possible for a permeability coefficient \( k \) may be determined as follows:

\[
p_{u,\text{max}} = -0.1234\ln(k) - 0.7059.
\]

You may predefine any number of layers with different permeability coefficient for free ground waters. 2 layers are required for stressed ground water and 3 layers for half-stressed ground water.

### Terrain - Layers

The menu item Layers may also be activated with on the function bar.

Layers run horizontally and are indicated through the depth of their bottom edge.

- Layer name with max. 15 symbols
- Depth of the bottom layer edge below surface
- Permeability coefficient in m/s
- Permeability coefficient for disturbed layers in m/s (in case of placing a tight base, for the analysis as trough-construction method for construction pits with tight bases only)
- Porous component \( n \) to define the water volume in the construction pit for the calculation of the time needed to pump dry in case of trough-construction method
- Unit weight of the layer for buoyancy analysis of a tight base
- Unevenness coefficient $U = d_{60}/d_{10}$ (used in vacuum method of drainage only)
- Layer type: compact or permeable (compact required only for half-stressed and stressed ground water situation)

The program may switch between several layers with different functions. The function may also be activated with the Alt-key and the underlined letters (e.g. Alt-1, Alt-W, etc.).

- First: Switch to the first layer
- Back: Switch back to the previous layer
- Forward: Switch forward to the next layer
- Last: Switch to the last layer
- New: Create a new layer
- Close: Close the layer input
- Delete: Remove the currently displayed layer

The program automatically sorts the layers by depth.
Terrain - Subsoil Pit

The menu item Terrain – Subsoil Pit may also be activated with on the function bar.

A construction pit may contain different sectors with different depths. Every sector must be input as a closed polygon with an arbitrary shape. You may close the polygon by running to the initial point. After that, the program prompts you to choose the parameters of the construction pit sector:

- Depth of the construction pit sector to define the required lowering: 
  \[ s = t_{\text{subsoil-pit}} - z_{\text{GW}} + \text{Reserve} \] (see Configuration)
- Waterproof enclosure to calculate with contraction of the ground-water inflow or as trough-construction method
- Enclosure depth to determine the reduction factor for the pumped quantity
- Residual inflow through the enclosure in l/s per m² wall area, only for the analysis as trough-construction method
- Placement of a tight base for the analysis as trough-construction method
- Depth of the top edge of the tight base
- Width of the tight base
- Permeability of the tight base in m/s for the calculation of the inflow through the tight base from the pressure head and the permeability, optionally
- Direct input of the flow through the tight base in l/s per 1000 m² base area

Instead of mouse clicking, you may use the coordinate input with the keyboard at any time. You simply have to type in the coordinates x and y with a decimal point, separated by a comma like x.xxx,y.yyy. The input appears in the status bar at the bottom of the screen. The coordinate is accepted by confirming with the Enter-key, as if you have pressed the left mouse-button there.

Optionally, you may also enter relative coordinates. To do this, you have to put the prefix d. If you click for instance on the start point of a line, then type in d2,0 and confirm with Enter, a horizontal line appears with a length of 2 m.
If you put w as a prefix in the coordinate input, you may draw a line at a preferred angle with predefined length. The positive direction of the angle goes counterclockwise from the horizontal. The input of w30,5 for the end point creates a line at 30 degrees with the length of 5 m.

If you enter only w and the angle (e.g. w30) and confirm with the Enter-key, the program will initially redefine only the angle. Then you may click on a line, and a line will be drawn up to the section point with the selected line at the respective angle. If you enter a free point, the line will be drawn at the length indicated by the point at the specified angle.

**Terrain - Split**

With Terrain - Split you may insert intermediate points on the edge of a construction pit or onto a section line. The intermediate points may be modified in order to adjust the course.

A cursor as a stick appears. You may insert a new point on the preferred position by a left mouse-click. You may close the function Split by a right mouse-click.

**Terrain - Join**

With Terrain - Join you may remove points from a construction pit section or a section, and a straight-line junction appears between the preceding and following points.

A cursor as a pair of scissors appears. You may remove the point to the preferred point. You may close the function Join by a right mouse-click.

**Terrain - Split Area**

With Terrain - Split Area, you may split a construction pit section into two sections. To these sections different depths may be assigned. You have to enter two points on the borderlines of a polygon. The junction between both points determines the splitting into two polygons.
Modify Point Coordinates

You may modify the coordinates of a point by a double click. The following dialog box appears, and you may enter the x and y coordinates of the point here:

Optionally, you may move points also by dragging them with a pressed left mouse-button. If the grid is on, they are rounded-up to grid values.
Well Menu

The Menu Well is available only when a project is open.

It inputs wells and contains the following commands:

- **New**: Input new wells
- **Optimize**: Optimize the number and the position of wells

You may modify existing Wells by a double click on the well icon.

Well - New

The menu item Well - New may also be activated with on the function bar.

You may input any number of wells that have different diameters and depths:

- **Position x**: Position of the well axis in x-direction
- **Position y**: Position of the well axis in y-direction
- **Diameter**: Well diameter in mm
- **Bottom edge depth**: Bottom edge depth in m below surface
- **Same depth/diameter for all wells**: with this tool, you may modify all available wells simultaneously, and all of them will have the displayed depth and diameter.
Well - Optimize

The tool Well – Optimize may also be activated with . You may make here an automatic arrangement and optimization of the wells while deleting already existing wells. Then, you may enter the following parameters:

- Depth of the preferred lowering, e.g. also adapted to different construction pit depths
- Diameter and depth of the wells
- Distance from the wells to the construction pit edge: negative = inside the construction pit
- Minimal distances between the wells

The program arranges new wells at the critical point until it has reached the required pumped quantity. The well arrangement around inner sectors (deeper areas) may be admissible or inadmissible here. If you cannot obtain the required number of wells with the minimal distances between them, the program displays a message. First, this number of wells has not reached the optimum yet, if you have not reached the required pumped quantity by one well less, for example.

- Optionally, you may optimize not only the number of wells, but also the position of the single wells afterwards. In case of several construction pit sectors and many wells, this optimization may be very time-consuming, because if there are \( n \) wells there are carried out \( 2 \times n \) shifts and calculations in each step.

- After that, you may optimize the well depth in order to keep the required pumping capacity as precise as possible. You may shorten all wells by the same dimension as long as this is possible.

In this way you may at best arrange the wells fully automatically. However, if you start with a different well depth, another total pumping capacity may follow as a result, as fewer wells and total pumping capacity result from deeper wells.
Section Menu

The section Menu is available only when a project is open. It is used to input and modify different sections for the section representation of the water level.

The following commands are available:
- Section : Define a new section
- Split : Split a section
- Join : Join a section

Section - Section

The command Section may also be activated with on the function bar. You may draw arbitrarily many section lines as continuous lines (one or several line parts).

The section may be assigned a name (the current number as a rule):

You may select the available sections in the result graphic in order to display the water level course along the section line.

Section - Split

The command Section - Split may join intermediate points in a section line. The intermediate points may be modified to adjust the course.

A cursor as a stick appears. You may insert a new point by a left mouse-click in the respective position. The tool Split may be closed by a right mouse-click.
Section - Join

The command Section - Join may remove existing points from a section, so a straight-line junction appears between the following and preceding points.

A cursor as a pair of scissors appears. The point may be removed by a left mouse-click at the preferred point. You may close the tool Join by a right mouse-click.
Start Menu

The Start Menu is available only when a project is open. It is used to start the analysis and the results.

The following commands are available:
- Analysis : Execute the analysis
  (available only when at least one layer, one construction pit sector and one well have been defined)
- Lowering : Indicate the water level at any arbitrary point
- Graphic : Switch to the first graphic in the results
- Results : Switch to the analysis results
- To input : Switch from the results back to the input window

Start - Analysis

The command Start Analysis may also be activated with on the function bar. An analysis is possible only when you input at least one layer, one construction pit sector, and one well.

The well data should be available as an initial value in order to define the pumping capacity, and the number of the required wells accordingly.

The following analysis options are available:
- Quantities : Calculates the pumped quantity, the pumping capacity, etc.
- Range : Calculates the time-dependent range (see below)
- Trough-construction method: Calculates a construction pit with a tight base according to the trough-construction method

Different analysis options are available in accordance to the construction pit types.
Quantity Analysis

The Quantity depends on the preferred
- Lowering (lowering aim in m below the static water level)
- Adapted to depth: optionally, you may select the lowering to be adapted to the different depths of diverse construction pit sectors. The reserve of 0.5 m is added here to the construction pit depth (see also Settings - Configuration).

The program determines
- for the selected well number
- the pumping capacity of the well
- for the selected series (if several series available) with the pertaining lowering aim
- the pumped water quantity \( Q_0 \) and \( Q_{\text{max}} \) incl. security addition (see Configuration)
- the required number of wells considering the different capacities in case of several available wells
- estimation of the overall construction by comparing the \( Q \) required and the \( Q \) available.
- optimization of the well depths: you may modify the well depths, and the required pumped quantity is obtained as precise as possible (precision: 10 cm). If an increase of the well depths would go deeper than to the deep tight layer depth, it would not be possible to obtain the required pumped quantity. Otherwise, the well depths are accordingly adjusted. All wells are made uniformly longer i.e. wells with different depths keep their depth difference, as long as the deep tight layer depth has not been reached.

The Analysis of Quantities is not available when you input construction pits with tight base and wells inside. An analysis after the trough-construction method is available in these cases.

You may see the above-mentioned chapter Analysis Fundamentals and the following chapters for details.

Eventual error messages are displayed in a result window.
Range Analysis

The following options are available in the calculation of the range:

- Preferred lowering aim, eventually adapted to the depths (see above)
- Selection of a construction pit, if sectors with a tight base and wells are available inside. You calculate the range with the residual inflow in the construction pit. By default, the trough-construction method cannot be selected.
- Preferred series, if several available
- Period to determine the lowering: You may enter both a number and a preferred unit (days, weeks, months, and years by opening the selected list with the arrow on the right).
- Optionally, analysis for the admissible residual lowering at the edge of the lowering funnel in m or
- The edge inflow in % of the pumped quantity
- The calculated range is displayed beside it
- As the calculated range is time-dependent (almost every small or high value may be calculated for very short or very long times), the program additionally displays the range after Sichardt acc. to the formula 3000 * s * sqrt(k).

See also the chapter Range Analysis for details.

Eventual error messages are displayed in a result window.
Trough-Construction Method Analysis

An analysis of construction pits of trough-construction method is possible when you input construction pit sectors with a tight base, and all wells of a series are situated in the construction pits.

You may select:
- Preferred lowering aim, eventually adapted to depths (see above)
- The construction pit sector, which is to be calculated, with a tight base and inner wells
- Eventually the well series, if several available.

The program calculates the following for this construction pit:
- Residual inflow through the wall
- Residual inflow through the base
- Precipitation inflow
- Pumping capacity of the wells
- Water volume of the construction pit

The Parameters for the analysis are input with the corresponding subsoil pit sector respectively with the Terrain (residual inflow), or with the layers.
- The time needed to pump the construction pit dry results from the single values
- In addition, the program may determine the lowering at the construction pit edge for a selected period from the inflow through the wall and the base.

For construction pits with waterproof enclosure with or without tight base an analysis is only possible, if all wells are positioned inside or all are outside of the construction pits. For wells outside the analysis is done as without waterproof enclosure and without tight base, as these are only effective if the wells are inside.

See chapter Trough-Construction Method for more details on the analysis method.
Start - Ground-Water Lowering

The command Start Ground-Water Lowering may also be activated with on the function bar.

This tool is used to display the water level in m below surface at any arbitrary point, both in the input window and in the graphic of elevation lines/color areas. If the cursor stops at a point, the program will display the water depth on this position. You may close the function by a right mouse-click.

Start - Graphic

The command Start Graphic may also be activated with on the function bar. The program switches the results directly to the first result graphic. Optionally, you may also use the commands Image Down / Image Up.

The following graphics are available:
- System graphic, optionally with section lines for each well series
- a graphic of the lowering, optionally with elevation lines or color area, optionally with indication of the critical point
- for every section a section representation of the system with the water level course

A graphic cannot be done for the analysis of waterproof enclosed construction pits, respectively Trough-Construction-Method, as no formulae are available for these influences.

First, you may enter different options for the representation of elevation lines:
- Display as lines or as color areas
- Details, e.g. output range and labeling

You may adjust in Details additionally:
- the output range both by the maximum construction pit dimensions +/- a selected boundary range or with absolute coordinates
- the value range for the water depths, and e.g. the deep lowering in the well may be cut in order to obtain a better color distribution
- the number of colors for the elevation lines or color areas. The lines in the color areas may be switched off, and the gradation may be better seen in case of many colors.
After that, the program prompts you to choose the preferred scales for the different pages and indicates the admissible maximum scale for the adjusted page format:

- Geometric (System) graphic
- Graphic with elevation lines / color areas
- Section graphics

The program switches then to the first graphic. You may move between the single graphics with the commands Image Down and Image Up or Ctrl-Home and Ctrl-End (first and last page).

**Please note:**
When you view the result graphics, the function bar buttons are inactive because no element may be modified in the result graphics. You may go back to the input window with the commands Image Up (several times eventually), Home or the button (Back to Input).

The formulae for the analysis of the water level in case of **half-stressed** ground water are valid according to Herth, Arndts outside the construction pit only. No usable values may result
inside the construction pit. Thus, an analysis is possible, yet no elevation lines and sections for half-stressed ground water.

You may calculate the increased water quantities according to the vacuum method of drainage. However, there are no analysis formulae for the water levels at arbitrary points. Too large water depths may result in the graphic with the standard formulae because of the bigger water quantity $Q$ thus.

The preferred graphics may be printed out through File Print or \( \text{on the toolbar.} \)

**Start - Results**

The tool Start Results may also be activated with \( \text{on the function bar. The program switches to the first page of the analysis results. Optionally, you may also use the keys Page Down / Page Up.} \)

The preferred lowering aim or the analysis may be predefined as adapted to the different depths for each series.

You may modify the preferred lowering aim by a double-click on the respective line:

Use \( \text{on the toolbar to print out the results respectively the preferred pages.} \)
Start - To input

You may switch from the results back to the input with the tool Start - To input or the icon.

This command is active only when you work in the results pages.
Settings Menu

The Settings Menu is completely available only when a project is open. The menu item Directories is available, if no project is open. It is used to adjust different options for the program.

The following commands are available:

- **Grid On/Off**: Switch the grid on and off (available also with the shortcut key Ctrl-R)
- **Grid Spacing**: Set the grid spacing
- **Snap On/Off**: Switch snap-functions on/off
- **Page**: Set the page format, orientation and margins
- **Scale**: Set the graphic scale
- **Configuration**: Configuration options: adjust the analysis and print settings and the margins
- **Line width**: Set line-width for different graphic components
- **Colors**: Set colors for different graphic components
- **Font sizes**: Set font sizes for different labels
- **Fonts**: Set fonts for different labels
- **Header**: Define the title block
- **Directories**: Set the data and configuration directory

(Settings Menu)

Settings - Grid On/Off

You may use a coordinate grid (displayed in gray) in DC-Dewatering in order to round up the coordinates to exact values (e.g. half a meter). The values on the coordinate are then displayed rounded up to these values.

The grid may be switched on and off with the command Settings - Grid On/Off and the shortcut key Ctrl-R. You may set the grid spacing arbitrarily.

If the grid is on, you may also enter any coordinates with the keyboard. To do this, instead of pressing the left mouse-button, you simply have to type in the x and y coordinates with a decimal point, separated by a comma: x.xxx,y.yyy. The program displays the typed-in values in the status bar at the bottom of the screen.
Settings - Grid Spacing

You may set the spacing between the gridlines arbitrarily in x and y direction:

![Mouse Grid]

See Settings - Grid On/Off for more details.

Settings - Snap On/Off

By default, you may jump exactly to existing points in new entries as „snapped to grid”, i.e. in the range of the snap radius. The size of the snap radius is about the size of the small crosshairs cursor. If the snap function is off, you cannot jump to existing points, so e.g. you may enter a new point near an existing one.

Please note: if the Grid is on, the program rounds up to a grid point regardless of the snap function. Yet, the program will jump to a point, if it is placed on a grid point. If you have doubts about it, you may switch off the snap function and the grid.

Settings - Page

DC-Dewatering may output graphically – according to the output device – in diverse page formats. In addition, you may set the orientation format (portrait or landscape) and the margins (to set a free margin outside the display see Settings - Configuration).

If you set a larger page format than the selected printer or plotter may work with, the image will be automatically split in DIN A4- or Letter-pages during the printing process (e.g. DIN A2 = 2 x 2 pages DIN A4).

However, this page setting is valid only for the system graphic and the result graphics, if a graphic is placed on an extra page. The program always displays the text results and, eventually, the embedded graphics in a DIN A4 or Letter portrait format.

In the configuration, you may change the standard sheet to DIN A4 or Letter format.
The following options are available:

- **Page height:** Format in vertical direction DIN A4 - A0
- **Page width:** Format in horizontal direction DIN A4 - A0
- **Orientation:** Portrait or landscape
- **Margins:** Margins left, top, right, bottom, single or none

As every page format has 2 dimensions (DIN A4: 29.7 cm height and 21.0 cm width), you should always consider to set the dimensions of a page in portrait format (height DIN A4 = 29.7 cm = width DIN A3!). You may afterwards turn the page in landscape format.

In the box "Paper" you may choose every page format that your special printer driver is offering. With the margin size you may define a smaller margin than the displayed maximum size.

### Settings - Scale

For each graphic (geometry, elevation lines, sections) different scales are interrogated. The minimum value is displayed and an even scale is proposed, depending on sheet format.
Settings - Configuration

Three groups of setting options are available in the Configuration:
- Analysis: Settings regarding the analysis (additions etc.)
- Management: Settings regarding the printout and the graphics
- Other: Further settings, here: sets up the margin for the output

Configuration - Analysis

The following values may be set in the configuration of the analysis parameters:
- Safety of the lowering depth in m (predefined 0.5 m): sets the depth below the construction pit depth at which the lowering should be aimed by default. You may set another lowering aim in the analysis.
- Addition for the pumped quantity in % (predefined 10%): addition for $Q_{\text{max}}$ above the calculated $Q_0$ in the determining of the required number of wells.
- Addition for the pumped quantity from the inflow into imperfect wells from below in % (predefined 25%): addition, by which the pumped quantity of imperfect wells is increased (depth < deep tight layer depth).
- Addition for the wetted filter height $h'$ of imperfect wells because of the lower gradient curve in % (predefined 10%): an addition, by which the wetted filter height is increased for the wells.
- Default distance of the wells to the construction pit in m (predefined 1 m): distance used to determine the circumference around the construction pit. It is required to calculate the distances between the wells in order to consider the interdependence for the determining of the required number of wells.
- The water quantities may optionally be output with the unit l/s or m³/h.
Configuration - Management

You may set the following options for the management:

- For the printout job - if color or black-and-white mode should be used. The program prompts you to choose the preferred option with Print again, but it is predefined as in the Configuration.
- For the graphic - if each image has to appear on an extra page or should be embedded in the text.
- You may set for the graphic range whether the images with elevation lines and sections should be displayed or not. If the images are on, but not needed for the printout, during the printout the program omits only the graphics, but the page orientation remains as in the complete output range (e.g. to print a page of a project again). If some images are off, the program pushes together the rest of the data, i.e. it does not keep free space for this graphic.

Configuration - Other

The following may be set up in Other:

- a margin (considering the maximum output range) that should be kept at the four borderlines of the page. In this way the graphics may be adapted to a letter format, for example.
  The margin data does not take into account the whole page size because the program does not know it. Rather than that, the program fixes the margin considering the outer borders when you set all margins to 0.
- The language both for the user interface and the output may be selected to be English or German. Changing this setting will only take effect after restart of the program. The language for the user interface may be selected differently, i.e. for user interface in english but results in german language. Please note that fixed texts in the header area, like load case and section, are saved in the header and must be changed with Settings - Header by double clicking the header fields. If you change the language often, you may manage
different headers by configuration directories. Changing the language of the interface requires to restart the program.

- Especially for English speaking countries the standard sheet for text results may be selected to be DIN A4 or Letter format.
- You may define the size of the well icons in the graphic in mm.
- For the DXF-Export you may choose how text is generated in Export - DXF - whether to output the texts in Windows or in DOS character set. If you transfer DXF files to a CAD-System that works in DOS, the (German) Umlauts cannot be displayed.
Settings - Line Width

You may set the Line Width for every graphic component. The number for the line width corresponds approximately to a multiplication of 0.1 mm (line width 5 = 0.5 mm).

Settings - Colors

You may set the preferred color for every graphic component:
The components concerning the lines are on the left, and the components concerning the texts on the right in each group.

With „All“, you may reset all Colors (except the dialog box colors) to one color, e.g. black.

A standard Windows color tab appears (on the left of the next figure). Here you may select standard colors. You may customize further 16 colors by selecting one of the free boxes and clicking on „Custom Colors“. The right half of the dialog box appears, and here you may select the color shade with the arrow on the scale on the right. „Add color“ saves the new color in the predefined box of the 16 free colors.
Settings - Font Sizes

You may select different font sizes for the labels in the graphic output. They are defined in mm, and thus, Windows uses the next available font size (in accordance to the printer driver).

Settings - Font

You may select a Font for the labels in the graphic output. The available fonts depend on the installed printer driver and it is possible that you might not be able to use every font from the list.

You may use in the Windows standard tab only the font name and style. You may select the font size separately for each label.
Settings - Header

Sets the title block and the footer:

You may customize the page title block and the footer. A dialog box that displays the width of the available page appears. The title block and the footer contain single lines. The following line types are available:

- **Company:** Address as defined on the data sheet (blue in the dialog box)
- **Project:** project data, i.e. your input is defined for the current project (i.e. Project and Project number) (green in the dialog box)
- **Type/DIN:** Attempt name and DIN-data (program name here) with fixed text (light blue in the dialog box)
- **Logo:** Company logo (only if you purchase the option DCLOGO or a DCLOGO.BMP file available) (gray in the dialog box)

The project lines consist of a fixed text and an input text. You may redefine an input text with the settings, and you will not need to enter texts every time. Each line has its own font size that determines the line height. You may customize the width arbitrarily. In addition, the line may be assigned an attribute, and the program will automatically enter specific data as date, scale etc. See Modify Title Block Lines for details.
The following tools are available for the editing of the title block:

- **Modify title block lines**: Modify existing lines
- **New**: Create new lines
- **Delete**: Remove (clicked) lines
- **Separation lines on/off**: Switch separation lines between single lines on/off

(Please note: the single separation lines for each line may also be switched on/off, see Modify Title Block for details).

Modify Title Block

For a single block you may modify:

- **The position of the block**: by clicking on a block and dragging it with a pressed left mouse-button you may move the block to a free position. If the space is not enough, the program shifts the block down.
- **The block size**: you may activate a block by clicking on it, and it is displayed with thick dots at the vertices and in the center:

![Block Display](image)

You may enlarge or reduce the block by clicking on one of the four vertices on the left or on the right, and dragging with the left mouse-button. Here you have to consider the cursor shape. If a crosshair with arrows to all four directions is displayed, you may shift the block. If the cursor is positioned on a thick dot, a diagonal arrow should appear. You may modify the block width by dragging it.

The line consists of a part for the fixed text and a part for the input text. If you have to resize the part for the fixed text, you should move one of the points in the center (at the parting line).

- **The contents of the block or the font size**: a dialog box appears by a double-click on a block, where you may edit the particular block:

![Title Block Editor](image)

Here you may edit the properties of a particular block. See chapter Edit Title Block Lines for details.
New Title Block Lines

For the creation of a new block, you should first select the type of the preferred line in the Header – layout:

The program creates then a new line by selecting „New“. It may be moved, resized and its contents may be edited, see Modify Title Block.

Delete Title Block Lines

Select by clicking a title block line in order to remove it. Select „Delete“ after that and the block line will be deleted.

„Delete All“ removes the entire title block for a new input.

Note: if you delete e.g. the definition file DCTITLDYA for portrait, or DCTITQ.DYA for landscape in the configuration directory by the File Manager or Explorer, the default title block will be created with the next program start.

Edit Title Block Lines

Edits the contents of a title block line:
You may edit the following parameters of a title block line:

- **Fixed text**: You may enter here the fixed text of a block.
  
  You should consider adapting the text length to the size of the corresponding block, see Modify Title Block for details.

- **Input text**: The text defined by the user may be predefined here. This predefinition is valid for the respective text until there is another text defined by the user.
  
  The input text is inactive, when the block has only one fixed text (s.b.) or if you define an attribute, and the program will determine the input text automatically.

- **Font size**: The font size is dimensioned in mm. The entire block automatically gets a height that is by 2 mm larger (1 mm above and below the font).

- **Attributes**: You may automatically enter a fixed text into a block.
  
  You cannot make free entries in the block afterwards.

  The following attributes are available:
  - **Date**: the current date is displayed
  - **Scale**: the graphic scale is displayed
  - **Project Name**: the program enters the project title given in Project - Name
  - **Series**: the selected series is displayed
  - **Section**: the name of the displayed section is shown
  - **2. Name line**: the second project line (s.a.) is displayed
  - **Page**: you may enter the page number

- **Components**: As a rule, one title block line has one fixed text and one input text. However, you may define to use only a fixed text or only an input text.

- **Texts**: the texts that have to be defined in the title block lines may be:
  - left aligned (by default)
  - centered or
  - right aligned

- **Separation lines**: Each block is restricted within four borderlines to the left, on the top, to the right and at the bottom. If not all of these lines are switched off, (s. Settings - Header : Separation Lines on/off), you may switch on or off every particular borderline in order to get a definite layout.
Settings - Directories

You may set the data directory and the configuration directory for the program in the menu Settings - Directories:

![Directories dialog box]

The project data (extension .dba) are stored in the data directory and the address file DCPROG.DYX and, if existing, the logo file DCLOGO.DXX or DCLOGO.BMP should be available in the configuration directory.

Directories - Data Directory

With a dialog box, you may set the directory, where the project data of the program (extension .dba) should be stored:

![Data directory dialog box]

You may display the current directory tree with the down arrow at the top of the dialog box. You may move with the icon one directory level up and create a new directory with .

When you activate the commands New File or Open File as well as Save File the program sets the file in the defined data directory.
Directories - Configuration Directory

With a dialog box you may set the directory where you find the configuration files for the program DC-Dewatering i.e. the address file DCPROG.DYX, the file of the predefined layer types DCPARA.DYX, the title block definition DCTITL.DYA and DCTITQ.DYA and, if available, the logo file DCLOGO.DXX or DCLOGO.BMP:

You may display the current directory tree by the down arrow at the top of the dialog box. You may move with the icon one directory level up and create a new directory with . At least the file DCPROG.DYX should be available in the defined directory, so that you can work with the program.
View Menu

In the View Menu the first two commands are always available here; likewise, the others are available only when a project is open.

The following commands are available:

- Toolbar: The Toolbar may be on or off.
- Status bar: The status bar at the bottom may be on or off.
- Sections On/Off: The display of section lines may be on or off in order to get a better overview.
- Full View: The entire image is displayed in the graphic window.
- Zoom in: Enlarge the image by a fixed factor
- Zoom out: Reduce the image by a fixed factor
- Zoom to: Enlarge a selected snip of the image.

View - Toolbar

The toolbar at the top of the screen offers the essential edit functions. It may be on or off.

View - Status Bar

The status bar at the bottom of the screen is used to display messages, the date and the time as well as the status of key as NumLock. It may optionally be on or off.
**View - Sections On/Off**

All defined section lines are displayed by default. You may switch them off in order to obtain a better overview.

**View - Full View**

The tool Full View may also be activated with the icon on the toolbar or with the shortcut key Ctrl-B. In this way you may reset a snip of the system created with Zoom back to the full image.

**View - Zoom In**

The tool Zoom In may be also activated with the icon on the toolbar or with the shortcut key Ctrl-G. In this way you may enlarge the image by a fixed factor.

You may obtain a customized snip through View - Zoom.

**View - Zoom Out**

The tool Zoom Out may also be activated with on the toolbar or with the shortcut key Ctrl-K. In this way you may reduce the image by a fixed factor, maximum to the full view.

**View - Zoom**

The tool Zoom may also be activated with on the toolbar. In this way you may display an arbitrary snip of the image by a lasso with a pressed left mouse-button.
Window Menu

The menu Window is available only when a project is open.

The menu contains the following commands:

- Cascade: Arrange several overlapping windows
- Tile Horizontal: Arrange several windows vertically
- Arrange Icons: Arrange icons of reduced windows
- Windows List: Select the currently open windows.

(Window Menu)

Window - Cascade

The program displays a project by default in a maximum window, and there is enough space for the input window. With Window - Cascade, you may reduce windows and display them as overlapping.

When you select a new project, the windows are always displayed at the maximum in order to obtain a better overview.

Window - Tile Horizontal

Normally, a project is displayed in a window of maximum size in order to obtain enough space for the input window. With Window – Tile Horizontal you may scale down and arrange windows vertically in a non-overlapping fashion.

When you select a new project, the windows are always displayed in the maximum size in order to obtain a better overview.

Window - Arrange Icons

When you reduce the windows to icons, you may arrange them at the bottom of the screen over again.

Window - <Windows List>

When several windows are open at the same time, you may select one of them from the window list. The windows are marked with the name of the project file.
Help Menu

The menu Help contains the following items:

- Help topics: Activate the help topics about DC-Dewatering
- About DC-Dewatering: Information on DC-Dewatering: Program version
- Updates: Poll the updates of the program

(Help Menu)

Help - Help Topics

You may activate the help about DC-Dewatering with the help topics. The preferred chapter has to be selected from the topics, or it may be started with Find by using headwords.

Help - About DC-Dewatering

You may find in About DC-Dewatering the version number of the current program as well as Copyright information.

Help - Updates

You may activate an update list of DC-Dewatering concerning the version numbers with the menu item Updates. The Windows-Editor NOTEPAD opens an RTF-file. If the system does not have NOTEPAD, the program displays an error message.
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