# Summary current model in use at Aa-en-Maas

## Explanation mowing advice

The mowing advice is determined based on two factors: The extra backwater due to vegetation and the risk factors for drain or supply

### Extra backwater due to vegetation

* Existing barriers (such as weirs) in a watercourse create resistance and impoundment when water is supplied and discharged.
* During the winter period, there is a clear relationship between discharge and backwater.
* In the spring and summer, this backwater is further reinforced by the growth of plants. Therefore, the backwater at a specific flow rate is higher in the spring and summer than in winter.
* The resistance due to vegetation is calculated by correcting the “total” impoundment with the impoundment without vegetation (backwater at this flow rate in the winter period).
  + The current model is a non-linear function a \* Q^b trained on train\_winter.
    - Q is the waterflow in qubicmeter per second
      * It is either measured with flow sensors or the formula:

Flow <- 1.705 \* 1.2 \* with weir valve \* (water level upstream – valve position) ^1.5

* + - Train\_winter are the measured data points in the winter season (October – End of February)
  + In the growing season (March – September):
    - The measured water flow Q is put into the model to get the winter-based backwater by water flow
    - Then the model output is subtracted from the measured water flow Q to get the backwater by plants
    - This means the measured water flow Q is put into the winter model to get the backwater without vegetation. This is then subtracted from the current measured water flow Q to get the backwater based on vegetation.
    - If the result is lower than 0, it is capped at 0 since the backwater can not be negative
* This impoundment is then compared with the historical impoundment due to vegetation of the past 3 years. The following classes can be distinguished:

1. The stowage compartment functions optimally. The vegetation is below the 25% percentile value of the past 3 years (1 risk point)
2. There is light vegetation with some degree of resistance. The vegetation is between the 25% and 50% percentile value of the past 3 years (2 risk points)
3. There is average vegetation with resistance. The vegetation is between the 50% and 75% percentile value of the past 3 years (3 risk points)

* There is high resistance due to dense vegetation in the watercourse. The vegetation is above the 75% percentile value of the past 3 years (4 risk points)
* A percentile of a data set is basically one of the 99 points that divide an ordered data set into 100 equally sized parts. A percentile value of 25% means that 25% of all vegetation in the past 3 years was below this value. A percentile value of 50% means that 50% of the values fell below this value, etc.
* In predicting the next 21 days of vegetation for the dashboard, the last 7 days are used within a linear model to derive the following days. Depending on the temperature, the values are in/ or decreased.

### Risk factors

* In addition to the extra backwater, various risk factors are also taken into account. The table below provides an overview of the various risk factors, including the associated risk points. In doing so, it is taken into account whether the watercourse or weir section has a supply or drain function.

#### Drain risk

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Score** | **Groundwater** | **Precipitation deficiency** | **Precipitation** | **Temperature** | **Cloud cover** | **Overflow** |
| 0 | Every other situation (zeer laag / laag) | |  |  | | --- | --- | | >10 % over median |  | | Every other situation | Always | Always |  |
| 1 | |  |  | | --- | --- | | Normal |  | | Within a margin of 10 % of the median | 1 day a chance of >10% of heavy rain, or several days in a row an event of >10% of heavy rain |  |  |  |
| 2 | Wet/very wet (hoog / zeer hoog) | > 10 % under median | |  |  | | --- | --- | | for several days in a row a >10% chance of intense rain |  | |  |  | yes |

#### Supply risk

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Score** | **Groundwater** | **Precipitation deficiency** | **Precipitation** | **Temperature** | **Cloud cover** | **Overflow** |
| 0 | |  |  | | --- | --- | |  | Every other situation | | |  |  | | --- | --- | | >10 % under the median |  | | cumulatively over 100 for the next 10 days, assuming operational run | Every other situation | Every other situation |  |
| 1 | |  |  | | --- | --- | |  | Normal | | Within a margin of 10 % of the median | cumulatively between 30 - 100 for the next 10 days, assuming operational run | > 3 days over 25 degrees | Average cloud coverage between 40 - 60 percent |  |
| 2 | Dry/ very dry | >10 % over median | cumulatively between 0 and 30 for the next 10 days, assuming operational run | > 5 days over 25 degrees | <= 30 procent for more or equal 5 days |  |

##### Groundwater level

The groundwater level is based on the relative groundwater level concerning the average.

##### Precipitation deficiency

The precipitation deficit is a measure of the drought and follows from the difference between evaporation and precipitation.

##### Precipitation forecast

The precipitation forecast indicates how many consecutive (very) wet days there will be in the next 10 days.  
*Very wet day = > 50 mm. per day and wet day = >10 mm per day*

In supply, the precipitation is a measure of the cumulative precipitation in the next 10 days.

##### Overflow

Is there an overflow within 500 meters?