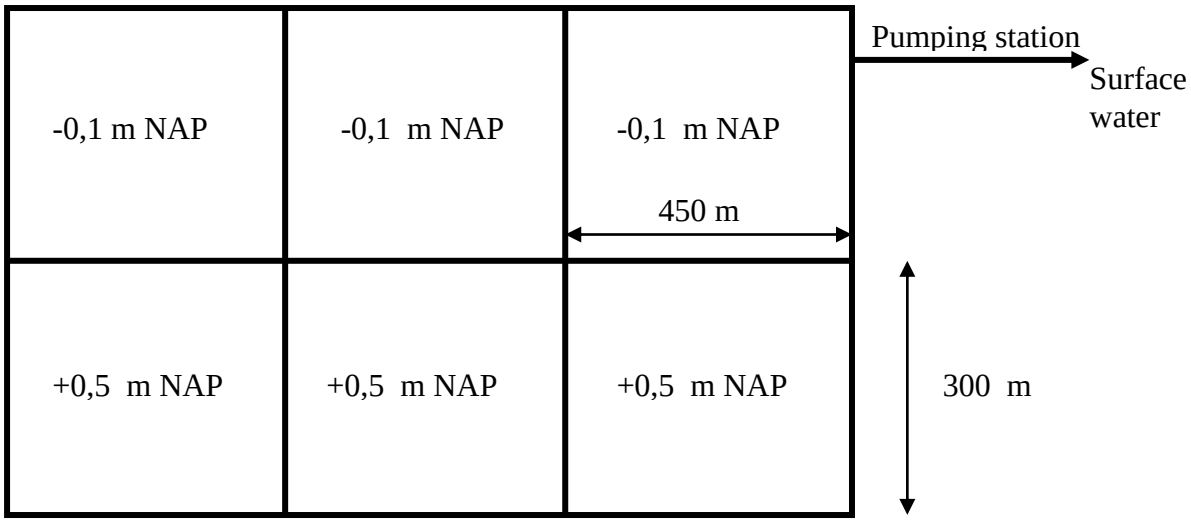
**Exercise drainage, see PPT 5 on Drainage**

An agreed surface water level area (peilgebied) is divided in 6 parcels.
Each parcels measures 450 x 300 m.

1. On each side of the parcel a ditch is located.
2. Ground levels +0,5 m en –0,1 m NAP (see sketch).
3. Winter surface water level is –1,0 m NAP,
   Summer surface water level is –0,7 m NAP
4. Percentage surface water is 2%
5. Soil type “podzol soil with clay upper layer between 30 end 50 cm thick”
6. Hydraulic conductivity soil k = $10^{-6}$ m/s.
7. At a depth off –6,5 m NAP an impermeable layer of clay is situated
8. Capacity pumping station 11 mm/dag = 8910 m3/dag
9. The pressure pipe of the pumping station has a length of 100 m, a diameter of 300 mm and ends on a level of +2,00 m NAP in surface water. Friction factor λ = 0,022. Loss coefficient inlet $\xi_i$ = 0,5. Loss coefficient ξ bends and valve is 2,5.
10. The surface water level the pumping station discharge at has a fixed level of +2,00 m NAP
11. Each parcel has drainage pipes (in de shortest direction). The drainage pipes are situated at a depth of 0,6 m below ground level and have slope of 1:1000

Situation Parcels




**Question 1**
Calculate the distance between two drainage pipes in the lowest situated parcels
The maximum allowed rise of the groundwater level is 30 cm, assuming a precipitation of 30 mm/day

**Question 2**
Calculated the maximum rise of groundwater level with a precipitation of 5 mm/day.
Base you’re answer on the distance between the pipe found in question 1

**Question 3**
If you have a choice between a drainage pipe with a diameter of 60 mm and a diameter of 80 mm. Which pipe would you use. Manning’s roughness coefficient n = 0,014 s/$m^{1/3}$

Henk Massink, 21-10-2010