

# Regional Management of Climate Change in the Metropolitan Area Hannover-Braunschweig-Göttingen – Integrative Management of Groundwater Aquifers and Surface Waters under Climate Change

**Client:** Stadtwerke Hannover AG

**Location:** catchment area of Wietze and Wulbeck

**Scope of Work:** hydraulic computations for primary and secondary climate changes, generating of arrangements

**Methodology:** unsteady hydronumeric 1D model, coupled surface water/ groundwater model

## INTRODUCTION

Actual climate change scenarios show significant changes of precipitation and temperatures with a shift between summer and winter months. They are influencing directly or indirectly the regeneration of groundwater and thereby the water balance of intensively used water bodies.

## METHODOLOGY

For the consideration of a primary and secondary hydrological impact (e.g. change of field irrigation and drinking water usage) a coupled surface water/ groundwater model of the „Fuhse/Wietze“ (Figure 1) basin was setup and used to simulate the unsteady response of the water body for actual conditions and under climate change.

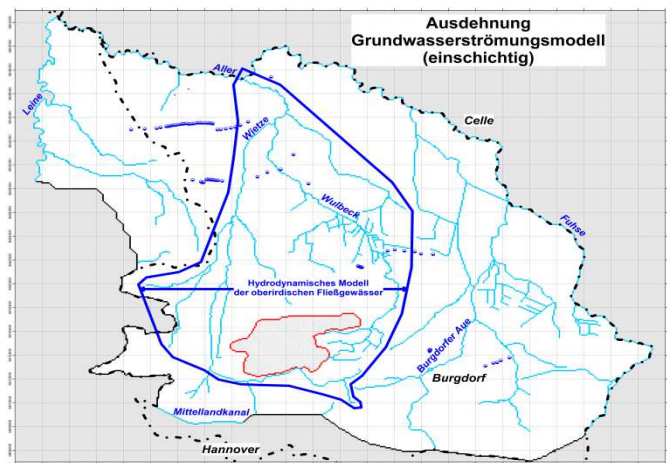


Figure 1: Coupled surface water/ groundwater model

The model was calibrated for the period 01.11.2000–31.12.2007.

## RESULTS & CONCLUSIONS

Climate change generates significant changes of the groundwater surface (Figure 2 and Figure 3).

Discharge in surface waters (exemplarily for the officially operated reference gauge Wieckenberg at the outlet of the basin) show a significant shift between winter and summer months (Table 1).

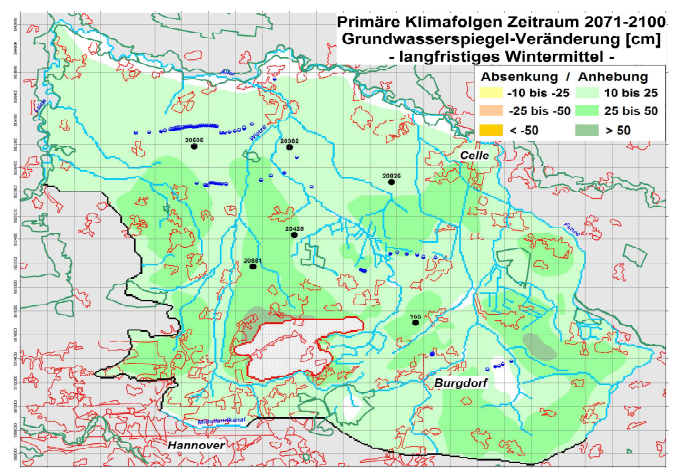


Figure 2: Change of groundwater levels in long-term average of the period 2071-2100 (winter)

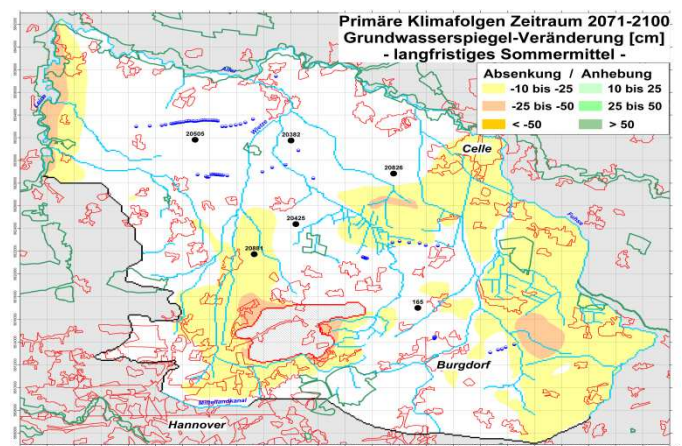


Figure 3: Change of groundwater level (long-term aver.) of the period 2071-2100 (summer)

Table 1: Change of monthly discharge [ $m^3$ ] at the gauges Fuhberg (Wulbeck) and Wieckenberg (Wietze)

| Month     | Wieckenberg/Wietze [ $m^3$ ] | Fuhberg [ $m^3$ ] |
|-----------|------------------------------|-------------------|
| January   | 3.331.807                    | 539.704           |
| February  | 2.313.072                    | 339.105           |
| March     | 1.000.354                    | 157.767           |
| April     | -77.754                      | -4.627            |
| May       | -498.200                     | -67.193           |
| June      | -724.524                     | -90.753           |
| July      | -902.772                     | -149.592          |
| August    | -843.395                     | -124.295          |
| September | -970.973                     | -147.560          |
| October   | -791.153                     | -127.124          |
| November  | 532.405                      | 105.949           |
| December  | 3.204.617                    | 496.173           |
| Sum       | 5.573.485                    | 927.554           |