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Temperature Distribution in the Ems near Dörpen for Cooling Water Discharge

Client: EnBW Kraftwerke AG, Stuttgart und BWK FMB Energie AG, Bern

Location: Dörpen, Ems

Construction: Cooling Water Discharge of a Power Plant

Scope of Work: Simulation of the temperature distribution for the unsteady case NNQ

Method: 2D heat-transport-model (unsteady) with tidal dynamics and variable Weir control, ADCP-measurements

INTRODUCTION

For the study on the spreading of cooling water in the Ems during low water phases (LLQ in summer) we setup a hydrodynamic 2D model and an associated 2D transport model (Fig. 1) between weir Bollingerfähr and weir Herbrum (Abb. 2).

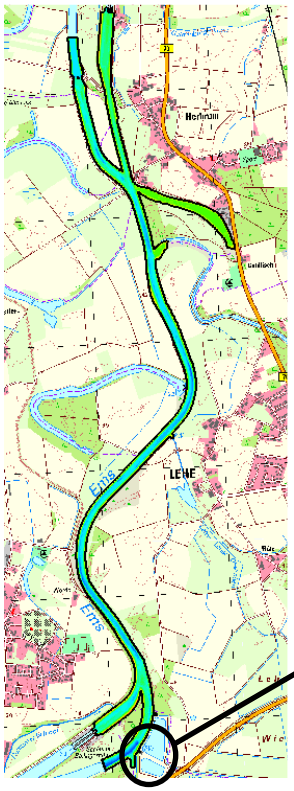

Figure 1: Reach Dörpen (Ems)

Figure 2: Weir Herbrum

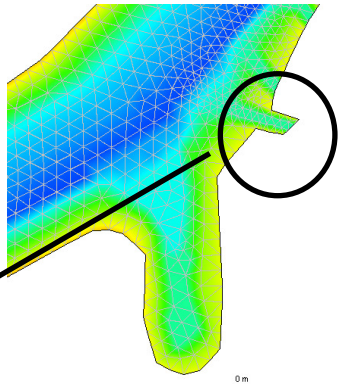

Figure 3: discharge point at the right sided riverbank

METHODOLOGY

At two different days measurements of water velocities (ADCP) and levels were taken for the calibration of this model.

For the unsteady simulation of a critical low water phase (LLQ) a critical state for discharge was localized in summer 1947 (Fig. 4).

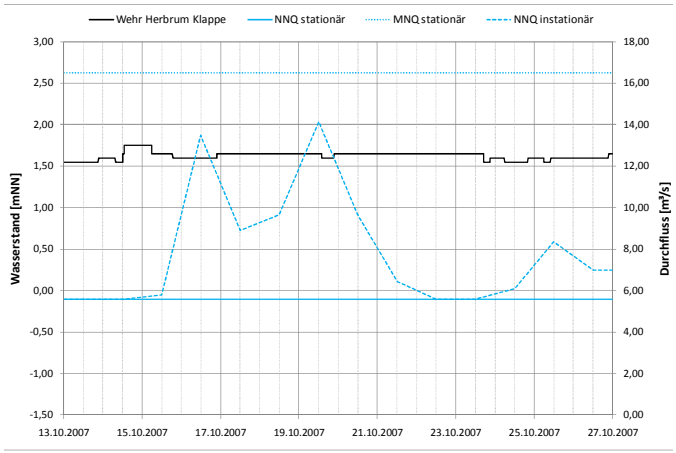

Figure 4: Situation of critical discharge in the Ems

CONCLUSIONS

These simulations showed, that even these extreme discharge situations abide by the limits and requirements of the fish waters quality regulations of Lower Saxony (Fig. 5).

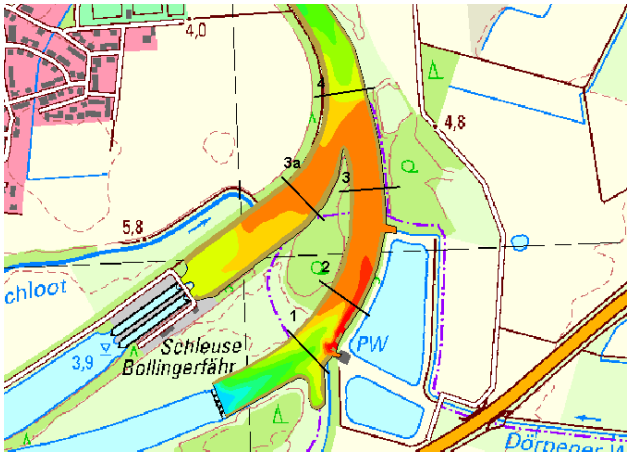

Figure 5: Distibution of temperatur at the construction site in the Ems while LLQ

For this situation the discharge is completely distributed after approximately 350 m.