HYDROGEOLOGICAL STUDY OF SOMES-SZAMOS TRANSBOUNDARY ALLUVIAL AQUIFER

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Peter SZUCS (HU), Marin Minciuna (RO)

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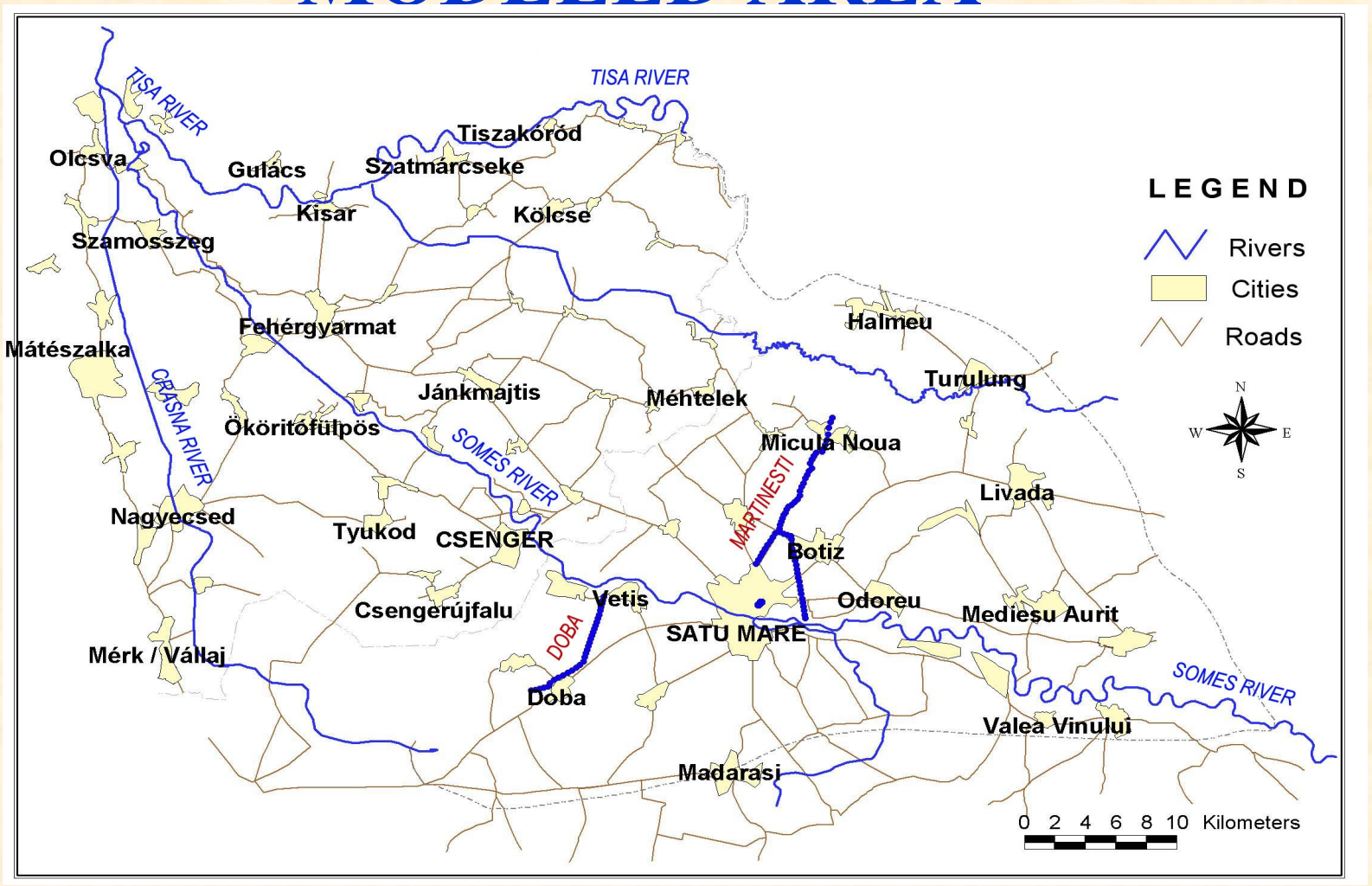
MODELED AREA



MAIN FEATURES

Towns: Satu-Mare, Carei, Csenger, Fehérgyarmat

Population: 400.000 inhabitants

Main waterworks: Martinesti, Doba

Recharge: Eastern part of the aquifer

natural percolation

Discharge: Tisa-Tisza river

Ecsedi swamps

MATHEMATICAL MODELLING

MAIN STAGES

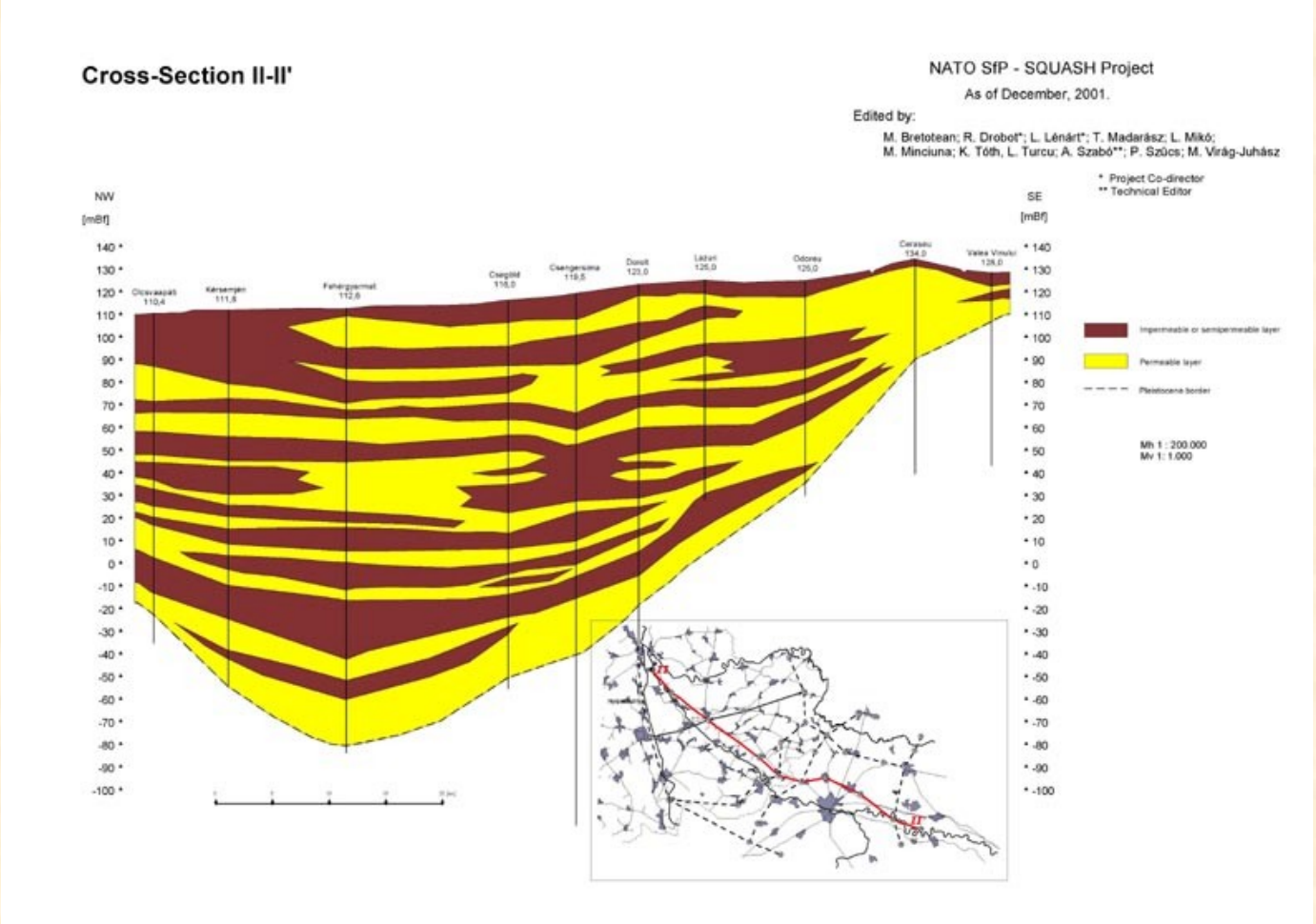
- Data collection
- Choice of the conceptual model
- Parameters calibration
- Parameters validation
- Model predictions

NECESSARY DATA

Hydrogeological data (lithology, groundwater levels, pumping rates, hydrogeological parameters)

- Hydrological data (levels of the rivers)
- Meteorological data (precipitation, temperature)
- Soil charateristics

HYDROGEOLOGICAL CROSS-SECTIONS



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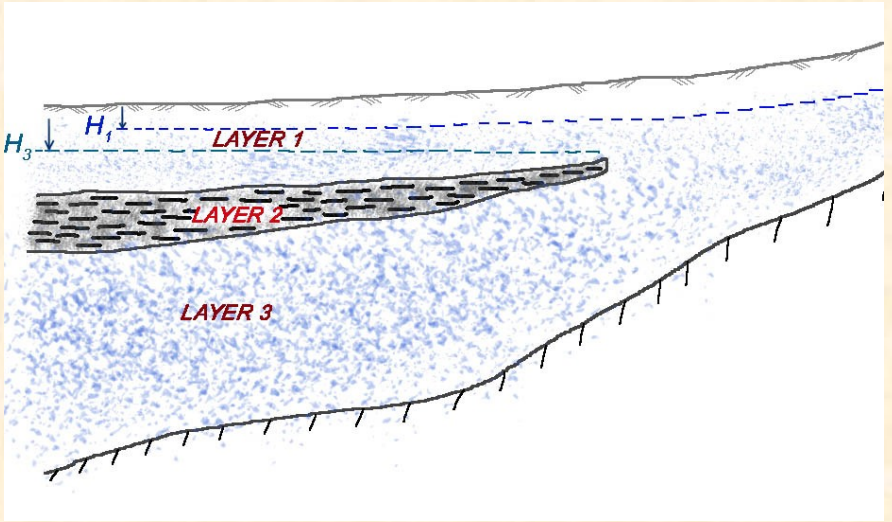
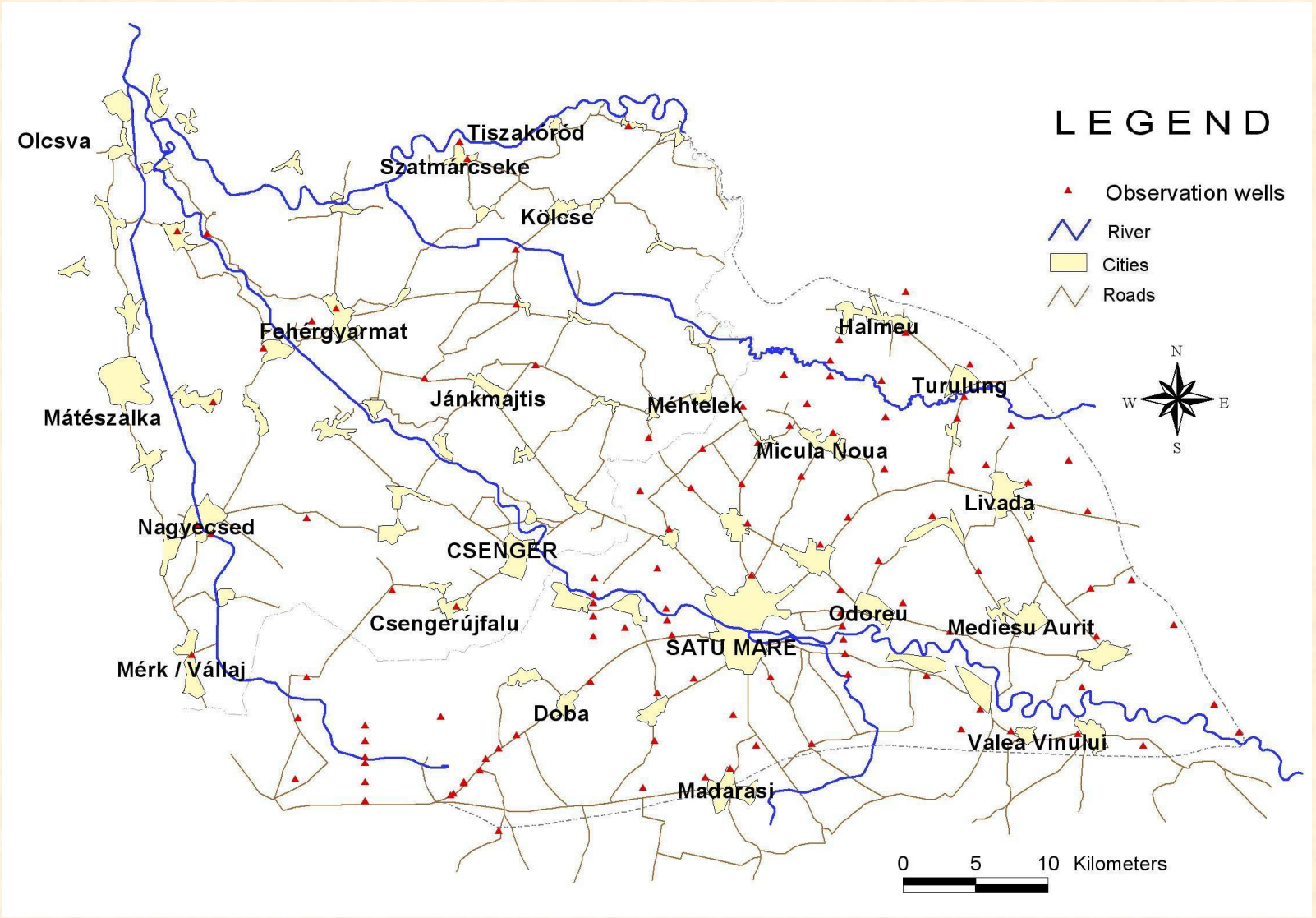
CHOICE OF THE CONCEPTUAL MODEL

Quasi 2-D model (3 layers):

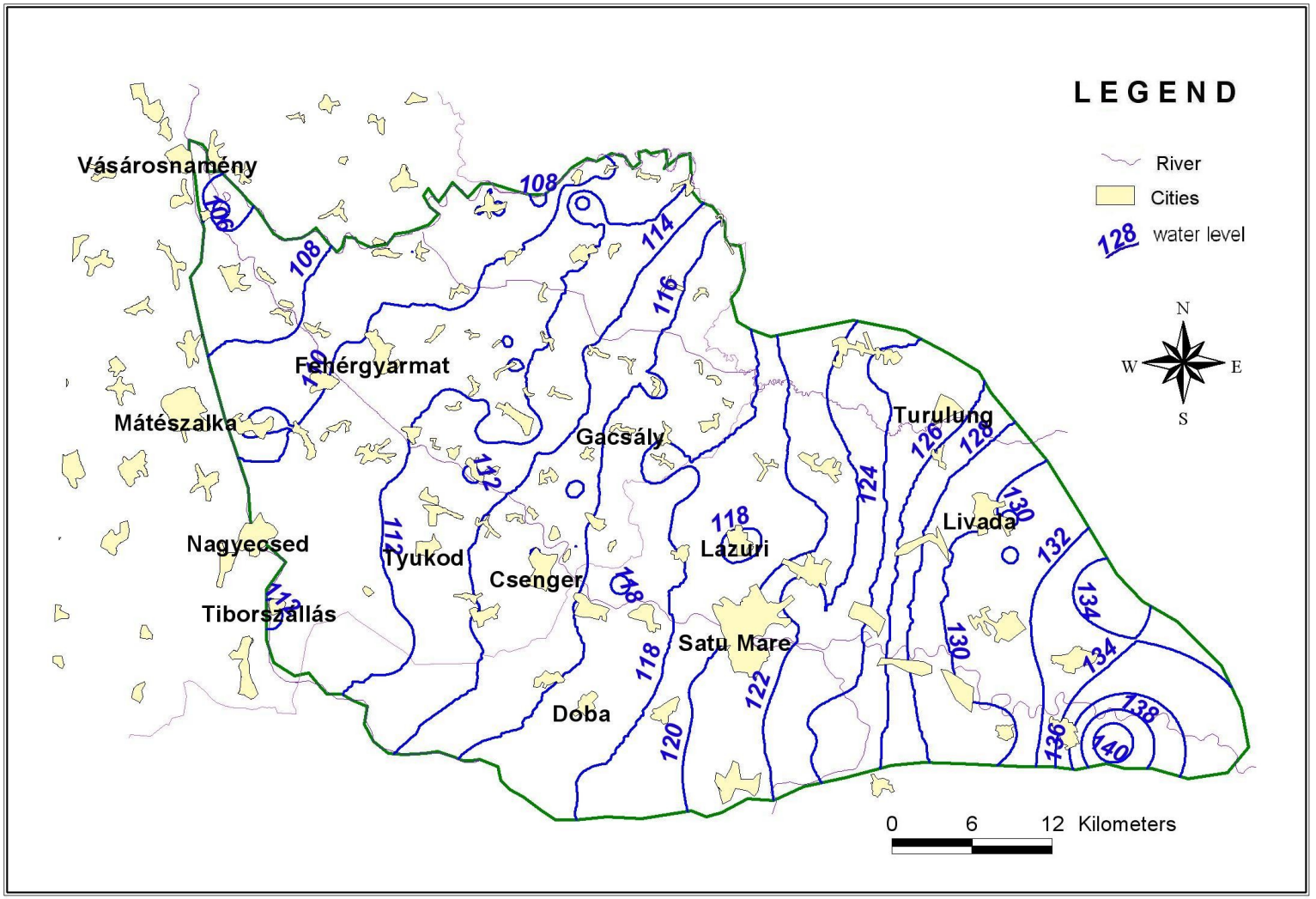
- Shallow aquifer
- Aquitard
- Deep aquifer



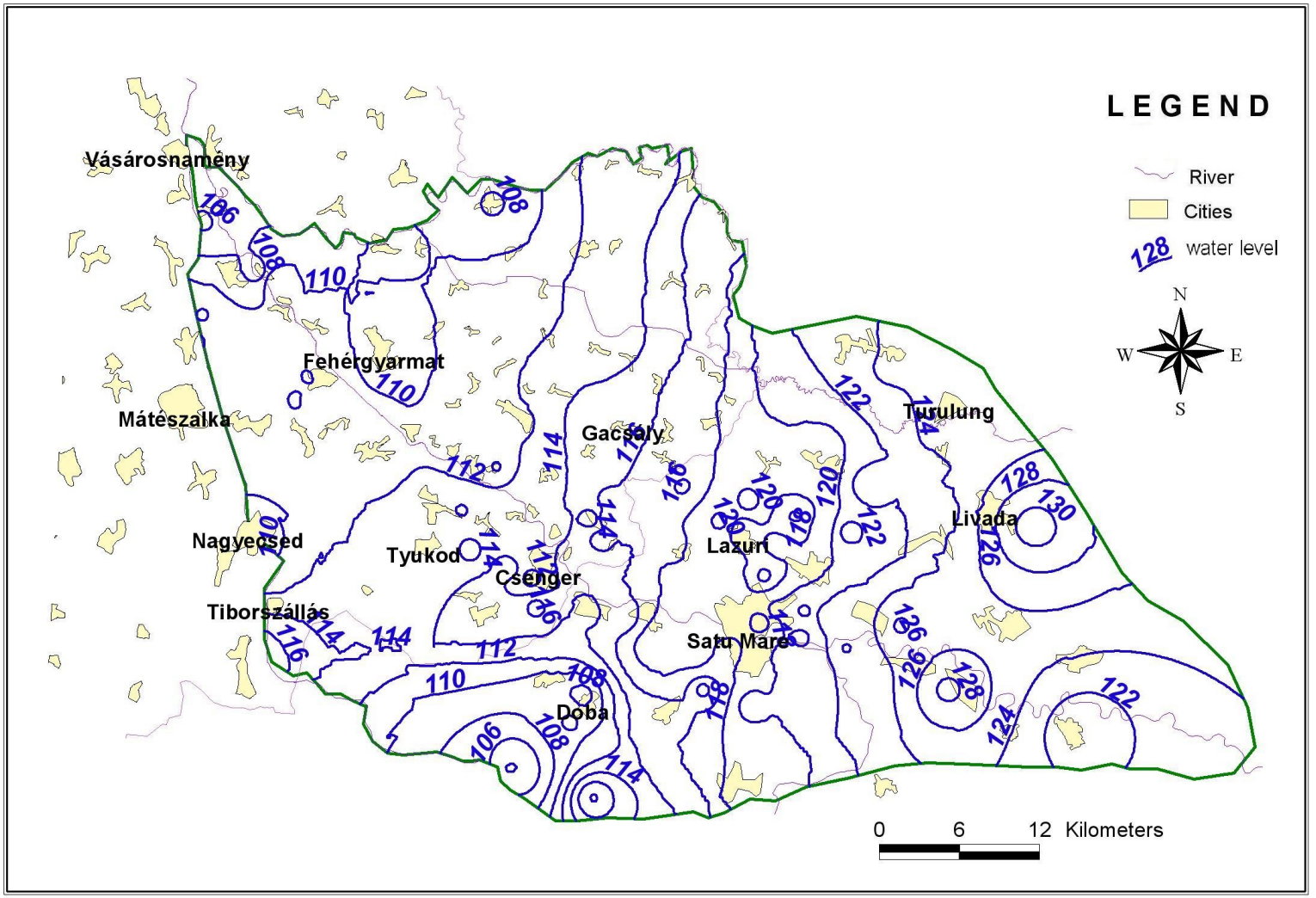
OBSERVATION WELLS



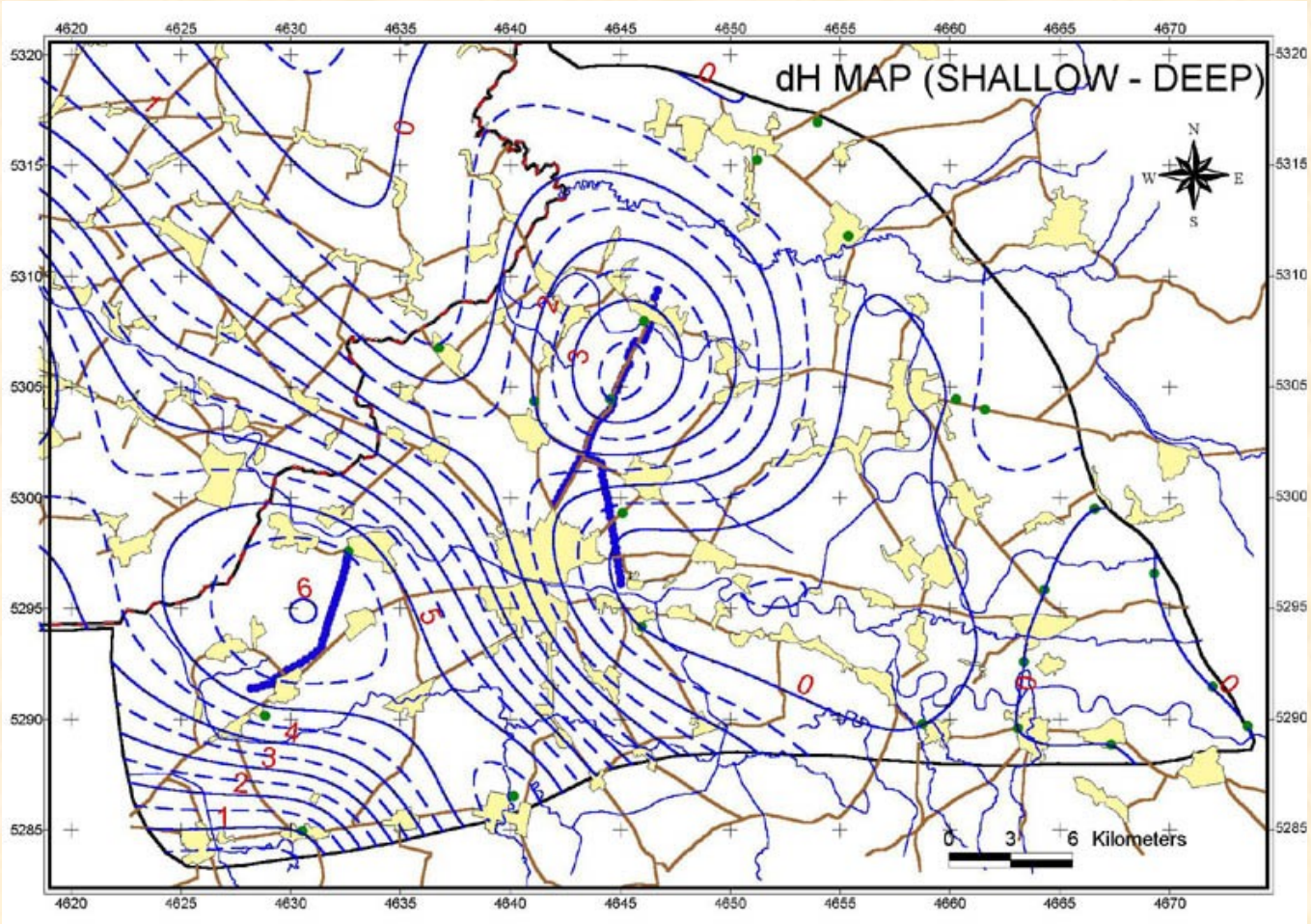
PIEZOMETRIC MAP – SHALLOW AQUIFER

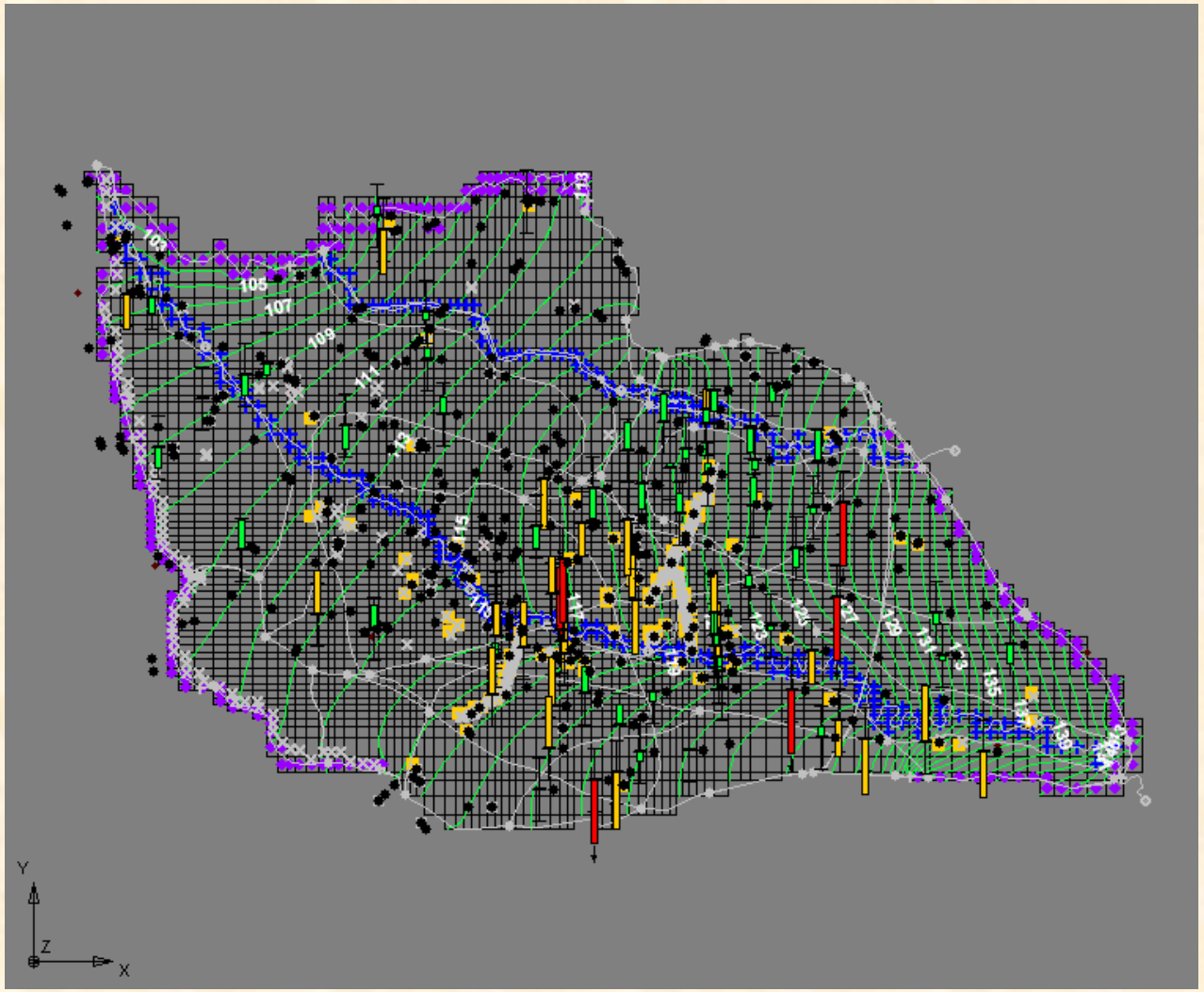


PIEZOMETRIC MAP – DEEP AQUIFER



HEAD DIFFERENCES





SIMULATIONS:

- steady state

- unsteady state:

Calibration: Jan 2001 – April 2002;
Validation: May 2002 – Dec 2002

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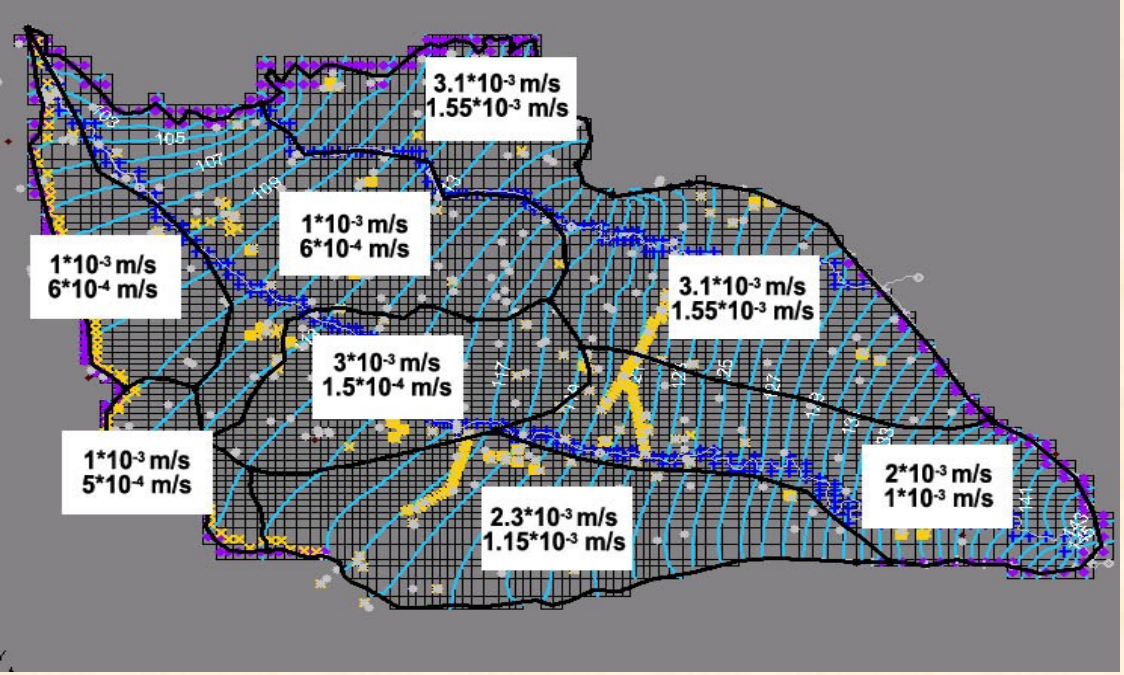

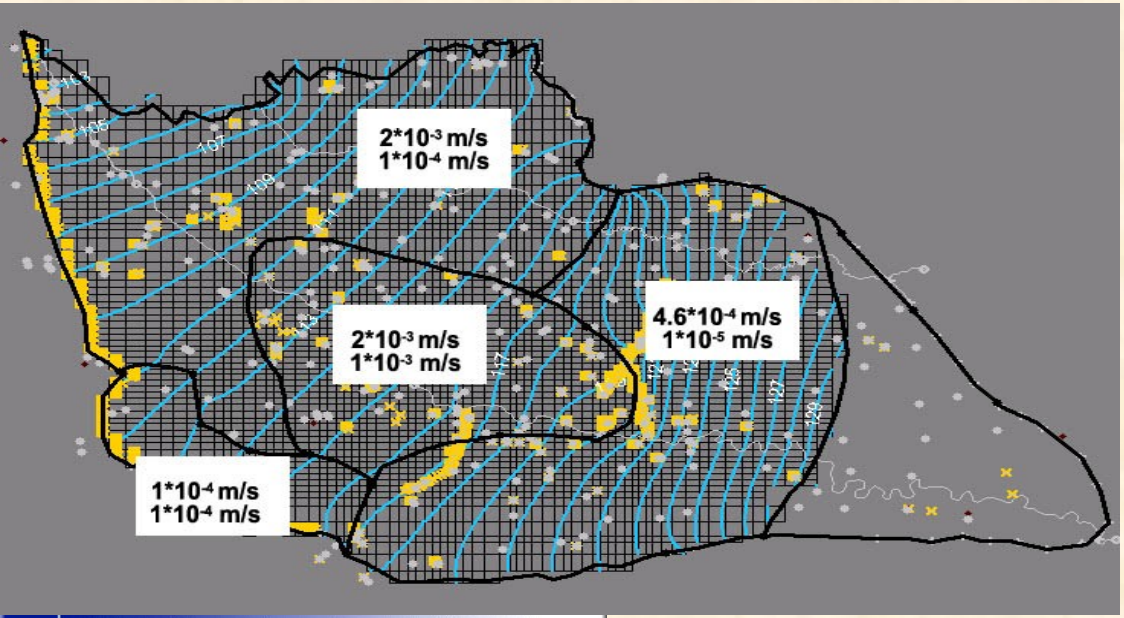

HYDRAULIC CONDUCTIVITIES

The horizontal (upper value) and vertical (lower value) hydraulic conductivity values in the shallow and deep aquifer of the calibrated regional groundwater model.

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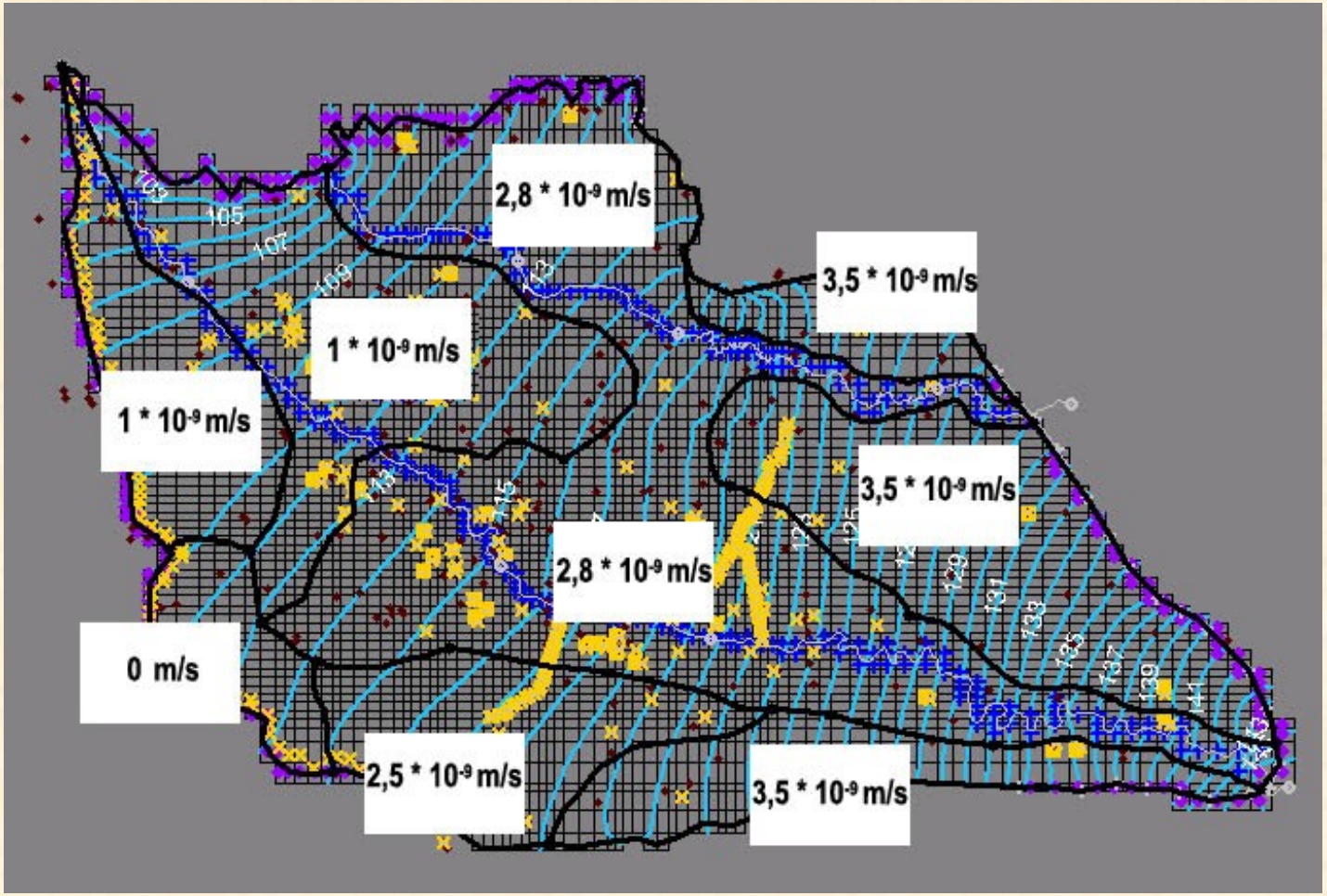
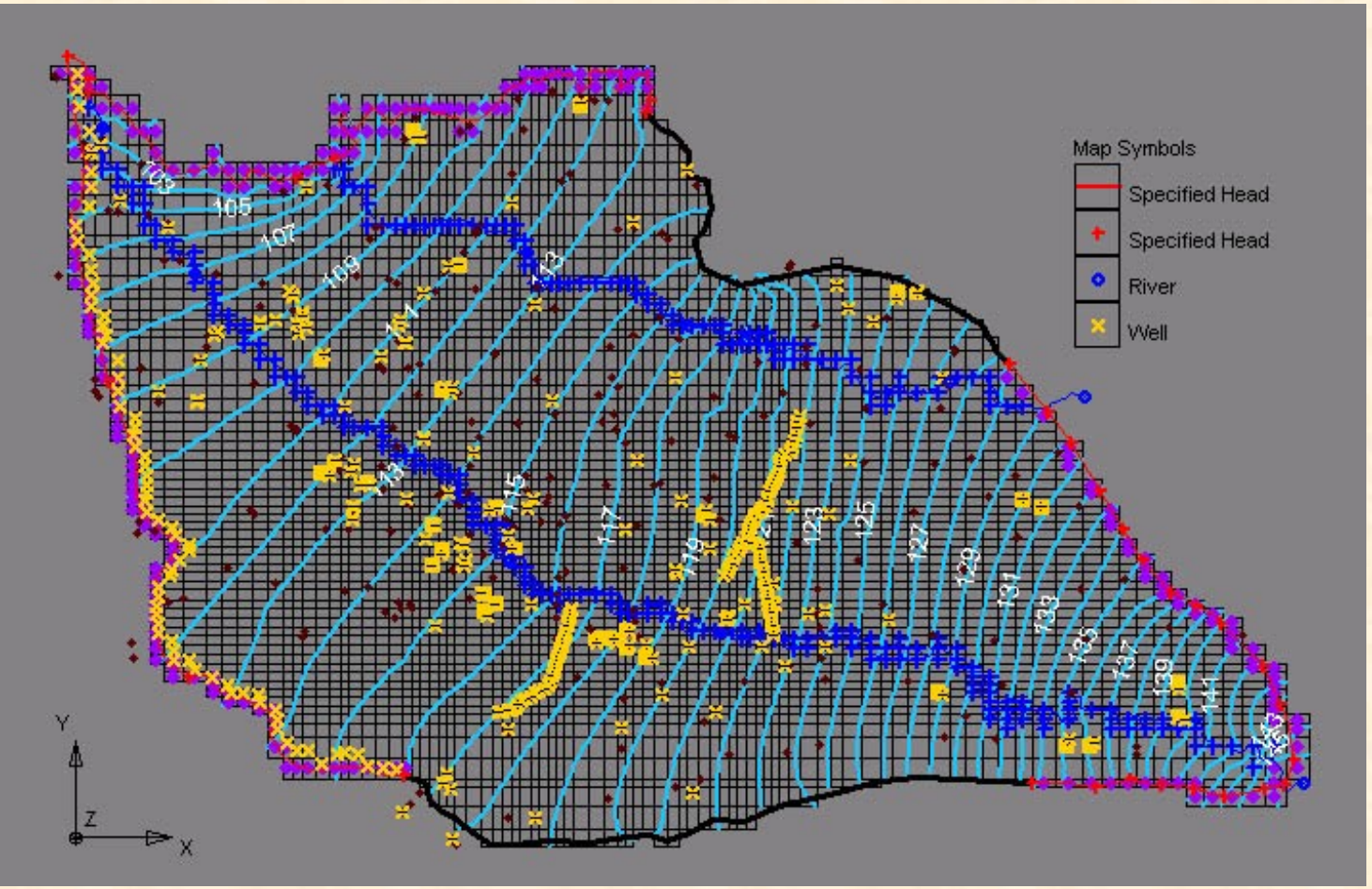
NATURAL RECHARGE

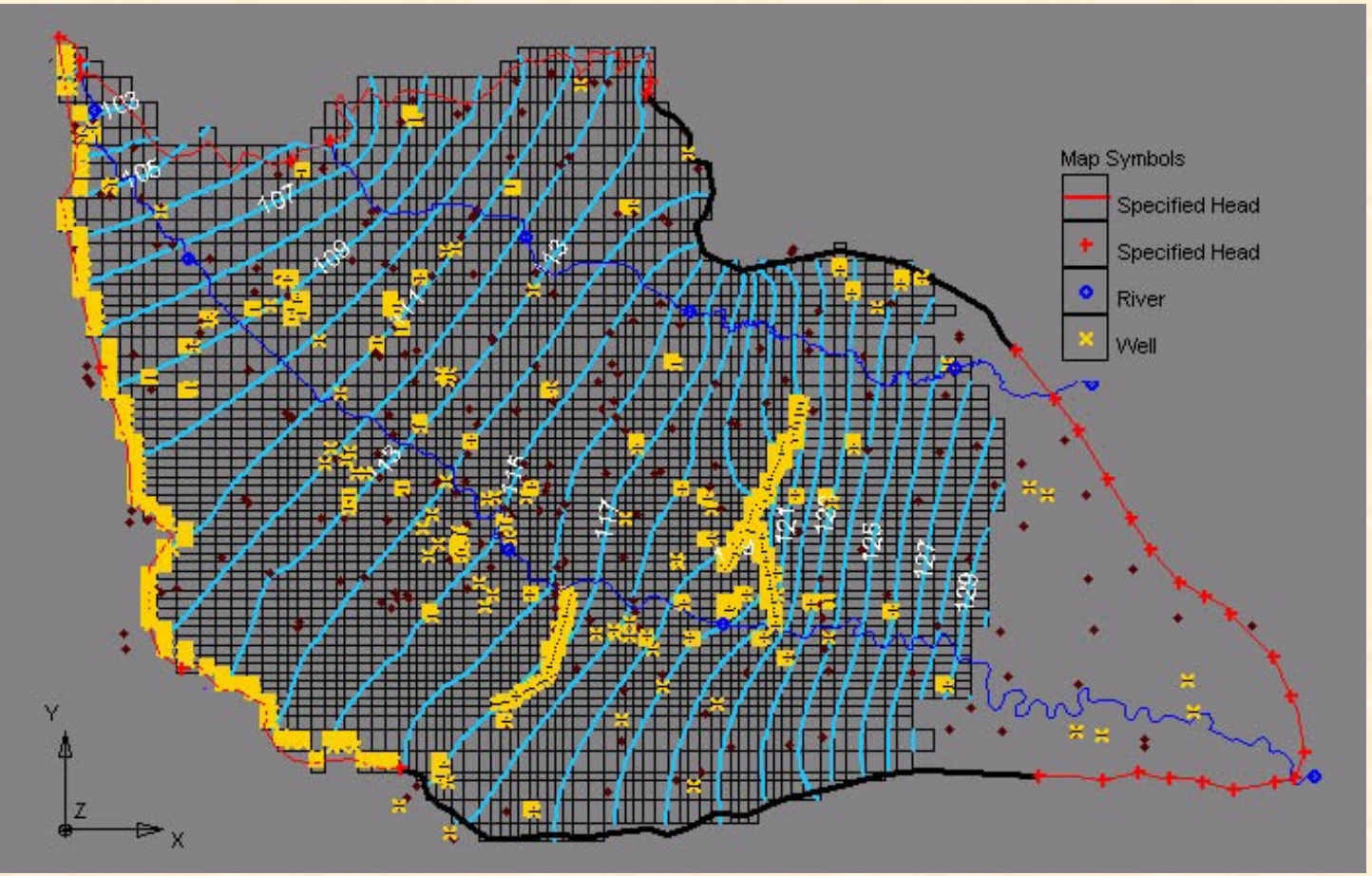


Recharge distribution for the uppermost active layer in case of the steady-state regional groundwater model



SHALLOW AQUIFER

The calibrated hydraulic head surface in case of the steady-state regional groundwater model

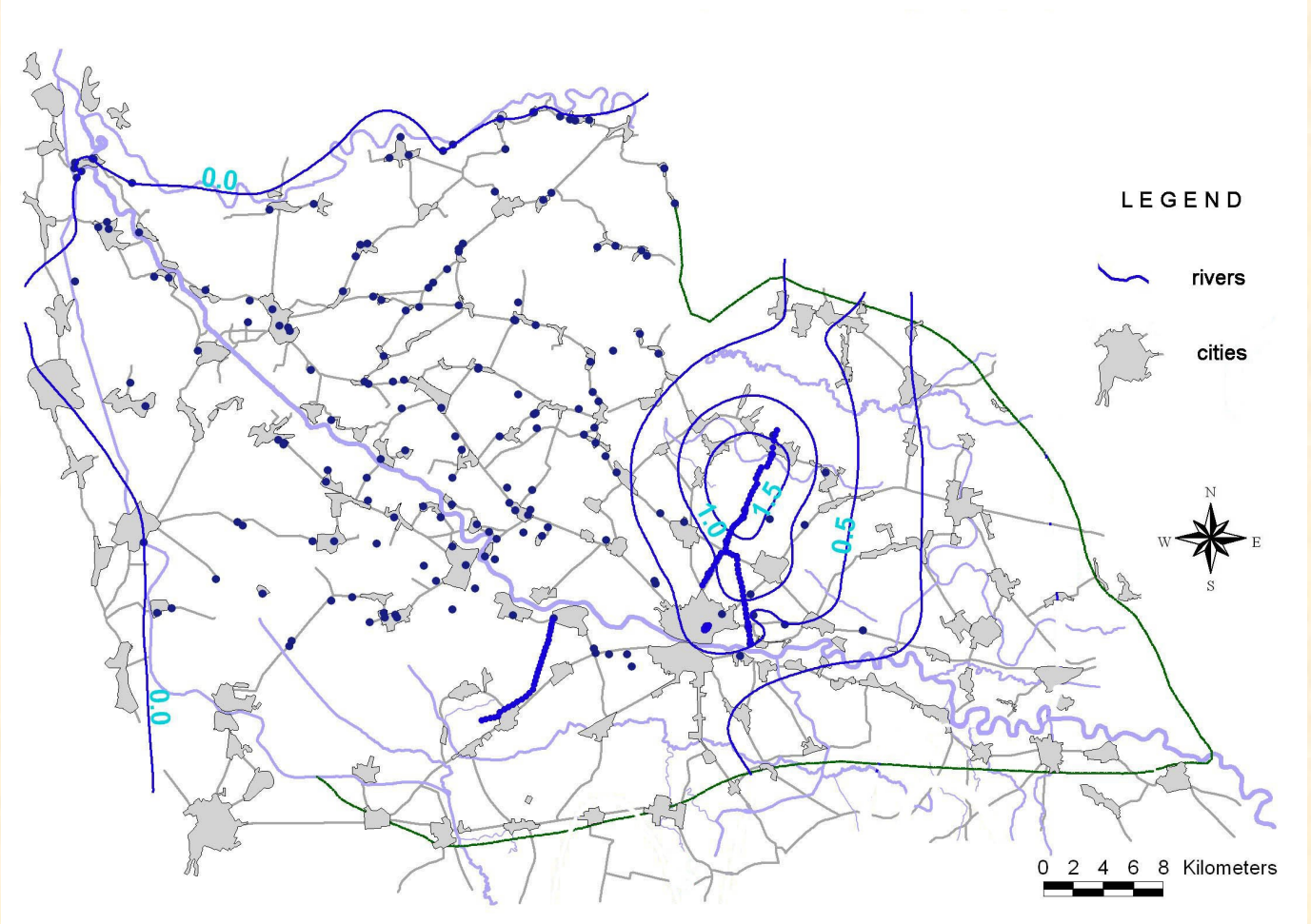


DEEP AQUIFER

The calibrated hydraulic head surface in case of the steady-state regional groundwater model

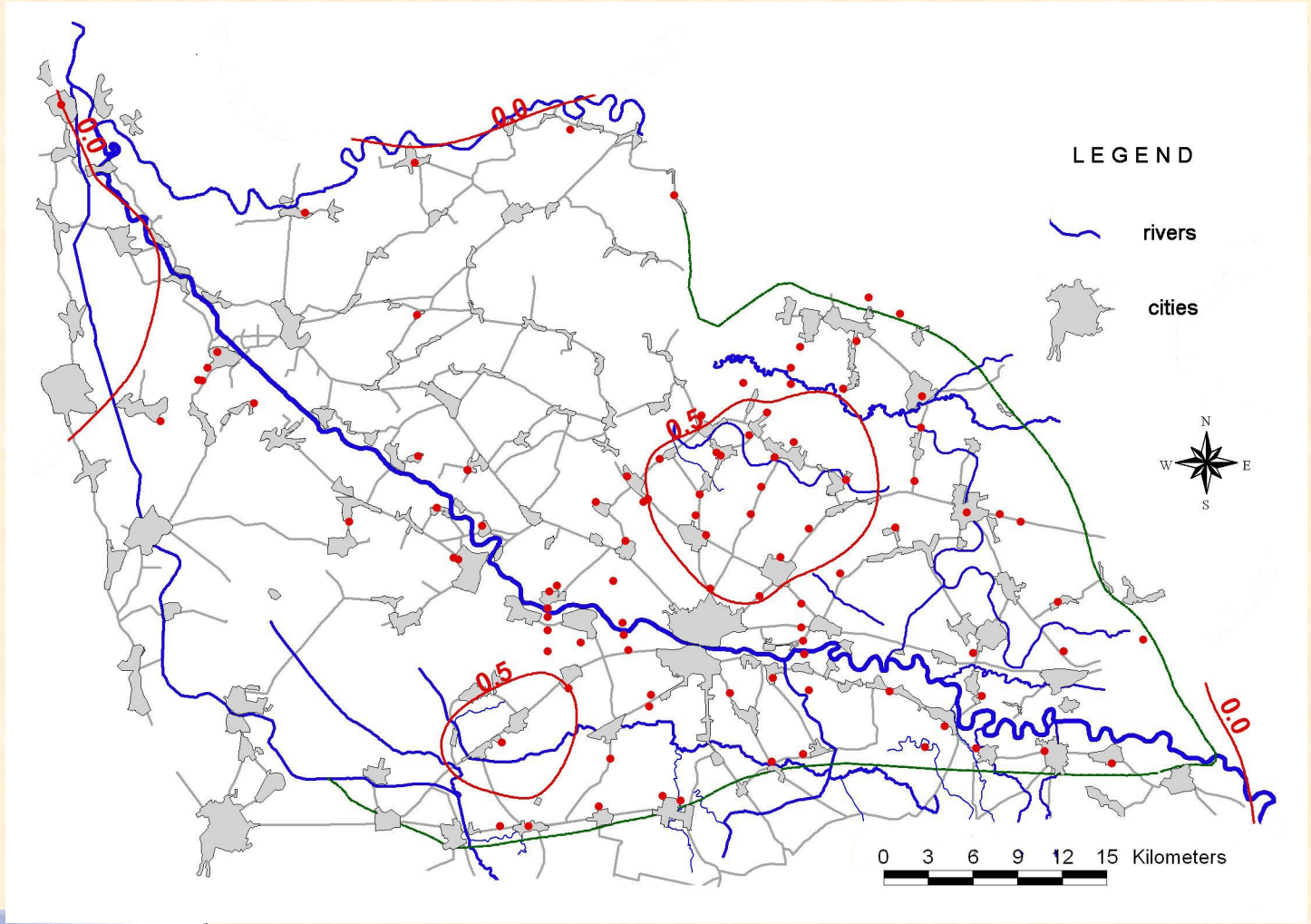
EXPLOITATION SCENARIO: ABSTRACTED DISCHARGE IS DOUBLED

Layer 3: Differences in Hydraulic Head

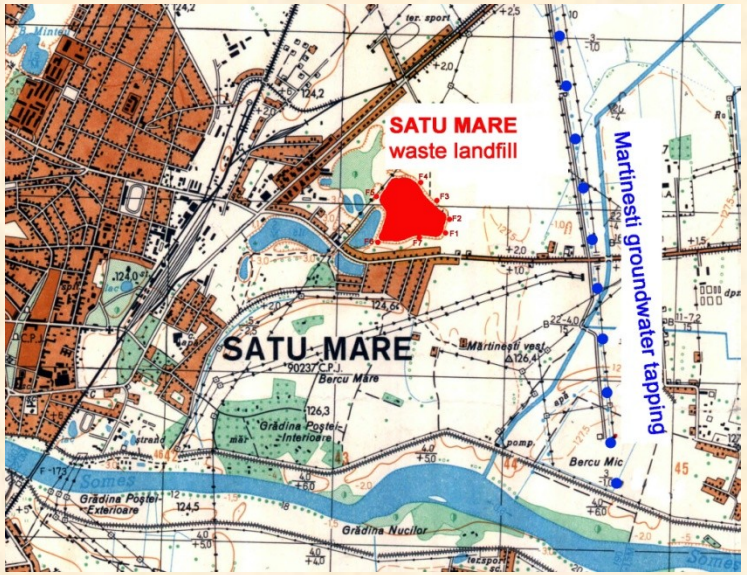


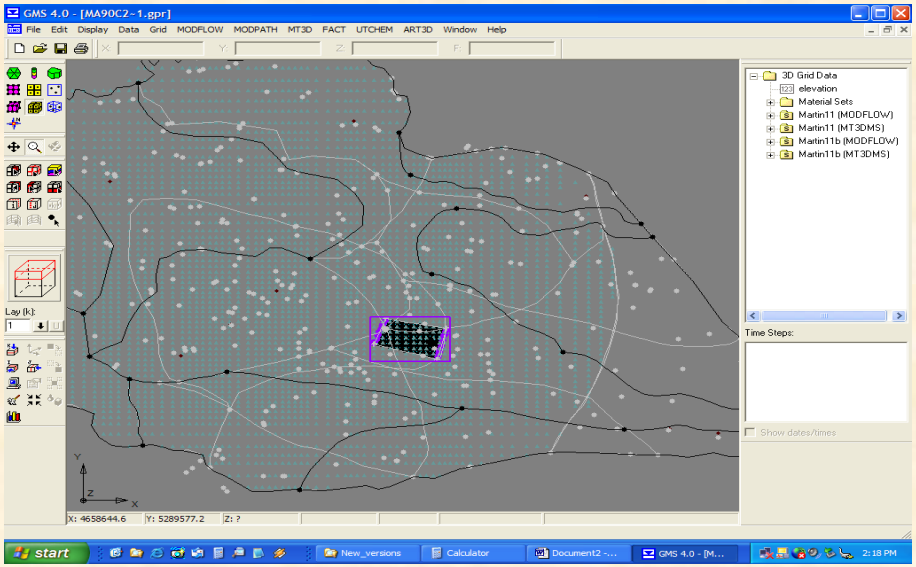
EXPLOITATION SCENARIO: ABSTRACTED DISCHARGE IS DOUBLED

Layer 1: Differences in Hydraulic Head



LOCAL TRANSPORT MODEL:
WASTE DISPOSAL OF SATU-MARE (RO)





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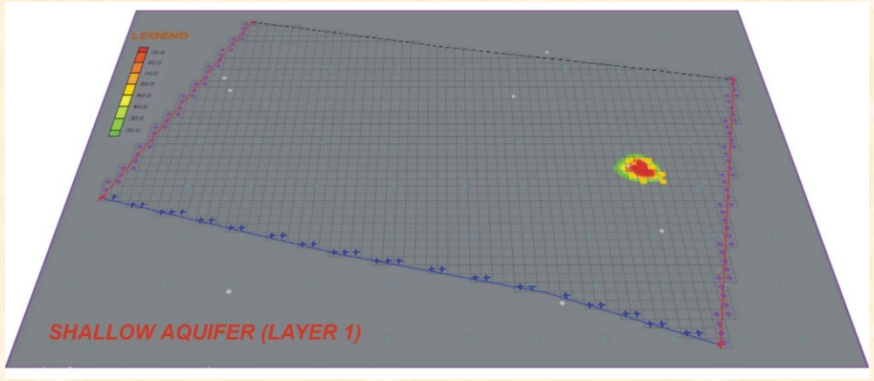
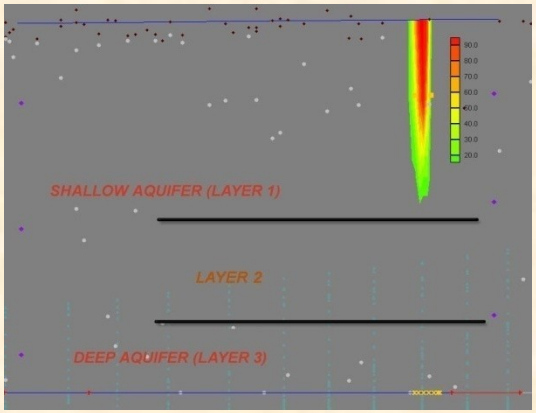
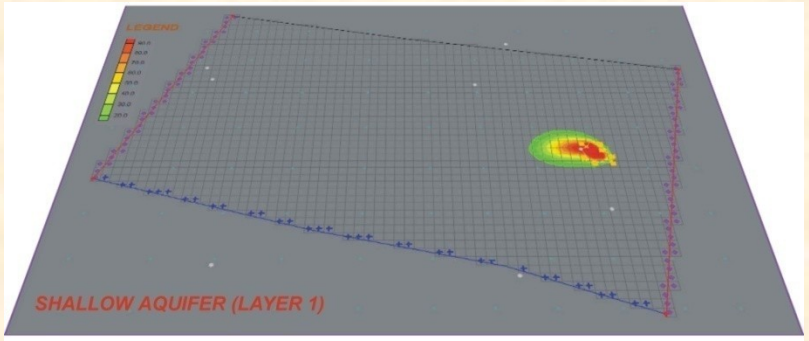
LOCAL TRANSPORT MODEL: WASTE DISPOSAL OF SATU-MARE

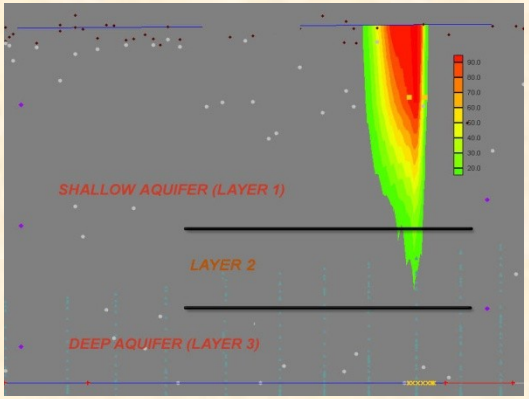
AFTER 1 YEAR





AFTER 10 YEARS





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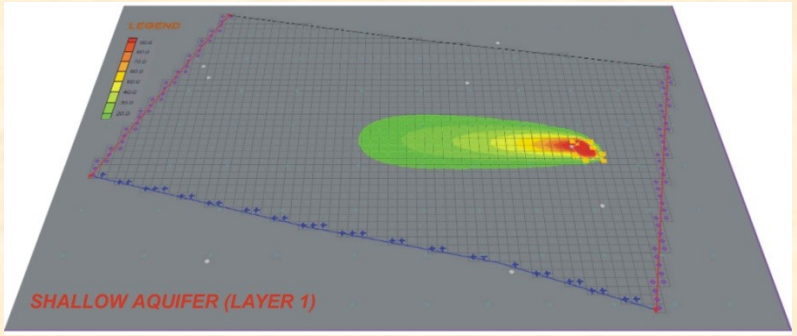
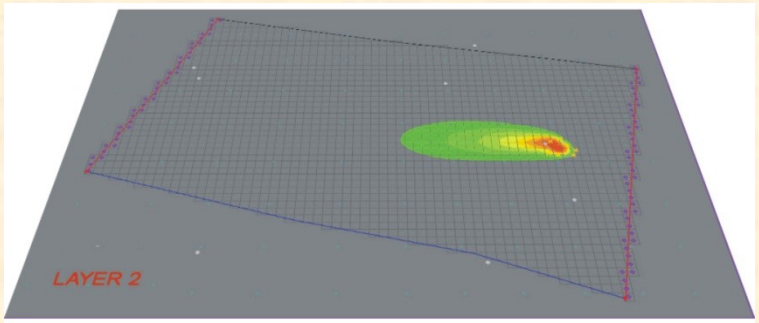
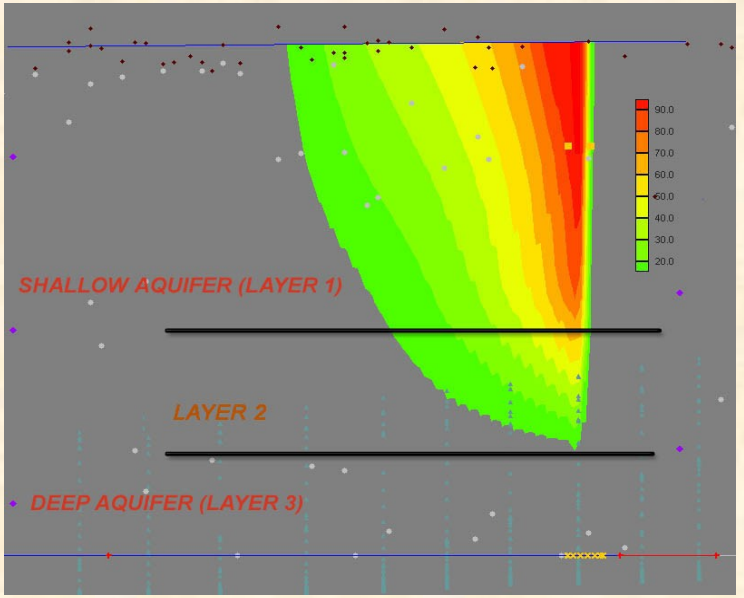
LOCAL TRANSPORT MODEL: WASTE DISPOSAL OF SATU-MARE

AFTER 50 YEARS







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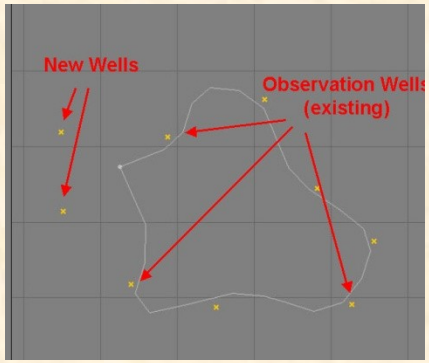
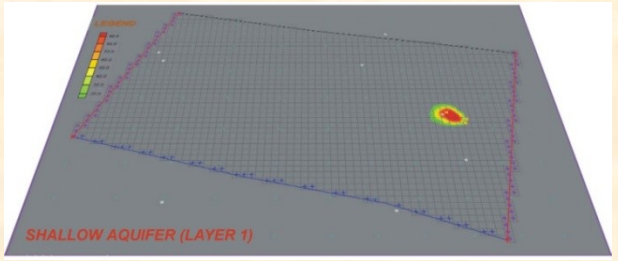
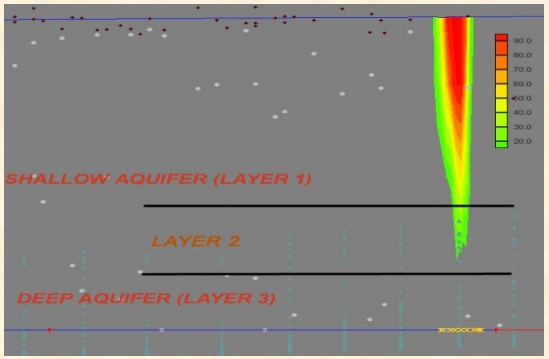
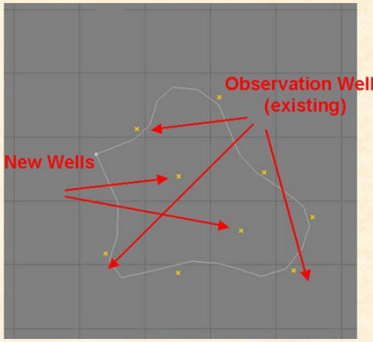
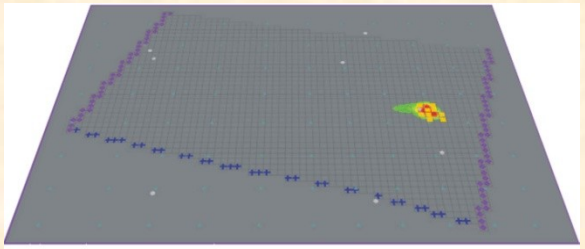
REMEDIATION MEASURES

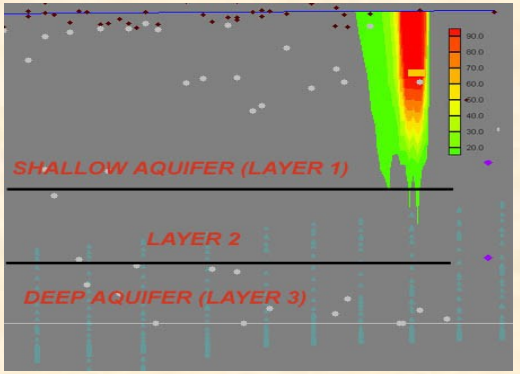












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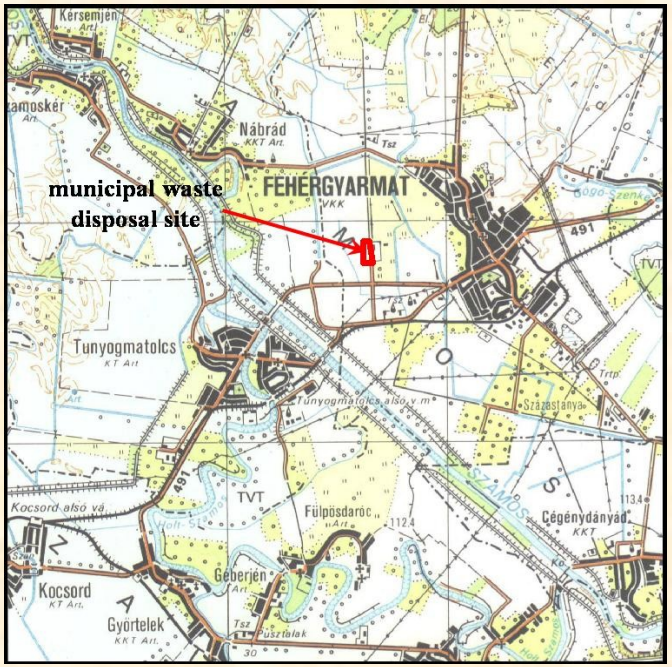
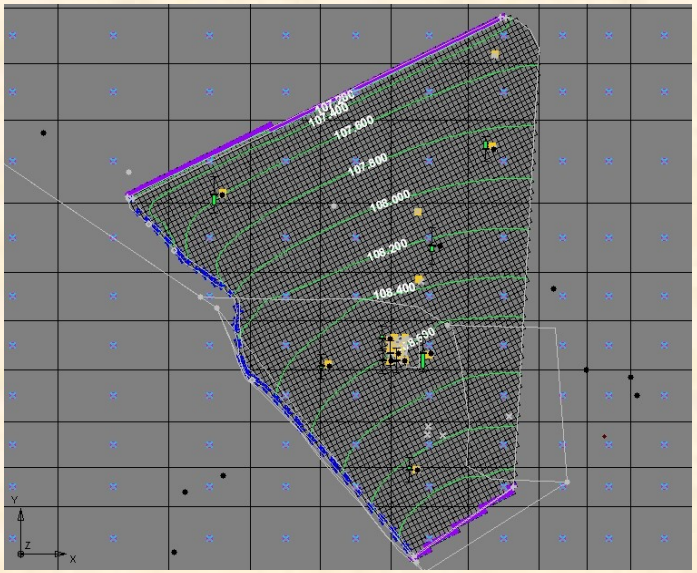
LOCAL TRANSPORT MODEL: WASTE DISPOSAL OF FEHERGYARMAT



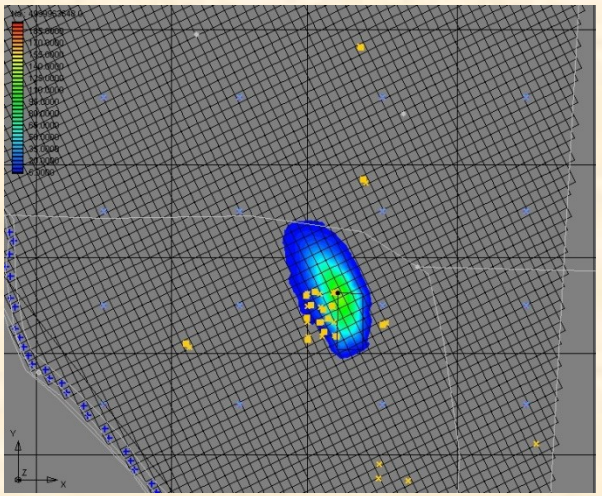
LOCAL TRANSPORT MODEL: WASTE DISPOSAL OF FEHERGYARMAT

RECALIBRATED MODEL

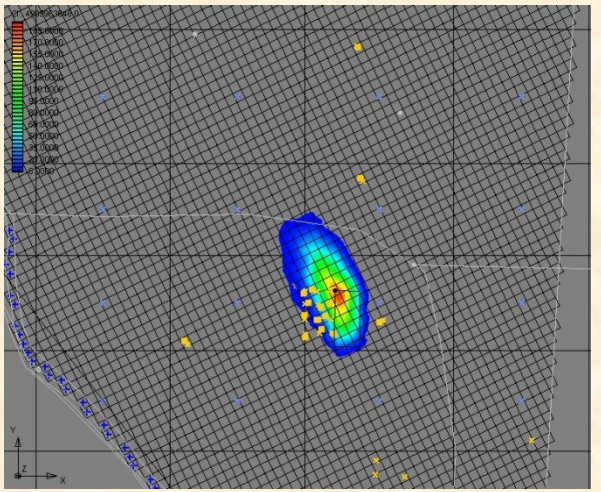


CONCENTRATION DISTRIBUTION AFTER 50 YEARS

a) Cl^-



b) Na^+



CONCLUSIONS

- The aquifer seems not to be at risk

from quantitative point of view

- The aquifer seems not to be at risk

from qualitative point of view

- Extension of the attribution of the Joint Romanian-Hungarian Hydrotechnical Commision to groundwater also