A Novel Approach in Estimating and Managing the Groundwater Resources in the Kingdom of Saudi Arabia

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Background Groundwater Resources Management

- Assessment of the entire non-renewable groundwater reserves
- Distribution of the groundwater reserves, their quality
- Assessment of reservoir properties for all aquifers
- Economic classification

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- MEWA Study of all aquifers on the Arabian Platform
- MEWA Study of Western Coastal Plain and Harrats + Wadis
Overall Goals GWRM

- Documentation
  - 2D Visualization
    - National Water Atlas
  - 3D Framework
    - Groundwater Modeling
      - Groundwater Management
        - Socio-Economic Perspective
      - 3D Visualization
  - Benefit for the Ministry
Rock Distribution
upper Wasia Group

Hydraulic Parameters
upper Wasia Group
Overall Goals: 3D Visualization

Hydrology

3D Framework
Groundwater Modeling

3D Visualization
Benefit for the Ministry Work

2D Visualization
130 maps

National Water Atlas

Documentation

5th Water Arabia Conference, Al-Khobar, Saudi Arabia 2017
Output of the Studies: Benefit for MEWA

• 3D Visualization of Reservoirs:
  • Structure Contour Maps & Digital Elevation Model (DEM)
  • Software creates georeferenced 3D surface
  • combination of 3D surfaces → 3D geological framework
  • software visualizes the reservoir
3D-Visualization of individual Surfaces
Development of structure model
Formations:
- Top Ilth
- Top Arab
- Top Jubaila/Haniita/Tuwaiq
- Top Dhurma
- Top Marrat
- Top Upper Minjur
- Top Lower Minjur
- Top Upper Jih
- Top Lower Jih
- Top Sudaar
- Top Khuff
- Base Khuff

Superelevation: 45
3D-Model of Groundwater Reservoirs
Overall Goals: 

3D Visualization

Groundwater Management 
Socio-Economic Aspects
Depth to Groundwater Table
Wasia Group

Aquifer Conditions
Wasia Group

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Groundwater Management Zones and Socio-Economic Potential

Boundary conditions

- TDS < 5000 mg/l
- Drilling Depth < 2000m
- Pumping Height < 300m
- Distance to consumer
- Property availability

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