AIRBORNE EM FRAMEWORKS FOR MANAGED AQUIFER RECHARGE ALONG THE SOUTH PLATTE RIVER

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Airborne Electromagnetic (AEM) mapping can provide critical information to a Managed Aquifer Recharge (MAR) program. However, for AEM to be useful, the electromagnetic contrast of the materials needs to be such that the imaging of the critical components of the earth materials for MAR (i.e., sand and gravel versus clay and silt) can be achieved. AEM has seen growing use within the United States (US) over the past 20 years and several of these projects have been specifically for MAR programs. The elements of the selection of an AEM system and the way in which those data are used to create a hydrogeological framework are the key steps in the usefulness of the AEM. Prior geological investigations including boreholes and/or any previous geophysical studies are critical for integration into any AEM based mapping program. With potential climate fluctuations and large runoff or flood events, opportunities exist for utilizing surplus water as recharge. However, to take advantage of these large flow events in the South Platte River, the infrastructure and locations need to be preplanned. Utilization of irrigation canals as buffers to high runoff has been used historically to mitigate infrastructure damage. By utilizing the stretches of the canals that will contribute leakage to managed aquifer storage areas, savings can be realized in infrastructure construction costs. MAR projects can be a key to the sourcing of water by municipal groundwater suppliers in times of reduced surface water flows. Three examples will be shown including two in Colorado and one in Nebraska along the South Platte River. These data were acquired with both frequency domain and time domain systems. Pre-existing geological and hydrogeological data have contributed to the construction of 3D hydrogeological frameworks to guide the delineation and management of managed aquifer recharge sites. Key features that were mappable with the AEM included bedrock configuration and formation identification, aquiclude lateral extent and thickness, near-surface permeable sands zones connections to deeper aquifer materials including sands and gravels, and identification of hydraulic connections of MAR zones to the South Platte River.