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Quantifying groundwater-surface water exchange fluxes based on steady state riparian area aquifier water balance

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The aim of this study was to perform a riparian area aquifer groundwater budget with an objective to estimate water exchange fluxes at an ungagged Modder River groundwater-surface water interaction research site. The study was based on the conceptual and quantitative knowledge on hydrogeological-landscape units, recharge to the riparian-area-aquifer, groundwater evapotranspiration, influx from terrestrial-area-aquifer and change in groundwater storage of the riparian-area-aquifer. Using heat pulse velocity method, the riparian evapotranspiration was estimated as 15.15 Mm3/month. For the southeastern side terrestrial-area-aquifer, the slope of groundwater table was estimated to approximately be 0.042 with the transmissivity of about 91.73 m2/month. The aquifer width was estimated to be 3000m; subsequently, influx from the terrestrial-area-aquifer into the riparian-area-aquifer was computed to be 235.68 Mm3. On the northwestern terrestrial-area-aquifer, the slope of groundwater table was estimated to approximately be 0.041 with the transmissivity of about 1.44 m2/month. With similar average aquifer width, influx from the terrestrial-area-aquifer into the riparian-area-aquifer was approximated to be 6.71 Mm3. Change in storage was approximated to be -18087.15 m3/month for the southeastern riparian-area-aquifer and 5166.45 m3/month for the northwestern riparian-area-aquifer. Using the soil moisture balance model, the average annual recharge computed for the riparian-area-aquifer was approximately 8.67 mm. Subsequently baseflow was estimated for the southeastern reach to be 220.54 Mm3/month and -8.45 Mm3/month for the northwestern reach using a groundwater budget model.
Keywords: Modder River, Riparian-area-aquifer, Terrestrial-area-aquifer, Groundwater budget, Baseflow

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