The search for renewable, environmentally friendly, energy sources has increased in the last decade and has driven a series of research projects across the globe. Their aim is to confirm the potential to store carbon dioxide from coal fired plants in geologic formations. As part of a second phase of the SECARB pilot test in the Black Warrior Basin of Alabama a series of tests were launched aiming to establish a small scale CO$_2$ injection in a local coalbed-methane reservoir at the Blue Creek field, Tuscaloosa county, Alabama. Soil surface monitoring work was done to establish a base-line CO$_2$ flux levels before, during, and after completing an injection. These near surface levels have not been affected by the reservoir injection into three coal zones at the Pratt, Mary Lee, and Black Creek coal groups. Results include general seasonal observations of high flux levels during warm weather and low levels through the cold seasons. Permeability calculations based on water-slug and pressure-buildup tests indicate strongest conductivity between the injection well and the northern monitoring well. The Black-Creek coal group exhibited the lowest pressure decline as indicated by the calculated permeability. Permeability was higher at the shallow coal groups, up to an order of magnitude in the Pratt group. Some issues of zone isolation and instrumental operation have risen during this project. However, the overall injectivity potential based on this analysis shows promise for depleted coalbed methane seams across the Black Warrior basin.