

Near Surface Characterization of the Baton Rouge and Scotlandville Faults, East Baton Rouge Parish, Louisiana

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ABSTRACT

The Baton Rouge and Scotlandville faults strike roughly east-west through East Baton Rouge Parish, Louisiana. These faults are believed to be growth faults that formed contemporaneously with Miocene sedimentation. However, the faults are currently active as evidenced by surface escarpments and structural damage to overlying buildings. Ground Penetrating Radar (GPR) and measurements of surface displacements are used to study the near surface character of the fault zones. GPR can image the fault zones to depths of about 40 ft. Below these depths, signal attenuation and multiples make interpretation difficult. Thus, it is not possible to determine whether the faults sole out at depth. GPR data show that the Baton Rouge and Scotlandville faults are complex structural features comprised of parallel and antithetic faults spread over more than 20 m. A diffuse fault zone has important hydrologic implications as it suggests that fault zone permeability may be anisotropic with much lower permeability perpendicular to the fault zone. Measurements of deformation within overlying buildings indicate 2 to 3 in of vertical movement has occurred along the fault zones since 1960. This is consistent with theoretical estimates of subsidence due to groundwater withdrawal, which has occurred only since the late 1940s. Displacements along individual offsets of bedding planes measured from GPR data range from 4 to 6 in. Thus, while large-scale groundwater withdrawal in East Baton Rouge Parish may be contributing to fault movement, some other mechanism, such as compaction or bending stresses, also must be driving fault movement.