IMPACTITE FACIES WITHIN THE WETUMPKA IMPACT-CRATER FILL, ALABAMA. D. T. King, Jr.[1], T. L. Neathery[2], and L. W. Petruny[3], [1]Dept. Geology, Auburn University, Auburn, AL 36849-5305 [kingdat@mail.auburn.edu], [2]Neathery and Associates, 1212-H 15th Street East, Tuscaloosa, AL 35404, [3]Wesleyan University, Dept. Earth and Environmental Sciences, Middletown, CT 06457.

Introduction: Alabama's Wetumpka impact crater is a 6.5-km diameter, Late Cretaceous structure that formed in a two-layer target (i.e., soft sediment overlying crystalline rock). At the time of cratering, estimated at 80 to 83 m.y. ago, this target was overlain by up to 100m of seawater covering a shallow continental shelf [1], [2].

Target stratigraphy: Target stratigraphy at Wetumpka includes three essentially unconsolidated Upper Cretaceous units which disconformably overlie pre-Cretaceous crystalline basement of the Appalachian piedmont. These units, in stratigraphic order, are: Tuscaloosa Group (including the Coker Formation and overlying Gordo Formation; total 60 m thick); Eutaw Formation (30 m); and Mooreville Chalk (30 m) [3]. All three stratigraphic units plus crystalline basement rocks were involved in the impact event and contributed clastic material to the crater-filling impactite unit [4].

Surficial crater geology: Surficial crater geology consists mainly of two distinctive terraines: 1) a semicircular rim (having up to 87 m relief) composed of Appalachian piedmont micacous schist and gneiss and 2) a relatively low-relief crater floor composed of contiguous tracts of highly disturbed, clastic dike-injected target strata (mostly Tuscaloosa Group, but significant tracts of Eutaw Formation and Mooreville Chalk also occur in the crater floor [2], [3]). Directly adjacent to the crater rim, slump-derived megablocks of Tuscaloosa and Eutaw strata crop out as minor crater-floor deposits [1]. Only small outcrops of impactite facies, like those cored in this study, crop out on the crater floor, and these impactite outcrops are located at Wetumpka's central rebound peak [3].

Drilling: During July-August 1998, two core holes were drilled on the eastern flank of Wetumpka's central rebound peak. Core holes were sited approximately 200 m apart and at approximately the same elevation, and both reached depths of approximately 190 m. Both core holes penetrated steeply dipping Upper Cretaceous target sediments (specifically, Tuscaloosa Group) to a depth of approximately 64 m. Below that level, both core holes penetrated intercalated impactite deposits, which encompass five main facies.

Impactite facies: Wetumpka impactite facies types include: (1) lignitic, clast-bearing, clay-rich sands; (2) sandy, matrix-supported, monomict crystalline clast diamictites; (3) monomict, clast-supported, impact breccias; (4) cataclastic, matrix-supported diamictites; and (5) target-rock blocks. Impactite sands have a green clay matrix, are rich in very fine lignite, and contain minor crystalline and sedimentary clasts, including rounded quartz pebbles from the Tuscaloosa Group. Monomict diamictites and breccias contain only crystalline (i.e., basement-derived) clasts, which are generally less than 0.2 m across. Cataclastic diamictites display crystalline clasts, which are generally less than 0.1 m across, within a matrix of finely comminuted crystalline and sedimentary rock. Target-rock blocks are internally deformed megaclasts (<1 m) of clayey sand, schist or gneiss.

Origin of facies: All impactite facies are interpreted to have formed from catastrophic disintegration of both sedimentary and crystalline target layers. Impactite sands are preliminarily interpreted to represent impact fluidization of the upper sedimentary target layer. Monomict diamictites and breccias represent, respectively, matrix-rich and matrix-poor end-members in a continuum of amalgamation between basement-derived clasts and fluidized impactite sands. Cataclastic diamictites, which superficially resemble suevites but apparently lack significant melted components, are interpreted as proximal ejecta fallout deposits. Sedimentary target-rock blocks are megaclasts that apparently escaped impact-induced fluidization, whereas crystalline target-rock blocks were brought up from depth at the crater's rebound peak.

References: [1] King D. T., Jr. (1997) *Ala. Geol. Soc. Guidebk., 34c*, 25-56. [2] King D. T., Jr., and Neathery T. L. (1998) *Amer. Assoc. Petrol. Geol. Ann. Conv. Abst., 7*, 358a-f. [3] Neathery T. L. et al. (1976) *Geol. Soc. Amer. Bull., 87*, 567-573. [4] King D. T., Jr. et al. (1998) *Geol. Soc. Amer. Ann. Mtg. Abst., 30(7)*, Add. 4.

Acknowledgments: Drilling at Wetumpka was an in-kind gift to Auburn University by Vulcan Materials Company of Birmingham, Alabama.