SEDIMENTOLOGY OF IMPACTOCLASTIC BRECCIAS, CRETACEOUS-TERTIARY BOUNDARY, BELIZE. D. T. King, Jr.[1] and L. W. Petruny[2], [1]Dept. Geology, Auburn University, Auburn, AL 36849 (kingdat@auburn.edu), [2]AstraTerra Research, Auburn, AL 36831-3323 (lpetruny@att.net).

Introduction: At Albion Island in northern Belize, Cretaceous-Tertiary boundary deposits, also known as the Albion formation [1], rest upon karsted and fractured Maastrichtian dolostones. These deposits consist of a basal impactoclastic clay layer (~ 1 to 2-m thick) and an upper carbonate-rich, coarse impactoclastic breccia layer (up to 15-m thick; Fiugre 1). The focus of this paper is the upper layer, the Albion impactoclastic breccia [2].

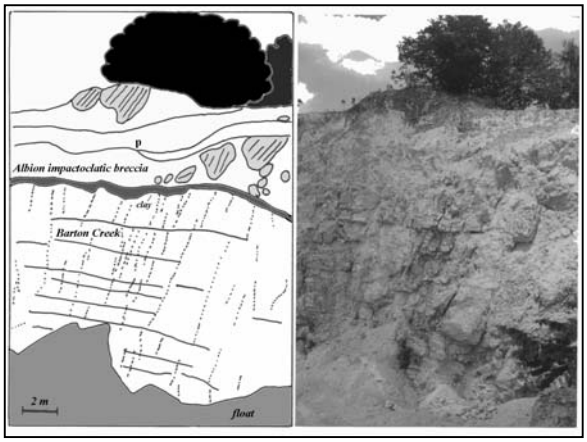

Figure 1. Fractured Barton Creek dolostones overlain by the Albion impactoclastic clay and impactoclastic breccia units, north-end high wall, Albion Quarry. Sketch shows contact between four sedimentation units within the breccia. Large carbonate boulders ('boulders with bedding') are shown shaded. **p** = pinch out of breccia sedimentation unit. Scale (2 m) is indicated.

Sedimentary structures: The Albion impactoclastic breccia shows several important sedimentary structures, including development of discrete sedimentation units (2 to 7-m thick), which are strata that have been enhanced by horizontal shearing, and other sedimentary structures such as normal and reverse size grading, clast imbrication, flow lamination, and isolated and linked aggregates of clasts (i.e., clast clustering; Figures 2 and 3) [3].

Clastic textures: Most carbonate clasts within the coarse impactoclastic unit show a broad range of angularities and shapes, with the most common being subangular and compact-bladed to compact-elongated, respectively. Surface texture analysis of carbonate clasts shows several types of surface markings, which display a gross sequential order (i.e., facets, polish, striations, cryptographic markings, bruises and pits, and chips).

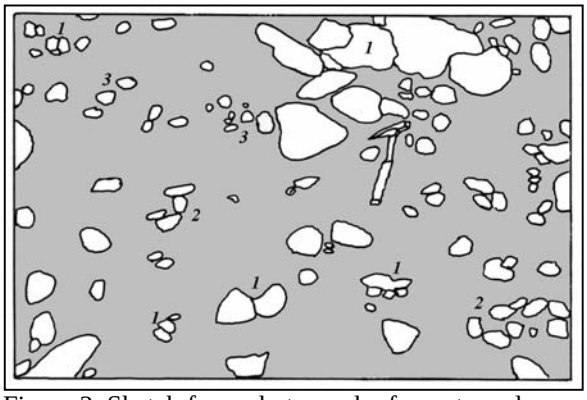

Figure 2. Sketch from photograph of a rectangular area approximately 2.1 m x 1.4 m, showing outline of all clasts larger than 5-cm diameter. Long axis of figure is parallel to bedding and area is located entirely within one sedimentation unit. Gross clast size distribution shows crude reverse grading (general coarsening upward) and various other features pertaining to clast aggregates. Aggregate types: ***1*** = clasts with jigsaw cracks; ***2*** = linked aggregates of clasts; ***3*** = isolated aggregates of clasts. See text for discussion and reference to these terms. Hammer is 31.5 cm long.

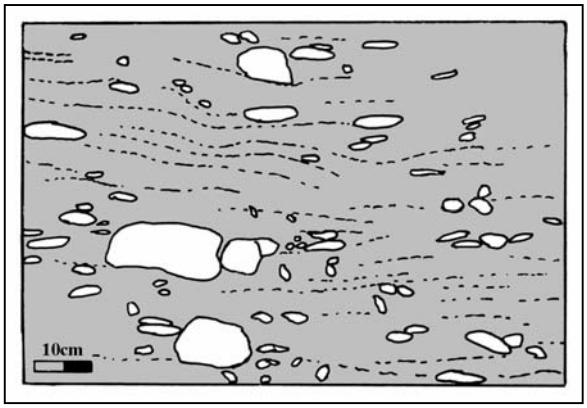

Figure 3. Sketch from photograph of a rectangular area, approximately 90 cm x 60 cm, showing outline of all clasts larger than 2.5-cm diameter. Long axis of figure is parallel to stratification and sketch area is located entirely within one sedimentation unit. Top of rectangle is approximately at the upper boundary of this sedimentation unit. Clast distribution shows preferential alignment of platy and bladed clasts. Dashed

lines indicate weathering along parting lineation in the matrix. Scale (10 cm) is indicated.

Grain size frequency: *In-situ*, apparent-diameter measurements of the carbonate clasts, which ranged in size from 10 to 300-mm (or -3.3 to -8.2 ϕ), resulted in cumulative grain-size (ϕ) frequency curves with similar shapes through the interval –3.3 ϕ and –6.25 ϕ (i.e., 10 to 76-mm; Figure 4). Matrix, the total area comprised of less-than-10 mm (< -3.3 ϕ) particles, ranged from approximately 71 to 82 percent. Modified moment measures of these curves show these breccias are "extremely poorly sorted." The matrix content increases upward through the entire coarse impactoclastic layer, but is slightly lower near its top [3].

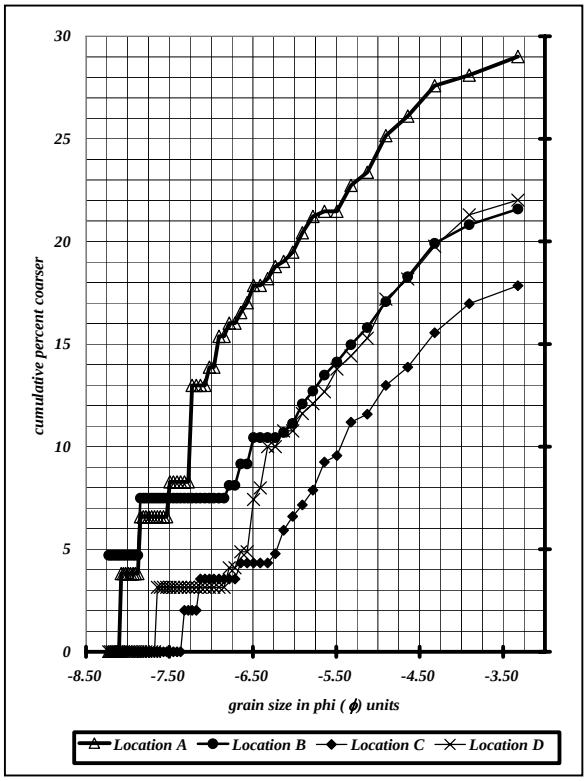

Figure 4. Cumulative grain-size (ϕ) frequency curves for grid locations A, B, C, and D, at Albion Quarry. The approximate location above base of the impactoclastic breccia for each grid location is as follows: A (1.5-m); B (3.0-m); C (8.0-m); and D (11.5.0-m). The number of clasts measured in our analyses at each grid location is as follows: A (413); B (421); C (323); and D (319). Clasts smaller than -2.32 ϕ (5-mm) were not measured in the field and are considered as part of the matrix. Rare boulders larger than -8.23 ϕ (300-mm) were not part of our analyses.

Interpretation: The Albion impactoclastic breccia has sedimentary structures and sedimentologic characteristics suggesting its mode of emplacement during the impact aftermath was similar to that of a very large volcanic debris avalanche [*cf.* 4]. Sedimentation units show evidence of early turbulent flow and a more conspicuous later stage of laminar flow with shearing accompanying emplacement of most breccia sedimentation units. Clasts within these debris flows are not locally derived for the most part. We speculate that each sedimentation unit at Albion may represent a separate emplacement event during the process of ejecta-curtain collapse, perhaps owing to variations in atmospheric interaction with the debris [3, 5].

References: [1] Ocampo A. C. et al. (1996) *Geol. Soc. Amer. Spec. Paper 307*, 75-88. [2] Terminology of Stöffler D. and Grieve R. A. F. (1994) *LPS XXV*, 1347–1348. [3] King, Jr. D. T. and Petruny L. W. (2003) Springer Impact Series (*Impact Markers*), 203-228. [4] Glicken, H. (1996) United States Geological Survey Open File Report 96-977. [5] Pope, K.O. et al. (1999) *Earth Planet. Sci. Let., 170,* 351-364.