Introduction: During the Chicxulub impact (or "KT" boundary) event of 65 m. y. ago, direct ejecta covered part of the Yucatán peninsula, including Belize [1-3]. In northern Belize, these ejecta consisted of vapor plume deposits with accretionary lapilli, glass fragments, and debris-flow deposits that accumulated as the ejecta curtain collapsed. These ejecta deposits occur today within fault-bounded graben fills and crop out at several places in northern Belize (Figs. 1 and 2).

Albion Island: At Albion Quarry (on Albion Island), Belize (~ 400 km from impact), about 15 m of direct ejecta crops out at a local quarry [1-4]. The stratigraphy of this deposit, from base upward, is ~1 meter of clay (resting on the eroded surface of the Maastrichtian (Barton Creek) dolostone) that has a minor component of carbonate spherules (formerly accretionary lapilli?), which is followed upward by ~14 m or more of impactoclastic carbonate breccia (carbonate clasts with a wide range of sizes within a fine clay, pulverized carbonate, and glass-fragment matrix; Fig. 3). The glass (vesicular, irregular fragments) in the matrix is now largely altered to green clay.

Progresso Lagoon: A similar pebble deposit, over 5 m thick, occurs at a site that is east of Albion Quarry and north of Armenia [5]. This site, called Progresso Lagoon, is an important location for preservation of the ballistically emplaced pebbles because their preservation at this site is much better than others in the area (especially regarding their surface textures, which included polish, pits, and striations; Fig. 4).

Armenia: At Armenia, Belize (~450 km from impact), ~10 m of direct ejecta and related KT boundary deposits crop out on a main highway [3]. These deposits include a boulder-bearing paleosol (atop the local Maastrichtian dolostone), a vapor plume deposit with accretionary lapilli and irregular, vesicular glass fragments, and a polished pebble bed [3]. It is likely that the vapor plume deposit at Armenia is the lateral equivalent of the impact breccia layer at Albion Quarry. The polished pebble bed is likely a secondary (reworked) deposit of ballistically emplaced pebbles that washed from the land surface into the low-lying area of the small graben basin at Armenia [5].

Correlation of sections: The datum for correlation is the top of the Maastrichtian dolostone section (top of the Barton Creek formation; Fig. 2). The brown clay bed at Albion Island contains small dolomitic lapilli, but the brown clay bed at Progresso Lagoon does not have these lapilli. These clay beds are provisionally correlated because there is a similar impactoclastic breccia layer above this basal clay bed at both Albion Island and Progresso Lagoon. Above the impactoclastic carbonate breccia at both Progresso Lagoon and Armenia is deposit of impactoclastic pebble conglomerate. At Armenia, the impactoclastic carbonate breccia is missing between the lapilli-bearing basal layer and the impactoclastic pebble conglomerate. These physical relationships represent facies changes within the distal part of the ejecta deposits that formed near sea level on the western side of the Yucatán peninsula, north of the Maya Mountains.


Figure 1. Location of KT boundary sections in northern Belize. AI = Albion Island; PL = Progresso Lagoon; Ar = Armenia. Blue dashed lines are faults [6].
Figure 2. Correlation of KT boundary sections, northern Belize. Numbered points: (1) impactoclastic breccia at surface; and, a few km away, Paleogene limestone beds occur above this unit; (2) a horst occurs between these sections (see faults in Fig. 1); correlation line between these sections suggests that the brown clay may be the same or a similar layer; (3) the impactoclastic pebble conglomerate is interpreted as fluvial re-deposition of Chicxulub primary ejecta, which rests on an erosional surface above the direct ejecta; these pebble deposits are restricted to the graben areas where Chicxulub direct ejecta are preserved as well; (5) a horst occurs between these section; same notes as (2); (6) these deposits likely abut against this fault or are otherwise confined to this graben; (7) the impactoclastic carbonate breccia may have occurred at this level, and was eroded away subsequently, or this layer may be the equivalent of the impactoclastic carbonate breccia – but with lapilli (carbonate spherule) components; (8) this is a glass-fragment-bearing deposit that contains also lapilli and carbonate clasts up to 10 cm in diameter; this deposit is in the same stratigraphic position as the brown clay bed at Albion Island and Progresso Lagoon, but is compositionally significantly different.

Figure 3. Overview of uppermost Maastrichtian and KT boundary interval, Albion Island, Corozal District, Belize.

Figure 4. Overview of section PL-1 in Progresso Lagoon composite section, Corozal District, Belize.