

A SHALLOW EXCAVATION TRANSECT ACROSS THE WETUMPKA IMPACT STRUCTURE, ALABAMA – THE EL PASO GAS COMPANY PIPELINE CUT. L. W. Petruny¹, D. T. King, Jr.¹, and P. Tabares Rodenas¹ ¹Geology Office, Auburn University, Auburn, Alabama 36849, USA.

Introduction: The Wetumpka impact structure (near the town of Wetumpka, Alabama) is a Late Cretaceous impact feature having a semi-circular crystalline rim that is ~ 5 km in diameter [1]. This well-exposed, marine-target impact structure developed in both poorly consolidated, water-saturated sediments and underlying crystalline basement. Previous studies have described a semi-circular, crystalline rim (mainly weathered schists and gneisses), an interior structure-filling unit (mainly disturbed sedimentary target materials and resurge breccias and chalky marl), and an exterior disturbed area (mainly faulted sedimentary target materials) [1, 2, 3]. The latter was developed within the sedimentary target sequence outside the southwestern part of the central, basement crater.

Background on pipeline cut: It is unusual to have an excavation associated with impact structure that extends entirely across the structure. In this instance, during 2011, El Paso Gas Company of Elmore, Alabama, re-opened an existing right-of-way for their natural gas pipelines in order to bury a new section of pipeline from the Coosa River floodplain on the west to the Jug Factory Road valve station on the east side of Wetumpka impact structure. The 2011 gas pipeline cut was generally ~ 3-4 m deep and ~ 4-5 m wide. During August-September 2011, we were allowed access to the pipeline cut under supervision of the pipeline's manager for the purposes of collecting samples and photographically documenting the excavated materials. This pipeline cut allows us to better understand the surface geology of the impact structure because much of that geology is covered with dense vegetation or commercial and residential development.

Gas pipeline cut, segment 1: This section spans the area from just west of waypoint 327 on the west to waypoint 322 on the east (Figure 1). Here, the pipeline cut revealed mainly clayey red sand, which is similar to the Tuscaloosa Group's Coker Formation (Kc). The lack of sedimentary structures such as cross-bedding and clearly defined vertical sequences of sand and clay (that are common in the intact fluvial deposits of Coker elsewhere) suggest to us that this material is impact-affected Coker that has slumped or flowed into place near the southern terminus of the western rim.

Gas pipeline cut, segment 2: This section spans the area from waypoint 323 on the west to near waypoint 321 on the east (Figure 1). Here, the pipeline cut revealed massive, non-bedded chalky marl deposits that were dark grey-brown and heavily affected by

fresh-water alteration (i.e., there were numerous masses of white caliche up to several cm across embedded in most parts of the deposit). This chalky marl deposit is part of the same unit drilled at well #09-03 (well marked B in Figure 1), which has been shown to be a muddy marine resurge unit [4].

Gas pipeline cut, segment 3: This section spans the area surrounding waypoint 321 on the west to waypoint 320 on the east (Figure 1). Here, the pipeline cut crosses the central breccia unit [5]. At waypoint 321, a steep hill is cut by the pipeline and a mass of intact schist ~ 15 m thick was exposed by excavation equipment. Adjacent to this mass on the east side (between waypoint 321 and Buck Ridge Road), ~ 3 m of clayey, red sands overlie grey clayey sands. The red sands here have the same characteristics as similar sands in segment 1 (i.e., Coker Formation); whereas the grey clayey sands are sediments likely derived from the target Eutaw Formation [6] (Ke in Figure 1).

Gas pipeline cut, segment 4: This section spans the area from waypoint 313 on the west to waypoint 316 on the east (Figure 1). In Figure 1, the geological map used for making this DEM shows this segment to be entirely crystalline rim (map unit msg – “metamorphic schist and gneiss”). However, at waypoints 313-315, chalky marl (similar in appearance to the chalky marl in segment 2) was excavated. At waypoint 319, red sand likely derived from impact-affected Coker Formation was excavated. At waypoint 318, nearly vertically standing foliation in highly weathered schist was observed in the pipeline cut. In Figure 1 this LiDAR-derived DEM resolution is ~ 2 m and we can see a much more detailed rendering of the topography of the area than in any previously made DEM (e.g., [7]). Here, terrain on the eastern rim crystalline rock (msg) has been mapped apparently in error. The smoother areas of the eastern rim are not in fact crystalline rock (msg), but are impact-affected sediments. This observations shows for the first time that the crystalline rock exposure of the eastern rim is not nearly as wide as shown in previous mapping. The narrowness of the eastern crystalline rim as compared to the western rim's wide flap may have implications as to the trajectory of flight of the bolide and how it affected the foliated target. At waypoint 316, which is located on Jug Factory Road near the pipeline valve station, red sands were exposed in the pipeline cut. These red sands are less clay-rich than the ones previously noted. The lack of definitive bedding did not allow us to determine if

these were undisturbed deposits of Tuscaloosa Group sediments of if they were impact-affected as well.

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Figure 1. DEM geological map of the Wetumpka impact structure and surrounding area. DEM LiDAR at ~ 2-m resolution data are from Emore County Revenue Commissioner's office. Geological map is from [8]. Red dots are waypoints mentioned in the text of this abstract. Larger color dots with + superimposed are scientific core holes (SCH and R [1, 7] and B, In, G, and BRR [9]).

