Appendix E:

Geomorphological Evaluation

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December 20, 2000

Ms. Barbara Shaffer
McCormick, Taylor & Associates, Inc.
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RE: 7NC-B-54
New Castle County Delaware

Dear Barb:

The following are a few brief comments summarizing my examination of the above referenced site. This site was visited on December 6, 2000.

The site is situated on a gently sloping upland landscape within the Piedmont Physiographic Province where soils are formed in residual materials derived from the native metamorphic rocks of the region. Locally, the rock type is identified as the Precambrian age Wilmington Complex, which consists of gneiss and amphibolite. Natural soils in such settings tend to be strongly developed with readily discernible subsoil argillic horizons documenting a prolonged period of soil formation and relative landscape stability. Prior to the advent of European settlement and historic agriculture, such gently sloping landscapes as that of the site can be considered to have been largely stable over a period reaching well into the Pleistocene.

Of particular interest for this now wooded site is whether or not it was ever plowed. Clearly, based on the present tree coverage including several relatively large specimens, it has no recent history of tillage. These trees, however, indicate nothing of the site land use prior to the 20th Century.

Three soil examinations made during the site visit shed some, albeit not definitive, light on plowing speculations. These closely spaced examinations entailed two shovel tests and one small tree throw exposure. Based primarily on surface horizon variables of thickness and abruptness of lower boundary, interpretations are somewhat conflicting. Whereas the relative thickness and uniformity of the surface horizon exposed in the tree throw would be consistent with a history of former plowing, properties of surface horizons exposed in the two shovel tests were less convincing. In one, these properties varied enough across the short exposure that an assessment of former plowing could go either way. In the second the surface horizon differed little from what would be expected in an essentially virgin forest soil.

Based on these variable observations, the site soil has probably been slightly disturbed, but obviously not to the extent compatible with a long history of tillage. In addition to duration of tillage, soil properties such as texture and drainage can also affect the degree to which evidence of former plowing still persists in abandoned farm fields. Upon abandonment, surface horizon morphology begins to revert back to that of a natural forest soil, and old plow zones may lose their identifiable traits over the course of decades or centuries in well drained medium-textured soils such as that of the site. Also with gentle slopes little soil erosion may have occurred, so soil profiles remain largely intact.

Since there is some evidence suggestive of plowing, and considering that over the course of more than 300 years of European settlement virtually all well drained and gently sloping Piedmont landscapes have been subject to at least some tillage, I suspect the area was farmed in early historic time. A possible scenario for the site would involve early historic tillage, perhaps a period of pasture, and eventual abandonment to woodland sometime around the middle to second half of the 19th Century.

Sincerely,

Daniel P. Wagner, Ph.D.
Pedologist

Geomorphological Assessment of a Portion of The Blue Ball Properties Area Bike Path

Daniel P. Wagner, Ph.D.
Pedologist

January 25, 2001

The following describes the results of the pedological and geomorphological examination conducted along a planned bike path approaching and paralleling a stretch of Matson Run in the vicinity of Blue Ball, Delaware. The interpretations of the study site are based on pedestrian traversal of the area landscapes undertaken on December 6, 2000, and were directed toward assessing potential occurrences of prehistoric artifacts with respect to landscape and soil conditions.

The study location is situated within Delaware's Piedmont Physiographic Province in a region where geology is dominated by gneiss and amphibolite of the Precambrian age Wilmington Complex. These metamorphic rocks tend to form moderately to steeply sloping uplands on which soil development is often a function of slope and landscape position. Natural erosional processes are the most active on more steeply sloping terrain, and soil development beneath such surfaces thus tends to be less advanced than that typical for lower gradient, more stable positions. Indeed, the erosion and redeposition of soil materials are the main natural mechanisms whereby any appreciable changes might be introduced to what would otherwise be old and mostly stable upland land surfaces. Where landscapes are cultivated or were formerly cultivated, erosional processes have been greatly accelerated by historic tillage, and the soils of such landscapes tend to be moderately to severely eroded, depending on slope gradient.

The investigated area is distributed over upland landscapes that although mainly wooded now, were at one time almost entirely subject to cultivation. Evidence for this is in several forms. One area just to the east of the golf course access road is till partially cleared, and most trees are only in sapling stage. As the path bends south to parallel Matson Run tree size increases somewhat, but growth is still at a relatively young stage. Additionally, a former field boundary is also present in one area where it is marked by an abandoned farm lane along an alignment of larger trees. Hence, for the great majority of the area, artifact context should be viewed as comparable to that expected for a field still actively subject to plowing. At least some amount of historic soil erosion therefore likely, but since most of the terrain is only gently sloping, soil losses and movement across the landscape have probably been only slight to moderate. Due to the antiquity of the regional upland soils, any artifacts present should be confined to near-surface levels. These would include the plowed surface horizon together with the immediately underlying subsoil horizon extending to the depth of perhaps 30 cm or so.

At several points the planned path approaches alluvial positions along Matson Run, but in no instance does the path ever decline from the upland to the floodplain until it actually crosses the stream beyond the southern limit of the area investigated. Along most of the demarcation

between these two landscape forms, clear separations are provided by a scarp or steep slope; and even where such abrupt transitions are absent the gentle slopes of the upland terrain are readily distinguishable from the level, often poorly drained surface of the floodplain.

Other than differing proximity to Matson Run, the only other significant variable likely to have had some affect on prehistoric occupations along the path relates to soil drainage. The great majority of the examined path is across landscapes that are sufficiently well drained to be well suited for human occupation. Only at two locations would drainage have potentially affected occupation patterns. Where the path begins its southern bend to parallel Matson Run it skirts a wetland and eventually crosses a ditched outlet leading from the wetland to the stream. For a distance of perhaps 100 feet or so northwest of this ditch crossing, soil drainage in a transitional area adjacent to the wetland is likely to be sufficiently poor that prehistoric people would probably have avoided the location in favor of nearby more favorably drained positions. A second drainage crossing also occurs at the southern end of the examined area just before the path drops from the upland to cross the stream. This drainageway is for the most part an incised erosion gully formed across the slope break between the upland and floodplain, and the gully is unlikely to have existed in prehistoric time. However, it does conduct water on at least an intermittent basis, and seasonal seepage in the immediate area of the present gully may have been sufficient to cause some avoidance of the location by prehistoric inhabitants.

To summarize, the investigated bike path is distributed across gently sloping upland terrain. At no location other than where it crosses Matson Run beyond the southern end of the investigation area does the path range onto an alluvial landscape. Although now wooded most of the tree growth is in fairly young stages, and there is little doubt that the great majority of the path area was formerly within plowed fields. Thus as would be typical for cultivated fields, at least some erosion and minor disturbance of the uppermost level of soil can be expected. Prior to the historic period the upland soils can be considered to have been long stable, and any artifacts should be within or just beneath surface horizons.

Most of the upland terrain crossed by the bike path is well drained, but proximity to a wetland around which the path makes a northern loop is probably close enough that impeded soil drainage would have been a limiting factor for prehistoric occupation at this location. A drainage gully near the southern end of the examined path may also mark another very small area where poor drainage could have been an avoidance consideration.