2.0 LOCATION AND NATURE OF THE STUDY AREA

2.1 Physiography and Hydrology

The study area is located in the Lower Coastal Plain physiographc province (Custer 1984:24). This physiographic province generally exhibits low-lying, nearly level topography with flat, sandy, and in some parts, swampy ground. Generally, the elevation of the Lower Coastal Plain physiographic province increases from east to west. The elevations in the study area range from below 1.5 m (5.0 ft) to slightly more than 10.7 m (35.0 ft) above mean sea level. Topographically, the study area is located on the mainland between Delaware Bay to the northeast and Rehoboth Bay to the southwest and contains benches, tidal streams associated with the two bays, tidal marshlands associated with the streams, sand dunes, and man-made ponds and ponded streams.

The Western Parkway study area is located in the Atlantic watershed and contains headwater streams, which drain into both Delaware and Rehoboth bays. Streams located within the study area include: Old Mill Creek, Black Hog Gut, Goslee Creek, Hetty Fisher Glade, and Love Creek. Redmill Pond, Goslee Millpond, and other smaller man-made ponds are present in the study area and speak to the historic commercial milling in the area.

2.2 Geology, Lithic Resources, and Soils

The surface geology of the Western Parkway study area is Quaternary and late Pleistocene in age (University of Delaware Mineralogical Museum 2006). The modern sediments of the Atlantic Coastal Plain, where the study area is located, are comprised of eroded materials from the mountain ranges, which were carried to the lower elevations by streams. The eastern edge (the barrier island) of the Atlantic Coastal Plain is primarily Holocene swamp and dune sands, while the mainland surface is made up of Pleistocene deposits and is underlain by deposits of the Quaternary and Tertiary periods. The Atlantic Coastal Plain deposits include the following from east to west: the Sinepuxent formation of Quaternary age; the Omar formation of Pleistocene age; the Parsonburg Sand of Quaternary age; the Kent formation of Pleistocene age; the Beaverdam formation of Tertiary age; and the Yorktown-Cohanssey formation of Miocene-Pliocene age (University of Delaware Mineralogical Museum 2006).

In general, primary (i.e., bedrock) sources of lithic raw materials are uncommon in the vicinity of the study area, as the majority of the Lower Coastal Plain physiographic province is covered by a thick mantle of Pleistocene sediments. While this situation virtually excludes surficial bedrock exposures of raw material, the same processes that resulted in the deposition of these sediments also transported a variety of knappable stone from primary outcrops located to the north. Thus, Native American knappers could have selected from a variety of lithic raw materials, including chalcedony, chert, quartz, and quartzite procured from secondary deposits (e.g., stream terraces, lag deposits, gravel bars) for stoneworking (Catts *et al.* 1988:14).

Especially common in Delaware lithic assemblages is quartz, a tenacious stone of variable flaking quality. While quartz is suitable for the manufacture of flaked stone tools, its ubiquity in the region and its propensity to shatter when struck during plowing or other earthmoving activities makes the attribution of some quartz specimens as pre-contact artifacts problematic. Other lithic raw material types identified in pre-contact period artifactual assemblages in Delaware include chert, jasper, quartzite, and chalcedony derived from secondary deposits. Occasionally, artifacts from primary bedrock sources are found on Delaware sites. Sources of Iron Hill (Newark) Jasper and Cecil County Black Flint are located in western New Castle County, Delaware and eastern Cecil County, Maryland. When good to excellent quality jasper is found, a wide variety of lithic tool forms are easily made (Petraglia and Knepper 1995). In addition to being found in primary outcrops, jasper cobbles can be found as secondary sources in certain streams on the Delmarva Peninsula.

Within the Lower Coastal Plain physiographic province, the soils are forming in unconsolidated coastal plain sediments, which are predominantly sandy sediments with smaller amounts of silt, clay, and fine gravels deposited by receding marine waters. Along streams and valley bottoms in floodplains and wetlands, these sediments are often reworked and redeposited. Specific soil types mapped within the study area include Evesboro, Fallsington, Johnston, Klej, Pocomoke, Rumford, Rutlege, Sassafras, Tidal Marsh, and Woodstown series, which all form in coastal plain sediments (Ireland and Matthews 1974). In addition, areas of borrow and fill are located within the study area. Soils in the Evesboro, Klej, Rumford, Sassafras, and Woodstown series have no or only moderate drainage restrictions within their internal soil profiles, and therefore would have been attractive for aboriginal human occupation. However, soils within the Fallsington, Johnston, Pocomoke, Rutlege, and Tidal Marsh series have severe drainage restrictions, displaying gleyed conditions at shallow depths, and would have been less suitable for direct aboriginal occupation; however, resources associated with these soils may have been exploited prehistorically.

2.3 Climate

The study area experiences a four-season continental climate, which sees the general flow of the atmosphere from west to east (Ireland and Matthews 1974:2). No elevationally induced microclimates exist in the study area due to its nearly level topography, and the Atlantic Ocean moderates extreme temperatures. High temperatures peak in July at an average of 30.6° C (87.0° F). Lowest temperatures occur in late January and February, with an average low of -3.9° C (25.0° F). The growing season is approximately 196 days in the study area (Ireland and Matthews 1974:2). Sussex County typically receives 114.3 cm (45.0 in) of rain throughout the year, and 40.6 cm (16.0 in) of snow during the colder months (Ireland and Matthews 1974:2).

Historically, the earth's long-term climate history has been punctuated with rapid changes in climate. Often, the climate impacts were very large, persisted for centuries or millennia, and were characterized by rapid shifts occurring over time spans as short as a few decades (Curry 2004). One such event occurred approximately 8,200 years ago when a rapid release of freshwater from a large lake near Hudson Bay into the subpolar North Atlantic caused a century-long interval of colder and drier conditions over much of the northern hemisphere, including Delaware (Curry 2004). As recently as two hundred years ago, between A.D. 1450 and 1850, a period of cold climate conditions known by historians as "The Little Ice Age" occurred (Tkachuck 1983:51). The period just before The Little Ice Age, A.D. 1100 to 1300, also presents a weather anomaly. It was characteristically different from the present day in that average temperatures were higher (Tkachuck 1983:51). The Little Ice Age was a five-hundred-year-long period of cold conditions affecting Europe and eastern North America. Contrary to what the name suggests, it did not involve ice-covered continents, as in a "real" ice age. The cooling associated with The Little Ice Age was small, yet it was enough to force the Vikings to abandon settlements in Greenland, to advance mountain glaciers in Europe, and to cause severe winters on both sides of the Atlantic. A historic record of the end of The Little Ice Age comes from accounts of George Washington's brutally cold winter at Valley Forge, and his crossing of the ice-bound Delaware River. Today, the Delaware rarely freezes.

This variability in climatic conditions has affected sea level with many significant changes in sea level evidenced over the course of the earth's history. The Western Parkway study area would have been especially susceptible to sea level changes due to its low, level topography, and the presence of tidal streams and marshes. During the geologic past, there is evidence of repeated variations of more than 100.6 m (330.0 ft) from present sea level

(Sugarman 1998). Landforms and drainages within the study area would have been reconfigured over the past 15,000 years due to post-Pleistocene sea level rise. Numerous studies (Belknap and Kraft 1977; Kraft 1971, 1974, 1976, 1977; Kraft *et al.* 1976; Kraft and John 1979; Sheridan *et al.* 1974, 1975) provide reconstructions of this sea level rise and reconfigured landforms for the Delaware Bay and Atlantic Coast. Based on the results of the studies listed above, the Western Parkway study area would have been located much further from the Atlantic Ocean than it is today. Between 12,000 B.P. and 1,500 B.P., the distance between the study area and the ocean would have varied from *ca.* 40.0 km (24.9 mi) to 2.6 km (1.6 mi), opening up large amounts of dry land, which would have been used by aboriginal peoples. The study area would have contained the major surface water settings of the interior throughout the Holocene and the Late Pleistocene (Custer 1987:16).

2.4 Flora and Fauna

Custer (1987:14) describes the floral changes which would have accompanied the changes in climate and sea level in various portions of the Atlantic Coastal Zone. The succession of floral changes within the study area would have included Boreal forest and limited grasslands from *ca.* 12,000 B.C. to 8,000 B.C.; Boreal forest from *ca.* 8,000 B.C. to 6,500 B.C.; Oak-Hemlock mesic deciduous forests from 6,500 B.C. to 800 B.C.; and Oak-Pine-Hickory forest with mixed mesic mesophytic communities from 800 B.C. to the present day (Custer 1987:14). Wooded lots comprise less than 25 percent of the current study area, having been cleared historically for farming and more recently for development.

Like the floral communities, the faunal species living in the study area would have varied through time with the changing climatic, sea level, and floral changes. Marshy areas present in the study area would have and currently attract large numbers of migratory waterfowl (Ireland and Matthews 1974:1). Historically, the vicinity of the study area was known for its vast wetlands and associated wildlife. As a major stop on the Atlantic flyway, the easternmost bird migration route in the Americas, the area offers resting and feeding grounds for more than a million migrating birds each spring. In fact, the shorebird population that assembles on Delaware Bay for a few weeks each May and June is the second largest in the Western Hemisphere (Honigfeld 1997).

Principal mammals which served as potential resources for the aboriginal inhabitants of Delaware included white-tailed deer, black bear, river otter, porcupine, cottontail rabbit, red squirrel, opossum, and woodchuck. Principal fur-bearing mammals were beaver, muskrat,

raccoon, mink, weasel, and red and gray foxes. Avian fauna of aboriginal importance included resident wild turkey, woodcock, ruffed grouse, and mourning dove, as well as migratory waterfowl such as Canada goose and various species of duck. Many species of fish, mussels, crawfish, and turtles would have been available in the tidal streams and coastal waters.