NOTES ON BLACK SAND AND ROCKS FOUND ON BEACH FOUND NEAR PEARCE CREEK DREDGED MATERIAL CONTAINMENT FACILITY

MDE asked MGS to provide some input on some samples of "black sand and rocks" collected from the beach near the Pearce Creek Dredged Material Containment Facility (DMCF) in Cecil County. The sample location provided is shown below. Groundwater downgradient from the DMCF has become contaminated from leakage from the facility, and residents are concerned that the black sands may be related to the contamination. MGS geologists examined the sediments and did a limited literature search to provide some input on the nature and possible source(s) of the material.

Two distinct samples were provided – sand and "rocks". The rocks were large gravels in size, subangular to subrounded, variable in sphericity (from flat to ovoid), and generally medium brown in color (most were reddish brown or black-brown). Most appeared to be quartz or quartzite in composition and, due to the color, possibly influenced by the presence of iron.

Under the microscope the black sand sample looks like an ilmenite sand. No mineral analysis was performed to ascertain whether or not the dark opaque grains are ilmenite. However the image below of an ilmenite sand looks similar to the Pearce Creek sample. The image is reportedly an ilmenite sand collected from the beach at Calvert Cliffs State Park, far down the Chesapeake from the Elk River. In general, grains in this image are more rounded and spherical than those in the Pearce Creek sample.

http://www.sandatlas.org/ilmenite/ *(from Calvert Cliffs area)*

In the Pearce Creek sample the dark grains are opaque particles – not dark coatings over light-colored grains. Ilmenite is commonly reported in sands from many Coastal Plain geologic units such as the Patapsco Formation (Anderson 1902 p. 22) and Magothy, Matawan, Monmouth, Hornerstown, Calvert Formations (e.g., Minard, 1970; 1980; Owens and others, 1970). The light-colored grains in the Pearce Creek sample appear to be quartz in large part and some translucent grains that are tinted orange appear to be iron-stained.

From historic maps, it appears that the sediment near that beach has been modified from natural conditions by human activity. Below are three images from a USGS report by Dieter and others (2013) that show the topography of the site in about 1890, prior to the DCMF, (USGS Figure 3); in 1944, during installation of the DMCF (USGS Figure 4); and circa 1990 (USGS Figure 5). Prior to the DMCF much of the shoreline was apparently adjacent to a wetland so it is not clear how much "beach" existed at that time.

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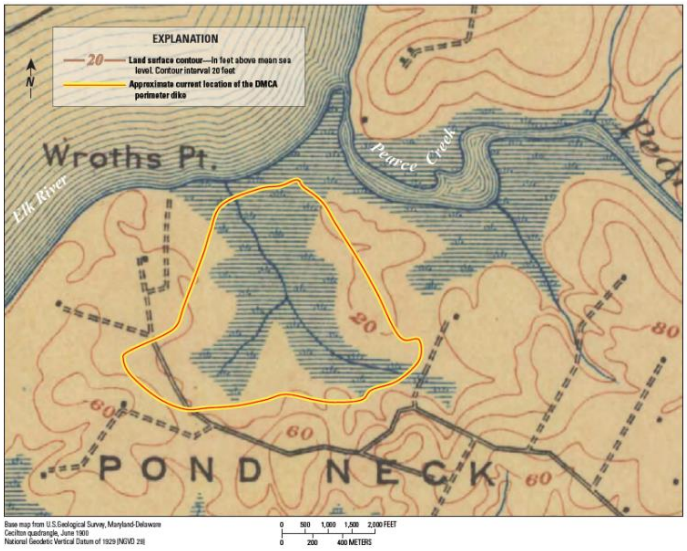


Figure 3. General topography and drainage characteristics of the study area before installation of the Pearce Creek Dredge Material Containment Area (DMCA), Cecil County, Maryland, circa 1890.

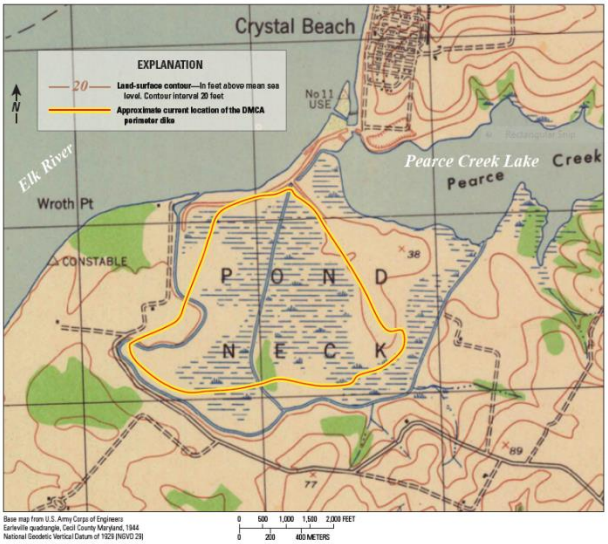
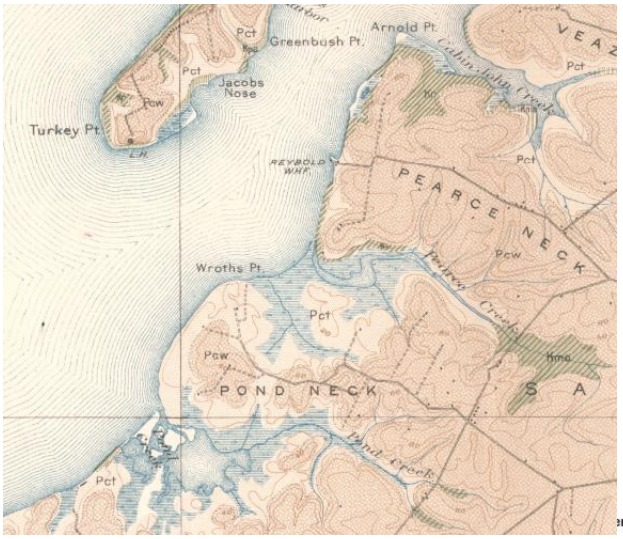
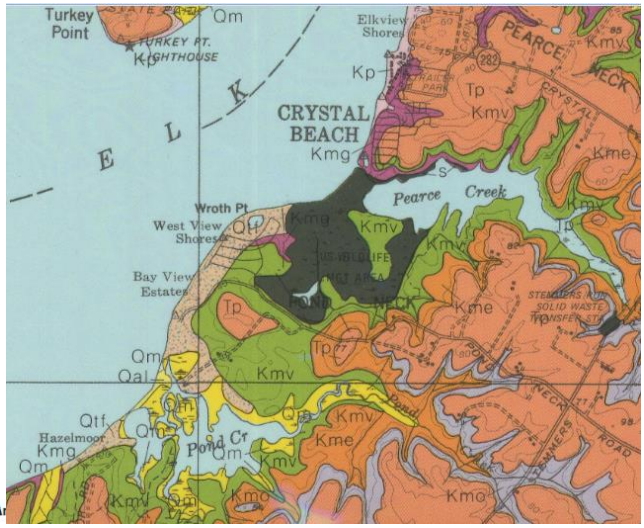


Figure 4. General topography and drainage characteristics of the study area during the installation of the Pearce Creek Dredge Material Containment Area (DMCA), Cecil County, Maryland, circa 1944.

The geology of Cecil County has been mapped several times by MGS and USGS geologists (MGS 1902; Higgins and Conant, 1986). Small excerpts of these maps follow:





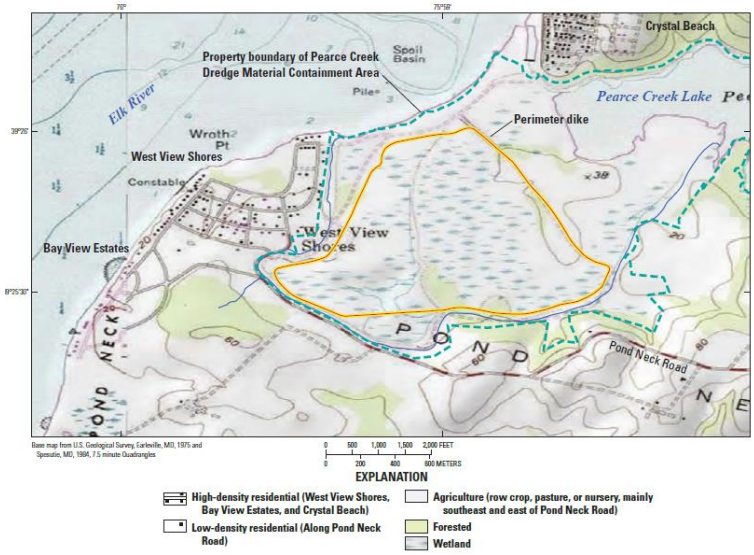


Figure 5. General topography and drainage characteristics of the study area after closure of the Pearce Creek Dredge Material Containment Area, Cecil County, Maryland, circa 1990s.

Excerpt from MGS, 1902; Pct = Talbot; Pcw = Wicomico. *Excerpt from Higgins and Conant, 1986.*

Based upon Higgins and Conant (1986), surrounding most of the DMCF (fill, shown in dark green), the surficial geologic units include those of Matawan Group (Marshalltown-Englishtown, Merchantville Formations) and the Magothy Formation. The Marshalltown-Englishtown Formations (undivided) (Kme) and the Merchantville Formation (Kmv) are characterized by black, very fine to medium-grained silty and clayey, variably micaceous and glauconitic, quartz sand. Siderite and lignite are also commonly reported in these units. Even the Magothy Formation (Kmg) in the area is reported to include some black to dark gray sands and clays, though commonly the dark grains reported are lignite and/or glauconite. Ilmenite is an opaque heavy mineral common to these units (e.g., Owens and others, 1970). The older, underlying Potomac Group, which contains both rounded gravels and ilmenite-bearing sands (e.g., Anderson, 1902), is exposed on the northern side of Elk River and upriver of the DMCP site. The highest upland areas around the DMCP site are mapped as the Tertiary-aged Pensauken Formation (Tp) which is characterized by gravel, sand and loam. On the north side of the Elk Neck River there are also Upland Gravel deposits on the upland.

Presumably as these units eroded they would contribute to the Quaternary deposits found mainly along the shoreline. Along the Elk River downstream of the DMCF, the sediments were mapped as a fine-

grained facies of the Talbot Formation (Qtf). This facies tends to be composed primarily of silt and fine-grained sand although the Talbot unit is also known to contain coarse-grained sand and gravel in some areas.

The Cretaceous and younger sediments discussed above occur along the Elk River and the Chesapeake and Delaware Canal. So while the surficial beach materials may not be in their naturally occurring position (i.e., they seem likely to have been emplaced or modified by human activity such as the presence of the jetty), the sediments themselves may be naturally occurring geologic materials in the vicinity.

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