PEARCE CREEK DREDGED MATERIAL CONTAINMENT FACILITY EXTERIOR MONITORING PROGRAM SPRING 2017 BASELINE SAMPLING RESULTS

The Pearce Creek Dredged Material Containment Facility (DMCF) is located on Maryland's Eastern Shore in the northern portion of the Chesapeake Bay, just east of the Elk River (Figure 1). The Pearce Creek DMCF was constructed in the mid-1930s for placement of dredged material from the southern approach channels to the Chesapeake and Delaware Canal. The DMCF is owned by the U.S. Army Corps of Engineers Philadelphia District and was operational until 1993.

Existing placement sites for dredged material from the Chesapeake Bay are limited resulting in a need to study, select, and implement new options capable of accepting sediment removed annually from the shipping channels serving the Port of Baltimore. Reactivation of the Pearce Creek DMCF to accept dredged material is one component of the Corps' Dredged Material Management Plan (DMMP) for the Chesapeake Bay Federal Navigation Channels. Reactivation was approved by the Maryland Department of the Environment (MDE), pending the completion of site improvements. Rehabilitation and repair of the existing Pearce Creek DMCF, including the installation of a geotextile liner, is ongoing and will be completed before the site accepts additional dredged material.

The Maryland Department of Transportation's Maryland Port Administration (MDOT MPA) is conducting the Pearce Creek DMCF Exterior Monitoring Program in an effort to establish baseline aquatic environmental conditions around the DMCF, and to ensure that the environmental conditions surrounding the DMCF remain unaffected by water being discharged from the facility. The Pearce Creek DMCF Exterior Monitoring Program consists of collecting sediment quality, surface water quality, benthic community, and benthic bioassay samples from the Pearce Creek Lake and the Elk River. Baseline information will be used to identify if there are any trends or changes in the aquatic environment in the vicinity of the Pearce Creek DMCF as a result of facility operations (i.e., "in-flow" or placement of dredged material; and permitted discharge of excess surface water through the spillways). Water discharges from the DMCF are only conducted in accordance with the permit, known as a Water Quality Certification, which was issued by MDE in December 2014.

A total of four baseline sampling events—fall 2015, spring 2016, fall 2016, and spring 2017—have been conducted. Dredged material placement at the Pearce Creek DMCF is currently planned to start in fall 2017. Future monitoring events for Pearce Creek DMCF Exterior Monitoring Program will include post-dredged material placement sampling. The frequency of monitoring events beyond those planned through the spring of 2018 will be determined as needed through the adaptive management process.

FIGURE 1. EXTERIOR MONITORING LOCATIONS

This data summary details the results of the spring 2017 baseline monitoring event, which was conducted in May 2017. The baseline monitoring event included sediment quality, surface water quality, benthic community (animals that live in the bottom sediment, such as worms, clams, and insects), and sediment bioassay sample collection from seven monitoring locations and one reference location in Pearce Creek Lake, and one monitoring location and one reference location in the Elk River (Figure 1).

Reference locations measure natural changes in background conditions and are located in areas that will remain outside of the influence of the DMCF operations. Results from the reference locations are compared to the results from the monitoring locations to evaluate if inputs from the surrounding watershed may be influencing conditions in Pearce Creek Lake or the Elk River.

SEDIMENT QUALITY

The physical and chemical characteristics of ten sediment samples from the Pearce Creek DMCF exterior monitoring locations were assessed to determine the sediment quality and baseline sediment conditions. Sediments were sent to a laboratory and tested for grain size, metals, nitrogen, phosphorus, sulfur, ammonia, and organic carbon. This list was chosen because it represents the composition of soils that erode from the surrounding area, which are the source for the majority of the Pearce Creek Lake sediments.

Sediment quality guidelines are used to identify potential chemicals of concern in aquatic ecosystems. The threshold effect concentrations (TEC) are chemical concentrations below which adverse effects on organisms are unlikely. Probable effect concentrations (PEC) represent concentrations above which adverse effects on organisms are possible. Concentrations that are between the TEC and PEC represent the concentrations at which adverse effects on organisms may occur, as shown in Figure 2:

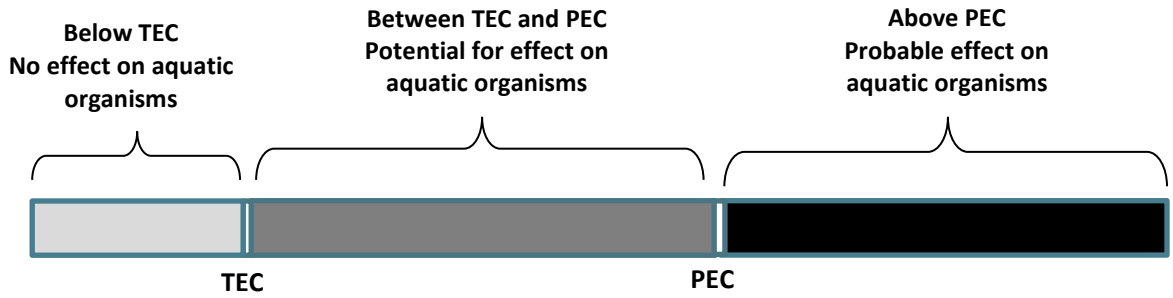

FIGURE 2. DATA EVALUATION USING SEDIMENT QUALITY GUIDELINES

Comparisons of chemical concentrations in sediment from the Pearce Creek Lake monitoring locations to the TECs and PECs indicated that five metals were detected at concentrations between the TEC and PEC, and only nickel was detected at a concentration that exceeded the PEC value. Nickel exceeded the PEC for both the Pearce Creek Lake monitoring locations and the reference site. These

results are consistent with concentrations observed in previous baseline sampling events conducted in September 2015, May 2016, and September 2016. Nickel is typically detected at concentrations that are slightly above the PEC throughout the Chesapeake Bay region due to the underlying geology in the area. Nickel concentrations will continue to be evaluated in subsequent sampling events.

Comparisons of chemical concentrations in sediment from the Elk River monitoring location to the TECs and PECs indicated that all of the metals concentrations were below the TEC values. Concentrations reported at the Elk River reference site were slightly higher than those reported at the Elk River monitoring location.

WATER QUALITY

The physical and chemical characteristics of ten water samples from the Pearce Creek DMCF exterior monitoring locations were assessed to determine surface water quality and baseline surface water conditions. Chemicals detected in the surface water were compared to water quality standards and criteria developed by the U.S. Environmental Protection Agency and the State of Maryland for freshwater environments. Each chemical has two criteria—one that evaluates short term, or acute, effects and one that evaluates long term, or chronic, effects.

Eight surface water samples were collected from Pearce Creek Lake, and two surface water samples were collected from the Elk River (Figure 1). In addition to measuring the surface water conditions when the samples were collected—such as water temperature, oxygen content, and water clarity (turbidity)—the surface water samples were also sent to a laboratory. Laboratory tests for the water samples included metals, phosphorus, nitrogen, ammonia, and suspended solids. This list was chosen to represent the composition of surface water runoff and soil erosion, which provide the majority of the surface water that flows into Pearce Creek Lake from the surrounding area.

For the Pearce Creek Lake samples, 9 of the 16 tested metals were detected in the surface water samples. Concentrations for the metals were generally low, and consistent with metal concentrations at the upstream reference site. The copper concentration at one monitoring location slightly exceeded the chronic freshwater criteria for aquatic life. None of the metals analyzed in the Pearce Creek Lake surface water samples, including both the monitoring locations and the reference location, exceeded the acute freshwater criteria for aquatic life.

For the Elk River samples, 5 of the 16 tested metals were detected in the surface water samples. Concentrations for the metals were generally low, and consistent with metal concentrations at the offshore reference site. The aluminum concentration at the monitoring location slightly exceeded the chronic freshwater criteria for aquatic life. All of the metals in the Elk River surface water samples were well below the freshwater acute criteria.

BENTHIC COMMUNITY

Benthic organisms (animals that live in the bottom sediment such as worms, clams, and insects) are important indicators of environmental stress in aquatic systems because they do not move very far during the course of their lifetime. Therefore, benthic organisms act as a record of the environmental

conditions in a specific area over a long period of time. Benthic invertebrates are also important food for many species, and in healthy ecosystems a robust and diverse benthic community provides food to many other animals.

To characterize the benthic communities in Pearce Creek Lake and the Elk River, several components of the community were calculated , including the total number of species, abundance (total number of organisms), and diversity (how many different species are present). The Pearce Creek Lake reference site fell within the range of the results of the Pearce Creek Lake monitoring locations for each of the measured metrics, indicating that there is not a difference between the benthic communities at these locations. The results of the benthic community metrics at the Elk River monitoring location and Elk River reference site were also similar.

BENTHIC BIOASSAYS

Benthic bioassays are standard laboratory tests designed to tell if the sediment from each sampling location is acutely toxic to benthic organisms by measuring the survival of organisms in the sediment after a set amount of time. For the Pearce Creek DMCF bioassays, a species of freshwater amphipod (a small crustacean that is typically found in sediments throughout the Chesapeake Bay) was used in the bioassays, and survival was measured after the amphipods had lived in the sediment for 10 days. After the tests were completed, statistical analyses were performed to determine if the Pearce Creek Lake and Elk River sediment samples were statistically different from reference site samples.

Survival of the amphipods at the Pearce Creek Lake monitoring locations and the Elk River monitoring location was high. Therefore, the sediments collected from Pearce Creek Lake and the Elk River were not were statistically different from reference site samples, and the sediments are unlikely to cause adverse effects to benthic organisms.