Piezometer Testing and Evaluation at the Youghiogheny River Dam

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The Youghiogheny River Dam is a rolled earth-filled embankment with a center impervious core that is instrumented to monitor seepage flows immediately downstream of the embankment. The project is located in the USACE Pittsburgh District in Fayette County, Pennsylvania near the borough of Confluence. Historic data plotted since January 1990 introduced concern that some of the piezometers have not been functioning properly. Consequently, testing was performed on the instrumentation at the dam to determine the operability of each piezometer. The tested site instrumentation included 18 open standpipe piezometers and 5 wellpoint piezometers. The Bouwer and Rice slug test method was employed to evaluate hydraulic conductivities (k). The volume of added water was limited to an equivalent column of 15 ft for each standpipe. Data was recorded using a data logger affixed to the standpipe and vibrating wire piezometer transducer set to +0.5 ft from the depth sounding. The hydraulic conductivity results and plotted data were used to provide evidence of the groundwater behavior through the embankment soil, foundation rock, and clay core. Results showed that the hydraulic conductivities and elevation versus time plots were consistent with expectations for 11 of 23 piezometers in the range of 10E-7 to 10E-9 cm/s. At least 3 of 23 piezometers were discovered to be not functioning. A total of 9 piezometers drained rapidly to historical elevations. The texture, color, and odor of the instruments indicated a bacterial presence in at least 3 of the piezometers. Observations showed that 2 of 23 piezometers are responsive to changes in the reservoir pool elevation. One reactive piezometer is located on the upstream side of the core at approximately the foundation elevation. The other reactive piezometer is tipped downstream of the core within foundation rock. Routine monthly readings current to 2019 indicate no significant deviations from historic observations. However, no piezometer data taken downstream nor upstream of these two instruments reveal a pathway for the groundwater flow. Irregular vegetation color was observed in the meadow area downstream of the toe throughout the 7 month testing phase which may be evidence of groundwater flow bypassing the grout curtain of the dam. Valley bottom thrust faults and valley wall dilation are features of valley stress relief. It is suspected that communication of these piezometers to the reservoir may be due to valley stress relief fracturing mechanisms within the native rock that are common in the Appalachian Plateau.