

**ADDENDUM NUMBER 2
TO THE BID DOCUMENTS**
Addendum Date: **February 13, 2020**

**RJRD BID DOCUMENT NUMBER RJRD 2020-01
Lower Lake Dredging**

**Excerpts from “Richfield Heritage Preserve – Hydrologic and Hydraulic Study”
Dated April 7, 2017, Prepared by Environmental Design Group, Prepared for Richfield
Joint Recreation District**

EDG obtained the H&H information on record with ODNR that were modeled using the United States Army Corps of Engineers Hydrologic Engineering Center (HEC) HEC-1 "Flood Hydrograph Package" computer program for the Lower Lake Dam (Appendix I) and the Upper Lake Dam (Appendix J). EDG then converted this information to the modeling software currently utilized by the United States Army Corps of Engineers, HEC-HMS (Hydrologic Modeling System) Version 4.2.

EDG modeled these dams in series instead of considering them individually since they function in series and not independently; the upper lake dam receives runoff from its watershed and discharges from the dam to the lower lake dam along with additional runoff from the lower lake watershed. The Upper Lake Dam has a drainage area of 1.09 square miles and its basin characteristics were found using the United States Geological Survey StreamStats application, included in Appendix K. The Lower Lake Dam has a drainage area of 0.67 square miles; however, StreamStats includes the Upper Lake Dam's watershed as well in its basin characteristics included in Appendix L. Therefore, the total drainage area to both dams is 1.76 square miles. These drainage areas are shown in Figure 2.

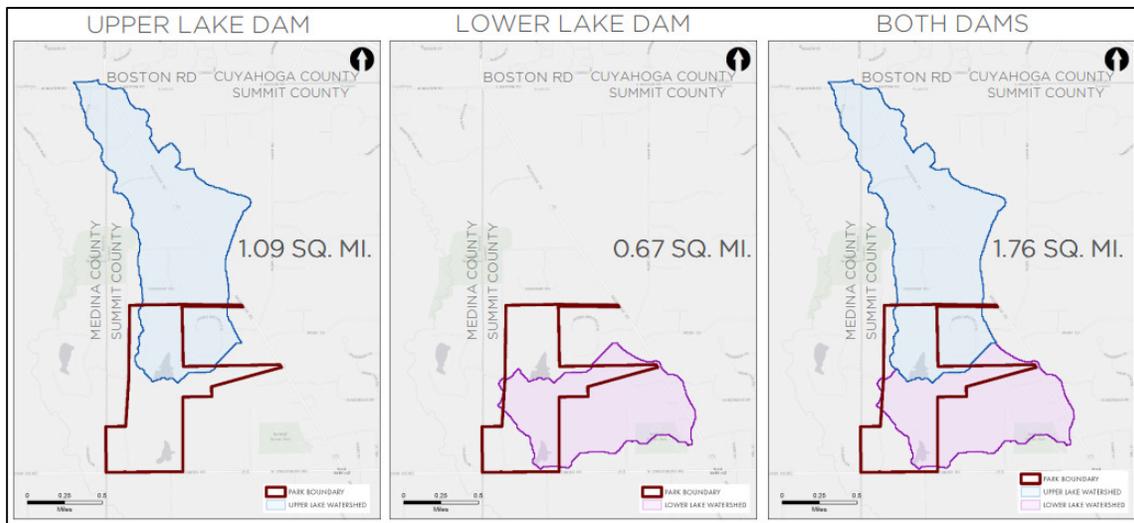


Figure 2 – Watersheds

The Soil Conservation Service (SCS) Curve Number Method was used to determine the approximate amount of runoff from the rainfall for each watershed. To determine how the runoff is distributed over time in the watershed, the time-of-concentration had to be calculated using the Lag Method. In the models on record, the lag time for the Upper Lake Dam was 67.8 minutes and the lag time for the Lower Lake Dam was 50.4 minutes. EDG performed calculations and confirmed that these values are correct for existing conditions.

The runoff curve number (CN) is an empirical parameter used to predict direct runoff from rainfall and is based on the drainage area's hydrologic soil group, land use, treatment, and hydrologic condition. The hydrologic soil group information for each watershed was determined using the United States Department of agriculture Natural Resources Conservation Service Custom Soil Resource Report for the Lower (Appendix M) and Upper (Appendix N) Lake Dams. Information from the Summit County Auditor website showing when structures were built on parcels was gathered, and aerial information was used to help determine land use. The hydrologic soils groups for the watersheds and years that structures were built on parcels within the watersheds are shown on Figure 3.

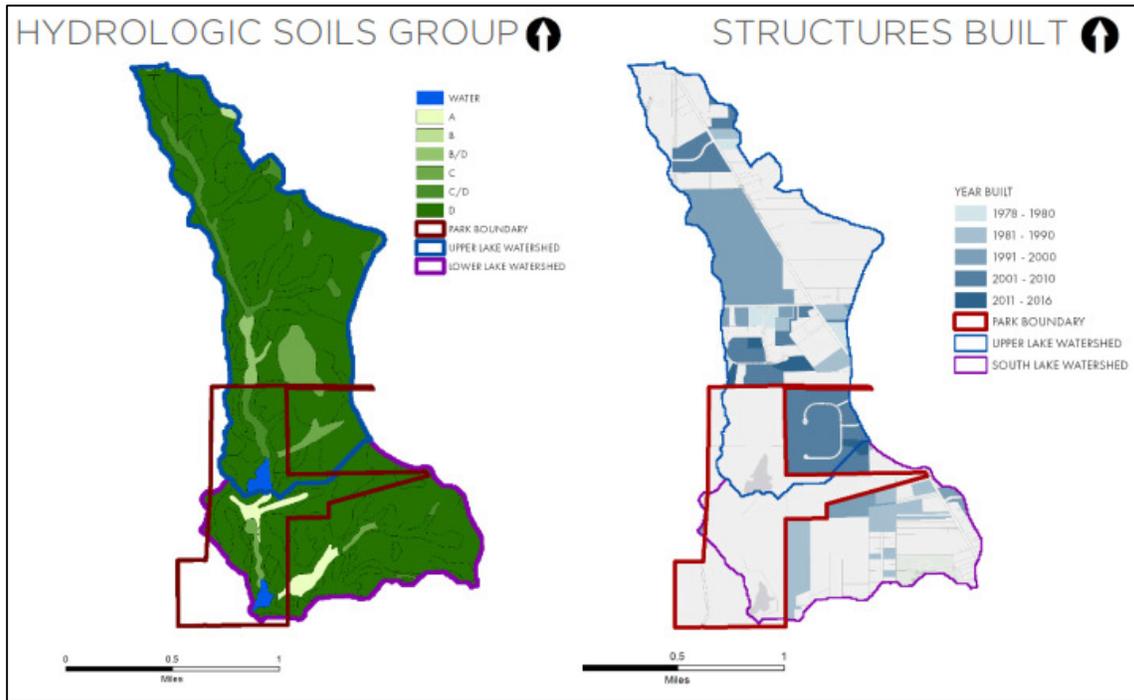


Figure 3 – Watershed Hydrologic Soils Groups and Structures Built

The previous model cited in the ODNR Dam Safety Inspection Report used a CN of 75 for the Upper Lake Dam and a CN of 83 for the Lower Lake Dam. Figure 4 shows the weighted CN calculations for the Upper Lake Dam Watershed and the Lower Lake Dam Watershed. Due to increased development and impervious area in the Upper Lake Dam watershed, the CN increased from 75 to 79, indicating that more runoff is expected for a given rainfall event. However, the CN decreased from 83 to 79 for the Lower Lake Dam partially because the previous calculation considered both the upper and lower lake watershed in its CN determination and partially because the woods in this area have matured since the last time the CN was calculated.

Upper Lake Dam			Lower Lake Dam		
Area (acres)	CN	Description	Area (acres)	CN	Description
23.30	98	Water Surface, HSD D	331.87	77	Woods, Good, HSG D
22.27	98	Paved parking, HSG D	9.49	98	Paved parking, HSG D
359.74	77	Woods, Good, HSG D	15.11	98	Water Surface, HSD D
264.19	80	>75% Grass cover, Good, HSG D	72.32	80	>75% Grass cover, Good, HSG D
28.10	70	Woods, Good, HSG C	428.80		Total Area (acres)
697.60		Total Area (acres)	79	Weighted CN	
79	Weighted CN				

Figure 4 – Weighted CN Values

The ODNR “Probable Maximum Precipitation Study, Report, Appendix, Maps and Guidelines” were updated in August 23, 2013 as documented in Appendix O. EDG applied these new guidelines to determine the updated PMP for the Richfield Heritage Preserve Watershed. Since the drainage basin size is between 1 square mile and 10 square miles, two storm durations had to be considered to determine the PMF:

- A 6-hour storm duration using the rainfall depths and spacial extents found from the All-Season PMP Values in the PMP Maps section at a Dimensionless Design Storm Temporal Distribution
- A 24-hour storm duration using the rainfall depths and spacial extents found from the All-Season PMP Values in the PMP Maps section at a SCS Type II Temporal Distribution at a 1.5-hour time step