

APPENDIX E-29

Recreation Study Report

**Pensacola Hydroelectric Project
FERC No. 1494**

**Recreation Facilities Inventory and Use Study
Report**

**Prepared for
Grand River Dam Authority**

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ABBREVIATIONS AND TERMS

A	Acceptable rating
ATV	All-Terrain Vehicle
Commission.....	Federal Energy Regulatory Commission
FERC.....	Federal Energy Regulatory Commission
Grand Lake.....	Grand Lake O' the Cherokees
GRDA	Grand River Dam Authority
Licensee	Grand River Dam Authority
LP	Large problem rating
MP	Moderate problem rating
N.....	Neither/Neutral rating
NA	No opinion/not applicable rating
NP	Not a problem rating
NR	Not rated
OTRD	Oklahoma Tourism and Recreation Department
PAD	Pre-Application Document
PD	Pensacola Datum
Project	Pensacola Hydroelectric Project
RV	Recreational Vehicle
SP.....	Small problem rating
Study	Recreation Facilities Inventory and Use Study
TA.....	Totally acceptable rating
TU.....	Totally unacceptable rating
UN	Unacceptable rating
US Census	United States Census Bureau
USACE	United States Army Corps of Engineers
Visitor	Study site interview participant

1. Project Introduction and Background

Grand River Dam Authority (GRDA, Licensee) holds a license issued by the Federal Energy Regulatory Commission (FERC, Commission) to operate and maintain the Pensacola Hydroelectric Project (Project). The Project is owned, operated, and maintained by the Licensee. The current license, which designates the Project as FERC No. 1494, expires on May 31, 2025 (FERC, 2018).

As part of the Integrated Licensing Process being utilized to relicense the Project, the Licensee prepared a proposed study plan and subsequently a revised study plan that included a Recreation Facilities Inventory and Use Study (Study) to gather information as part of the relicensing process. The Commission issued a study plan determination approving the study on November 8, 2018.

According to the approved study plan, GRDA completed the following:

- A recreation observation survey during the 2020 recreation season from May through September.
- Interviews during observation surveys.
- A recreation facility inventory at each of the 20 surveyed recreation sites in September 2020.
- A facility condition assessment during the inventory.
- Data collection on the effect of high water on recreation site usability.

Grand Lake O' the Cherokees (Grand Lake) was formed in 1940 when the Pensacola Dam was completed and impounded two primary perennial waterbodies. These waterbodies include the Neosho River and Spring River, as well as numerous secondary perennial and intermittent tributary streams. Grand Lake contains approximately 45,200 surface acres of water and spans Ottawa, Craig, Delaware, and Mayes Counties in Oklahoma. The Pensacola Dam is a hydroelectric facility with a capacity of 120 megawatts. The main span of Pensacola Dam includes a spillway containing twenty-one radial gates, a non-overflow gravity section, and two non-overflow abutments. There is an additional span located one mile east of the main dam that includes a gravity-type spillway section containing twenty-one radial gates (GRDA, 2018).

Northeast Oklahoma is locally known as the Green Country and includes the counties of Ottawa, Craig, Delaware, Mayes, Tulsa, Creek, Rogers, Pawnee, Osage, Washington, Nowata, Wagoner, Cherokee, Adair, Sequoyah, Muskogee, Okmulgee, and McIntosh (TravelOK, n.d.). Grand Lake is the premier recreational lake in northeast Oklahoma (GRDA, 2017). There are numerous public recreation facilities on Grand Lake, which offer locals and visitors opportunities for fishing, camping, swimming, trail riding, and other outdoor and water activities.

The Recreation Facilities Inventory and Use Study includes 20 recreation sites¹ in the vicinity of Grand Lake. GRDA operates and maintains five FERC-approved public access sites for the Pensacola Project. The remaining sites are not related to the Pensacola Project and are owned, operated, and maintained by the State of Oklahoma, local municipalities, or private owners. These sites include six state parks with a total of nine areas, five public access sites, and various channel sites located downstream of the Pensacola Dam along the Grand River. The name of each recreation site is included **Table 1-1**.

¹ Twin Bridge State Park was separated into two site locations for survey purposes (Twin Bridge Upper and Twin Bridge Lower) and Cherokee State Park was separated into three site locations (Cherokee Main, Cherokee Lakeside, and Cherokee Riverside).

Table 1-1: Recreation Facilities Inventory and Use Study Sites

FERC-Approved Sites	State Park Sites (non-project)	Public Access Sites (non-project)
• Big Hollow Public Access	• Bernice	• Connors Bridge
• Duck Creek Bridge Access Area	• Disney	• Council Cove
• Monkey Island Public Boat Ramp	• Honey Creek	• Riverview Park
• Seaplane Base Public Access	• Little Blue	• Spring River
• Wolf Creek Public Access	• Twin Bridges Lower	• Willow Park
	• Twin Bridges Upper	
	• Cherokee Main	
	• Cherokee Lakeside	
	• Cherokee Riverside	
		Downstream Sites (non-project)
		• Channel Sites

2. Study Objectives

GRDA filed a Pre-Application Document (PAD) with the FERC in February 2017 as part of the relicensing effort. In the PAD, GRDA proposed a Recreation Facilities Inventory and Use Study to characterize recreation resources within the Project Boundary.

The FERC, in its April 2018 Scoping Document 2, identified environmental resource issues that are related to recreation and are to be analyzed for the Project relicensing.

These environmental resource issues include the following:

- Whether existing recreation facilities and public access are adequate to meet current and future recreation demand;
- Effects of Project operation (reservoir fluctuation) on access to existing recreation facilities;
- Effects of Project operation on the visitor experience at Grand Lake; and
- Adequacy of the existing Recreation Management Plan to manage development and use of the Project's recreation facilities.

The goals of the study are to gather information regarding current recreational use and identify recreation resources and activities that may be affected by the continued operation of the Project.

The specific study objectives are to:

- Characterize current recreational use of the Project area;
- Estimate future demand for public recreation use at the Project;
- Gather information on the condition of GRDA's FERC-approved recreation facilities and identify any need for improvement; and
- Evaluate the potential effects of continued operation of the Project on recreation resources and public access in the project area.

3. Study Area

The 20 recreation sites included in the Study are located around Grand Lake in Delaware, Mayes, and Ottawa Counties in northeastern Oklahoma. The recreation sites are listed in **Table 3-1** in a general north to south direction and a map showing the general location of each site is included as **Figure 3-1**.

The recreation sites were divided into north and south groups, based on relative proximity to each other, to build in surveying efficiencies. Distance between sites in the north group ranged from 0.1 miles between the Twin Bridges Upper site and Twin Bridge Lower site and up to 16 miles between Bernice State Park and Connors Bridge. Distance between sites in the south group ranged from 0.2 miles between Cherokee Main State Park and Disney State Park and up to 21 miles between Little Blue State Park and Big Hollow.

The north and south site groups were rearranged to east and west site groups for the last three survey dates. This was necessary to accommodate more efficient travel distances due to the closing of State Highway 28 for bridge deck reconstruction. The recreations sites were accessible from the east side and west side of the Pensacola Dam.

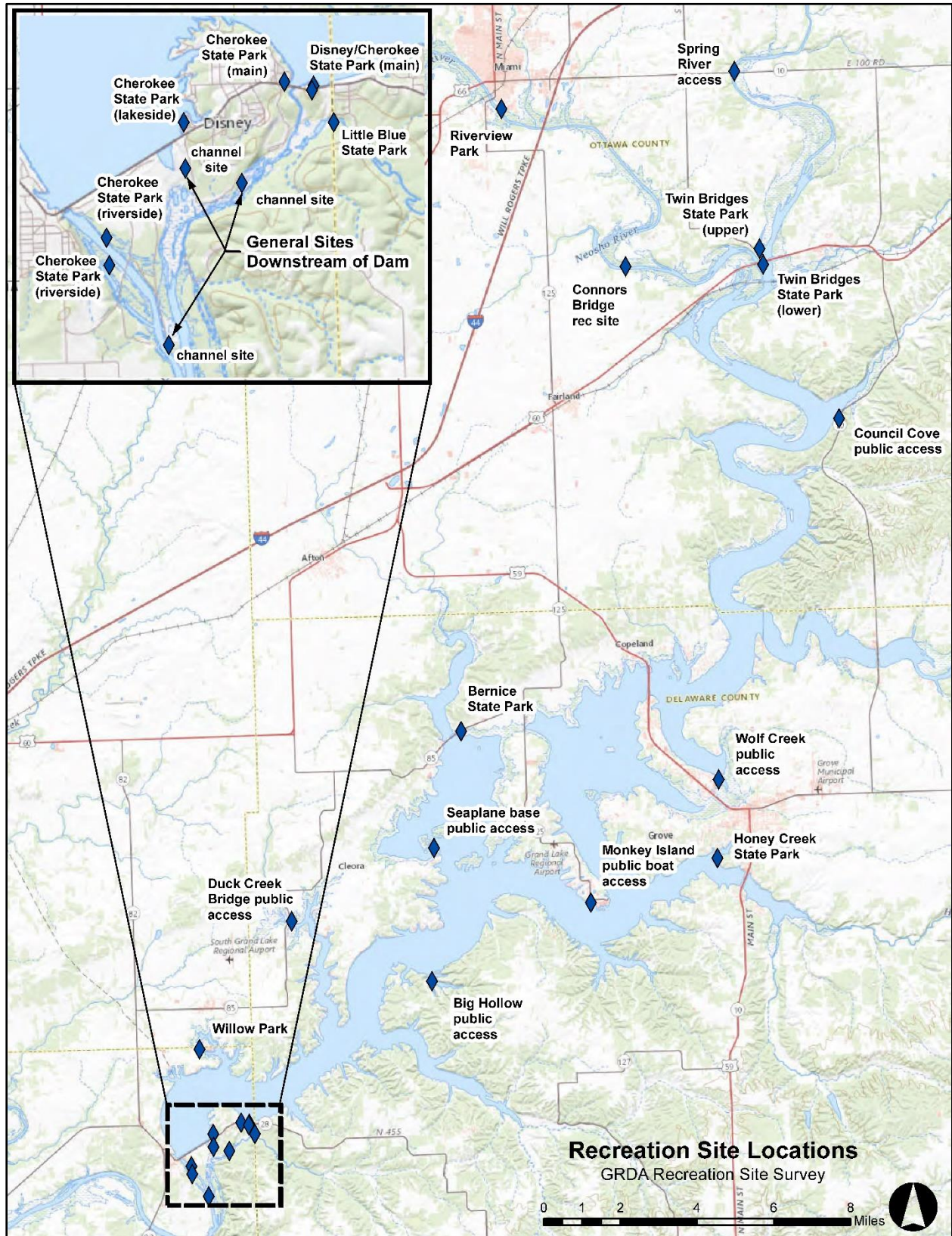
Table 3-1: Study Site List

Site Name	County	Site Operator	Site Group	
			Original	Hwy Closed
Spring River	Ottawa	Ottawa County	North	West
Riverview Park	Ottawa	City of Miami	North	West
Twin Bridges Lower State Park	Ottawa	OTRD ²	North	West
Twin Bridges Upper State Park	Ottawa	OTRD	North	East
Connors Bridge	Ottawa	Ottawa County	North	West
Council Cove	Ottawa	Ottawa County	North	East
Bernice State Park	Delaware	OTRD	North	West
Wolf Creek*	Delaware	GRDA	South	East
Seaplane Base*	Delaware	GRDA	North	West
Honey Creek State Park	Delaware	OTRD	South	East
Monkey Island*	Delaware	GRDA	North	East
Duck Creek*	Delaware	GRDA	North	West
Big Hollow*	Delaware	GRDA	South	East
Willow Park	Mayes	Town of Ketchum	North	West
Cherokee Main State Park	Mayes	OTRD	South	East
Disney State Park	Mayes	OTRD	South	East
Cherokee Lakeside State Park	Mayes	OTRD	South	East
Little Blue State Park	Mayes/Delaware	OTRD	South	East
Cherokee Riverside State Park	Mayes	OTRD	South	West
Channel Sites	Mayes	GRDA	South	East

* FERC-approved site

² Oklahoma Tourism and Recreation Department

Figure 3-1: Recreation Site General Location Map



4. Methodology

Mead & Hunt was retained by GRDA to conduct the Study which included undertaking the recreation observation surveys and facility condition assessments between May and September 2020. Two teams of two people completed the surveys on pre-determined days, one team at the north end of Grand Lake and the other at the south end. Each team completed paper forms and visitor interviews to assess the use of each recreation site. Recreation visitor-use data was collected using an electronic form on a tablet. Photos were taken at each site on each survey day to document water level impacts on site use at the time of the survey and provide additional site detail.

Per the FERC-approved study plan, six surveys per month were completed for the five-month survey period. Three surveys were to be completed on a weekday (Monday, Tuesday, Wednesday, Thursday) and three on a weekend day (Friday, Saturday, Sunday). Three surveys were mandatory on certain weekends including Memorial Day, Independence Day, and Labor Day. All 20 recreation sites were visited on each of the six monthly survey days by the survey teams. Surveys were completed on each day between the hours of 07:00 and 19:00 and an hour was spent at each site, unless the roads to a site were inundated and impassable due to high water events³. A typical survey day was 12 to 14 hours of combined survey work and associated travel. Efforts were made to vary the survey times for each of the sites throughout the five-month survey period.

A bimonthly assessment along channel sites below the Pensacola Dam and spillways was included in the survey efforts. There are multiple access points to numerous off-road, rough terrain trails along the channel sites, as provided in **Appendix A**. Channel site surveys focused on recreation areas and activities that involved the usage of a variety of off-road vehicles, including all-terrain vehicles (ATV), Jeeps, and highly modified four-wheel drive vehicles. One survey per month was conducted on a weekday and the other on a weekend day. Morning and afternoon survey times were alternated each month. There were limited opportunities to undertake interviews in these settings due to the small number of recreationists who use ATVs in these extremely rugged areas.

Recreation site surveys included counting individuals and vehicles, classifying primary and secondary activities, and interviewing people at the sites. Photos were taken at each recreation site during each survey, which focused on public access boat ramps, water level at boat ramps, typical activities, or the lack of people and activity.

The 20 recreation sites around Grand Lake varied greatly in size and available facilities. Nine recreation sites are part of the Oklahoma Tourism and Recreation Department park system and offer a range of facilities including camping sites with electricity and water, primitive tent sites, gazebos, bathroom and shower facilities, day use picnic areas, covered picnic facilities, nature centers, fishing docks, and boat ramps. Photos of each of the 20 surveyed recreation sites are provided in **Appendix B**. Photos represent an overview of activities and the level of occupancy at the sites over the course of the study.

³ High water events generally occur when the water level is higher than the ordinary high-water mark of the reservoir and channel and is inundating the floodplain.

4.1 Recreation Observation Survey

Each recreation site listed in [Table 3-1](#) was surveyed for usage six times per month between May and September 2020, as stated in [Section 3](#). Specific survey dates are listed below in **Table 4.1-1**. The forms provided in **Appendix C** were used to collect information regarding the primary and secondary activities at each recreation site and to record an approximate number of people and vehicles at each site.

Table 4.1-1: Survey Dates (2020)

Month	Day of Week	Date
May	Tuesday	May 12
	Sunday	May 17
	Friday	May 22
	Saturday	May 23
	Wednesday	May 27
	<i>Saturday</i>	<i>May 30*</i>
June	Friday	June 5
	Sunday	June 7
	Wednesday	June 10
	Thursday	June 18
	Saturday	June 27
	Sunday	June 28
July	Thursday	July 2
	<i>Sunday</i>	<i>July 5*</i>
	Tuesday	July 7
	Saturday	July 18
	Saturday	July 25
	Thursday	July 30
August	Wednesday	August 5
	Saturday	August 8
	Monday	August 10
	Sunday	August 16
	Saturday	August 22
	Thursday	August 27
September	Friday	September 4
	<i>Sunday</i>	<i>September 6*</i>
	Sunday	September 13
	Tuesday	September 15
	Tuesday	September 22
	Saturday	September 26

* Mandatory holiday survey dates.

4.2 Recreation Visitor Use Interviews

GRDA developed an interview derived from the general concepts provided in the National Visitor Use Monitoring Field Guide (USFS, 2007) and relicensing studies approved by the FERC for other hydroelectric projects. Survey questions were developed for all 20 recreation sites. These questions were combined in the electronic form but depending on the interview site, certain and specific questions related to the type of site were triggered in the form.

The questions were designed to collect information regarding the following:

- General use information
- Resident or visitor
- Purpose and duration of visit
- Distance traveled
- Day use or overnight lodging
- History of site/area visitation
- Types of recreational activity participation, including primary and secondary activities;
- Other recreational sites that were or were intended to visit
- General satisfaction with recreational opportunities, facilities, overall perceptions, and areas that need improvement
- Effects of project operations on recreation use and access
- Accessibility of facilities

Visitor interviews were conducted at all five FERC-approved recreation sites, state parks, and other public access sites identified in [Table 3-1](#). The survey was an electronic, multi-page form that consisted of questions predetermined by GRDA and is provided in **Appendix D**. Participants were asked various questions based on their input for sites visited. If additional sites were visited in the Project area, other than the interview site location, the survey required visitors to input additional information for each site. Due to COVID-19⁴ safety precautions, survey questions were asked by Mead & Hunt personnel who then entered the visitor response into the electronic form. Tablets were not handled by the public.

4.3 Facility Condition Assessment

During at least one site visit to the five FERC-approved recreation sites, state parks, and other public access sites, the condition of each recreation facility and its immediate vicinity were assessed. Each site facility was assigned a rating according to the following scale:

- N: needs replacement (broken or missing components, or nonfunctional)
- R: needs repair (structural damage or otherwise in obvious disrepair)
- M: needs maintenance (ongoing maintenance issue, primarily cleaning)
- G: good working condition (functional and well maintained)

A note was added to the assessment form for any facility that received a rating of needs replacement, needs repair, or needs maintenance, which stated additional attention is required. The assessment form was also used to capture information about parking and signs, as well as the age of facilities and if any showed signs of overuse. The available facilities at each site and the associated ratings are summarized in [Section 5.6](#). The completed facility condition assessment forms are provided in **Appendix E**.

⁴ <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html>

4.4 Boat Launch Elevation Data Collection

Boat launch elevation data was collected at the recreation sites to document the effects of high water on access to existing recreation facilities. Daily water level data were accessed online from two sources which include the United States Army Corps of Engineers (USACE) Tulsa District Water Control Data System for Pensacola (Grand Lake) and the Grand Lake website (Grand Lake, n.d.). Data from USACE were recorded in a spreadsheet and are summarized in [Section 5.9](#). Photos were taken of water levels at boat ramps for comparison to Grand Lake water levels and are provided in **Appendix F**.

5. Study Results

Data gathered for the recreational use survey, facility condition assessment, lake elevation boat ramp comparisons, and photo documentation meet the study data objectives described in [Section 2](#). The following sections provide both general information and details to meet the study objectives.

5.1 Current Project Area Recreation Use

Surveyed recreation sites range in size, usage, facilities, and accessibility. Survey results indicate the most popular sites include three state parks (Bernice, Honey Creek, Little Blue) and one FERC-approved site (Wolf Creek). Most of these sites are relatively large, easily accessible, and have diverse facilities. Little Blue State Park has one of the highest number of visitors even though it is a smaller site. This site cannot be expanded due to topography. Little Blue State Park provides a scenic setting and the high volume of visitors can be attributed to its seasonal access point to channels and water below the easternmost spillway of the Pensacola Dam system. It is a popular destination for swimming and shoreline fishing, as well as ATV and off-road vehicles since the location allows access to off-road and rock exploration activities.

5.2 Future Demand for Recreation Use

Available census data indicates the northeast region of Oklahoma is projected to have a minimum to moderate population growth of 4.3% over the period of 2010 to 2019, as shown in **Table 5.2-1**. The growth is considered minimum to moderate when compared to the projected growth of 5.5% for all of Oklahoma and 6.3% for the United States during the same time frame (US Census, n.d.).

Table 5.2-1: Projected Population Growth in Northeast Region of Oklahoma 2010-2019

County	Population		Projected Population Growth	
	2010	2019 Projected	Percent*	People*
Ottawa	31,848	31,127	(2.3%)	(721)
Craig	15,027	14,142	(5.9%)	(885)
Delaware	41,498	43,009	3.6%	1,511
Mayes	41,266	41,100	(0.4%)	(166)
Tulsa	603,340	651,552	8.0%	48,212
Creek	69,992	71,552	2.2%	1,560
Rogers	86,914	92,459	6.4%	5,545
Pawnee	16,570	16,376	(1.2%)	(194)
Osage	47,473	46,963	(1.1%)	(510)
Washington	50,979	51,527	1.1%	548

County	Population		Projected Population Growth	
	2010	2019 Projected	Percent*	People*
Nowata	10,536	10,076	(4.45%)	(460)
Wagoner	73,082	81,289	11.2%	8,207
Cherokee	46,992	48,657	3.5%	1,665
Adair	22,668	22,194	(2.1%)	(474)
Sequoyah	42,428	41,569	(2.0%)	(859)
Muskogee	70,997	67,997	(4.2%)	(3,000)
Okmulgee	40,062	38,465	(4.0%)	(1,567)
McIntosh	20,247	19,596	(3.2%)	(651)
Total	1,331,919	1,389,650	4.3%	57,731

* Numbers in parentheses indicate a negative value (decrease)

A comparison of projected population data for Ottawa, Craig, Delaware, and Mayes Counties shows that between the years 2010 and 2019, these counties have projected population growth of (2.3%), (5.9%), 3.6%, and (0.4%) respectively (US Census, n.d.).

If the projected population growth experienced from 2010 to 2019 continues at this rate, the public can further utilize any of the surveyed recreation sites that have unused capacity, which would absorb the needs of the growing population. It is generally not feasible to expand the highly-used sites due to physical and/or geographical barriers, seasonal high water events, and private property surrounding most sites. Very few visitor comments referenced overcrowding at recreation sites. Data indicates additional recreation sites or addition of camping sites to existing state parks is not necessary.

5.3 Recreation Observation Survey

The most popular recreational activities at the surveyed sites include camping⁵, shoreline fishing, boat fishing, boating, and picnicking. Visitors and vehicles that visited the sites during the 30 survey dates were counted. The counts are approximate and were tallied at each site over the course of the 30 one-hour visits. Recreational activities were classified using the forms provided by the GRDA. A blank form of the survey and a copy of survey results are provided in **Appendix C**.

Figure 5.3-1 on the following page shows the total visitor count of each surveyed recreation site for all survey days. The top five sites with the greatest number of visitors are all state parks and include Little Blue, with the greatest number of visitors at 2,674, followed by Bernice with 1,860 visitors, Honey Creek with 1,026 visitors, Twin Bridges Upper with 888 visitors, and Cherokee Lakeside with 859 visitors.

Any surveyed recreation site listed in **Figure 5.3-1** that received more than 300 total visitors over the 30 survey days is included in **Table 5.3-1**, which shows the limiting capacity factor and explains the ability to improve capacity through expansion.

⁵ Camping was characterized by general activities in and around recreational vehicle (RV)-capable and primitive campsites or the presence of vehicles, campers, trailers, and tents at pre-designated sites. Camping was not an option on the FERC-approved form; it was added in the "other" column and used on most survey dates due to its popularity as a recreation use activity.

Figure 5.3-1: Total Visitors at Each Surveyed Site for All Survey Days

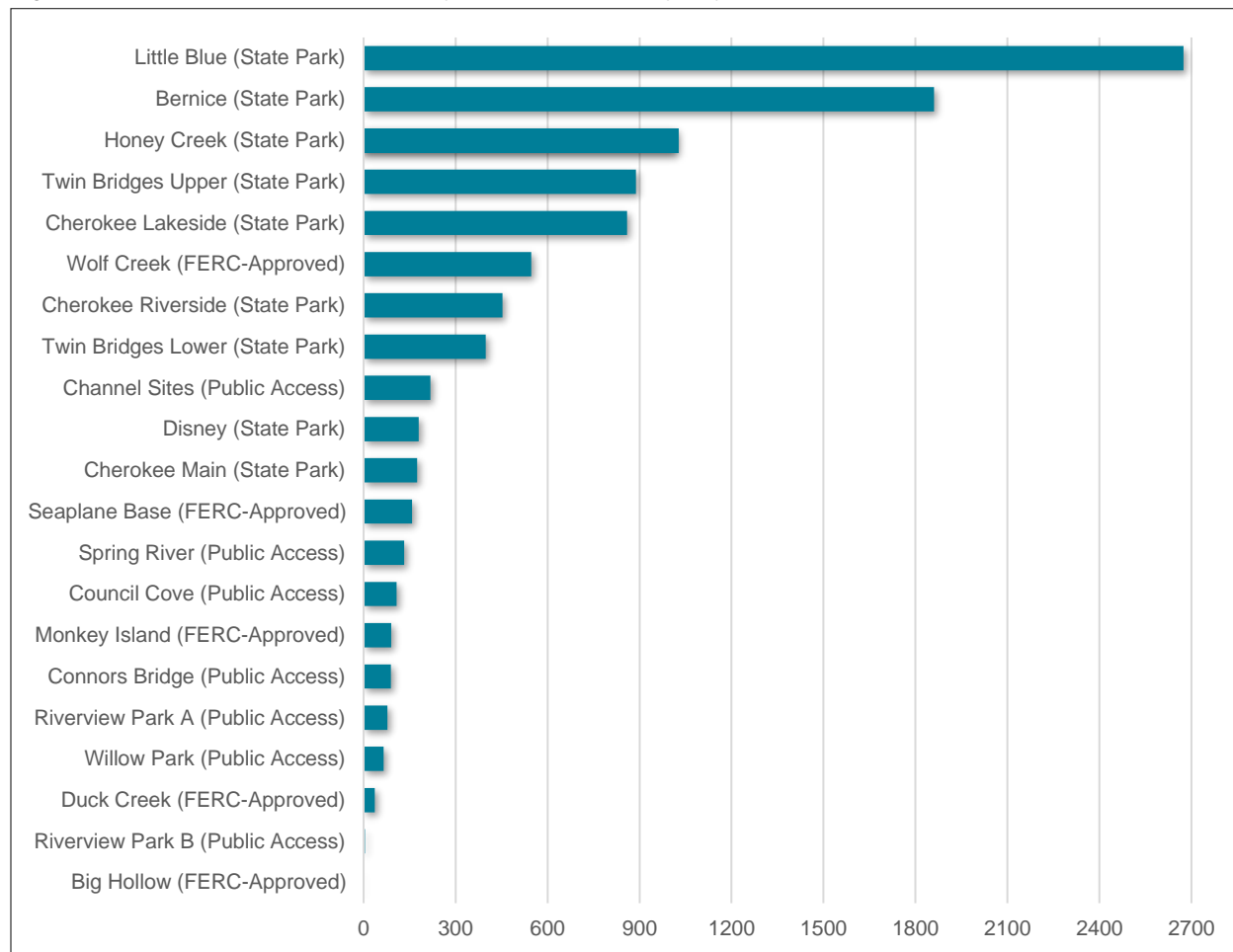


Figure 5.3-2 on the following page shows the total number of vehicles counted at each surveyed recreation site for all survey days. The top five sites with the greatest number of vehicles include four state parks and one FERC-approved site. Honey Creek State Park had the greatest number of vehicles with a total of 2,036, followed by Bernice State Park with 1,989 vehicles, Wolf Creek (FERC-Approved) with 1,587 vehicles, Little Blue State Park with 1,454 vehicles, and Twin Bridges Upper State Park with 1,168 vehicles.

Any surveyed recreation site listed in **Figure 5.3-2** that received more than 300 total vehicle counts over the 30 survey days is included in **Table 5.3-1**, which shows the limiting capacity factor and explains the ability to improve capacity through expansion.

Sites with the highest vehicle counts were those that offered numerous recreation opportunities. Bernice State Park, for example, provides opportunities for swimming, camping, boat launching, shoreline fishing, as well as access to a one-mile paved trail system, playground equipment, and a nature center. Those sites that only provide parking for boat access, including Duck Creek, Disney State Park, Seaplane Base, and Monkey Island had lower vehicle counts overall due to limited, longer-term uses and specific recreation activities.

Figure 5.3-2: Total Vehicles Counted at Each Surveyed Site for All Survey Days

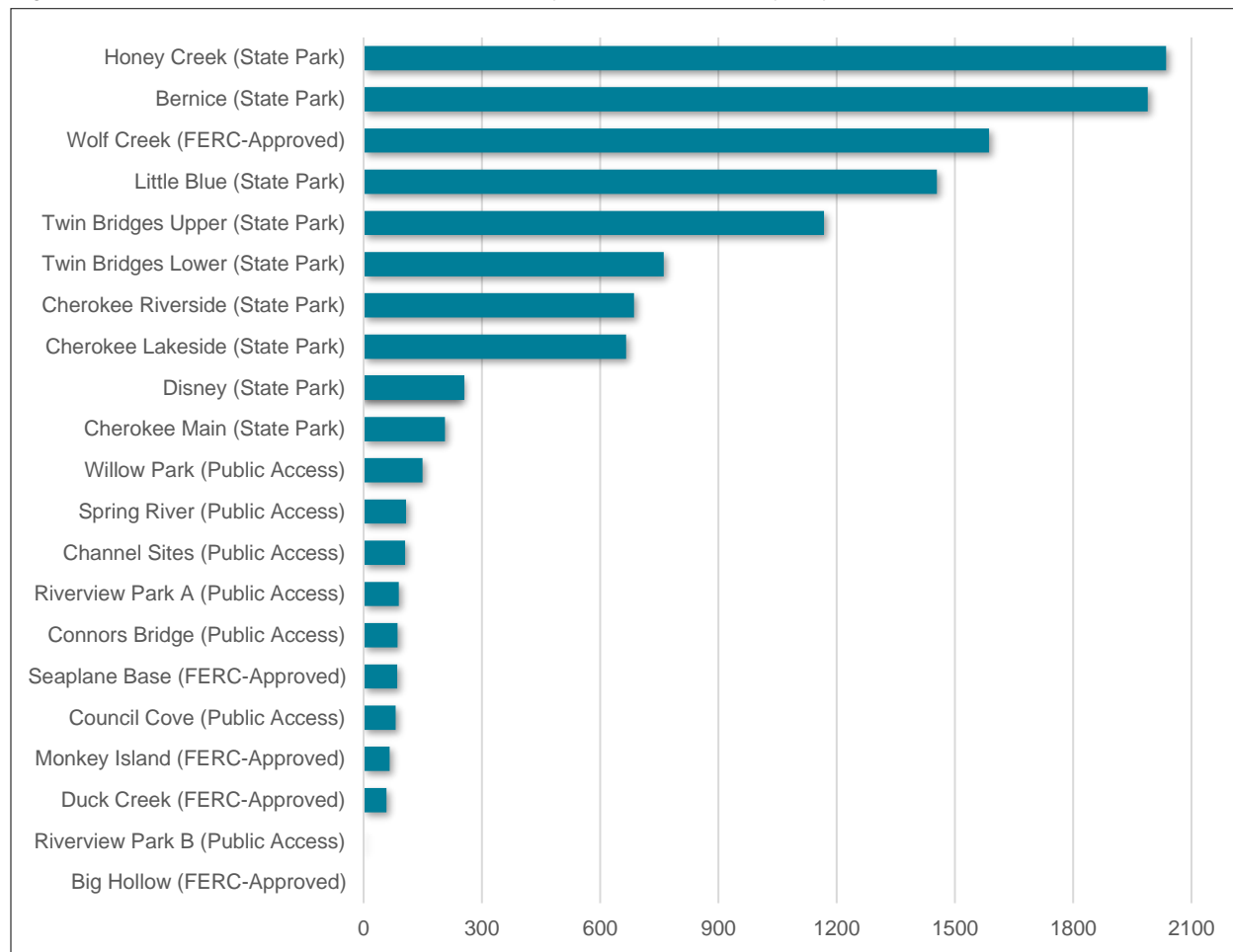


Table 5.3-1 includes only the surveyed recreation sites that received more than 300 visitors (eight sites) and/or more than 300 vehicles were counted (same eight sites) during the 30 days included in the survey period. **Table 5.3-1** shows the limiting capacity factor and explains the ability to improve capacity through expansion. The surveyed recreation sites listed in the table include one FERC-approved site and seven state park sites. The FERC-approved site is listed first, followed by the state park sites.

All but one highly utilized recreation site (Little Blue State Park) has an average of at least 25% parking capacity available. Based on this average parking space availability and the projected population growth of less than 25% over the next 10 years⁶, parking availability will not be limited at the highly used recreation sites. Little Blue State Park has additional parking capacity on the rocky bottom of the channel and along the side of the entry road coming into the site. Potential development of formal additional parking capacity at this site is limited by topography and would be challenging because additional capacity could reduce the appeal of swimming in the creek.

⁶ Census data for 2020 is not yet available to project growth for 2020-2030; however, growth is not expected to exceed 25%.

Table 5.3-1: Limiting Factors to Vehicle Capacity at Highly Utilized Recreation Sites

Recreation Site	Limiting Capacity Factor	Average Use Capacity and Percent Capacity	Capacity Improvement Expansion Needs
Wolf Creek	Primary Activity: Boat Launch Vehicle parking spaces: 15 Trailer parking spaces: 85 ⁷	Total vehicles: 1,587 Vehicle/30 days: 53 Site Capacity: 100 % Capacity: 53%	Boat Launching is well-utilized. Parking available for all users. Expansion not needed.
Bernice Creek State Park	Primary Activity: Camping RV sites w/ parking: 33 Primitive sites w/ parking: 28 Additional parking spaces: 28	Total vehicles: 1,989 Vehicle/30 days: 66 Site Capacity: 89 % Capacity: 74%	Camping sites are well-utilized. Parking available for all users. Expansion not needed.
Honey Creek State Park	Primary Activity: Camping RV sites w/ parking: 30 Primitive sites w/ parking: 150 Trailer parking spaces: 20	Total vehicles: 2,036 Vehicle/30 days: 68 Site Capacity: 200 % Capacity: 34%	Camping sites are well-utilized. Parking available for all users. Expansion not needed.
Little Blue State Park	Primary Activity: Swimming Camp sites w/ parking: 18 Additional parking spaces: 5	Total vehicles: 1,454 Vehicle/30 days: 48 Site Capacity: 23 % Capacity: 200%	Overflow parking on road, at State Park entrance, and Reservoir bottom. Site restricted by topography and geography. Expansion not feasible.
Twin Bridges Lower State Park	Primary Activity: Camping RV sites w/ parking: 17 Primitive sites w/ parking: 10 Vehicle parking spaces: 12 Trailer parking spaces: 53 ⁸	Total vehicles: 761 Vehicle/30 days: 25 Site Capacity: 39 % Capacity: 64%	Camping sites are well-utilized. Parking available for all users. Expansion not needed.
Twin Bridges Upper State Park	Primary Activity: Camping RV sites w/ parking: 46 Primitive sites w/ parking: 54 Vehicle parking spaces: 72	Total vehicles: 1,168 Vehicle/30 days: 39 Site Capacity: 105 % Capacity: 37%	Camping sites are well-utilized. Parking available for all users. Expansion not needed.
Cherokee Lakeside State Park	Primary Activity: Camping Small RV sites w/ parking: 11 Primitive sites with parking: 6 Trailer parking spaces: 30	Total vehicles: 666 Vehicle/30 days: 22 Site Capacity: 47 % Capacity: 47%	Camping sites are well-utilized. Parking available for all users. Expansion not needed.
Cherokee Riverside State Park	Primary Activity: Camping RV sites w/ Parking: 33 Additional parking spaces: 5	Total vehicles: 686 Vehicle/30 days: 23 Site Capacity: 38 % Capacity: 61%	Camping sites are well-utilized. Parking available for all users. Expansion not needed.

5.4 Downstream Channel Sites Observation Results

Ten surveys were completed at various channel sites downstream of the Pensacola Dam along the Grand River stream channels, a map is provided in **Appendix A**. The primary recreation in the area was ATV and off-road vehicle use. Access to primary gravel roads into the channel areas are well maintained and accessible. Water flow over the spillways can directly impact the available area for recreation; these flows may make the area temporarily inaccessible and unavailable for recreation use.

⁷ The parking at Wolf Creek was expanded significantly to accommodate fishing tournament traffic. The smaller lot includes 85 trailer parking spaces, the expanded lot includes 208 spaces. Only those trailer parking spaces in the smaller lot are considered for capacity calculations.

⁸ Counting the boat launch trailer parking spaces (53) would skew the capacity results at Twin Bridges State Park Lower, as the primary recreation activity was camping. Therefore, the calculation did not include the boat launch parking spaces.

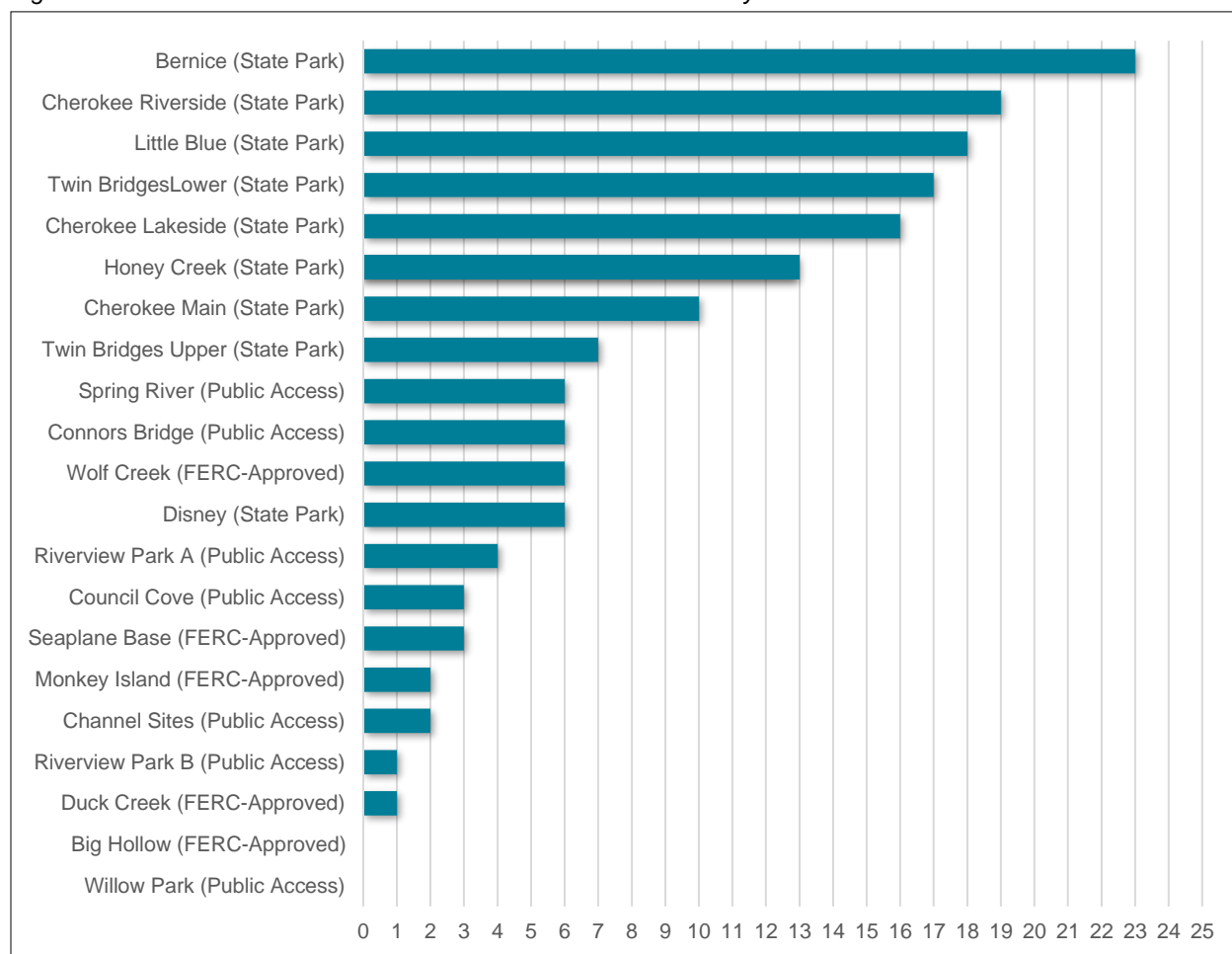
5.5 Interview Results

Visitor interviews were conducted at sites between May and September 2020, except for Big Hollow and Willow Park. The observed use at Big Hollow is minimal; no visitors were observed during survey times and therefore no visitors could be interviewed. Willow Park is a boat launch facility, and although visitors were observed, they generally were not available for interviews as they were on the water. The interview questions are provided in **Appendix D**.

5.5.1 Number of Visitor Interviews

The number of visitor interviews conducted at each surveyed recreation site is shown in **Figure 5.5.1-1**. A total of 163 visitor interviews were conducted, with the majority (23) conducted at Bernice State Park. The number of interviews at each site reflects the availability of visitors at that recreation site. Sites with a greater number of campsites had more visitors to interview, while sites with high boating usage had fewer visitors to interview, as they were typically on the water. Repeat and regular site visitors were not interviewed more than once. Most repeat visitors utilized smaller sites such as Spring River, Connors Bridge, Riverview Park, Seaplane Base, and Council Cove. First time visitors were more likely to visit larger sites such as Bernice State Park and Honey Creek State Park. Regular visitors traveled an average of 48.8 miles to recreate in the vicinity of Grand Lake. By comparison, first time visitors traveled an average of 177.06 miles. On survey days with excessive amounts of rain and/or high water, no visitors were available for interviews.

Figure 5.5.1-1: Total Number of Visitor Interviews Conducted at Survey Sites



5.5.2 Visitor Rating for Primary Recreation Use Fishing and/or Boating

If a visitor indicated their primary recreation use at the interview site that day was for fishing and/or boating, which includes 71 visitors, they were asked to rate that use based on the following criteria: safety, enjoyment, crowding, and overall experience. The tables below summarize what percentage of visitors at each recreation site rated fishing and/or boating as totally acceptable (TA), acceptable (A), neutral (N), unacceptable (UN), and totally unacceptable (TU). If a visitor chose not to provide a rating, it is indicated under the not rated (NR) column. **Table 5.5.2-1** includes the percentages for the FERC-approved sites, **Table 5.5.2-2** includes the state park sites (non-project), and **Table 5.5.2-3** includes the public access sites (non-project). All interview sites, except for Big Hollow (FERC-Approved site) and Willow Park (Public Access site), included at least one visitor who indicated their primary recreational use was fishing and/or boating. Therefore, Big Hollow is not included in **Table 5.5.2-1** and Willow Park is not included in **Table 5.5.2-3**.

Table 5.5.2-1: Visitor Rating Percentages for Fishing and/or Boating as Primary Recreation Use at FERC-Approved Sites

Interview Site	Rating Criteria	Rating Scale Percentages					
		(some criteria may not add up to 100% due to rounding)					
		TA	A	N	U	TU	NR
FERC-Approved Sites							
• Duck Creek (1 Visitor)	Safety		100%				
	Enjoyment		100%				
	Crowding			100%			
	Overall Experience			100%			
• Monkey Island (2 Visitors)	Safety		100%				
	Enjoyment	50%	50%				
	Crowding		100%				
	Overall Experience	50%	50%				
• Seaplane Base (3 Visitors)	Safety	34%	66%				
	Enjoyment	100%					
	Crowding	66%	34%				
	Overall Experience	66%	34%				
• Wolf Creek (4 Visitors)	Safety	100%					
	Enjoyment	25%	75%				
	Crowding	25%	75%				
	Overall Experience	50%	50%				

Table 5.5.2-2: Visitor Rating Percentages for Fishing and/or Boating as Primary Recreation Use at State Park Sites

Interview Site	Rating Criteria	Rating Scale Percentages (some criteria may not add up to 100% due to rounding)					
		TA	A	N	U	TU	NR
State Park Sites (non-project)							
• Bernice (4 Visitors)	Safety	50%	25%	25%			
	Enjoyment	50%	25%	25%			
	Crowding		50%	25%	25% ⁹		
	Overall Experience	50%	25%	25%			
• Disney (2 Visitors)	Safety		100%				
	Enjoyment		100%				
	Crowding		100%				
	Overall Experience		100%				
• Honey Creek (4 Visitors)	Safety		100%				
	Enjoyment		100%				
	Crowding		75%	25%			
	Overall Experience		75%		25% ¹⁰		
• Little Blue (3 Visitors)	Safety		66%	34%			
	Enjoyment	66%		34%			
	Crowding		66%	34%			
	Overall Experience		66%	34%			
• Twin Bridges Lower (12 Visitors)	Safety	17%	58%	17%		8% ¹¹	
	Enjoyment	25%	42%	8%	17% ^{12, 13}	8% ¹¹	
	Crowding	8%	75%	8%		8% ¹¹	
	Overall Experience	25%	42%	17%	8% ¹³	8% ¹¹	
• Twin Bridges Upper (1 Visitor)	Safety	100%					
	Enjoyment	100%					
	Crowding	100%					
	Overall Experience		100%				
• Cherokee Main (4 Visitors)	Safety		100%				
	Enjoyment	50%	50%				
	Crowding	25%	50%		25% ¹⁴		
	Overall Experience	50%	50%				
• Cherokee Lakeside (3 Visitors)	Safety	33%	33%				33%
	Enjoyment	33%	33%				33%
	Crowding		66%				34%
	Overall Experience	66%					34%
• Cherokee Riverside (10 Visitors)	Safety	20%	60%	20%			
	Enjoyment	30%	60%	10%			
	Crowding	40%	60%				
	Overall Experience	20%	80%				

⁹ Bernice State Park: Visitor interview date 5/23/2020. No documented comment for the unacceptable crowding rating.

¹⁰ Honey Creek State Park: Visitor interview date 5/27/2020. See Table 5.5.5-2 for visitor comment.

¹¹ Twin Bridges Lower State Park: Visitor interview date 5/30/2020. See Table 5.5.5-2 for visitor comment.

¹² Twin Bridges Lower State Park: Visitor interview date 5/30/2020. See Table 5.5.5-2 for visitor comment.

¹³ Twin Bridges Lower State Park: Visitor interview date 7/5/2020. See Table 5.5.5-2 for visitor comment.

¹⁴ Cherokee Main State Park: Visitor interview date 7/18/2020. No documented comment for the unacceptable crowding rating.

Table 5.5.2-3: Visitor Rating Percentages for Fishing and/or Boating as Primary Recreation Use at Public Access Sites

Interview Site	Rating Criteria	Rating Scale Percentages (some criteria may not add up to 100% due to rounding)					
		TA	A	N	U	TU	NR
Public Access Sites (non-project)							
• Connors Bridge (6 Visitors)	Safety	83%				17% ¹⁵	
	Enjoyment	83%				17% ¹⁵	
	Crowding	17%	66%	17%			
	Overall Experience	17%	66%			17% ¹⁵	
• Council Cove (1 Visitor)	Safety		100%				
	Enjoyment		100%				
	Crowding	100%					
	Overall Experience		100%				
• Riverview Park (4 Visitors)	Safety	25%	50%	25%			
	Enjoyment	50%	50%				
	Crowding		50%	50%			
	Overall Experience	50%	50%				
• Spring River (6 Visitors)	Safety	17%	50%	17%		17% ¹⁶	
	Enjoyment	50%	50%				
	Crowding	17%	66%			17% ¹⁷	
	Overall Experience	33%	50%	17%			
• Channel Sites (1 Visitor)	Safety	100%					
	Enjoyment	100%					
	Crowding		100%				
	Overall Experience	100%					

5.5.3 Visitor Ratings for Reservoir Water Level at Interview Sites

Each of the 163 interviewed visitors were asked to rate whether the reservoir water level was a problem at the interview site for the visitor’s ability to safely swim, launch or take out a boat, safely boat, fish along the shoreline, access the shoreline, and use the docks, as well as the scenic quality of the shoreline. The tables below summarize what percentage of visitors rated the reservoir water level at the interview sites as not a problem (NP), small problem (SP), neither (N), moderate problem (MP), large problem (LP), or no opinion /not applicable (NA). **Table 5.5.3-1** includes the ratings for the FERC-approved sites, **Table 5.5.3-2** includes the state park sites (non-project), and **Table 5.5.3-3** includes the public access sites (non-project). All interview sites, except for Big Hollow and Willow Park, included at least one visitor who rated the reservoir water level impact on the recreational use of the site.

¹⁵ Connors Bridge: Visitor interview date 8/22/2020. See Table 5.5.5-3 for visitor comment.

¹⁶ Spring River: Visitor interview date 6/7/2020. See Table 5.5.5-3 for visitor comment.

¹⁷ Spring River: Visitor interview date 5/27/2020. No documented comment for the totally unacceptable crowding rating.

Table 5.5.3-1: Visitor Rating Percentages for Reservoir Water Level at FERC-Approved Sites

Interview Site	Rating Criteria	Rating Scale Percentages					
		(some criteria may not add up to 100% due to rounding)					
		NP	SP	N	MP	LP	NA
FERC-Approved Sites (12 interviewed visitors)							
• Duck Creek (1 Visitor)	Safely Swim						100%
	Launch/Take Out Boat						100%
	Safely Boat						100%
	Fish Along Shoreline						100%
	Access Shoreline						100%
	Use Docks						100%
	Scenic Quality						100%
• Monkey Island (2 Visitors)	Safely Swim	50%					50%
	Launch/Take Out Boat	50%					50%
	Safely Boat	100%					
	Fish Along Shoreline	50%					50%
	Access Shoreline	100%					
	Use Docks	100%					
	Scenic Quality	100%					
• Seaplane Base (3 Visitors)	Safely Swim	66%	34%				
	Launch/Take Out Boat	66%			34% ¹⁸		
	Safely Boat	100%					
	Fish Along Shoreline		100%				
	Access Shoreline		34%		66% ^{18,19}		
	Use Docks			34%			66%
	Scenic Quality	66%	34%				
• Wolf Creek (6 Visitors)	Safely Swim	83%			17% ²⁰		
	Launch/Take Out Boat	50%			17% ²¹	17% ²⁰	17%
	Safely Boat	50%				17% ²⁰	34%
	Fish Along Shoreline	50%	17%			17% ²⁰	34%
	Access Shoreline	33%	17%		17% ²²	17% ²⁰	17%
	Use Docks	17%			17% ²²		66%
	Scenic Quality	33%	17%				50%

¹⁸ Seaplane Base: Visitor interview date 5/17/2020. No documented comment for either moderate problem ratings.

¹⁹ Seaplane Base: Visitor interview date 5/17/2020. No documented comment for the moderate problem rating.

²⁰ Wolf Creek: Visitor interview date 5/30/2020. See Table 5.5.5-1 for visitor comment.

²¹ Wolf Creek: Visitor interview date 6/5/2020. See Table 5.5.5-1 for visitor comment.

²² Wolf Creek: Visitor interview date 6/7/2020. See Table 5.5.5-1 for visitor comment.

Table 5.5.3-2: Visitor Rating Percentages for Reservoir Water Level at State Park Sites

Interview Site	Rating Criteria	Rating Scale Percentages					
		(some criteria may not add up to 100% due to rounding)					
		NP	SP	N	MP	LP	NA
State Park Sites (non-project) (129 interviewed visitors)							
• Bernice (23 Visitors)	Safely Swim	70%	9%	4%	4% ²³		13%
	Launch/Take Out Boat	30%		39%	4% ²⁴	9% ^{25,26}	17%
	Safely Boat	39%		43%			17%
	Fish Along Shoreline	52%	4%	17%			26%
	Access Shoreline	78%	9%		4% ²⁷		9%
	Use Docks	4%	4%	57%		4% ²⁴	30%
	Scenic Quality	87%					13%
• Disney (6 Visitors)	Safely Swim	33%		67%			
	Launch/Take Out Boat			83%	17% ²⁸		
	Safely Boat			83%	17% ²⁸		
	Fish Along Shoreline		17%	83%			
	Access Shoreline	67%		17%	17% ¹⁸		
	Use Docks	17%		83%			
	Scenic Quality	100%					
• Honey Creek (13 Visitors)	Safely Swim	54%	8%	31%			8%
	Launch/Take Out Boat	31%		46%	8% ²⁹	8% ³⁰	8%
	Safely Boat	46%		46%			8%
	Fish Along Shoreline	23%	8%	54%	8% ³¹		8%
	Access Shoreline	31%	8%	38%	8% ³¹		15%
	Use Docks	31%	8%	38%	8% ²⁹		15%
	Scenic Quality	69%	8%	15%			8%
• Little Blue (18 Visitors)	Safely Swim	78%	6%	6%			11%
	Launch/Take Out Boat	6%	11%	32%	6% ³²		44%
	Safely Boat	11%	6%	28%	6% ³²		50%
	Fish Along Shoreline	44%	6%	6%			44%
	Access Shoreline	61%	11%				28%
	Use Docks	6%	6%	33%	6% ³²		50%
	Scenic Quality	72%					28%

Table 5.5.3-2 continued next page

²³ Bernice State Park: Visitor interview date 6/28/2020. See Table 5.5.5-2 for visitor comment.

²⁴ Bernice State Park: Visitor interview date 8/16/2020. See Table 5.5.5-2 for visitor comment.

²⁵ Bernice State Park: Visitor interview date 9/4/2020. See Table 5.5.5-2 for visitor comment.

²⁶ Bernice State Park: Visitor interview date 9/4/2020. See Table 5.5.5-2 for visitor comment.

²⁷ Bernice State Park: Visitor interview date 9/4/2020. See Table 5.5.5-2 for visitor comment.

²⁸ Disney State Park: Visitor interview date 5/17/2020. See Table 5.5.5-2 for visitor comment.

²⁹ Honey Creek State Park: Visitor interview date 6/7/2020. No documented comment for either moderate problem rating.

³⁰ Honey Creek State Park: Visitor interview date 5/27/2020. No documented comment for the large problem rating.

³¹ Honey Creek State Park: Visitor interview date 6/28/2020. No documented comment for either moderate problem rating.

³² Little Blue State Park: Visitor interview date 5/12/2020. No documented comment for any moderate problem rating.

Interview Site	Rating Criteria	Rating Scale Percentages					
		(some criteria may not add up to 100% due to rounding)					
		NP	SP	N	MP	LP	NA
State Park Sites (non-project) (129 interviewed visitors)							
• Twin Bridges Lower (17 Visitor)	Safely Swim	24%		29%	18% ^{33,37,38}	6% ³⁴	24%
	Launch/Take Out Boat	35%	6%	35%	12% ^{35,36}		12%
	Safely Boat	53%		35%			12%
	Fish Along Shoreline	47%		12%	18% ^{37,38,39}	6% ³⁴	18%
	Access Shoreline	41%	6%	12%	12% ^{37,38}		29%
	Use Docks	24%	6%	35%		6% ³⁴	29%
	Scenic Quality	59%	6%	12%	6% ³⁹		18%
• Twin Bridges Upper (7 Visitors)	Safely Swim	29%		43%			29%
	Launch/Take Out Boat	29%		43%			29%
	Safely Boat	29%		43%			29%
	Fish Along Shoreline	14%		57%			29%
	Access Shoreline	14%		57%			29%
	Use Docks	14%		57%			29%
	Scenic Quality	14%	29%	43%			14%
• Cherokee Main (10 Visitors)	Safely Swim	70%		10%			20%
	Launch/Take Out Boat	40%	10%	20%			30%
	Safely Boat	30%	10%	20%	10% ⁴⁰		30%
	Fish Along Shoreline	40%	10%	30%			20%
	Access Shoreline	70%		10%			20%
	Use Docks	20%		40%			40%
	Scenic Quality	60%	10%				30%
• Cherokee Lakeside (16 Visitors)	Safely Swim	81%		13%		6% ⁴¹	
	Launch/Take Out Boat	31%	6%	44%			19%
	Safely Boat	25%		44%	6% ⁴²		25%
	Fish Along Shoreline	31%		38%			31%
	Access Shoreline	38%	19%	19%			25%
	Use Docks	25%		44%			31%
	Scenic Quality	63%		6%		6% ⁴²	25%

Table 5.5.3-2 continued next page

³³ Twin Bridges Lower State Park: Visitor interview date 6/27/2020. No documented comment for the large problem rating.
³⁴ Twin Bridges Lower State Park: Visitor interview date 5/30/2020. See Table 5.5.5-2 for visitor comment.
³⁵ Twin Bridges Lower State Park: Visitor interview date 7/2/2020. No documented comment for the moderate problem rating.
³⁶ Twin Bridges Lower State Park: Visitor interview date 8/22/2020. No documented comment for the moderate problem rating.
³⁷ Twin Bridges Lower State Park: Visitor interview date 7/5/2020. See Table 5.5.5-2 for visitor comment.
³⁸ Twin Bridges Lower State Park: Visitor interview date 9/4/2020. See Table 5.5.5-2 for visitor comment.
³⁹ Twin Bridges Lower State Park: Visitor interview date 6/5/2020. See Table 5.5.5-2 for visitor comment.
⁴⁰ Cherokee Main State Park: Visitor interview date 7/18/2020. No documented comment for the moderate problem rating.
⁴¹ Cherokee Lakeside State Park: Visitor interview date 5/17/2020. No documented comment for the large problem rating.
⁴² Cherokee Lakeside State Park: Visitor interview date 5/17/2020. No documented comment for moderate or large problem ratings.

Interview Site	Rating Criteria	Rating Scale Percentages					
		(some criteria may not add up to 100% due to rounding)					
		NP	SP	N	MP	LP	NA
State Park Sites (non-project) (129 interviewed visitors)							
• Cherokee Riverside (19 Visitors)	Safely Swim	21%	5%	37%		5% ⁴³	32%
	Launch/Take Out Boat		11%	42%		5% ⁴³	42%
	Safely Boat	11%	11%	42%			37%
	Fish Along Shoreline	37%	11%	21%	5% ⁴⁴		26%
	Access Shoreline	32%	26%	16%	5% ⁴⁴		21%
	Use Docks	11%		42%			47%
	Scenic Quality	53%	11%	11%			26%

Table 5.5.3-3: Visitor Rating Percentages for Reservoir Water Level at Public Access Sites

Interview Site	Rating Criteria	Rating Scale Percentages					
		(some criteria may not add up to 100% due to rounding)					
		NP	SP	N	MP	LP	NA
Public Access Sites (non-project) (22 interviewed visitors)							
• Connors Bridge (6 Visitors)	Safely Swim	17%		33%			50%
	Launch/Take Out Boat	17%	17%	50%			17%
	Safely Boat		17%	50%			33%
	Fish Along Shoreline	50%			17% ⁴⁵		33%
	Access Shoreline	67%			33% ^{45,46}		
	Use Docks			50%			50%
	Scenic Quality	67%	17%				17%
• Council Cove (3 Visitors)	Safely Swim	33%		33%			33%
	Launch/Take Out Boat	33%		33%	33% ⁴⁷		
	Safely Boat	67%		33%			
	Fish Along Shoreline	33%		33%			33%
	Access Shoreline	100%					
	Use Docks			100%			
	Scenic Quality	100%					

Table 5.5.3-3 continued next page

⁴³ Cherokee Riverside State Park: Visitor interview date 5/30/2020. See Table 5.5.5-2 for visitor comment.

⁴⁴ Cherokee Riverside State Park: Visitor interview date 5/27/2020. See Table 5.5.5-2 for visitor comment.

⁴⁵ Connors Bridge: Visitor interview date 8/22/2020. See Table 5.5.5-3 for visitor comment.

⁴⁶ Connors Bridge: Visitor interview date 5/17/2020. No documented comment for the moderate problem rating.

⁴⁷ Council Cove: Visitor interview date 8/16/2020. See Table 5.5.5-3 for visitor comment.

Interview Site	Rating Criteria	Rating Scale Percentages					
		(some criteria may not add up to 100% due to rounding)					
		NP	SP	N	MP	LP	NA
Public Access Sites (non-project) (22 interviewed visitors)							
• Riverview Park (5 Visitors)	Safely Swim		20%	20%	40% ^{48,49,50}	20% ⁵⁰	
	Launch/Take Out Boat	20%			20% ⁴⁹	20% ⁵¹	40%
	Safely Boat	40%			20% ⁴⁹		40%
	Fish Along Shoreline	60%	20%		20% ⁵²		
	Access Shoreline	60%	20%		20% ⁵²		
	Use Docks	40%				20% ⁵¹	40%
	Scenic Quality	60%		20%		20% ⁵²	
• Spring River (6 Visitors)	Safely Swim	17%	17%	17%		33% ^{53,54}	17%
	Launch/Take Out Boat	50%		17%	33% ^{53,55}		
	Safely Boat	50%	17%	17%		17% ⁵⁴	
	Fish Along Shoreline	83%	17%				
	Access Shoreline	67%	33%				
	Use Docks			50%		17% ⁵⁴	33%
	Scenic Quality	83%	17%				
• Channel Sites (2 Visitors)	Safely Swim					50% ⁵⁶	50%
	Launch/Take Out Boat					50% ⁵⁶	50%
	Safely Boat					50% ⁵⁶	50%
	Fish Along Shoreline	50%					50%
	Access Shoreline				50% ⁵⁶		50%
	Use Docks					50% ⁵⁶	50%
	Scenic Quality	50%					50%

⁴⁸ Riverview Park: Visitor interview date 7/18/2020. See Table 5.5.5-3 for visitor comment.

⁴⁹ Riverview Park: Visitor interview date 5/12/2020. No documented comment for any moderate problem ratings.

⁵⁰ Riverview Park: Visitor interview date 7/18/2020. See Table 5.5.5-3 for visitor comment.

⁵¹ Riverview Park: Visitor interview date 8/8/2020. No documented comment for either large problem rating.

⁵² Riverview Park: Visitor interview date 5/23/2020. No documented comment for any moderate or large problem ratings.

⁵³ Spring River: Visitor interview date 5/23/2020. No documented comment for either moderate or large problem rating.

⁵⁴ Spring River: Visitor interview date 5/27/2020. No documented comment any large problem ratings.

⁵⁵ Spring River: Visitor interview date 8/22/2020. See Table 5.5.5-3 for visitor comment.

⁵⁶ Channel Sites: Visitor interview date 5/17/2020. No documented comment for any moderate or large problem ratings.

5.5.4 Visitor Rating for Recreation Activities in the Grand Lake Area

Each of the 163 interviewed visitors were asked to rate the following ten recreation activities the visitor has participated in at any survey site in the Grand Lake area⁵⁷: bank fishing, boat fishing, pleasure boating, personal water crafting, picnicking, swimming, sight-seeing, hunting, rafting, and wildlife viewing. All ten recreation activities may or may not be formally available at each surveyed site. **Table 5.5.4-1** includes which activities are formally available at each site; these are indicated with an “x”. The rating choices for each of the ten recreation activities include totally acceptable (TA), acceptable (A), neutral (N), unacceptable (UN), and totally unacceptable (TU). If a visitor chose not to provide a rating, it is indicated under the not rated (NR) column. **Table 5.5.4-2** includes information collected for the FERC-approved sites, **Table 5.5.4-3** includes the state park sites (non-project), and **Table 5.5.4-4** includes the public access sites (non-project). No visitors indicated they participated in any recreation activities at Willow Park; therefore, this site is not included in **Table 5.5.4-3**.

Table 5.5.4-1: Formal Recreation Amenities at Surveyed Sites in the Grand Lake Area

Survey Site	Formal Recreation Amenities ⁵⁸									
	Bank Fishing	Boat Fishing	Pleasure Boating	Water Crafting	Picnicking	Swimming	Sight-Seeing	Hunting	Rafting	Wildlife Viewing
FERC-Approved Sites										
• Big Hollow	x	x	x	x						
• Duck Creek	x	x	x	x						
• Monkey Island	x	x	x	x						
• Seaplane Base	x	x	x	x						
• Wolf Creek	x	x	x	x	x	x				
State Park Sites (non-project)⁵⁹										
• Bernice	x	x	x	x	x	x	x			x
• Disney	x	x	x	x	x					
• Honey Creek	x	x	x	x	x	x				x
• Little Blue	x				x	x				
• Twin Bridges Lower	x	x	x	x	x		x			x
• Twin Bridges Upper	x				x		x			x
• Cherokee Main	x				x					
• Cherokee Lakeside	x	x	x	x	x	x				
• Cherokee Riverside	x	x	x	x	x					
Public Access Sites (non-project)										
• Connors Bridge	x	x	x	x						
• Council Cove	x	x	x	x	x					
• Riverview Park	x	x	x	x	x					
• Spring River	x	x	x	x						
• Willow Park	x	x	x	x						
• Channel Sites	x									

⁵⁷ Data collected on 5/27/2020 at the Spring River recreation site (objectid 71) is suspect (i.e., all recreation sites received the identical rating for each of the 10 recreation activities). Data regarding recreation in the Grand Lake area for objectid 71 is not included in any Section 5.5.4 table.

⁵⁸ Information obtained from site visit.

⁵⁹ Additional information obtained from www.travelOK.com.

Visitors were asked to rate hunting and wildlife viewing to gain useful data for off-season participation in land-based activities. One visitor listed hunting as a previous activity at Seaplane Base (FERC-approved site), one visitor listed hunting as both a current and previous activity at Bernice State Park, and two visitors listed hunting as a previous activity at Little Blue State Park. Hunting was rated as acceptable at Honey Creek State Park, Little Blue State Park, Riverview Park, and channel sites. Hunting was rated as unacceptable at Twin Bridges Lower State Park. It is worth noting hunting is not allowed at any of the sites included in this survey, with exception of the channel sites. Wildlife viewing was a popular recreation use, with 13 visitors reporting the activity as both a current and past use at Seaplane Base (FERC-approved site), Twin Bridges State Upper Park, Honey Creek State Park, Cherokee Lakeside State Park, Little Blue State Park, Cherokee Riverside State Park, Spring River, Riverview Park, and Connors Bridge. Wildlife viewing was rated as a totally acceptable and/or acceptable activity at all 20 recreation sites.

Table 5.5.4-2: Visitor Ratings for Recreation Activities at FERC-Approved Sites in the Grand Lake Area

Survey Site	Rating Criteria	Rating Scale Percentages					
		(some criteria may not add up to 100% due to rounding)					
		TA	A	N	U	TU	NR
FERC-Approved Sites							
• Big Hollow (2 visitor responses)	Bank Fishing		50%	50%			
	Boat Fishing	50%		50%			
	Pleasure Boating	50%	50%				
	Water Crafting	50%	50%				
	Picnicking			50%	50% ⁶⁰		
	Swimming		50%	50%			
	Sight-Seeing		50%	50%			
	Hunting			100%			
	Rafting			100%			
	Wildlife Viewing			100%			
• Duck Creek (6 visitor responses)	Bank Fishing	17%	50%	33%			
	Boat Fishing	17%	33%	50%			
	Pleasure Boating	17%	17%	67%			
	Water Crafting	17%	33%	50%			
	Picnicking	17%	33%	33%		17% ⁶¹	
	Swimming		67%	33%			
	Sight-Seeing	17%	67%	17%			
	Hunting			100%			
	Rafting			100%			
	Wildlife Viewing			100%			

Table 5.5.4-2 continued next page

⁶⁰ Big Hollow: this FERC-approved site does not provide formal picnicking amenities, unacceptable rating received 5/12/2020.

⁶¹ Duck Creek: this FERC-approved site does not provide formal picnicking amenities, totally unacceptable rating received 5/13/2020.

Survey Site	Rating Criteria	Rating Scale Percentages					
		(some criteria may not add up to 100% due to rounding)					
		TA	A	N	U	TU	NR
FERC-Approved Sites							
<ul style="list-style-type: none"> • Monkey Island (7 visitor responses) 	Bank Fishing	14%	43%	43%			
	Boat Fishing	14%	29%	57%			
	Pleasure Boating	14%	29%	57%			
	Water Crafting	14%	43%	43%			
	Picnicking		43%	57%			
	Swimming	29%	29%	43%			
	Sight-Seeing		57%	43%			
	Hunting			100%			
	Rafting		14%	86%			
	Wildlife Viewing		14%	86%			
<ul style="list-style-type: none"> • Seaplane Base (2 visitor responses) 	Bank Fishing		100%				
	Boat Fishing		100%				
	Pleasure Boating		50%	50%			
	Water Crafting	50%		50%			
	Picnicking	50%	50%				
	Swimming	50%	50%				
	Sight-Seeing	50%		50%			
	Hunting	50%		50%			
	Rafting			100%			
	Wildlife Viewing	50%		50%			
<ul style="list-style-type: none"> • Wolf Creek (11 visitor responses) 	Bank Fishing	18%	73%	9%			
	Boat Fishing	18%	18%	55%			9%
	Pleasure Boating	9%	27%	55%			9%
	Water Crafting	9%	9%	73%			9%
	Picnicking	9%	18%	64%			9%
	Swimming	9%	36%	55%			
	Sight-Seeing	18%	18%	64%			
	Hunting			91%			9%
	Rafting	18%	9%	73%			
	Wildlife Viewing	9%	9%	73%			9%

Table 5.5.4-3: Visitor Ratings for Recreation Activities at State Park Sites in the Grand Lake Area

Survey Site	Rating Criteria	Rating Scale Percentages					
		(some criteria may not add up to 100% due to rounding)					
		TA	A	N	U	TU	NR
State Park Sites (non-project)							
• Bernice (37 visitor responses)	Bank Fishing	3%	43%	49%	5% ⁶²		
	Boat Fishing	3%	24%	68%			5%
	Pleasure Boating	5%	22%	68%			5%
	Water Crafting	5%	16%	73%			5%
	Picnicking	5%	49%	43%	3% ⁶³		
	Swimming	5%	54%	35%	5% ⁶⁴		
	Sight-Seeing	5%	32%	59%	3% ⁶⁵		
	Hunting			97%			3%
	Rafting		11%	86%			3%
	Wildlife Viewing	3%	3%	92%			3%
• Disney (14 visitor responses)	Bank Fishing	7%	50%	36%			7%
	Boat Fishing	7%	36%	57%			
	Pleasure Boating	7%	7%	86%			
	Water Crafting	7%	7%	79%			7%
	Picnicking	7%	21%	71%			
	Swimming	7%	21%	71%			
	Sight-Seeing	7%	50%	36%			7%
	Hunting			93%			7%
	Rafting		7%	71%	7% ⁶⁶		14%
	Wildlife Viewing		21%	79%			
• Honey Creek (24 visitor responses)	Bank Fishing	8%	33%	54%	4% ⁶⁷		4%
	Boat Fishing	12%	20%	60%	8% ⁶⁸		
	Pleasure Boating	8%	28%	64%			
	Water Crafting		12%	88%			
	Picnicking	8%	64%	28%			
	Swimming	4%	40%	44%	12% ⁶⁹		
	Sight-Seeing	8%	36%	52%			4%
	Hunting		4%	88%			8%
	Rafting		8%	84%	8% ⁷⁰		
	Wildlife Viewing		24%	76%			

⁶² Bernice State Park: bank fishing unacceptable ratings received 7/5/2020 (no documented visitor comment) and 8/16/2020 (see Table 5.5.5-2 for visitor comment).

⁶³ Bernice State Park: picnicking unacceptable rating received 7/25/2020, see Table 5.5.5-2 for visitor comment.

⁶⁴ Bernice State Park: swimming unacceptable ratings received 8/6/2020 and 9/4/2020, see Table 5.5.5-2 for visitor comments.

⁶⁵ Bernice State Park: sight-seeing unacceptable rating received 7/5/2020, no documented visitor comment.

⁶⁶ Disney State Park: this site does not provide formal rafting amenities, unacceptable rating received 5/17/2020.

⁶⁷ Honey Creek State Park: bank fishing unacceptable rating received 5/17/2020, no documented visitor comment.

⁶⁸ Honey Creek State Park: boat fishing unacceptable ratings received 7/2/2020 and 8/8/2020, see Table 5.5.5-2 for visitor comments.

⁶⁹ Honey Creek State Park: swimming unacceptable ratings received 6/27/2020, 7/25/2020, and 8/8/2020, no documented visitor comments.

⁷⁰ Honey Creek State Park: this site does not provide formal rafting amenities, unacceptable ratings received 6/10/2020 and 6/27/2020.

Survey Site	Rating Criteria	Rating Scale Percentages					
		(some criteria may not add up to 100% due to rounding)					
		TA	A	N	U	TU	NR
State Park Sites (non-project)							
<ul style="list-style-type: none"> • Little Blue (29 visitor responses) 	Bank Fishing	31%	34%	31%			3%
	Boat Fishing	14%	10%	76%			
	Pleasure Boating	10%	7%	79%	3% ⁷¹		
	Water Crafting	7%	7%	86%			
	Picnicking	28%	38%	31%		3% ⁷²	
	Swimming	31%	55%	14%			
	Sight-Seeing	31%	31%	34%			3%
	Hunting	7%		93%			
	Rafting	10%	10%	79%			
	Wildlife Viewing	14%	24%	62%			
<ul style="list-style-type: none"> • Twin Bridges Lower (32 visitor responses) 	Bank Fishing	16%	50%	25%	9% ⁷³		
	Boat Fishing	13%	38%	38%	6% ⁷⁴	3% ⁷⁵	3%
	Pleasure Boating	13%	19%	63%	3% ⁷⁶		3%
	Water Crafting	6%	9%	78%		3% ⁷⁷	3%
	Picnicking	3%	34%	56%	3% ⁷⁸		3%
	Swimming	6%	19%	63%	6% ⁷⁹	3% ⁸⁰	3%
	Sight-Seeing	3%	25%	66%			6%
	Hunting			91%	3% ⁸¹		6%
	Rafting		6%	84%	6% ⁸²		3%
	Wildlife Viewing		19%	78%			3%
<ul style="list-style-type: none"> • Twin Bridges Upper (14 visitor responses) 	Bank Fishing	7%	21%	57%	7% ⁸³		7%
	Boat Fishing	7%	21%	57%			14%
	Pleasure Boating		21%	71%			7%
	Water Crafting		14%	79%			7%
	Picnicking	7%	57%	29%			7%
	Swimming		29%	64%			7%

⁷¹ Little Blue State Park: this site does not provide formal pleasure boating amenities, unacceptable rating received 5/12/2020.

⁷² Little Blue State Park: picnicking totally unacceptable rating received 8/22/2020, no documented visitor comment.

⁷³ Twin Bridges Lower State Park: bank fishing unacceptable ratings received 5/30/2020 (no documented visitor comment), 8/10/2020 (no documented visitor comment), and 9/4/2020 (see Table 5.5.5-2 for visitor comments).

⁷⁴ Twin Bridges Lower State Park: boat fishing unacceptable ratings received 8/8/2020 (no documented visitor comment) and 8/22/2020, (see Table 5.5.5-2 for visitor comments).

⁷⁵ Twin Bridges Lower State Park: boat fishing totally unacceptable rating received 6/27/2020, no documented visitor comment.

⁷⁶ Twin Bridges Lower State Park: pleasure boating unacceptable rating received 5/12/2020, no documented visitor comment.

⁷⁷ Twin Bridges Lower State Park: water crafting totally unacceptable rating received 5/17/2020, no documented visitor comment.

⁷⁸ Twin Bridges Lower State Park: picnicking unacceptable rating received 8/22/2020, no documented visitor comment.

⁷⁹ Twin Bridges Lower State Park: this site does not provide formal swimming amenities, both unacceptable ratings received 5/17/2020.

⁸⁰ Twin Bridges Lower State Park: this site does not provide formal swimming amenities, totally unacceptable rating received 5/30/2020.

⁸¹ Twin Bridges Lower State Park: this site does not provide formal hunting amenities, totally unacceptable rating received 5/17/2020.

⁸² Twin Bridges Lower State Park: this site does not provide formal rafting amenities, totally unacceptable rating received 5/17/2020.

⁸³ Twin Bridges Upper State Park: bank fishing unacceptable ratings received 5/17/2020, no documented visitor comment.

Survey Site	Rating Criteria	Rating Scale Percentages					
		(some criteria may not add up to 100% due to rounding)					
		TA	A	N	U	TU	NR
• Twin Bridges Upper (14 visitor responses)	Sight-Seeing	7%	43%	50%			
	Hunting			71%			29%
	Rafting	7%		86%			7%
	Wildlife Viewing	21%		71%			7%
• Cherokee Main (17 visitor responses)	Bank Fishing	12%	29%	47%			12%
	Boat Fishing	12%	29%	47%			12%
	Pleasure Boating	18%	12%	65%			6%
	Water Crafting	18%	6%	71%			6%
	Picnicking		47%	41%			12%
	Swimming		41%	47%			12%
	Sight-Seeing	6%	41%	53%			
	Hunting			88%			12%
	Rafting		6%	82%			12%
Wildlife Viewing		12%	82%			6%	
• Cherokee Lakeside (26 visitor responses)	Bank Fishing	8%	27%	50%	4% ⁸⁴	4% ⁸⁵	8%
	Boat Fishing	12%	8%	73%			8%
	Pleasure Boating	12%	12%	77%			
	Water Crafting	8%	8%	77%			8%
	Picnicking	12%	50%	35%			4%
	Swimming	4%	62%	27%			8%
	Sight-Seeing	12%	23%	58%			8%
	Hunting			92%			8%
	Rafting	4%		88%			8%
	Wildlife Viewing	4%	4%	85%			8%
• Cherokee Riverside (22 visitor responses)	Bank Fishing	18%	41%	36%	5% ⁸⁶		
	Boat Fishing	5%	23%	73%			
	Pleasure Boating		18%	82%			
	Water Crafting			95%			5%
	Picnicking	5%	41%	50%	5% ⁸⁷		
	Swimming	5%	27%	64%			5%
	Sight-Seeing	18%	27%	55%			
	Hunting			100%			
	Rafting	5%		86%			9%
	Wildlife Viewing	5%		91%			5%

⁸⁴ Cherokee Lakeside State Park: bank fishing unacceptable rating received 6/27/2020, no documented visitor comment.

⁸⁵ Cherokee Lakeside State Park: bank fishing totally unacceptable rating received 5/23/2020, no documented visitor comment.

⁸⁶ Cherokee Riverside State Park: bank fishing unacceptable rating received 5/27/2020, see Table 5.5.5-2 for visitor comments.

⁸⁷ Cherokee Riverside State Park: picnicking unacceptable rating received 5/22/2020, see Table 5.5.5-2 for visitor comments.

Table 5.5.4-4: Visitor Ratings for Recreation Activities at Public Access Sites in the Grand Lake Area

Survey Site	Rating Criteria	Rating Scale Percentages					
		(some criteria may not add up to 100% due to rounding)					
		TA	A	N	U	TU	NR
Public Access Sites (non-project)							
• Connors Bridge (9 visitor responses)	Bank Fishing	33%	67%				
	Boat Fishing	22%	11%	67%			
	Pleasure Boating	11%	11%	78%			
	Water Crafting		11%	89%			
	Picnicking		11%	89%			
	Swimming		33%	67%			
	Sight-Seeing		33%	67%			
	Hunting			100%			
	Rafting		11%	89%			
	Wildlife Viewing		33%	67%			
• Council Cove (3 visitor responses)	Bank Fishing	33%	33%	33%			
	Boat Fishing		33%	33%	33% ⁸⁸		
	Pleasure Boating			100%			
	Water Crafting			100%			
	Picnicking			100%			
	Swimming	33%		67%			
	Sight-Seeing			100%			
	Hunting			100%			
	Rafting			100%			
	Wildlife Viewing			100%			
• Riverview Park (4 visitor responses)	Bank Fishing	25%	25%	25%	25% ⁸⁹		
	Boat Fishing	50%		50%			
	Pleasure Boating		25%	75%			
	Water Crafting			75%	25% ⁹⁰		
	Picnicking		50%	50%			
	Swimming		25%	50%	25% ⁹¹		
	Sight-Seeing		100%				
	Hunting		25%	75%			
	Rafting			75%	25% ⁹²		
	Wildlife Viewing		50%	50%			

Table 5.5.4-4 continued next page

⁸⁸ Council Cove: boat fishing unacceptable rating received 8/22/2020, see Table 5.5.5-3 for visitor comments.

⁸⁹ Riverview Park: bank fishing unacceptable rating received 8/8/2020, see Table 5.5.5-3 for visitor comments.

⁹⁰ Riverview Park: water crafting unacceptable rating received 5/17/2020, no documented visitor comment.

⁹¹ Riverview Park: this site does not provide formal swimming amenities, unacceptable rating received 5/17/2020.

⁹² Riverview Park: this site does not provide formal rafting amenities, unacceptable rating received 5/17/2020.

Survey Site	Rating Criteria	Rating Scale Percentages					
		(some criteria may not add up to 100% due to rounding)					
		TA	A	N	U	TU	NR
Public Access Sites (non-project)							
<ul style="list-style-type: none"> • Spring River (5 visitor responses) 	Bank Fishing	20%	60%	20%			
	Boat Fishing	20%		80%			
	Pleasure Boating			100%			
	Water Crafting		20%	80%			
	Picnicking			80%			20%
	Swimming		20%	80%			
	Sight-Seeing		40%	60%			
	Hunting			100%			
	Rafting			100%			
	Wildlife Viewing		20%	80%			
<ul style="list-style-type: none"> • Channel Sites (5 visitor responses) 	Bank Fishing	40%	40%	20%			
	Boat Fishing	60%	20%	20%			
	Pleasure Boating	40%		40%		20% ⁹³	
	Water Crafting	40%		40%	20% ⁹⁴		
	Picnicking	40%	20%	40%			
	Swimming	40%	60%				
	Sight-Seeing	40%	40%	20%			
	Hunting	20%	20%	60%			
	Rafting	20%	20%	60%			
	Wildlife Viewing	20%	20%	60%			

⁹³ Channel sites: this site does not provide formal pleasure boating amenities, unacceptable rating received 5/17/2020.

⁹⁴ Channel sites: this site does not provide formal water crafting amenities, unacceptable rating received 5/17/2020.

5.5.5 Visitor Comments for Survey Site and Recreation Amenities

Visitors were given the opportunity to provide comments on any of the 20 recreation sites included in the survey. Overall, most visitors were satisfied with the recreation sites and the available recreation amenities provided in the Grand Lake area. Favorable ratings of facilities and positive comments were received regarding specific campsites, nature trails, shoreline accessibility, clean bathrooms, and swimming areas. All the comments received from the visitor interviews are listed in the tables below.

Table 5.5.5-1 includes the comments for the FERC-approved sites, **Table 5.5.5-2** includes the state park sites (non-project), and **Table 5.5.5-3** includes the public access sites (non-project).

Table 5.5.5-1: Visitor Comments for FERC-Approved Sites

Interview Site	Comment Date (2020)	Visitor Interview Comments
FERC-Approved		
• Big Hollow	-	No additional comments received.
• Duck Creek	-	No additional comments received.
• Monkey Island	-	No additional comments received.
• Seaplane Base	5/30	It's a pretty decent lake.
• Wolf Creek	5/23	Great place to fish.
	5/30	Flooding often bad.
	6/5	It's very accessible and from what I can see the boats can be launched easily.
	6/7	Open more fishing spots. Open more places around Jay area. Docks are always flooded, only used once in the past four years.
	7/7	No public sandy beaches like at other lakes.

Table 5.5.5-2: Visitor Comments for State Park Sites (non-project)

Interview Site	Comment Date (2020)	Visitor Interview Comments
State Park Sites (non-project)		
• Bernice *unless noted otherwise	5/23	Like it here. Great park.
	5/30	Would like to see the rock cleared by the shoreline. Love the camp host! Very safe for kids. Great place to fish.
	6/5	We like it! Nice campground. One of our favorite campgrounds. Did not like the dumpster right by the shoreline view.
	6/10	Don't close the dam.
	6/10	Love the online reservation! Shoreline view ten out of ten.
	6/28	Swimming sometimes hazardous.
	6/28	Need to remove the merry go round, it's a safety issue.
	7/2	Nice nature center. Plenty area to swim. Favorite place to go. Put in bathroom connection for RVs/campers.
	7/5*	Bernice is crowded to camp. (Interview site: Twin Bridges Upper)
	7/25	Love the nature walk! It has some great views of the lake. Loved being close to the restrooms. Picnic table is very unstable and not trustworthy to sit on.
7/25	Really like the camp host. Really great access to shoreline, one of the best we have seen so far.	

Interview Site	Comment Date (2020)	Visitor Interview Comments
State Park Sites (non-project)		
	8/5	Need more trees and landscaping closer to the exit for shade. Great peaceful, not a crowded area. Has great access to the shoreline.
	8/10	Add a water slide, add a floating trampoline. Trash.
	8/16	Beach is a little rocky would like more sand or something easier to walk on.
	8/16	More shade trees for camping spots. Add boat dock for fishing and loading into boats.
	8/22	Bathroom needs better locks for female bathroom. Shade trees are great, might want to add more for other camping spots. Love this area, it is on our list for places to stay!
	8/22*	Location underneath the bridge needs more sideline bank fishing. Mainly find more places for people to fish on the bank. (Interview site: Connors Bridge)
	9/4	Trash left by other visitors. More lighting for the kids to go to the bathroom. Rock on the beach makes it painful to swim.
	9/4	Online program is awful and needs to be fixed. I had reservation and got kicked out because of a mistake. The camp host was not understanding. Camping sites needs more trees. Boat ramps are terrible, open up Snowdale (a great park with boat ramps).
	9/4	Please add sewers to each camp spot. Boat ramps are awful, I pay \$5 at the other side of the lake to put my boat in. Quiet park on the weekdays.
<ul style="list-style-type: none"> • Disney *unless noted otherwise	5/17	I love it! Dam hotel is a great place to shop!
	5/17	Like the fresh air! Nice scenic areas.
	5/17	When the flood gates are open there are no places to use boat ramp on other side that are close, have to travel drowning creek.
	5/17*	"Cops are kinda jerks at Disney." (Interview site: channel sites)
	6/7	Nice seating areas. Roads are nice and curve. Need more trash cans and coolers at each picnic table.
	6/27	Don't think there are enough motoring.
	8/8	It's beautiful out by the lake.
<ul style="list-style-type: none"> • Honey Creek *unless noted otherwise	5/17	All good.
	5/27	Better bathroom cleaning, floor can be slippery. Need lock on some bathrooms since restrooms are public, the town will take showers and leave the restrooms unusable to the campers. Online reservation is hard for seniors. Love the camp host!
	6/7	Turn off on Main Street is a little tight.
	6/10*	Honey creek can be crowded. (Interview site: Bernice)
	6/27	It's absolutely beautiful.
	6/27	Women's shower does not work.
	6/28	Cleanest bathroom. Bathrooms are very clean.
	6/28	Bathrooms are always clean.
	7/2*	Honey creeks boat ramp has a very big drop off, do not like to use it because of it. (Interview site: Twin Bridges Lower)
7/18	It's good place to come.	

Interview Site	Comment Date (2020)	Visitor Interview Comments
State Park Sites (non-project)		
	7/25*	Honey creek can be a little cramped together. (Interview site: Bernice)
	8/8	Liked when we could park the trailer after unloading. It is hard to unload by yourself and can feel very rushed because of no available parking after unloading boat close to the boat ramp.
	8/8	RV site closest to the water has a tree way too close to the RV station that needs to be taken down.
• Little Blue *unless noted otherwise	5/12	Use of trash cans, people need to use them.
	5/17	Love to swim in little blue! Great place for a family.
	5/22	Brings back childhood memories. Nice clean facilities.
	5/22	It's close to my ice cream store.
	5/23	Noise complaint at night on the county road leading to the park.
	5/27	It's beautiful down here. Nice people!
	7/5*	Little Blue is not as nice, left over trash and dead fish everywhere. (Interview site: Cherokee Main)
	6/27	Put in showers.
	7/7	Trashy and bathrooms are gross. Have to be careful getting down to swimming area.
	7/25	Need more grass.
	7/25	Need more tables. Keep dogs on leash. Like scenic quality of waterfall.
	8/22*	Little Blue a has a lot of trash around at site. (Interview site: Twin Bridges Lower)
8/27	Need RV hook ups, more parking, better roads to get to sites.	
• Twin Bridges Lower *unless noted otherwise	5/23	Crowed RV camping on the riverside of the facility.
	5/30	Bathrooms not open due to Covid-19. Camps need to sell more groceries. Firewood is super wet.
	5/30	Boat ramps ruin the fishing for the shoreline. Cannot fish off the dock which doesn't allow for little kids to learn. Not safe for little kids to swim due to boating. Can become very packed and people can become rude. Open up the other restrooms.
	6/5	Area is great to fish when it's not flooded. Boat ramp needs to be fixed. There is a hole on the bottom section of the boat ramp. Fix the top part not the bottom!
	6/10	It's enjoyable. Relaxing.
	6/27	No parking fees. Dislike them. Too much.
	7/5	More handicap accessible spots/locations for fishing and swimming. Cannot get down to the water. Bathrooms are decent shape.
	7/25	Swimming areas designated at Twin Bridges Lower would be nice. Nice spaces for camping.
	8/10*	Trash. (Interview site: Bernice)

Interview Site	Comment Date (2020)	Visitor Interview Comments
State Park Sites (non-project)		
	8/16	Would be nice if you could have someone pick up along the shorelines. It's sad that people do not take care of their own trash. Trash along the shoreline.
	8/16	Can get really crowded. Visitor cleans fish at Twin Bridges.
	8/22	Unlock the bathrooms. Fix the boat ramp underneath the water. Please give another alternative for people who do not use technology to reserve camping spots. A lot of trash around the site.
	8/22	Fix boat ramps.
	9/4	More wooden picnic tables would be nice for larger groups. Bank fishing needs more areas to fish without all the extra stuff in the way. Could use some more docks for boaters. It's a nice park.
	9/6	Probably the best campgrounds in the state.
<ul style="list-style-type: none"> • Twin Bridges Upper <p>*unless noted otherwise</p>	6/10	Take really good care of the facility.
	7/5	Nice roads for hiking. Nature trail is unsafe for kids. Would like the office to sell ice. Like the online reservation. Does not like fee increases. Fee increase could be deciding factor between state parks and Corps parks.
	7/25	Does not like crossing the highway to go to the restroom.
	7/30	Love this area the best. Has great shade and is not crowded.
	8/5	Do it every year. Twin bridges upper does not see much shoreline.
	8/10*	Trash. (Interview site: Bernice)
	8/16	Clean up around the shoreline would be nice. Bathrooms are old but clean.
	9/6*	Would like more showers. (Interview site: Twin Bridges Lower)
<ul style="list-style-type: none"> • Cherokee Main 	5/17	Usually fishes at Hudson Lake.
	5/22	Place is clean, people are nice.
	5/22	Need dump station hook up supply.
	5/22	Need water supply to connect to.
	7/18	Trash cans would be nice!
	7/25	Dock at Cherokee main. Raise speed limit over bridge. Less police harassment.
	8/8	Water connection for the RVs would be nice. Bigger signage would be nice.
<ul style="list-style-type: none"> • Cherokee Lakeside 	5/12	Beautiful place with beautiful people!
	5/30	Prefers sand back.
	6/7	Bathrooms are great! Very taken care of.
	6/27	Reservation locations are not right on website.
	6/27	Kids are crazy with the bikes. Revamping in bathrooms. Showers are great.

Interview Site	Comment Date (2020)	Visitor Interview Comments
State Park Sites (non-project)		
	6/27	Open up Snowdale! Online reservations are confusing with locations.
	6/27	Need 50 Amp service.
	7/5	Thankful it's here.
	7/5	A problem with accessibility for handicapped people.
	7/18	Like the accessibility of it. People can be a little noisy.
	8/5	"The website sucks", keep having to put in your information repeatedly.
	8/8	Websites to reserve is trash, it is very misleading.
• Cherokee Riverside	5/12	Enjoyed the scenic qualities and wildlife.
	5/17	Beautiful space. First time experience was awesome. Trash on fishing banks and bridge. Would like recycling options. Emergency light goes off in camp that makes me concerned.
	5/17	Great spacing from other neighbors. Trees are very scenic.
	5/22	More picnic areas. More play grounds.
	5/23	Spent 3 hours here morning and evening, bathrooms are never cleaned. There is a lot of trash litter.
	5/27	Was told we could fish in flooded area by camp host, but was asked to leave by police. Had to access the shoreline on the non-flooding side (east) to fish. Wish Oklahoma would put more money into their state parks since so many people use them.
	5/27	Other side of riverside needs electric! Concerned with random people that are not park campers driving though or staying in the park.
	5/30	Need electrics at west side. Need more boat access, need boat ramp access when park is closed. Need keypad on bathroom. Public restroom needed at other sites in area to avoid late night traffic.
	6/5	When the water is low, I'm frustrated the yellow gate is closed because I can't get to the fishing spots downstream in my boat.
	6/7	Everything is fine.
	6/27	Bathrooms are gross.
	6/28	Nice shade and green! Improve bathrooms and put in showers.
	6/28	Being close to the restrooms. Location is misleading.
	7/5	Really clean.
	7/5	Upset that you can't camp Lindley's point anymore.
7/25	Make shoreline/fishing spots more accessible for elderly people. Level areas to walk on/dock or bridge to cross over towards the dam area.	

Table 5.5.5-3: Visitor Comments for Public Access Sites (non-Project)

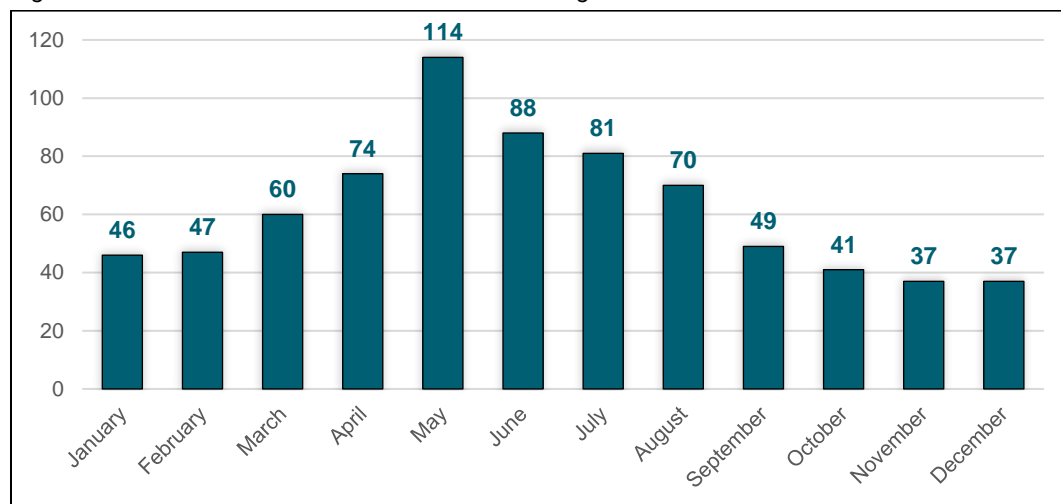
Interview Site	Comment Date (2020)	Visitor Interview Comments
Public Access Sites (non-project)		
• Connors Bridge	5/23	Need trash can to limit trash around site. Concerned about the people fishing from the bridge area. Place can get really muddy and tends to smell.
	5/30	Floods once or twice if it rains enough.
	7/5	Trash cans would be nice. Cut some tree limbs, but not too much because we like the shade. Would like if they would clear the grass near the shore more often.
	8/22	Sailboat bridge - put some places for people to fishing. Clean out brush for access and safer use. Mainly find more places for people to fish on the bank.
• Council Cove <small>*unless noted otherwise</small>	5/23	Trash cans. Lots of trash around the sight. Would not trust cars going down to the boat ramp due to eroded roads.
	6/27	Not as crowded as Sycamore.
	8/16	It is more difficult to launch a boat, but this makes people come here less so it is less crowded to fish.
	8/22*	Fix boat ramps. (Interview site: Spring River).
• Riverview Park	7/18	Site A: complaints about losing tackle because of river debris.
	8/8	Site A: boat ramp needs dock to access boats when muddy.
	7/18	Site B: mow along the shoreline and raise the water level.
• Spring River	5/17	Public docks not user friendly.
	6/7	Shimmer horn ⁹⁵ swimming problematic due to current, venomous snakes.
	6/10	Areas can become trashy due to people not taking care of their own trash. Great view of the river.
	8/22	Would like to see the trash at the locations be improved. Put out trash cans and signs to help with the trash issue. Boat ramp needs to be widened and fixed below the water. Add senior fishing.
• Willow Park	-	No comments received.
• Channel Sites	5/17	It's an awesome lake!

5.5.6 Visitor Usage of the Grand Lake Area (12-month period)

While most interview questions compiled data for specific activities and recreation sites visited between May and September, input regarding visitor usage of the Grand Lake area over a 12-month period was also collected during visitor interviews. **Figure 5.5.6-1** summarizes the usage data collected from visitors. Based on those interviewed, visitors recreated in the Grand Lake all year-round. Based on a calendar year, visitor use gradually increased from January to April, more often from April through August, with a notable increase in use from April to May and a notable decrease from May to June.

⁹⁵ Unable to interpret if this comment is referring to the Spring River recreation site.

Figure 5.5.6-1: Grand Lake Area Recreation Site Usage for a 12-Month Period



5.6 Recreation Facility Inventory

An inventory of recreation facilities at each of the 20 sites was completed on September 22 and 23, 2020. As discussed in [Section 4.3](#), each facility was assigned a rating according to the following scale:

- N: Needs Replacement (broken or missing components, or nonfunctional)
- R: Needs Repair (structural damage or otherwise in obvious disrepair)
- M: Needs Maintenance (ongoing maintenance issue, primarily cleaning)
- G: Good Working Condition (functional and well maintained)

5.6.1 FERC-Approved Sites

Table 5.6.1-1 summarizes each FERC-approved site facility condition assessment and lists the number of amenities available at each site. All amenities are assigned a rating of G, unless noted otherwise in a footnote. The following sections provide additional information gathered at each site during the assessment.

Table 5.6.1-1: FERC-Approved Site Facility Condition Assessment Summary

Grand Lake Area Recreation Site	Amenity (assigned a G rating, unless noted otherwise)						
	Boat Launch Ramp/Lane	Dock or Pier	Mooring Dock	Pavilion	Picnic Table	Restroom	Trash Receptacle
FERC-Approved							
• Big Hollow	1 ⁹⁶	-	-	-	-	-	-
• Duck Creek	1	-	-	-	-	-	-
• Monkey Island	1 ⁹⁷	-	-	-	-	-	-
• Seaplane Base	1	-	-	-	-	-	-
• Wolf Creek ⁹⁸	6	1	4	1	6	1	7

⁹⁶ Big Hollow boat launch ramp/lane rating = M, gravel needs grading.

⁹⁷ Monkey Island boat launch ramp/lane rating = M, washed out gravel.

⁹⁸ Wolf Creek: each facility type provides barrier-free access.

5.6.1.1 Big Hollow

Big Hollow is located on the east side of Grand Lake in a rural and relatively remote area in Delaware County. The site is maintained by GRDA. The one facility at this site is a concrete boat launch ramp with a gravel approach. The boat launch ramp was rated G and is in good condition; however, the gravel needs grading. There is no parking at the site. There are no signs directing the public to the site or at the site. No visitors were observed using Big Hollow during the site surveys or the assessment. This site is directly surrounded by private homes and a private boat ramp.

5.6.1.2 Duck Creek

Duck Creek is located north of the town of Ketchum and is maintained by GRDA. The one facility at the site is a boat launch ramp which was rated as G and is in good condition. A note was made that some of the boat ramp concrete is broken⁹⁹, most likely due to the deep channel. The gravel parking lot has approximately six double/trailer parking spaces. The parking area was rated G and is in good condition. Signage includes one wooden Facility ID sign, one regulation sign regarding deep water, and two directional signs along State Highway 85. All but one sign is in good condition.

5.6.1.3 Monkey Island

Monkey Island is located centrally on Grand Lake and is maintained by GRDA. The one facility at the site is a boat launch ramp which was rated as M and needs maintenance. The parking area is asphalt and unmarked with approximately 15 double/trailer parking spaces. The parking area was rated as M and needs maintenance. There are no signs at or near the site. One golf course sign near the entrance of the public access area notes that pedestrian access is prohibited, which may cause confusion as to accessing Monkey Island site.

5.6.1.4 Seaplane Base

Seaplane Base is located on the west side of Grand Lake in a rural and relatively remote area northeast of the town of Cleora. The site is maintained by GRDA. The one facility at the site is a concrete boat launch ramp with a gravel approach. The boat ramp was rated as G and is in good condition. The parking area has a gravel surface with approximately nine unmarked double/trailer parking spaces. The parking area was rated as M and needs maintenance. There is no signage at or near the site.

5.6.1.5 Wolf Creek

Wolf Creek is located on the northeastern portion of Grand Lake in the city of Grove and is maintained by the City. Site facilities include six boat launch ramps, one dock/pier, four mooring docks, one pavilion with a weighing live tank, six picnic tables, one large restroom facility, and seven trash receptacles. This site includes three areas dominated by parking. The north area includes only parking. The south area includes parking, restrooms, and camping refuse depository. The area also includes parking sites, barrier-free ramps and docks, and a swimming area. The restrooms, trash receptacles, and one picnic table are also barrier-free. All facilities were rated as G and in good condition.

The extensive parking areas are surfaced with both asphalt and concrete. There are a total of 413 parking spaces within the three areas. Most (353) of the parking spaces are double/trailer spaces; there are 51 standard parking spaces and 17 barrier-free parking spaces (standard and double sized). Signage at the site includes one Facility ID sign, six directional signs, and multiple regulation signs. Directional signs are also present along the major road outside the facility.

⁹⁹ The boat ramp was re-surfaced by GRDA in late 2020, after the facility assessment was completed on September 22, 2020.

5.6.2 State Park Sites

Table 5.6.2-1 summarizes each state park site facility condition assessment and lists the number of amenities available at each site. All amenities are assigned a rating of G, unless noted otherwise in a footnote. The following sections provide additional information gathered at each site during the assessment.

Table 5.6.2-1: State Park Site Facility Condition Assessment Summary

Grand Lake Area Recreation Site	Amenity (assigned a G rating, unless noted otherwise)						
	Boat Launch Ramp or Lane	Dock or Pier	Mooring Dock	Pavilion	Picnic Table	Restroom	Trash Receptacle
State Park Sites (non-project)							
• Bernice ¹⁰⁰	2 ¹⁰¹	1 ¹⁰²	-	1	Many	3	5
• Disney	3	-	-	-	2	-	-
• Honey Creek	1	1	1	2	Many	3	5
• Little Blue	-	-	-	-	-	5	3
• Twin Bridges Lower ¹⁰³	2	-	1	1	4	1	2
• Twin Bridges Upper ¹⁰⁴	-	-	-	5	Many	10	5
• Cherokee Main ¹⁰⁵	-	-	-	1	-	1	-
• Cherokee Lakeside ¹⁰⁶	1	-	-	1	3	1	3
• Cherokee Riverside ¹⁰⁷	-	-	-	1	1	3	4

5.6.2.1 Bernice State Park

Bernice State Park is part of the OTRD state park system and is maintained by OTRD. The site is centrally located on the east side of Grand Lake in the town of Bernice. Facilities include two boat launch ramps, one dock, one pavilion, multiple picnic tables, three restrooms, four dumpsters, and one trash can. There are also 33 RV campsites and 27 tent campsites, each include electricity and water hookup and picnic tables. Additionally, the site includes playground equipment, a nature center, a barrier-free nature trail, two wildlife watch towers, and a swimming area.

All parking areas are asphalt paved and include spaces at each campsite, five regular and two barrier-free parking spaces at the pavilion, 15 spaces at the nature center and trailhead, and regular and barrier-free parking at restroom locations. Parking near the boat ramp is asphalt paved but spaces are not well marked. Parking also occurs on unpaved areas in and around the boat ramps. There are many signs including a large Facility ID sign at the park entrance, which is visible from the road; multiple regulation signs, including lakeside; and metal interpretive signs at the trailhead and along the trail. All signs were rated as G and in good condition.

¹⁰⁰ Bernice State Park: restroom provides barrier-free access.

¹⁰¹ Bernice State Park boat launch rating = G / M, one launch is in good condition, the other needs concrete work.

¹⁰² Bernice State Park dock/pier was not in place at the time of the survey and therefore the condition could not be rated.

¹⁰³ Twin Bridges State Park Lower: mooring dock, pavilion, and restroom provide barrier-free access.

¹⁰⁴ Twin Bridges State Park Upper: pavilion provides barrier-free access.

¹⁰⁵ Cherokee State Park, Main: pavilion provides barrier-free access.

¹⁰⁶ Cherokee State Park, Lakeside: pavilion and restroom provide barrier-free access.

¹⁰⁷ Cherokee State Park, Riverside: pavilion, restroom, and trash receptacles provide barrier-free access.

5.6.2.2 Disney State Park

Disney State Park is part of the OTRD state park system and is maintained by OTRD. The small site is located on the southern end of Grand Lake, is divided by State Highway 28, and is adjacent to one of the Pensacola spillways. All facilities are located on the north side of the highway and include three boat launch lanes, two picnic tables, and four primitive campsites with picnic tables and grills. No facilities are located on the south side. The parking area is asphalt paved and parking spaces are not defined. The site includes a roadside Facility ID sign, regulation signs, and one interpretive sign (south side of highway). Facilities, parking, and signage are all rated as G and in good condition.

5.6.2.3 Honey Creek State Park

Honey Creek State Park is part of the OTRD state park system and is maintained by OTRD. The site is centrally located on the east side of Grand Lake in the city of Grove. This site has high usage and many facilities that include one boat launch ramp, one dock, one mooring dock, two pavilions, three restroom facilities (one with showers), and five trash receptacles. There are 39 RV campsites, each include electricity and water hookup and picnic tables. There are multiple primitive tent campsites and day use picnic tables. The park also has a swimming pool, playground, visitor center/office/gift shop, fishing pier, and fish cleaning station. The boat ramp has broken concrete in some areas but is usable. All the facilities were rated as G and in good condition.

Parking areas are all asphalt paved. The parking area designated for boats is not well marked and has approximately eight to ten double/trailer parking spaces. There are also marked regular and barrier-free parking spaces at the restroom facilities and pool. The site includes regulation signs, as well as directional signs on the State Park Road leading to the site. Parking and signage were rated as G and in good condition.

5.6.2.4 Little Blue State Park

Little Blue State Park is part of the OTRD state park system and is maintained by OTRD. The site is located south of the town of Tijuana on the channel below a spillway. This site has high usage and minimal facilities that include five restrooms (four portable and one latrine) and three trash receptacles. There are 18 primitive campsites, each with a picnic table, grill, and fire ring but no designated parking. The only marked and maintained parking area is located along the western end of a paved loop road. This area is asphalt paved and includes five standard parking spaces. Most parking at the site occurs on unpaved areas along the loop road and to the west of the loop closer to the river channel. Swimming is a popular activity at the site but there is no designated swimming area(s). The site includes one Facility ID sign at the park entrance and some interpretive/regulation signs along Summer Creek. All the facilities, parking, and signage were rated as G and in good condition.

5.6.2.5 Twin Bridges Lower State Park

Twin Bridges Lower State Park is part of the OTRD state park system and is maintained by OTRD. The lower portion has lake access and is located on the north end of Grand Lake at the convergence of the Neosho and Spring Rivers. Facilities include two boat launch ramps, one mooring dock, one pavilion, four picnic tables, one restroom, and two trash receptacles. There are also 16 camping sites with electric and water hook ups, grills, and picnic tables, as well as one fish cleaning station. All facilities were rated as G and in good condition.

The parking area and roads were paved with asphalt and in good condition. There are multiple parking spaces associated with each camping spot and 36 marked, double parking spaces near the boat ramps. Approximately 25 single parking spaces are available near the park entrance and five single spaces associated with a pavilion. Parking is also available in a gravel lot on the east side of the site along the water. Signage at the site includes a Facility ID sign that is visible from the road and multiple regulation signs regarding fishing.

5.6.2.6 Twin Bridges Upper State Park

Twin Bridges Upper State Park is part of the OTRD state park system and is maintained by OTRD. The upper portion does not have lake access and is divided into east and west areas by State Highway 137. Facilities include five pavilions, numerous picnic tables, ten restrooms, and at least five trash receptacles. There are also 18 tent camping sites with picnic tables, five cabins, multiple playgrounds, one volleyball court, one basketball court, a nature center/office building and 35 RV campsites with electricity, water, and picnic tables. All facilities were rated as G and in good condition.

Most parking is associated with campsite, restroom, and pavilion locations; they are asphalt paved. There are approximately 72 single parking spaces and five barrier-free parking spaces. The site includes Facility ID, directional, regulations, and interpretive signs. The interpretive signs are located at the nature center. The signs are constructed of a combination of wood and metal. Parking areas and signs were rated as G and in good condition.

5.6.2.7 Cherokee State Park, Main

Cherokee State Park, Main is part of the OTRD state park system and is maintained by OTRD. The site is located on the southern end of Grand Lake (no lake access) on the east side of the town of Disney and is adjacent to one of the Pensacola spillways. Facilities include one pavilion and one restroom facility with showers. Ten campsites are available, each with a picnic table and grill; four have electricity hookup. A gravel parking area near the pavilion is unmarked. The site includes one roadside Facility ID sign and a few regulation signs. Facilities, parking, and signage are all rated as G and in good condition.

5.6.2.8 Cherokee Lakeside State Park

Cherokee Lakeside State Park is part of the OTRD state park system and is maintained by OTRD. The site is located on the southern end of Grand Lake on the west side of the town of Disney. It is immediately above the Pensacola Dam and spillway. Facilities include one boat launch ramp, one pavilion, three picnic tables with grills in the designated day use swimming area, one restroom with showers, and three trash receptacles. There is also a playground, as well as ten RV campsites, which each include electricity and water hookup and a picnic table with a grill. All the facilities were rated as G and in good condition.

Approximately 20 unmarked, double parking spaces are available for boaters on an asphalt paved lot. More unorganized parking occurs along the road and the edge of the swimming area. The pavilion also has an asphalt paved, unmarked parking area. The site includes a roadside Facility ID sign, regulation sign, and directional signs. Parking and signage are all rated as G and in good condition.

5.6.2.9 Cherokee Riverside State Park

Cherokee Riverside State Park is part of the OTRD state park system and is maintained by OTRD. The site is directly below the Pensacola Dam and spillway and is divided by the Grand River. The site includes an area on the west side of the river and another on the east side.

West Side

The west side provides river access and facilities include one pavilion, two restrooms (latrine), and two trash receptacles. There are 18 primitive campsites, each with a picnic table, grill, and fire ring. Water is available on-site. The facilities are all rated as G and in good condition. Parking includes a small asphalt paved area, unorganized parking along the paved loop through the site, and in unpaved areas among trees. The loop and parking was rated as R and needs repair. The site includes a wooden, roadside Facility ID sign, multiple regulation signs, some directional signs, and an invasive species sign. The signs were rated as G and in good condition except for one of the regulation signs, the paddle fish sign, which needs replacement.

East Side

The east side does not provide river access and facilities include one picnic table, one restroom (with shower), and two trash receptacles. There are 12 RV campsites with electricity and water hookup, picnic table, grill, and fire ring. All facilities were rated as G and in good condition. The site is asphalt paved and includes parking at each of the 12 campsites, as well as five parking spaces at the restroom, two of which are barrier-free. The parking area was rated as G and is in good condition. Three campsites were closed due to an eroding bank and related safety hazards. The site includes wooden and aluminum directional roadside signs and multiple regulation signs. The signs were rated as G and in good condition.

5.6.3 Public Access Sites

Table 5.6.3-1 summarizes each public access site facility condition assessment and lists the number of amenities available at each site. All amenities are assigned a rating of G, unless noted otherwise in a footnote. The following sections provide additional information gathered at each site during the assessment.

Table 5.6.3-1: Public Access Site Facility Condition Assessment Summary

Grand Lake Area Recreation Site	Amenity (assigned a G rating, unless noted otherwise)						
	Boat Launch Ramp or Lane	Dock or Pier	Mooring Dock	Pavilion	Picnic Table	Restroom	Trash Receptacle
Public Access Sites (non-project)							
• Connors Bridge ¹⁰⁸	2	1	-	-	-	-	-
• Council Cove	1 ¹⁰⁹	-	-	-	2 ¹¹⁰	-	-
• Riverview Park A ¹¹¹	1	-	-	2	7	3	2
• Riverview Park B ¹¹²	1	-	-	-	1	-	1
• Spring River	1	-	-	-	-	-	-
• Willow Park	1	-	1	-	-	-	-
• Channel Sites	-	-	-	-	-	-	-

¹⁰⁸ Connors Bridge: boat launch ramp/lane provides barrier-free access.

¹⁰⁹ Council Cove boat launch ramp/lane rating = R, rutted gravel.

¹¹⁰ Council Cove picnic table rating = N, the east table should be replaced and the west table should be relocated.

¹¹¹ Riverview Park A: pavilion and restroom provide barrier-free access.

¹¹² Riverview Park B: boat launch ramp/lane provides barrier-free access.

5.6.3.1 Connors Bridge

Connors Bridge is located northeast of the town of Fairland on the Neosho River and is maintained by GRDA. Facilities include two parallel boat launch ramps and one barrier-free embarkation pier. All facilities were rated as G and in good condition. The parking area is asphalt paved and provides 13 marked parking spaces, which include five standard and eight double spaces. The site includes four metal regulation signs: two near the riverbank regarding paddlefish rules, one regarding no vehicular access to the southwest side of the parking area, and one on the east side of the site marking a Wildlife Management Area boundary. Parking and signs were rated as G and in good condition.

5.6.3.2 Council Cove

Council Cove is located at the north end of Grand Lake, south of the town of Wyandotte. The site is maintained by Ottawa County. Facilities are minimal and include a user-developed informal boat launch ramp with a gravel surface and two picnic tables. The user-developed boat ramp surface was rated as R and was in a state of disrepair. The two picnic tables were rated as N and need to be replaced. The parking area surface is gravel and has approximately ten, unmarked standard spaces. The parking area was rated as M and needs maintenance. There are no trash receptacles at the site and trash and litter were present. There are no signs present at the site or along the roadway for the public boat ramp.

5.6.3.3 Riverview Park

Riverview Park is located on the southeast side of the city of Miami and is maintained by the City. It spans both sides of the Neosho River, south of the highway bridge over the river. For surveying purposes, the site was assessed based on which side of the river it is located. Site A is on the east and Site B is on the west.

Site A

Facilities include one boat launch ramp (not barrier-free), two pavilions, seven picnic tables, three restrooms, and two trash receptacles. The site also includes playground equipment, a disc golf course, and five baseball fields. All the facilities were rated as G and in good condition.

Parking areas are asphalt paved and no parking spaces are barrier-free defined. The east pavilion provides approximately 30 unmarked parking spaces. The central pavilion provides approximately 27 unmarked parking spaces. One baseball field provides 43 marked parking spaces, the remaining four fields provide no organized parking. The boat ramp parking area is paved but unmarked. These parking areas were rated as G and in good condition. A parking area along the river and near the low water dam is paved and was rated as R because it needs repair. Site A includes one monument-type Facility ID sign near the park entrance, which is visible from the road, and several regulation signs that are area-specific. The signs were rated as G and in good condition.

Site B

Facilities include one boat launch ramp (barrier-free, elevated pier for embarkation), one picnic table, and one trash receptacle. The boat launch ramp and picnic table were rated as G and were in good condition. The trash receptacle was rated as M and needs maintenance. The county fairgrounds are adjacent to the site with restrooms within walking distance from Site B.

The parking area is asphalt paved and has approximately 21 unmarked spaces that include one space that is barrier-free parking, approximately 15 double/trailer spaces, and up to five additional spaces. The site includes regulation signage. Parking and signs were rated as G and in good condition.

5.6.3.4 Spring River

Spring River is located north of Grand Lake along the Spring River and is maintained by Ottawa County. The one facility at the site is a boat launch ramp and is not barrier-free. This facility was rated as G and is in good condition. There is no directional signage on the roads approaching the site, nor any signage at the site. The road leading into the site and the western portion of the site are paved and in good condition.

5.6.3.5 Willow Park

Willow Park is a small site located on the southeast portion of Grand Lake in the town of Ketchum and is maintained by the Town. Facilities include one paved boat launch ramp and one mooring dock. The facilities were rated as G and in good condition. The site includes a gravel parking area with approximately 15 unmarked parking spaces. The parking area was rated as G and in good condition. There are no signs at the site.

5.6.3.6 Channel Sites

Multiple sites below the dam and along channels are accessible mainly to off-road and four-wheel drive vehicles. There are no facilities in this area. Water access provides opportunities for fishing and ATV recreation. It is not possible to launch a boat in this area. Primary roads leading into these channel areas are well-maintained gravel roads that quickly change to unimproved roads and trails. Regulatory signs regarding high water hazards and access in the channels are present along the roads.

5.7 FERC-Approved Recreation Site Condition Assessments

Both a recreation facility inventory and site condition assessment were completed at each of the five FERC-approved recreation sites on either September 22 or 23, 2020. A summary of the recreation facility inventory is provided in [Section 5.6.1](#). The paragraphs below summarize each site condition assessment and any subsequent recommendations. The photos provided in the paragraphs below, as well as additional site-specific photos, are also included in **Appendix B**.

5.7.1 Big Hollow

Big Hollow is a rarely-used narrow boat launch site located along the middle of a peninsula with residential homes on each side (photo below, left). The launch has a hard-surface approach and is relatively steep (photo below, right). No property is available for parking.



5.7.2 Duck Creek Public Access

Duck Creek is a primitive boat launch site with a gravel parking area and hard-surface launch. The boat launch was resurfaced in late 2020. The current sign does not meet Part 8 recreation sign standards and the steep drop-off sign needs repairs.

A member of the public contacted GRDA through social media to request a barrier-free dock be added at this site. However, the gravel surface and steep drop into the channel do not make this site amenable to barrier-free facilities.

5.7.3 Monkey Island

Monkey Island is a boat launch site located on a shoreline buffer waterward of a residential area. The site is accessed through a housing development and the access road is very narrow. The asphalt road is in poor condition and the concrete ramp needs to be cleaned of loose gravel.

No Part 8 recreation sign was identified at the site and directional signage to the site was lacking. A private property owner installed a sign next to the fence (photo below, left). The fence separates private property on the left, which includes a concrete sidewalk, from public property on the right, which includes the asphalt road (photo below, right). The public may interpret this sign to mean the boat launch is on private property and not open to the public.



5.7.4 Seaplane Base

Seaplane Base is a boat launch site with a gravel access road that leads to a gravel parking area. The boat launch was resurfaced in late 2020. No part 8 sign was identified and the gravel parking area needed to be graded. Visitor interview responses on May 17 and 30, 2020 indicate a moderate problem with launching or taking out a boat and accessing the shoreline, but no similar comments were subsequently provided.



5.7.5 Wolf Creek

Wolf Creek is a boat launch site that has been recently updated and is designed to handle recreation needs for fishing tournaments. The site is a well-designed and maintained facility. No Part 8 sign was identified.



Visitor interview responses on May 30, 2020 and June 7, 2020 indicate a moderate problem with safely swimming and the scenic quality of the shoreline during high water events, and a large problem with launching or taking out a boat (docks are flooded), safely boating, and shoreline fishing (would like more fishing spots) during high water events. One of these two visitors indicated a moderate problem with

accessing the shoreline, while the other indicated this is a large problem during high water events. Both visitors indicated when water is higher than normal, it is an issue at this site. A visitor interview response on July 7 indicated the site does not include a public sandy beach like other locations do. Currently the main activity at this recreation site is boat launching.

5.8 Boat Launch Elevation Data

Boat launch elevations were photo-documented at all recreation sites with a boat launch. Photos showing high water and low water elevations at these sites are provided in **Appendix F**. Twin Bridges Upper State Park, Little Blue State Park, Cherokee Main State Park, and channel sites do not have a boat launch.

The top of the reservoir conservation pool is 745.00 feet above the Pensacola Datum (PD). Over the course of the survey dates, Grand Lake elevation fluctuated between 742.20 and 748.29 feet above PD. **Table 5.8-1** lists all survey dates and the corresponding reservoir elevation acquired from USACE (USACE, n.d.). The highest reservoir elevation was recorded on May 30, 2020 and the lowest on September 26, 2020 (last survey day), both are bolded in **Table 5.8-1**. Minor inundation of the sites occurred at various sites on May 27 and May 30, 2020.

GRDA assessed boat launch elevations to evaluate the reservoir surface elevation range at which the boat ramps are accessible. At the lowest recorded water elevation during the survey of 742.2 feet PD all boat launches appeared to be accessible. At the highest and second highest recorded water elevations during the survey of 748.29 or 747.83 feet PD nine of the sixteen boat launch sites are accessible.

Table 5.8-1: Survey Day and Corresponding Reservoir Elevation

Month	Day of Week	Date (2020)	Reservoir Elevation (PD)
May	Tuesday	May 12	745.02
	Sunday	May 17	747.43
	Friday	May 22	745.34
	Saturday	May 23	745.73
	Wednesday	May 27	747.83
	Saturday	May 30	748.29
June	Friday	June 5	745.16
	Sunday	June 7	744.91
	Wednesday	June 10	744.60
	Thursday	June 18	744.07
	Saturday	June 27	743.97
	Sunday	June 28	744.02
July	Thursday	July 2	744.07
	Sunday	July 5	744.07
	Tuesday	July 7	744.01
	Saturday	July 18	743.95
	Saturday	July 25	744.05
	Thursday	July 30	744.01

Month	Day of Week	Date (2020)	Reservoir Elevation (PD)
August	Wednesday	August 5	743.60
	Saturday	August 8	743.50
	Monday	August 10	743.29
	Sunday	August 16	743.01
	Saturday	August 22	742.96
	Thursday	August 27	743.06
September	Friday	September 4	743.07
	Sunday	September 6	743.00
	Sunday	September 13	743.01
	Tuesday	September 15	742.95
	Tuesday	September 22	742.55
	Saturday	September 26	742.20

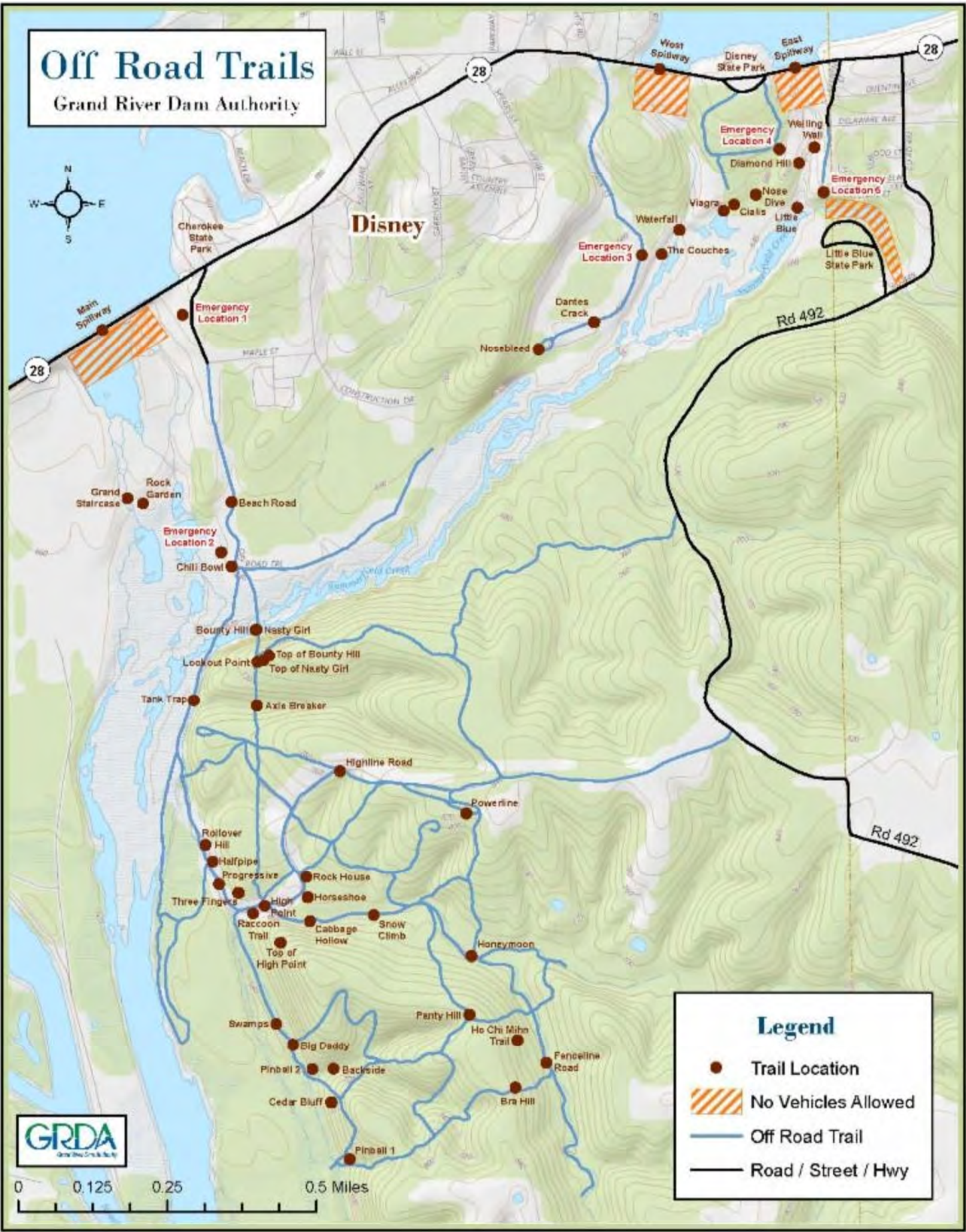
6. References

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- (Grand Lake, n.d.) Grand Lake OK. (n.d.). *Grand Lake OK Water Level (last 30 days)*. Retrieved November 2020 from www.grandlake.com/information.
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APPENDIX A: Downstream Channel Map

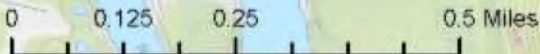
Off Road Trails

Grand River Dam Authority



Legend

- Trail Location
- No Vehicles Allowed
- Off Road Trail
- Road / Street / Hwy



APPENDIX B: Representative Site Photos

FERC-Approved Sites

Big Hollow Public Access Site Representative Photos



1. Big Hollow – May 12, 2020. View northwest of boat ramp access.



2. Big Hollow – May 30, 2020. View northwest of flooded boat ramp access.



3. Big Hollow – September 6, 2020. View northwest of boat ramp.



4. Big Hollow – September 6, 2020. View southwest of adjacent property.

Duck Creek Public Access Area Representative Site Photos



1. Duck Creek - May 23, 2020. View south of parking area and boat ramp.



2. Duck Creek - June 7, 2020. View south of boat ramp.



3. Duck Creek – August 8, 2020. View southeast of parking area.



4. Duck Creek – September 26, 2020. View north of parking area.

Duck Creek Public Access Area Representative Site Photos



5. Duck Creek – May 17, 2020. View south of flooding.

Monkey Island Public Access Representative Photos



1. Monkey Island – May 23, 2020. View west of parking area toward ramp.



2. Monkey Island – May 30, 2020. View east of parking area.



3. Monkey Island – September 6, 2020. View south of boat ramp.



4. Monkey Island – September 2020. Signage near entrance of site.

Seaplane Base Public Access Site Representative Photos



1. Seaplane Base – June 5, 2020. View east of boat ramp.



2. Seaplane Base – June 10, 2020. View east of boat ramp.



3. Seaplane Base – July 2, 2020. View southeast of parking area.



4. Seaplane Base – September 6, 2020. View east of boat ramp.

Wolf Creek Public Access Site Representative Photos



1. Wolf Creek – May 12, 2020. View south of park signage.



2. Wolf Creek – May 12, 2020. View north of mini pavilion.



3. Wolf Creek – May 12, 2020. View north of bathroom facility with RV dump site on right side.



4. Wolf Creek – May 23, 2020. View southeast of boat ramps.

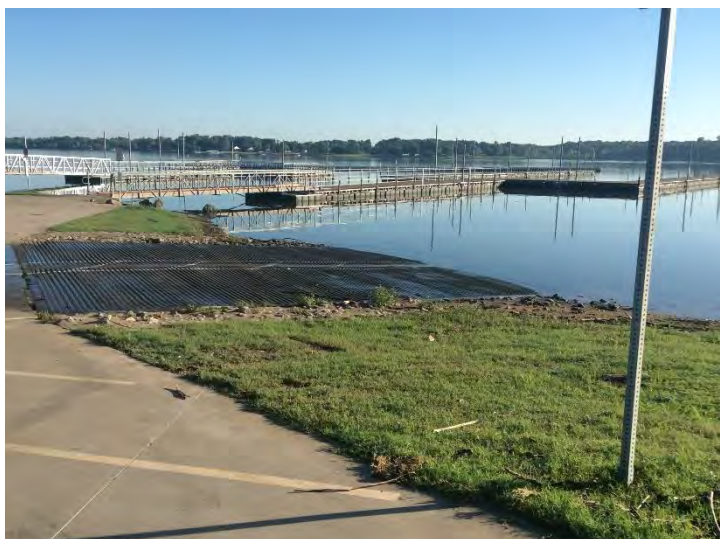
Wolf Creek Public Access Site Representative Photos



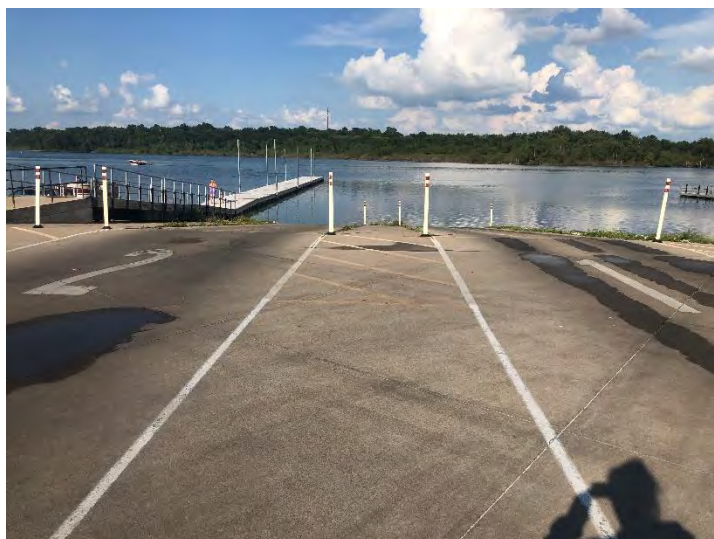
5. Wolf Creek – May 23, 2020. View south of mini pavilion from dock.



6. Wolf Creek – May 30, 2020. View northwest of north parking lot from picnic table area.



7. Wolf Creek – June 7, 2020. View north of docks from boat ramps.



8. Wolf Creek – September 4, 2020. View northeast of boat ramps.

Wolf Creek Public Access Site Representative Photos



9. Wolf Creek – September 4, 2020. View northeast of boat ramps.



10. Wolf Creek – September 4, 2020. View northeast of boat ramps.



11. Wolf Creek – September 6, 2020. View southwest from dock toward east parking lot.



12. Wolf Creek – September 13, 2020. View east of south parking area and restroom facility.

State Park Sites (non-project)

Bernice State Park Representative Site Photos



1. Bernice State Park – May 12, 2020. View west of east end of Nature Center.



2. Bernice State Park – May 23, 2020. View east of campsites from boat ramp parking area.



3. Bernice State Park – June 5, 2020. View northeast of campsites from west end of park near entrance.



4. Bernice State Park – June 7, 2020. View south of boat ramp from unpaved portion of boat ramp parking area.

Bernice State Park Representative Site Photos



5. Bernice State Park – July 2, 2020. View southeast of RV campsites.



6. Bernice State Park – July 25, 2020. View east of tent campsites.



7. Bernice State Park – August 8, 2020. View northeast of boat ramp parking area.



8. Bernice State Park – September 6, 2020. View southwest of boat ramp

Bernice State Park Representative Site Photos



9. Bernice State Park – June 2020. Coyote on display at nature center.



10. Bernice State Park – June 2020. Opal the opossum at nature center

Disney State Park Representative Site Photos



1. Disney State Park – View east of facility signage.



2. Disney State Park – May 12, 2020. View east of area on south side of State Highway 28.



3. Disney State Park – May 12, 2020. View northeast of parking and day use area on north side of State Highway 28.



4. Disney State Park – July 5, 2020. View south of parking area on north side of State Highway 28

Disney State Park Representative Site Photos



5. Disney State Park – September 26, 2020. View north of boat ramp.

Honey Creek State Park Site Representative Photos



1. Honey Creek State Park – May 12, 2020. View northwest of office and gift shop.



2. Honey Creek State Park – May 12, 2020. View west of pavilion.



3. Honey Creek State Park – May 12, 2020. View south of restroom facility in boat trailer parking/camping area.



4. Honey Creek State Park – May 12, 2020. View southeast of swimming pool facility.

Honey Creek State Park Site Representative Photos



5. Honey Creek State Park – May 12, 2020. View northwest of restroom/shower facility.



6. Honey Creek State Park – May 12, 2020. View north of pavilion near shower facility and camp sites.



7. Honey Creek State Park – May 12, 2020. View south of playground equipment near swimming pool.



8. Honey Creek State Park – May 23, 2020. View southwest of boat trailer parking area and campsites.

Honey Creek State Park Site Representative Photos



9. Honey Creek State Park – August 8, 2020. View northeast of RV campsites at west end of park.



10. Honey Creek State Park – June 7, 2020. View north of fishing dock and fish cleaning station at north end of boat trailer parking area.



11. Honey Creek State Park – September 13, 2020. View north of boat trailer parking area and campsites.



12. Honey Creek State Park – May 30, 2020. View south of boat ramp.

Little Blue State Park Representative Site Photos



1. Little Blue State Park – View northeast of facility sign.



2. Little Blue State Park – June 18, 2020. View north of Summerfield Creek on north side of park.



3. Little Blue State Park – July 5, 2020. View northeast of campsites, trash receptacle.



4. Little Blue State Park – July 25, 2020. View northwest of campsites and unorganized parking.

Little Blue State Park Representative Site Photos



5. Little Blue State Park – July 25, 2020. View west of swimming at confluence of Summerfield Creek and main channel from spillway.



6. Little Blue State Park – August 16, 2020. View west of swimming area.



7. Little Blue State Park – August 16, 2020. View north of sign.



8. Little Blue State Park – View west of regulation sign.

Little Blue State Park Representative Site Photos



9. Little Blue State Park – May 23, 2020. View west of swimming during water release from spillway.



10. Little Blue State Park – September 6, 2020. View northwest of ATVs on rock.

Twin Bridges State Park, Lower, Representative Site Photos



1. Twin Bridges State Park, Lower – May 22, 2020. View northeast of camping sites from boat ramps.



2. Twin Bridges State Park, Lower – August 5, 2020. View southeast of boat trailer parking area.



3. Twin Bridges State Park, Lower – August 8, 2020. View south of camping and boat access area.



4. Twin Bridges State Park, Lower – September 6, 2020. View southwest from boat ramps.

Twin Bridges State Park, Lower, Representative Site Photos



5. Twin Bridges Lower – May 17, 2020. Facility signage.

Twin Bridges State Park, Upper Representative Site Photos



1. Twin Bridges State Park, Upper – June 5, 2020. View northeast of RV camping area on east side of SH137.



2. Twin Bridges State Park, Upper – June 10, 2020. View southwest of tent camping area on west side of SH137.



3. Twin Bridges State Park, Upper – August 8, 2020. View west of RV camping area on west side of SH137.



4. Twin Bridges State Park, Upper – September 6, 2020. View north of RV camping area on east side of SH137.

Twin Bridges State Park, Upper Representative Site Photos



5. Twin Bridges State Park, Upper – May 2020. Administrative offices and Nature Center



6. Twin Bridges State Park, Upper – May 2020. Interpretive signage at building.



7. Twin Bridges State Park, Upper – May 2020. Interpretive signage at building.



8. Twin Bridges State Park, Upper – May 2020. Interpretive signage at building.

Twin Bridges State Park, Upper Representative Site Photos



9. **Twin Bridges State Park** – View southwest of facility signage.

Cherokee State Park, Main Representative Site Photos



1. Cherokee State Park, Main – May 30, 2020. View west of pavilion.



2. Cherokee State Park, Main – June 18, 2020. View west of primitive campsites and bathroom facility.



3. Cherokee State Park, Main – August 8, 2020. View north of RV campsites.



4. Cherokee State Park, Main – May 12, 2020. View north from State Highway 28 of facility sign and campsites.

Cherokee State Park, Lakeside Representative Site Photos



1. Cherokee State Park, Lakeside – May 12, 2020. View north of restroom/shower facility.



2. Cherokee State Park, Lakeside – May 23, 2020. View north day use picnic area, campsites and boat trailer parking area.



3. Cherokee State Park, Lakeside – July 18, 2020. View southwest of swimming beach.



4. Cherokee State Park, Lakeside – September 4, 2020. View east from parking area of RV campsites.

Cherokee State Park, Lakeside Representative Site Photos



5. Cherokee State Park, Lakeside – Facility signage

Cherokee State Park, Riverside (East and West) Representative Site Photos



1. Cherokee State Park, Riverside (west) – May 12, 2020.
View north of campsites.



2. Cherokee State Park, Riverside (west) – May 12, 2020.
View south from parking area of restroom.



3. Cherokee State Park, Riverside (west) – May 12, 2020.
View northeast of pavilion.



4. Cherokee State Park, Riverside (west) – June 27, 2020.
View north of parking and riverbank.

Cherokee State Park, Riverside (East and West) Representative Site Photos



5. Cherokee State Park, Lakeside (east) – May 27, 2020.
View northeast of restroom facility.



6. Cherokee State Park, Lakeside (east) – May 27, 2020.
View southeast of campsites.



7. Cherokee State Park, Lakeside (east) – June 18, 2020.
View northwest of RV campsites.



8. Cherokee State Park, Riverside. Facility ID signage

Public Access Sites and Channel Sites (non-project)

Connors Bridge Public Access Representative Site Photos



1. Connors Bridge – May 17, 2020. View north of partially flooded parking lot.



2. Connors Bridge – May 23, 2020. View southeast of parking area.



3. Connors Bridge – May 23, 2020. View west of parking area and ramp.



4. Connors Bridge – September 4, 2020. View southeast of parking area from boat ramp.

Connors Bridge Public Access Representative Site Photos



5. Connors Bridge – View east of signage.



6. Connors Bridge – View south of signage.

Council Cove Public Access Representative Site Photos



1. Council Cove – May 22, 2020. View east of boat ramp access. Parking area above and to left.



2. Council Cove – June 27, 2020. View west of boat ramp.



3. Council Cove – July 30, 2020. View north of parking area and State Highway 10.



4. Council Cove – September 4, 2020. View west of boat ramp.

Council Cove Public Access Representative Site Photos



5. Council Cove – picnic table in need of replacement



6. Council Cove – picnic table in need of replacement

Riverview Park, Site A, Representative Site Photos



1. Riverview Park Site A – May 17, 2020. View south from park entrance. Park closed due to flooding of Neosho River.



2. Riverview Park Site A – May 22, 2020. View west of parking area from top of boat ramp. Mud due to flooding.



3. Riverview Park Site A – June 5, 2020. View southeast from parking area.



4. Riverview Park Site A – August 8, 2020. View west from parking area near boat ramp.

Riverview Park, Site B, Representative Site Photos



1. Riverview Park Site B – July 5, 2020. View east of boat ramp from parking area.



2. Riverview Park Site B – July 5, 2020. View northwest of parking area.



3. Riverview Park Site B – August 22, 2020. View south from parking area.



4. Riverview Park Site B – September 6, 2020. View northwest of parking area.

Spring River Access Representative Site Photos



1. Spring River – May 17, 2020. View SW from parking area.



2. Spring River – May 23, 2020. View west of Spring River. Site had minor flooding.



3. Spring River – July 5, 2020. View northwest from parking area.



4. Spring River - August 22, 2020. View west of Spring River.

Willow Park Representative Site Photos



1. Willow Park – May 30, 2020. View north of boat ramp and mooring dock.



2. Willow Park – June 5, 2020. View northwest of boat docks from parking area.



3. Willow Park – August 10, 2020. View west of parking area.



4. Willow Park – September 13, 2020. View north of parking area with ramp and mooring dock to left.

Willow Park Representative Site Photos



5. Willow Park – View west of signage.

Channel Sites below Pensacola Dam and Spillways Representative Photos



1. **Channel Site** – June 18, 2020. View southeast of area below Pensacola dam spillway.



2. **Channel Site** – July 5, 2020. Area south of golf course.



3. **Channel site** – August 16, 2020. Area southeast of golf course.



4. **Channel Site** – August 10, 2020. View north of Pensacola dam spillway.

Channel Sites below Pensacola Dam and Spillways Representative Photos



5. Channel Site – September 6, 2020. View west from south end of Beach Road



6. Channel Site – September 6, 2020. View south of Beach Road.



7. Channel Site – September 6, 2020. View southwest of river from Beach Road area.

APPENDIX C: Recreation Observation Forms

Recreation Observation Documentation Form

Project Name: _____ Observer(s): _____

Date: ____/____/____

Temp: _____ Weather: _____ Wind: _____

(month / day / year)

Recreation Location	Start Time (military)	End Time (military)	Time Observed (military)	No. People	Observed Recreation Activities												Notes	
					ATV/OHV	Shoreline Fishing	Boat Fishing	Swimming	Run/Jogging	Hiking/Walking	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Boating/Canoeing/Kayaking	Other (specify)		
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Notes: If a group is participating in multiple activities, identify the **primary activity** by placing a “p” in the appropriate box. To identify the **secondary activity**, place an “s” in the appropriate box. Use your best personal judgment in determining between primary and secondary activities. If no one is observed recreating, please fill in the recreation location and time and simply write “no one observed” in the notes column.

Additional notes regarding observations of recreational activities or river access observed at site:

Recreation Observation Documentation Form

Project Name: _____ Observer(s): _____

Date: ____/____/____

Temp: _____ Weather: _____ Wind: _____

(month / day / year)

Recreation Location	Start Time (military)	End Time (military)	Time Observed (military)	No. People	Observed Recreation Activities												Notes	
					ATV/OHV	Shoreline Fishing	Boat Fishing	Swimming	Run/Jogging	Hiking/Walking	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Boating/Canoeing/Kayaking	Other (specify)		
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Additional notes regarding observations of recreational activities or river access observed at site:

Recreation Observation Documentation Form

Project Name: _____ Observer(s): _____

Date: ____/____/____

Temp: _____ Weather: _____ Wind: _____

(month / day / year)

Recreation Location	Start Time (military)	End Time (military)	Time Observed (military)	No. People	Observed Recreation Activities											Notes		
					ATV/OHV	Shoreline Fishing	Boat Fishing	Swimming	Run/Jogging	Hiking/Walking	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Boating/Canoeing/Kayaking		Other (specify)	
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Additional notes regarding observations of recreational activities or river access observed at site:

Recreation Observation Documentation Form

Project Name: _____ Observer(s): _____

Date: ____/____/____

Temp: _____ Weather: _____ Wind: _____

(month / day / year)

Recreation Location	Start Time (military)	End Time (military)	Time Observed (military)	No. People	Observed Recreation Activities												Notes	
					ATV/OHV	Shoreline Fishing	Boat Fishing	Swimming	Run/Jogging	Hiking/Walking	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Boating/Canoeing/Kayaking	Other (specify)		
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Additional notes regarding observations of recreational activities or river access observed at site:

Recreation Observation Documentation Form

Project Name: _____ Observer(s): _____

Date: ____/____/____

Temp: _____ Weather: _____ Wind: _____

(month / day / year)

Recreation Location	Start Time (military)	End Time (military)	Time Observed (military)	No. People	Observed Recreation Activities												Notes	
					ATV/OHV	Shoreline Fishing	Boat Fishing	Swimming	Run/Jogging	Hiking/Walking	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Boating/Canoeing/Kayaking	Other (specify)		
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Additional notes regarding observations of recreational activities or river access observed at site:

Recreation Observation Documentation Form

Project Name: _____ Observer(s): _____

Date: ____/____/____

Temp: _____ Weather: _____ Wind: _____

(month / day / year)

Recreation Location	Start Time (military)	End Time (military)	Time Observed (military)	No. People	Observed Recreation Activities												Notes	
					ATV/OHV	Shoreline Fishing	Boat Fishing	Swimming	Run/Jogging	Hiking/Walking	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Boating/Canoeing/Kayaking	Other (specify)		
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Additional notes regarding observations of recreational activities or river access observed at site:

Recreation Observation Documentation Form

Project Name: _____ Observer(s): _____

Date: ____/____/____

Temp: _____ Weather: _____ Wind: _____

(month / day / year)

Recreation Location	Start Time (military)	End Time (military)	Time Observed (military)	No. People	Observed Recreation Activities												Notes	
					ATV/OHV	Shoreline Fishing	Boat Fishing	Swimming	Run/Jogging	Hiking/Walking	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Boating/Canoeing/Kayaking	Other (specify)		
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Additional notes regarding observations of recreational activities or river access observed at site:

Recreation Observation Documentation Form

Project Name: _____ Observer(s): _____

Date: ____/____/____

Temp: _____ Weather: _____ Wind: _____

(month / day / year)

Recreation Location	Start Time (military)	End Time (military)	Time Observed (military)	No. People	Observed Recreation Activities												Notes	
					ATV/OHV	Shoreline Fishing	Boat Fishing	Swimming	Run/Jogging	Hiking/Walking	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Boating/Canoeing/Kayaking	Other (specify)		
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Additional notes regarding observations of recreational activities or river access observed at site:

Recreation Observation Documentation Form

Project Name: _____ Observer(s): _____

Date: ____/____/____

Temp: _____ Weather: _____ Wind: _____

(month / day / year)

Recreation Location	Start Time (military)	End Time (military)	Time Observed (military)	No. People	Observed Recreation Activities											Notes		
					ATV/OHV	Shoreline Fishing	Boat Fishing	Swimming	Run/Jogging	Hiking/Walking	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Boating/Canoeing/ Kayaking		Other (specify)	
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Additional notes regarding observations of recreational activities or river access observed at site:

Recreation Observation Documentation Form

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Date: ____/____/____

Temp: _____ Weather: _____ Wind: _____

(month / day / year)

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6.																		
7.																		
8.																		
9.																		
10.																		

Notes: If a group is participating in multiple activities, identify the **primary activity** by placing a “p” in the appropriate box. To identify the **secondary activity**, place an “s” in the appropriate box. Use your best personal judgment in determining between primary and secondary activities. If no one is observed recreating, please fill in the recreation location and time and simply write “no one observed” in the notes column.

Additional notes regarding observations of recreational activities or river access observed at site:

Recreation Observation Documentation Form

Project Name: _____ Observer(s): _____

Date: ____/____/____

Temp: _____ Weather: _____ Wind: _____

(month / day / year)

Recreation Location	Start Time (military)	End Time (military)	Time Observed (military)	No. People	Observed Recreation Activities												Notes	
					ATV/OHV	Shoreline Fishing	Boat Fishing	Swimming	Run/Jogging	Hiking/Walking	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Boating/Canoeing/ Kayaking	Other (specify)		
1.																		
2.																		
3.																		
4.																		
5.																		
6.																		
7.																		
8.																		
9.																		
10.																		

Notes: If a group is participating in multiple activities, identify the **primary activity** by placing a “p” in the appropriate box. To identify the **secondary activity**, place an “s” in the appropriate box. Use your best personal judgment in determining between primary and secondary activities. If no one is observed recreating, please fill in the recreation location and time and simply write “no one observed” in the notes column.

Additional notes regarding observations of recreational activities or river access observed at site:

Recreation Observation Documentation Form

Project Name: _____ Observer(s): _____

Date: ____/____/____

Temp: _____ Weather: _____ Wind: _____

(month / day / year)

Recreation Location	Start Time (military)	End Time (military)	Time Observed (military)	No. People	Observed Recreation Activities												Notes	
					ATV/OHV	Shoreline Fishing	Boat Fishing	Swimming	Run/Jogging	Hiking/Walking	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Boating/Canoeing/Kayaking	Other (specify)		
1.																		
2.																		
3.																		
4.																		
5.																		
6.																		
7.																		
8.																		
9.																		
10.																		

Notes: If a group is participating in multiple activities, identify the **primary activity** by placing a “p” in the appropriate box. To identify the **secondary activity**, place an “s” in the appropriate box. Use your best personal judgment in determining between primary and secondary activities. If no one is observed recreating, please fill in the recreation location and time and simply write “no one observed” in the notes column.

Additional notes regarding observations of recreational activities or river access observed at site:

Recreation Observation Documentation Form

Project Name: _____ Observer(s): _____

Date: ____/____/____

Temp: _____ Weather: _____ Wind: _____

(month / day / year)

Recreation Location	Start Time (military)	End Time (military)	Time Observed (military)	No. People	Observed Recreation Activities												Notes	
					ATV/OHV	Shoreline Fishing	Boat Fishing	Swimming	Run/Jogging	Hiking/Walking	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Boating/Canoeing/Kayaking	Other (specify)		
1.																		
2.																		
3.																		
4.																		
5.																		
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9.																		
10.																		

Notes: If a group is participating in multiple activities, identify the **primary activity** by placing a “p” in the appropriate box. To identify the **secondary activity**, place an “s” in the appropriate box. Use your best personal judgment in determining between primary and secondary activities. If no one is observed recreating, please fill in the recreation location and time and simply write “no one observed” in the notes column.

Additional notes regarding observations of recreational activities or river access observed at site:

APPENDIX D: Interview Question Results Spreadsheet

Spreadsheet not included in PDF

e-filed in Spreadsheet Format as Appendix 8 in Accession # 20220930-5107

APPENDIX E: Facility Assessment Forms

RECREATION FACILITY INVENTORY AND CONDITION ASSESSMENT
Pensacola Hydroelectric Project (FERC No. 1494)

Location:	
Date:	Surveyor:
Photo Number(s):	

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane			N / R / M / G	
Dock/Pier			N / R / M / G	
Mooring Dock			N / R / M / G	
Pavilion			N / R / M / G	
Picnic Table			N / R / M / G	
Restroom			N / R / M / G	
Trash Receptacles			N / R / M / G	
Other			N / R / M / G	

PARKING	Total Spaces: _____ Standard: _____ ADA: _____ Double (trailer): _____ Other: _____	Condition
	Surface Type: <i>Asphalt</i> <i>Concrete</i> <i>Gravel</i> <i>Other: _____</i>	N / R / M / G

Signs	#	Size	Material	Condition	Comments
FERC Project			wood / metal / other	N / R / M / G	
Facility ID			wood / metal / other	N / R / M / G	
Regulations			wood / metal / other	N / R / M / G	
Directional			wood / metal / other	N / R / M / G	
Interpretive			wood / metal / other	N / R / M / G	

N - Needs replacement (broken or missing components, or non-functional)
 R - Needs repair (structural damage or otherwise in obvious disrepair)
 M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
 G - Good condition (functional and well-maintained)
 If a facility is given a rating of "N", "R", or "M", provide specific details.

ADDITIONAL COMMENTS/NOTES:

Note the age of the facilities (if known) as well as any signs of overuse.

FERC-Approved Sites

RECREATION FACILITY INVENTORY AND CONDITION ASSESSMENT
Pensacola Hydroelectric Project (FERC No. 1494)

Location: <i>Big Hollow</i>	
Date: <i>9-23-20</i>	Surveyor: <i>Shawn P / Kims</i>
Photo Number(s): <i>999-1001</i>	

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane	<i>1</i>		N / R / <u>M</u> / <u>G</u>	<i>Concrete w/ gravel approach (Needs Grading)</i>
Dock/Pier			N / R / M / G	
Mooring Dock			N / R / M / G	
Pavilion			N / R / M / G	
Picnic Table			N / R / M / G	
Restroom			N / R / M / G	
Trash Receptacles			N / R / M / G	
Other			N / R / M / G	

PARKING	Total Spaces: _____ Standard: _____ ADA: _____ Double (trailer): _____ Other: _____ <i>None</i>	Condition
	Surface Type: <i>Asphalt</i> <i>Concrete</i> <i>Gravel</i> <i>Other: _____</i>	N / R / M / G

Signs	#	Size	Material	Condition	Comments
FERC Project			wood / metal / other	N / R / M / G	<i>None</i>
Facility ID			wood / metal / other	N / R / M / G	<i>None</i>
Regulations			wood / metal / other	N / R / M / G	<i>None</i>
Directional			wood / metal / other	N / R / M / G	<i>None</i>
Interpretive			wood / metal / other	N / R / M / G	<i>None</i>

N - Needs replacement (broken or missing components, or non-functional)
 R - Needs repair (structural damage or otherwise in obvious disrepair)
 M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
 G - Good condition (functional and well-maintained)
 If a facility is given a rating of "N", "R", or "M", provide specific details.

ADDITIONAL COMMENTS/NOTES:

Note the age of the facilities (if known) as well as any signs of overuse.

*Private ownership very close
 no usage documented during rec survey
 Private Ramp immediately adjacent*

RECREATION FACILITY INVENTORY AND CONDITION ASSESSMENT
Pensacola Hydroelectric Project (FERC No. 1494)

Location:	Duck Creek		
Date:	9-22-20	Surveyor:	Shawn Puzen
Photo Number(s):	954-961		

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane	1	N	N / R / M / <u>G</u>	Concrete Broken but usable Probably due to deep channel
Dock/Pier			N / R / M / G	
Mooring Dock			N / R / M / G	
Pavilion			N / R / M / G	
Picnic Table			N / R / M / G	
Restroom			N / R / M / G	
Trash Receptacles			N / R / M / G	
Other			N / R / M / G	

PARKING	Total Spaces: <u>6</u>	Standard: _____	ADA: _____	Double (trailer): <u>6</u>	Other: <u>Estimated No Lines</u>	Condition
	Surface Type:	Asphalt	Concrete	<u>Gravel</u>	Other: _____	N / R / M / <u>G</u>

Signs	#	Size	Material	Condition	Comments
FERC Project	NA		wood / metal / other	N / R / M / G	
Facility ID	1	wooden	<u>wood</u> / metal / other	N / R / M / <u>G</u>	See Picture
Regulations	1		wood / metal / other	N / R / M / <u>G</u>	Deepwater sign
Directional	2		wood / <u>metal</u> / other	N / R / M / <u>G</u>	Oh Road See pictures
Interpretive			wood / metal / other	N / R / M / G	on each side of Bridge

N - Needs replacement (broken or missing components, or non-functional)
 R - Needs repair (structural damage or otherwise in obvious disrepair)
 M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
 G - Good condition (functional and well-maintained)
 If a facility is given a rating of "N", "R", or "M", provide specific details.

ADDITIONAL COMMENTS/NOTES:

Note the age of the facilities (if known) as well as any signs of overuse.

RECREATION FACILITY INVENTORY AND CONDITION ASSESSMENT
Pensacola Hydroelectric Project (FERC No. 1494)

Location:	Monkey Island	
Date:	9-22-20	Surveyor: Shawn Puzan
Photo Number(s):	920-927	

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane	1	N	N / R / <u>M</u> / G	washed out gravel is causing it to narrow
Dock/Pier			<u>N</u> / R / M / G	
Mooring Dock			<u>N</u> / R / M / G	
Pavilion			<u>N</u> / R / M / G	
Picnic Table			<u>N</u> / R / M / G	
Restroom			<u>N</u> / R / M / G	
Trash Receptacles			<u>N</u> / R / M / G	
Other			<u>N</u> / R / M / G	

PARKING	Total Spaces: _____	Standard: _____	ADA: _____	Double (trailer): <u>15</u>	Other: _____	Condition
	Surface Type: <u>Asphalt</u>	Concrete	Gravel	Other: _____	_____	N / R / <u>M</u> / G

Signs	#	Size	Material	Condition	Comments
FERC Project	No		wood / metal / other	N / R / M / G	
Facility ID	No		wood / metal / other	N / R / M / G	
Regulations	No		wood / metal / other	N / R / M / G	
Directional	No		wood / metal / other	N / R / M / G	
Interpretive	No		wood / metal / other	N / R / M / G	

N - Needs replacement (broken or missing components, or non-functional)
 R - Needs repair (structural damage or otherwise in obvious disrepair)
 M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
 G - Good condition (functional and well-maintained)
 If a facility is given a rating of "N", "R", or "M", provide specific details.

ADDITIONAL COMMENTS/NOTES:

Note the age of the facilities (if known) as well as any signs of overuse.

Could use directional signage
 Repair of asphalt lot & road
 Drainage work to stop gravel from washing onto landing
 entrance sign prohibiting pedestrians on GC is misleading

RECREATION FACILITY INVENTORY AND CONDITION ASSESSMENT
Pensacola Hydroelectric Project (FERC No. 1494)

Location:	Seaplane Base	
Date:	9-22-20	Surveyor: Shawn Puzen
Photo Number(s):	951 - 953	

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane	1		N / R / M / G	Room for a second, but not needed
Dock/Pier			N / R / M / G	
Mooring Dock			N / R / M / G	
Pavilion			N / R / M / G	
Picnic Table			N / R / M / G	
Restroom			N / R / M / G	
Trash Receptacles			N / R / M / G	
Other			N / R / M / G	

PARKING	Total Spaces: 9	Standard: _____	ADA: _____	Double (trailer): 9	Other: _____	Condition
	Surface Type: Asphalt Concrete <u>Gravel</u> Other: _____					N / R / <u>M</u> / G

Signs	#	Size	Material	Condition	Comments
FERC Project			wood / metal / other	N / R / M / G	None
Facility ID			wood / metal / other	N / R / M / G	None
Regulations			wood / metal / other	N / R / M / G	None
Directional			wood / metal / other	N / R / M / G	None
Interpretive			wood / metal / other	N / R / M / G	

N - Needs replacement (broken or missing components, or non-functional)
 R - Needs repair (structural damage or otherwise in obvious disrepair)
 M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
 G - Good condition (functional and well-maintained)
 If a facility is given a rating of "N", "R", or "M", provide specific details.

ADDITIONAL COMMENTS/NOTES:

Note the age of the facilities (if known) as well as any signs of overuse.

Parking lot needs to be graded



RECREATION FACILITY INVENTORY AND CONDITION ASSESSMENT

Pensacola Hydroelectric Project (FERC No. 1494)

Location:	Wolf Creek	
Date:	9-23-20	Surveyor: KIMS Shawn P
Photo Number(s):	969-989	

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane	6	Y	N / R / M / <u>G</u>	
Dock/Pier	1	Y	N / R / M / <u>G</u>	barrier free fishing pier
Mooring Dock	4	Y	N / R / M / <u>G</u>	
Pavilion	1	Y	N / R / M / <u>G</u>	
Picnic Table	11	Y	N / R / M / <u>G</u>	1 table ADA accessible from a sidewalk
Restroom	1	Y	N / R / M / <u>G</u>	
Trash Receptacles	7	Y	N / R / M / <u>G</u>	
Other			N / R / M / G	

PARKING	Total Spaces: 413	Standard: 51	ADA: 17	Double (trailer): 353	Other: _____	Condition
	Surface Type: Asphalt Concrete Gravel Other: _____					

Signs	#	Size	Material	Condition	Comments
FERC Project	Yes		wood / metal / other	N / R / M / G	NA
Facility ID	1	4'x8'	wood / <u>metal</u> / other	N / R / M / G	Y
Regulations			wood / metal / other	N / R / M / G	As appropriate
Directional	6		wood / <u>metal</u> / other	N / R / M / <u>G</u>	see picture 3 from each direction
Interpretive			wood / metal / other	N / R / M / G	

only pictures of two sets of signs

N - Needs replacement (broken or missing components, or non-functional)
 R - Needs repair (structural damage or otherwise in obvious disrepair)
 M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
 G - Good condition (functional and well-maintained)
 If a facility is given a rating of "N", "R", or "M", provide specific details.

ADDITIONAL COMMENTS/NOTES:
 Note the age of the facilities (if known) as well as any signs of overuse.
 Designated Swim Area
 parking & Main Bldg to accommodate Fishing Tournaments
 Fish Cleaning Station, weighing Live Tank
 Restroom parking = 5 reg, 5 ADA
 North lot - 48 trailers, 5 ADA trailers, 29 auto
 South lot - 271 trailers, 4 auto, 4 ADA auto
 Lake lot - 7 ADA w/ trailer, 34 trailer, 4 auto

State Park Sites (non-project)

RECREATION FACILITY INVENTORY AND CONDITION ASSESSMENT
Pensacola Hydroelectric Project (FERC No. 1494)

Location:	Bernice State Park		
Date:	9-22-20	Surveyor:	Shawn Puzon
Photo Number(s):	928- 950		

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane	2	Y?	N / R / M / G	Two landings old one needs concrete work
Dock/Pier	1	N	N / R / (M) / G	Not in place at time of survey
Mooring Dock			N / R / M / G	
Pavilion	1		N / R / M / (G)	
Picnic Table			N / R / M / G	Each site has picnic table & Grill/Fire Ring
Restroom	3	Y	N / R / M / (G)	
Trash Receptacles	5	N	N / R / M / (G)	(4) Dumpsters (1) can at other trail parking
Other	3		N / R / M / (G)	Nature Center (ADA) playground equip estimated No Lines

PARKING	Total Spaces: <u>114</u> Standard: <u>12</u> ADA: <u>5</u> Double (trailer): <u>11</u> Other: <u> </u> Each site	Condition
	Surface Type: <u>Asphalt</u> Concrete Gravel Other: <u> </u> has parking	

Signs	#	Size	Material	Condition	Comments
FERC Project	NA		wood / metal / other	N / R / M / G	Not a FERC Facility
Facility ID			wood / metal / other	N / R / M / (G)	Road Sign at Road
Regulations			wood / metal / other	N / R / M / (G)	As appropriate
Directional			wood / metal / other	N / R / M / G	None needed visible from road
Interpretive	✓		wood / metal / other	N / R / M / (G)	ON trail ~ 12" x 20"

N - Needs replacement (broken or missing components, or non-functional)
 R - Needs repair (structural damage or otherwise in obvious disrepair)
 M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
 G - Good condition (functional and well-maintained)
 If a facility is given a rating of "N", "R", or "M", provide specific details.

ADDITIONAL COMMENTS/NOTES:
 Note the age of the facilities (if known) as well as any signs of overuse.

33 camping sites RD Elect water
 Wildlife feeding area
 2 tent sites
 Barrier Free Wildlife Trail w/ 40 x 80' asphalt parking (separate) & Barrier Free see picture # 950
 & Another Asphalt lot w/ 5 spaces
 some (asphalt) roads in campsite need maint.
 Pavilion parking
 5 cars
 2 ADA needs maint.

10

RECREATION FACILITY INVENTORY AND CONDITION ASSESSMENT

Pensacola Hydroelectric Project (FERC No. 1494)

Location:	Disney South	
Date:	9-23-20	Surveyor: Shawn Perkins
Photo Number(s):	1016 - 1021	

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane	3		N / R / M / <u>G</u>	
Dock/Pier			N / R / M / G	
Mooring Dock			N / R / M / G	
Pavilion			N / R / M / G	
Picnic Table	2		N / R / M / <u>G</u>	
Restroom			N / R / M / G	
Trash Receptacles			N / R / M / G	
Other			N / R / M / <u>G</u>	4 campsites w/ Picnic & Grill

PARKING	Total Spaces: _____ Standard: _____ ADA: _____ Double (trailer): _____ Other: _____	Condition
	Surface Type: <u>Asphalt</u> Concrete Gravel Other: _____	N / R / M / <u>G</u>

Signs	#	Size	Material	Condition	Comments
FERC Project			wood / metal / other	N / R / M / G	No
Facility ID			wood / metal / other	N / R / M / G	on Road
Regulations			wood / metal / other	N / R / M / G	As appropriate
Directional			wood / metal / other	N / R / M / G	None
Interpretive	1		wood / <u>metal</u> / other	N / R / M / <u>G</u>	Points of Interest 3'x3.5'

- N - Needs replacement (broken or missing components, or non-functional)
 - R - Needs repair (structural damage or otherwise in obvious disrepair)
 - M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
 - G - Good condition (functional and well-maintained)
- If a facility is given a rating of "N", "R", or "M", provide specific details.

ADDITIONAL COMMENTS/NOTES:

Note the age of the facilities (if known) as well as any signs of overuse.

RECREATION FACILITY INVENTORY AND CONDITION ASSESSMENT
Pensacola Hydroelectric Project (FERC No. 1494)

Location:	Honey Creek	
Date:	9-23-20	Surveyor: Shawn P/Kims
Photo Number(s):	988 - 998	

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane	1		N / R / M / <u>G</u>	concrete Broken but still in place
Dock/Pier	1		N / R / M / <u>G</u>	
Mooring Dock	1		N / R / M / <u>G</u>	
Pavilion	2		N / R / M / <u>G</u>	
Picnic Table			N / R / M / G	Just at campsites
Restroom	3		N / R / M / <u>G</u>	one has showers
Trash Receptacles	5		N / R / M / <u>G</u>	Dumpsters
Other			N / R / M / G	

PARKING	Total Spaces: _____ Standard: _____ ADA: <u>1</u> Double (trailer): _____ Other: _____	Condition
	Surface Type: <u>Asphalt</u> Concrete Gravel Other: _____	N / R / M / <u>G</u>

Signs	#	Size	Material	Condition	Comments
FERC Project			wood / metal / other	N / R / M / G	None
Facility ID			wood / metal / other	N / R / M / G	None
Regulations			wood / metal / other	N / R / M / G	As appropriate
Directional			wood / metal / other	N / R / M / G	Located on State Park Road
Interpretive			wood / metal / other	N / R / M / G	

N - Needs replacement (broken or missing components, or non-functional)
 R - Needs repair (structural damage or otherwise in obvious disrepair)
 M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
 G - Good condition (functional and well-maintained)
 If a facility is given a rating of "N", "R", or "M", provide specific details.

ADDITIONAL COMMENTS/NOTES:

Note the age of the facilities (if known) as well as any signs of overuse.

Each site has water Grill & electric
 Pool
 Playground
 Fish cleaning station
 Fishing Pier
 Visitor Center / office Gift shop

RECREATION FACILITY INVENTORY AND CONDITION ASSESSMENT
Pensacola Hydroelectric Project (FERC No. 1494)

Location:	Little Blue	
Date:	9-23-20	Surveyor: Kims / Shawn P
Photo Number(s):	1002 - 1015	

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane			N / R / M / G	
Dock/Pier			N / R / M / G	
Mooring Dock			N / R / M / G	
Pavilion			N / R / M / G	
Picnic Table			N / R / M / G	
Restroom	5		N / R / M / <u>G</u>	4 portables 1 permanent privy
Trash Receptacles	23		N / R / M / <u>G</u>	Dumpsters (2) 1 can
Other			N / R / M / G	Campsites (18) each site picnic table Grill & Fire Ring

PARKING	Total Spaces: 5	Standard: 5	ADA: _____	Double (trailer): _____	Other: _____	Condition
	Surface Type: <u>Asphalt</u>	Concrete	Gravel	Other: _____		N / R / M / <u>G</u>

Signs	#	Size	Material	Condition	Comments
FERC Project			wood / metal / other	N / R / M / G	None
Facility ID			wood / metal / other	N / R / M / G	None
Regulations			wood / metal / other	N / R / M / G	As appropriate
Directional			wood / metal / other	N / R / M / G	Entry Sign
Interpretive			wood / metal / other	N / R / M / G	None

N - Needs replacement (broken or missing components, or non-functional)
 R - Needs repair (structural damage or otherwise in obvious disrepair)
 M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
 G - Good condition (functional and well-maintained)
 If a facility is given a rating of "N", "R", or "M", provide specific details.

ADDITIONAL COMMENTS/NOTES:

Note the age of the facilities (if known) as well as any signs of overuse.

Popular access to channel for off-roading
 No formal swimming, but swimming is popular



RECREATION FACILITY INVENTORY AND CONDITION ASSESSMENT
Pensacola Hydroelectric Project (FERC No. 1494)

Location: <i>Two Bridges Lower</i>	Surveyor: <i>Shawn Puzon/Kims</i>
Date: <i>9-23-20</i>	
Photo Number(s):	

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane	<i>2</i>		N / R / M / <u>G</u>	
Dock/Pier			N / R / M / G	
Mooring Dock	<i>1</i>	<i>Y</i>	N / R / M / <u>G</u>	<i>A bit steep</i>
Pavilion	<i>1</i>	<i>Y</i>	N / R / M / <u>G</u>	
Picnic Table	<i>4</i>	<i>?</i>	N / R / M / <u>G</u>	<i>Five not associated w/ sites</i>
Restroom	<i>1</i>	<i>Y</i>	N / R / M / <u>G</u>	
Trash Receptacles	<i>2</i>		N / R / M / <u>G</u>	
Other			N / R / M / G	

PARKING	Total Spaces: _____	Standard: _____	ADA: _____	Double (trailer): _____	Other: _____	Condition
	Surface Type: <u>Asphalt</u>	Concrete	Gravel	Other: _____		N / R / M / <u>G</u>

Signs	#	Size	Material	Condition	Comments
FERC Project			wood / metal / other	N / R / M / G	<i>NA</i>
Facility ID			wood / metal / other	N / R / M / G	<i>Visible from Road</i>
Regulations			wood / metal / other	N / R / M / G	<i>Posted as Nec</i>
Directional			wood / metal / other	N / R / M / G	<i>None</i>
Interpretive			wood / metal / other	N / R / M / G	<i>None</i>

- N - Needs replacement (broken or missing components, or non-functional)
 - R - Needs repair (structural damage or otherwise in obvious disrepair)
 - M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
 - G - Good condition (functional and well-maintained)
- If a facility is given a rating of "N", "R", or "M", provide specific details.

ADDITIONAL COMMENTS/NOTES:

Note the age of the facilities (if known) as well as any signs of overuse.

*Each site elect water grill picnic table
 Fish cleaning station*

RECREATION FACILITY INVENTORY AND CONDITION ASSESSMENT
Pensacola Hydroelectric Project (FERC No. 1494)

4:20pm

Location:	Twin Bridges State Park Upper	
Date:	5/12/2020	Surveyor: KAS
Photo Number(s):		

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane	/		N / R / M / G	
Dock/Pier	/		N / R / M / G	
Mooring Dock	/		N / R / M / G	
Pavilion	III	Yes	N / R / M / G	12 tables in pavilion @ Gopher Valley Eagle Bluff
Picnic Table	IIIIIIIIII		N / R / M / G	check online to verify
Restroom	IIIIIIIIII		N / R / M / G	2 closed @ park office, Gopher Valley, Woody Trail
Trash Receptacles	IIIIIIIIII		N / R / M / G	
Other cabins	III	III	N / R / M / G	

PARKING	Total Spaces: _____ Standard: <u>13+12+12+10+6+17</u> ADA: <u>III</u> Double (trailer): <u>1</u> Other: _____	Condition N / R / M / G
	Surface Type: <u>Asphalt</u> Concrete Gravel Other: _____	

Signs	#	Size	Material	Condition	Comments
FERC Project			wood / metal / other	N / R / M / G	
Facility ID	IIIIIIIIII	2x3' <u>6ft</u>	<u>wood</u> / metal / <u>other</u>	N / R / M / G	office sign x2 Gopher Valley, Eagle
Regulations	IIIIIIIIII	2x2'	wood / <u>metal</u> / other	N / R / M / G	
Directional	III		wood / <u>metal</u> / other	N / R / M / G	
Interpretive	IIIIIIIIII		<u>wood</u> / <u>metal</u> / other	N / R / M / G	

N - Needs replacement (broken or missing components, or non-functional)
 R - Needs repair (structural damage or otherwise in obvious disrepair)
 M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
 G - Good condition (functional and well-maintained)
 If a facility is given a rating of "N", "R", or "M", provide specific details.

ADDITIONAL COMMENTS/NOTES:
 Note the age of the facilities (if known) as well as any signs of overuse.

1 mature center; 1 large truck parking spot @ park office
 playground equipment not accessible; volley ball + basketball @ Eagle
 updated Sept 2020

RECREATION FACILITY INVENTORY AND CONDITION ASSESSMENT
Pensacola Hydroelectric Project (FERC No. 1494)

Location: Cherokee Main	
Date: 9/23/20	Surveyor: Kim S Shawnp
Photo Number(s): 1022-1026	

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane			N / R / M / G	
Dock/Pier			N / R / M / G	
Mooring Dock			N / R / M / G	
Pavilion	1	Y	N / R / M / <u>G</u>	
Picnic Table			N / R / M / G	
Restroom	1	N	N / R / M / <u>G</u>	with Showers
Trash Receptacles			N / R / M / G	
Other	10		N / R / M / G	Campsites (10) Table & Grill w/ Electricity

PARKING	Total Spaces: _____	Standard: _____	ADA: _____	Double (trailer): _____	Other: <u>unorganized parking</u>	Condition
	Surface Type: <u>Asphalt</u>	Concrete	<u>Gravel</u>	Other: _____		N / R / M / <u>G</u>

Signs	#	Size	Material	Condition	Comments
FERC Project			wood / metal / other	N / R / M / G	None
Facility ID			wood / metal / other	N / R / M / G	Sign at Road
Regulations			wood / metal / other	N / R / M / G	As appropriate
Directional			wood / metal / other	N / R / M / G	None
Interpretive			wood / metal / other	N / R / M / G	None

N - Needs replacement (broken or missing components, or non-functional)
 R - Needs repair (structural damage or otherwise in obvious disrepair)
 M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
 G - Good condition (functional and well-maintained)
 If a facility is given a rating of "N", "R", or "M", provide specific details.

ADDITIONAL COMMENTS/NOTES:
 Note the age of the facilities (if known) as well as any signs of overuse.

RECREATION FACILITY INVENTORY AND CONDITION ASSESSMENT
Pensacola Hydroelectric Project (FERC No. 1494)

Location:	Cherokee Lakeside	
Date:	9/23/20	Surveyor: Kim S & Shawn P
Photo Number(s):	1028-1034	

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane	1	N	N / R / M / G	
Dock/Pier			N / R / M / G	
Mooring Dock			N / R / M / G	
Pavilion	1	Y	N / R / M / G	
Picnic Table	3		N / R / M / G	Day use on Beach w/ 3 Grills
Restroom	1	Y	N / R / M / G	w/showers
Trash Receptacles	3		N / R / M / G	2 Dumpsters 1 can
Other			N / R / M / G	Designated Swimming ^{Camping sites} RU w/ Electric ^{Water picnic} Grill

PARKING	Total Spaces: _____	Standard: _____	ADA: _____	Double (trailer): <u>12±</u>	Other: _____	Condition
	Surface Type: <u>Asphalt</u>	Concrete	Gravel	Other: _____		N / R / M / G

Signs	#	Size	Material	Condition	Comments
FERC Project			wood / metal / other	N / R / M / G	None
Facility ID			wood / metal / other	N / R / M / G	Yes at Road
Regulations			wood / metal / other	N / R / M / G	As appropriate
Directional			wood / metal / other	N / R / M / G	Sign at Road
Interpretive			wood / metal / other	N / R / M / G	None

N - Needs replacement (broken or missing components, or non-functional)
 R - Needs repair (structural damage or otherwise in obvious disrepair)
 M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
 G - Good condition (functional and well-maintained)
 If a facility is given a rating of "N", "R", or "M", provide specific details.

ADDITIONAL COMMENTS/NOTES:

Note the age of the facilities (if known) as well as any signs of overuse.

Gravel Beach is graded
 Playground

parking lot spaces not painted/ marked
 parking at each camping site
 - 5+ auto parking at swimarea
 - parking on road
 - unsafe playground equipment

RECREATION FACILITY INVENTORY AND CONDITION ASSESSMENT
Pensacola Hydroelectric Project (FERC No. 1494)

Location:	Riverstone Upper (east)		
Date:	5/23/20	Surveyor:	Kims / Shawn P
Photo Number(s):	1038-1042		

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane			N / R / M / G	
Dock/Pier			N / R / M / G	
Mooring Dock			N / R / M / G	
Pavilion			N / R / M / G	
Picnic Table	1		N / R / M / G	other tables at site
Restroom	1	Y	N / R / M / G	w/showers
Trash Receptacles	2	Y	N / R / M / G	Dumpsters
Other			N / R / M / G	Campsites (12) Water, Elect picnic table Grill Fire Ring

PARKING	Total Spaces: <u>5</u>	Standard: <u>3</u>	ADA: <u>2</u>	Double (trailer): <u> </u>	Other: <u> </u>	Condition
	Surface Type: <u>Asphalt</u>	<u>Concrete</u>	<u>Gravel</u>	Other: <u> </u>		N / R / M / G

Signs	#	Size	Material	Condition	Comments
FERC Project			wood / metal / other	N / R / M / G	None
Facility ID			wood / metal / other	N / R / M / G	sign on road see pictures
Regulations			wood / metal / other	N / R / M / G	As Appropriate 1044-1046
Directional			wood / metal / other	N / R / M / G	None
Interpretive			wood / metal / other	N / R / M / G	None

N - Needs replacement (broken or missing components, or non-functional)
 R - Needs repair (structural damage or otherwise in obvious disrepair)
 M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
 G - Good condition (functional and well-maintained)
 If a facility is given a rating of "N", "R", or "M", provide specific details.

ADDITIONAL COMMENTS/NOTES:

Note the age of the facilities (if known) as well as any signs of overuse.

3 sites closed due to eroding bank parking @ camp sites and restrooms only

RECREATION FACILITY INVENTORY AND CONDITION ASSESSMENT
Pensacola Hydroelectric Project (FERC No. 1494)

for Riverside
 Direction
 sign
 see pic 1055

Location:	Riverside Lower (west)	
Date:	9/23/20	Surveyor: Kims/ShawnP
Photo Number(s):	1043 1047-1054	

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane			N / R / M / G	
Dock/Pier			N / R / M / G	
Mooring Dock			N / R / M / G	
Pavilion	1	Y	N / R / M / G	
Picnic Table			N / R / M / G	
Restroom	2	Y	N / R / M / G	2 ADA parking @ each restroom
Trash Receptacles	2		N / R / M / G	Pumpster (1) Trashcan (1)
Other		Y	N / R / M / G	Compsites (18) water picnic table Grill Ring

PARKING	Total Spaces: _____	Standard: _____	ADA: _____	Double (trailer): _____	Other: _____	Condition
	Surface Type: _____	Asphalt	Concrete	Gravel	Other: _____	N / (R) / M / G

Signs	#	Size	Material	Condition	Comments
FERC Project			wood / metal / other	N / R / M / G	None
Facility ID			wood / metal / other	N / R / M / G	sign at rd
Regulations			wood / metal / other	N / R / M / G	As appropriate
Directional			wood / metal / other	N / R / M / G	sign at rd see pict 1047
Interpretive			wood / metal / other	N / R / M / G	None

N - Needs replacement (broken or missing components, or non-functional)
 R - Needs repair (structural damage or otherwise in obvious disrepair)
 M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
 G - Good condition (functional and well-maintained)
 If a facility is given a rating of "N", "R", or "M", provide specific details.

ADDITIONAL COMMENTS/NOTES:

Note the age of the facilities (if known) as well as any signs of overuse.

unorganized parking; much on unpaved areas

Public Access Sites and Channel Sites (non-project)

RECREATION FACILITY INVENTORY AND CONDITION ASSESSMENT
Pensacola Hydroelectric Project (FERC No. 1494)

Location:	Connors Bridge	
Date:	9-22-20	Surveyor: Shawn Puzan
Photo Number(s):	913 - 919	

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane	2	Y	N / R / M / <u>G</u>	
Dock/Pier		Y	N / R / M / <u>G</u>	BF Embarkation pier
Mooring Dock		N	N / R / M / G	
Pavilion		N	N / R / M / G	
Picnic Table		N	N / R / M / G	
Restroom		N	N / R / M / G	
Trash Receptacles		N	N / R / M / G	
Other			N / R / M / G	

PARKING	Total Spaces: <u>13</u>	Standard: <u>5</u>	ADA: <u> </u>	Double (trailer): <u>8</u>	Other: <u> </u>	Condition
	Surface Type: <u>Asphalt</u>	Concrete	Gravel	Other: <u> </u>		

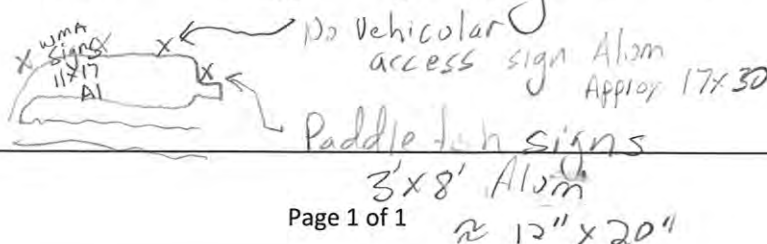
Signs	#	Size	Material	Condition	Comments
FERC Project			wood / metal / other	N / R / M / G	NA
Facility ID			wood / metal / other	N / R / M / G	None
Regulations	3	See Below	<u>wood</u> / metal / other	N / R / M / <u>G</u>	ODWC WMA
Directional			wood / metal / other	N / R / M / G	None
Interpretive			wood / metal / other	N / R / M / G	None

N - Needs replacement (broken or missing components, or non-functional)
 R - Needs repair (structural damage or otherwise in obvious disrepair)
 M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
 G - Good condition (functional and well-maintained)
 If a facility is given a rating of "N", "R", or "M", provide specific details.

ADDITIONAL COMMENTS/NOTES:

Note the age of the facilities (if known) as well as any signs of overuse.

could use more Directional signage but not located on main Road - BL Sign on Road?



RECREATION FACILITY INVENTORY AND CONDITION ASSESSMENT
Pensacola Hydroelectric Project (FERC No. 1494)

Location:	Council Cove	
Date:	9/23/2020	Surveyor: KS SP
Photo Number(s):	962-968	

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane	1	NO	N / <u>R</u> / M / G	ruttled gravel
Dock/Pier	—		N / R / M / G	
Mooring Dock	—		N / R / M / G	
Pavilion	—		N / R / M / G	
Picnic Table	2		<u>N</u> / R / M / G	both in need of replacement & west table should be relocated
Restroom	/		N / R / M / G	
Trash Receptacles	/		N / R / M / G	
Other			N / R / M / G	

PARKING	Total Spaces: _____	Standard: <u>10</u>	ADA: _____	Double (trailer): _____	Other: _____	Condition
	Surface Type:	Asphalt	Concrete	<u>Gravel</u>	Other: _____	N / R / <u>M</u> / G

Signs	#	Size	Material	Condition	Comments
FERC Project	/		wood / metal / other	N / R / M / G	
Facility ID	/		wood / metal / other	N / R / M / G	
Regulations	/		wood / metal / other	N / R / M / G	
Directional	/		wood / metal / other	N / R / M / G	
Interpretive	/		wood / metal / other	N / R / M / G	

N - Needs replacement (broken or missing components, or non-functional)
 R - Needs repair (structural damage or otherwise in obvious disrepair)
 M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
 G - Good condition (functional and well-maintained)
 If a facility is given a rating of "N", "R", or "M", provide specific details.

ADDITIONAL COMMENTS/NOTES:

Note the age of the facilities (if known) as well as any signs of overuse.

site not good for boat launching, steep grade + gravel
 no signage present, formalize ped. access to water (stairs)
 trash cans needed, litter abundant

RECREATION FACILITY INVENTORY AND CONDITION ASSESSMENT

Pensacola Hydroelectric Project (FERC No. 1494)

Location:	Riverview A	
Date:	9-22-20	Surveyor: Shawn Puzen
Photo Number(s):	899-907	

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane	1	N	N / R / M / G	
Dock/Pier			N / R / M / G	
Mooring Dock			N / R / M / G	
Pavilion	2	Y	N / R / M / G	2 pavilions
Picnic Table	7	N	N / R / M / G	Difficult to dist. from Pic center
Restroom	3	Y	N / R / M / G	
Trash Receptacles			N / R / M / G	Dumpster & Tras
Other			N / R / M / G	Playground equip Pool & water park Frisbee Golf Course Baseball Fields

PARKING	Total Spaces: _____ Standard: _____ ADA: _____ Double (trailer): _____ Other: <u>See Below</u>	Condition
	Surface Type: <u>Asphalt</u> Concrete Gravel Other: _____	N / R / M / G

Signs	#	Size	Material	Condition	Comments
FERC Project	NA		wood / metal / other	N / R / M / G	
Facility ID	1		wood / metal / other	N / R / M / G	Monument Type
Regulations			wood / metal / other	N / R / M / G	Throughout park as appropriate
Directional	None		wood / metal / other	N / R / M / G	Park entrance sign visible from Road
Interpretive	None		wood / metal / other	N / R / M / G	

N - Needs replacement (broken or missing components, or non-functional)
 R - Needs repair (structural damage or otherwise in obvious disrepair)
 M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
 G - Good condition (functional and well-maintained)
 If a facility is given a rating of "N", "R", or "M", provide specific details.

ADDITIONAL COMMENTS/NOTES: Pool → 25 in lot + 7 + 9 ADA
 Note the age of the facilities (if known) as well as any signs of overuse.
 Pool Parking has 31 spots (verify) 9 ADA spots
 Pavilion Parking Approximately 30 cars (verify) asphalt
 Pavilion Parking ~~gravel~~ 20 cars Asphalt No ADA spots → unmarked No ADA
 4 baseball fields no organized parking 1 baseball field Asphalt
 Over flow ~~gravel~~ / Asphalt parking by low water Dam Parking 43 spots
 (Needs Repair) Page 1 of 1

RECREATION FACILITY INVENTORY AND CONDITION ASSESSMENT

Pensacola Hydroelectric Project (FERC No. 1494)

Location: Riverview B
Date: 9-22-20 Surveyor: Shawn Puzm
Photo Number(s): 908-918

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane	1	Yes	N / R / M / G	Elevated ADA pier foreembarkation
Dock/Pier		N	N / R / M / G	
Mooring Dock		N	N / R / M / G	
Pavilion		N	N / R / M / G	
Picnic Table	1	Y	N / R / M / G	
Restroom		N	N / R / M / G	Fairground Restroom w/walking Dist.
Trash Receptacles	1	Y	N / R / M / G	
Other			N / R / M / G	

PARKING	Total Spaces: <u>21</u> Standard: <u>5</u> ADA: <u>1</u> Double (trailer): <u>15</u> Other: _____	Condition N / R / M / G
	Surface Type: <u>Asphalt</u> Concrete Gravel Other: _____	

Signs	#	Size	Material	Condition	Comments
FERC Project	NA		wood / metal / other	N / R / M / G	
Facility ID	ND		wood / metal / other	N / R / M / G	
Regulations	Y		wood / metal / other	N / R / M / G	Throughout as appropriate
Directional	N		wood / metal / other	N / R / M / G	
Interpretive	N		wood / metal / other	N / R / M / G	

N - Needs replacement (broken or missing components, or non-functional)
 R - Needs repair (structural damage or otherwise in obvious disrepair)
 M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
 G - Good condition (functional and well-maintained)
 If a facility is given a rating of "N", "R", or "M", provide specific details.

ADDITIONAL COMMENTS/NOTES:

Note the age of the facilities (if known) as well as any signs of overuse.

No parking lines (estimated #spots)

RECREATION FACILITY INVENTORY AND CONDITION ASSESSMENT
Pensacola Hydroelectric Project (FERC No. 1494)

3

Location:	Spring River	
Date:	9-22-20	Surveyor: Shawn Puzen
Photo Number(s):	892-897	

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane	1	N	N / R / M / <u>G</u>	
Dock/Pier			N / R / M / G	
Mooring Dock			N / R / M / G	
Pavilion			N / R / M / G	
Picnic Table			N / R / M / G	
Restroom			N / R / M / G	
Trash Receptacles			N / R / M / G	
Other			N / R / M / G	

PARKING	Total Spaces: <u>10</u>	Standard: _____	ADA: _____	Double (trailer): <u>10</u>	Other: <u>estimated No Lines</u>	Condition
	Surface Type: <u>Asphalt</u>	Concrete	Gravel	Other: _____		N / R / M / <u>G</u>

Signs	#	Size	Material	Condition	Comments
FERC Project	NA		wood / metal / other	N / R / M / G	
Facility ID	N		wood / metal / other	N / R / M / G	
Regulations	N		wood / metal / other	N / R / M / G	
Directional			wood / metal / other	N / R / M / G	
Interpretive	N		wood / metal / other	N / R / M / G	

N - Needs replacement (broken or missing components, or non-functional)
 R - Needs repair (structural damage or otherwise in obvious disrepair)
 M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
 G - Good condition (functional and well-maintained)
 If a facility is given a rating of "N", "R", or "M", provide specific details.

ADDITIONAL COMMENTS/NOTES:
 Note the age of the facilities (if known) as well as any signs of overuse.

*No directional signage on road
 Refuse dumped at parking No signage present at site.
 Sedimentation runoff directly into river (could be addressed)
 site should be posted to close at night
 Pier may not be a good idea because river is relatively narrow. Road into site is paved.*

**8*

RECREATION FACILITY INVENTORY AND CONDITION ASSESSMENT
Pensacola Hydroelectric Project (FERC No. 1494)

Location: <i>W. New Park</i>	Surveyor: <i>Shawn P / King</i>
Date:	
Photo Number(s): <i>1056 - 1057</i>	

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane	<i>1</i>	<i>N</i>	N / R / M / <u>G</u>	
Dock/Pier			N / R / M / <u>G</u>	
Mooring Dock	<i>1</i>	<i>N</i>	N / R / M / <u>G</u>	
Pavilion			N / R / M / G	
Picnic Table			N / R / M / G	
Restroom			N / R / M / G	
Trash Receptacles			N / R / M / G	
Other			N / R / M / G	

PARKING	Total Spaces: _____	Standard: _____	ADA: _____	Double (trailer): _____	Other: _____	<i>estimated No Lines</i>	Condition
	Surface Type:	Asphalt	Concrete	<u>Gravel</u>	Other: _____		N / R / M / <u>G</u>

Signs	#	Size	Material	Condition	Comments
FERC Project			wood / metal / other	N / R / M / G	<i>None</i>
Facility ID			wood / metal / other	N / R / M / G	<i>None</i>
Regulations			wood / metal / other	N / R / M / G	<i>None</i>
Directional			wood / metal / other	N / R / M / G	<i>None</i>
Interpretive			wood / metal / other	N / R / M / G	<i>None</i>

N - Needs replacement (broken or missing components, or non-functional)
 R - Needs repair (structural damage or otherwise in obvious disrepair)
 M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
 G - Good condition (functional and well-maintained)
 If a facility is given a rating of "N", "R", or "M", provide specific details.

ADDITIONAL COMMENTS/NOTES:
 Note the age of the facilities (if known) as well as any signs of overuse.

RECREATION FACILITY INVENTORY AND CONDITION ASSESSMENT
Pensacola Hydroelectric Project (FERC No. 1494)

Location:	Channel S, for 1, 2, 3	
Date:	9/22, 20	Surveyor: Kim S / Shawn P
Photo Number(s):	1027 1035-1037	

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane			N / R / M / G	
Dock/Pier			N / R / M / G	
Mooring Dock			N / R / M / G	
Pavilion			N / R / M / G	
Picnic Table			N / R / M / G	
Restroom			N / R / M / G	
Trash Receptacles			N / R / M / G	
Other			N / R / M / G	

PARKING	Total Spaces: _____	Standard: _____	ADA: _____	Double (trailer): _____	Other: <u>side of road</u>	Condition
	Surface Type: <u>Asphalt</u>	<u>Concrete</u>	<u>Gravel</u>	Other: _____	N / R / M / G	

Signs	#	Size	Material	Condition	Comments
FERC Project			wood / metal / other	N / R / M / G	None
Facility ID			wood / metal / other	N / R / M / G	None
Regulations			wood / metal / other	N / R / M / G	As approp
Directional			wood / metal / other	N / R / M / G	None
Interpretive			wood / metal / other	N / R / M / G	None

N - Needs replacement (broken or missing components, or non-functional)
 R - Needs repair (structural damage or otherwise in obvious disrepair)
 M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
 G - Good condition (functional and well-maintained)
 If a facility is given a rating of "N", "R", or "M", provide specific details.

ADDITIONAL COMMENTS/NOTES:
 Note the age of the facilities (if known) as well as any signs of overuse.

Access to channel for ATVs & off road

APPENDIX F: Water Level Photos

Water Level Photos



1. Spring River Public Access - May 27, 2020; view west. High water recorded on May 30, 2020 at 748.29 feet but no photo due to site flooding.



2. Spring River Public Access - September 26, 2020; view west. Low water level recorded at 742.2 feet.



3. Riverview Park Site A – May 22, 2020; view west. High water recorded on May 30, 2020 at 748.29 feet. No photo due to site flooding.



4. Riverview Park Site A – September 26, 2020; view west. Low water level recorded at 742.2 feet.

Water Level Photos



5. Riverview Park Site B – September 26, 2020; view east. Low water level recorded at 742.2 feet. (no high water mark photo from May available)



6. Twin Bridges State Park (lower) – May 30, 2020; view west. Site flooded. High water level recorded at 748.29 feet.



7. Twin Bridges State Park (lower) – September 26, 2020; view west. Low water level recorded at 742.2 feet.

Water Level Photos



8. Connors Bridge Public Access – May 27, 2020; view south. High water level recorded on May 30, 2020 at 748.29 feet, but site was flooded/inaccessible on that date.



9. Connors Bridge Public Access – September 26, 2020; view south. Low water level recorded at 742.2 feet.



10. Council Cove Public Access – May 30, 2020; view west. High water level recorded at 748.29 feet.



11. Council Cove Public Access – September 26, 2020; view west. Low water level recorded at 742.2 feet.

Water Level Photos



12. Wolf Creek – May 30, 2020; view northeast. High water level recorded at 748.29 feet.



13. Wolf Creek – May 30, 2020; view northeast. High water level recorded at 748.29 feet.



14. Wolf Creek – May 30, 2020; view northeast. High water level recorded at 748.29 feet.



15. Wolf Creek – May 30, 2020; view northeast. High water level recorded at 748.29 feet.

Water Level Photos



16. Wolf Creek – May 30, 2020; view northeast. Site flooding. High water level recorded at 748.29 feet.



17. Wolf Creek – May 27, 2020; view southeast. Water level recorded at 747.83 feet.



18. Wolf Creek – September 26, 2020; view northeast. Low water level recorded at 742.2 feet.



19. Wolf Creek – September 26, 2020; view northeast. Low water level recorded at 742.2 feet.

Water Level Photos



20. Wolf Creek – September 26, 2020; view northeast. Low water level recorded at 742.2 feet.



21. Wolf Creek – September 26, 2020; view northeast. Low water level recorded at 742.2 feet.



22. Wolf Creek – September 26, 2020; view northeast. Low water level recorded at 742.2 feet.



23. Wolf Creek – September 26, 2020; view northeast. Low water level recorded at 742.2 feet.

Water Level Photos



24. Honey Creek State Park – May 30, 2020; view north. High water level recorded at 748.29 feet.



25. Honey Creek State Park – September 26, 2020; view north. Low water level recorded at 742.2 feet.



26. Big Hollow – May 30, 2020; view northwest. High water level recorded at 748.29 feet.



27. Big Hollow – September 26, 2020; view northwest. Low water level recorded at 742.2 feet.

Water Level Photos



28. Cherokee State Park at Disney – May 30, 2020; view north. High water level recorded at 748.29 feet. Ramp closed.



29. Cherokee State Park at Disney – September 26, 2020; view north. Low water level recorded at 742.2 feet.



30. Cherokee State Park, Lakeside – May 27, 2020; view west. Second highest lake level recorded at 747.83 feet.



31. Cherokee State Park, Lakeside – September 26, 2020; view west. Low water level recorded at 742.2 feet.

Water Level Photos



32. Cherokee State Park, Riverside – May 27, 2020; view from east portion of Riverside park; west side closed due to flooding.
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33. Cherokee State Park, Riverside – September 26, 2020; view northeast.
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34. Willow Park – May 30, 2020; view north. High water level recorded at 748.29 feet.



35. Willow Park – September 26, 2020; view north. Low water level recorded at 742.2 feet.

Water Level Photos



36. Duck Creek – May 30, 2020; view east. High water level of 748.29 feet caused flooding and no access to site.



37. Duck Creek – September 26, 2020; view south. Low water level recorded at 742.2 feet.



38. Seaplane Base – May 30, 2020; view west. High water level recorded at 748.29 feet and flooded boat ramp.



39. Seaplane Base – September 26, 2020; view west. Low water level recorded at 742.2 feet.

Water Level Photos



40. Bernice State Park – May 30, 2020; view southwest of north ramp. High water level recorded at 748.29 feet.



41. Bernice State Park – May 30, 2020; view southwest of south ramp. High water level recorded at 748.29 feet.



42. Bernice State Park – September 26, 2020; view southwest of north ramp. Low water level recorded at 742.2 feet.



43. Bernice State Park – September 26, 2020; view southwest of south ramp. Low water level recorded at 742.2 feet.

Water Level Photos



44. Monkey Island – May 30, 2020; view south. High water level recorded at 748.29 feet.



45. Monkey Island – September 26, 2020; view south. Low water level recorded at 742.2 feet.

APPENDIX E-30

Socioeconomic Study Report

SEPTEMBER 14, 2021

SOCIOECONOMIC STUDY
THE GRAND RIVER DAM AUTHORITY—PENSACOLA PROJECT



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1.0 Demography and Socioeconomic Conditions

The Pensacola Hydroelectric Project (Pensacola Project or Project), owned and operated by the Grand River Dam Authority (GRDA), is licensed by the Federal Energy Regulatory Commission (FERC or Commission) as Project No. 1494. GRDA is a non-appropriated agency of the State of Oklahoma, created by the Oklahoma legislature in 1935 to be a “conservation and reclamation district for the waters of the Grand River.” As licensed by FERC, the Project serves multiple purposes, including hydropower generation, water supply, public recreation, and wildlife enhancement. As directed by Congress under the Flood Control Act of 1944, 58 Stat. 887, 890-91, the U.S. Army Corps of Engineers (USACE) has exclusive jurisdiction over Grand Lake for flood control purposes. The Pensacola Project dam and hydroelectric generating facility are located northeast of Tulsa on the Grand (Neosho) River (Grand River) in Craig, Delaware, Mayes, and Ottawa counties, Oklahoma (see Figure 1). The Pensacola Dam creates the Grand Lake O’ The Cherokees, also known as Grand Lake. This section presents information on the socioeconomics, including land use patterns, population, and employment, of the Project and the State of Oklahoma (GRDA 2017a). The region of influence (ROI) for socioeconomic impacts are defined as Craig, Delaware, Mayes and Ottawa County, Oklahoma, where the project impacts is located (FERC 2018). Socioeconomic and demographic data utilized in this discussion to establish baseline conditions consist of publicly available information about the ROI and, to provide perspective, the state of Oklahoma (Attachment A).

1.1 General Land Use Patterns

As shown in Figure 2, primary land use and land cover types in the four-county ROI are agricultural and forest covering approximately 86.2 percent of the area. As listed in Table 1, developed areas cover 6.3 percent of the land and are indicative of residential, commercial/industrial, and recreational development. Land cover has changed very little between 2001 and 2019, with most categories changing less than one percent. As of 2019, approximately 66.8 percent of lands adjacent to Grand Lake are forested or woody wetlands, 14.6 percent are designated as agricultural/crop lands, and 9.6 percent are developed areas (MRCL 2021). Lands in the ROI are generally rural and undeveloped, but historically, mining for lead and zinc was prevalent in Ottawa County, mining for coal was prevalent in Craig County, and agriculture played a major role in Delaware and Mayes counties (Oklahoma Historical Society 2020).

Table 1: Land Use Land Cover

Land Cover Category	2019 Percentage	2001 Percentage
Open Water	3.8	3.76
Developed, Open Space	3.59	3.88
Developed, Low Intensity	1.6	1.03
Developed, Medium Intensity	0.79	0.34
Developed, High Intensity	0.27	0.12
Barren Land	0.23	0.22
Deciduous Forest	26.95	28.07
Evergreen Forest	0.27	0.26

Land Cover Category	2019 Percentage	2001 Percentage
Mixed Forest	1.16	1.18
Shrub/Scrub	0.89	0.24
Herbaceous	2.49	1.92
Hay/Pasture	52.86	54.88
Cultivated Crops	3.95	3.06
Woody Wetlands	1	0.92
Emergent Herbaceous Wetlands	0.14	0.11

Northeastern Oklahoma is commonly referred to as the “Green Country,” denoting its rolling green hills, tumbling rivers, expansive lakes, tallgrass prairies, and mild climate. Green Country includes 18 counties, including Craig, Delaware, Mayes, and Ottawa counties (TOK 2021). The ROI contains eight state parks, 20 city parks, six local recreational areas such as ballparks, Lake Eucha Park, Fort Gibson Lake, Fort Gibson Public Hunting Area & Waterfowl Refuge Portion, the Spavinaw Game Management Area, and the Spavinaw Public Hunting Area. As shown in Figure 3, of these recreational areas, five state parks and four local parks are adjacent to Grand Lake. The Ozark Plateau National Wildlife refuge has one of its nine units in the ROI, adjacent to Grand Lake (USFWS 2021; USGS 2020).

Grand Lake is a premier recreational lake in northeastern Oklahoma that is wholly or partially within Craig, Delaware, Mayes and Ottawa counties in Oklahoma. There are five state parks located around the shoreline and more than a dozen privately operated facilities. There are also numerous boat launches, marinas, tailwater fishing facilities, and fishing piers available to the public, as well as several wildlife areas, two visitor centers, several public overlooks, and one golf course. There are also many sites that can be used to access Grand Lake, as well as many areas offering tent, trailer, and recreational vehicle sites. GRDA operates and maintains the Duck Creek Bridge Public Access Area, Seaplane Bass Public Access Area, Monkey Island Public Boat Ramp, Big Hollow Public Access, and Wolf Creek Public Access Area (GRDA 2017a).

Development along the shoreline of Grand Lake primarily consists of residential, commercial, and business, with limited agricultural lands. Grand Lake is a popular location for recreation and residential development, particularly summer homes, due in part to the scenic quality of the reservoir and surrounding landscape, recreational fishing, and proximity to major population centers in Oklahoma, Kansas, Missouri, and Arkansas (GRDA 2017a). A comprehensive shoreline management plan was developed, submitted to FERC, and put in place to manage multiple resources (i.e., recreation, land use, aquatic habitat, terrestrial, cultural, etc.) and promote responsible growth-sensitive areas around Grand Lake (GRDA 2017d). The plan manages land use surrounding the lake by providing clear guidance to determine whether a proposed land use is appropriate. (GRDA 2008).

1.2 Population Trends and Demography

The population of the State of Oklahoma increased consistently between 2000 and 2020. As seen in Table 2, the state’s population increased since the previous decennial census in 2010 from 3,751,351 to 3,959,353 in the latest decennial census in 2020. The previous estimated population

of Oklahoma was 3,956,971 persons in 2019 (USCB 2020a; USCB 2021). The population in the ROI increased between 2000 and 2010, but decreased between 2010 and 2020 (ODC 2015b). Based on the *Demographic State of the State* report, Oklahoma is expected to see a population increase up to 5,560,007 by 2075, with the population in the ROI expected to reach 198,444 for the same time period (ODC 2015b). Table 2 provides a summary of the population characteristics for the four counties that comprise the ROI and the state of Oklahoma.

Table 2: Population Characteristics

Characteristic	Craig County	Delaware County	Mayes County	Ottawa County	Oklahoma
2010 Population Total (Decennial) ^(a)	15,029	41,487	41,259	31,848	3,751,351
2019 Population Total (Estimate) ^(a)	14,142	43,009	41,100	31,127	3,956,971
2020 Population Total (Decennial) ^(b)	14,107	40,397	39,046	30,285	3,959,353
2075 Population Total (Projection) ^(c)	14,075	79,945	68,504	35,920	5,560,007
White ^(b)	60.8%	62.9%	61.3%	63.9%	63.5%
Black or African American ^(b)	2.7%	0.3%	0.5%	1%	7.3%
American Indian and Alaska Native ^(b)	20.2%	21.5%	21.1%	18.8%	8.4%
Asian ^(b)	0.5%	1.2%	0.5%	0.5%	2.3%
Native Hawaiian and Other Pacific Islander ^(b)	0.02%	0.1%	0.1%	0.8%	0.2%
Some Other Race ^(d)	1.1%	1.5%	1.1%	1.8%	5.4%
Two or More Races ^(b)	14.6%	12.5%	15.5%	13.1%	12.8%
Hispanic or Latino ^(b)	3.0%	4.0%	3.5%	5.6%	11.9%
Poverty (Families) ^(d)	12.9%	13.3%	14.1%	15.8%	10.8%
Poverty (Individual) ^(d)	18.6%	18.3%	18.1%	20.7%	15.2%
Persons under 18 years ^(b)	21.5%	20.0%	24.0%	23.4%	24.0%
Education – high school graduate or higher, percent of persons age 25 years+, 2014–2018 estimate ^(a)	86.6%	83.9%	86.6%	84.9%	87.8%

a. USCB 2020a

b. USCB 2021

c. ODC 2015b

d. USCB 2020b

1.2.1 Craig County

Craig County is a predominantly rural county in northeastern Oklahoma. The population density of the county was 19.7 persons per square mile in 2010, and the population experienced a slight increase between 2000 and 2010. Craig County had a population of 17,404 in 1910 with a peak population of 21,083 in 1940. (ODC 2015b) As seen in Table 2, since the previous decennial census in 2010, Craig County's population has decreased from 15,029 to 14,107 persons as indicated in the latest decennial census in 2020. During the same time period, the state of Oklahoma increased its population from 3,751,351 persons in 2010 to 3,959,353 persons in 2020. (USCB 2020a; USCB 2021) Based on the *Demographic State of the State* report, Craig County is expected to experience a decrease in population, reaching 14,075 by 2075 (ODC 2015b).

In 2020, Craig County had 21.5 percent of its population under 18 years of age, which is less than the state of Oklahoma (24.0 percent) (USCB 2021). As of 2014 through 2018, Craig County was estimated to have persons 65 years and over represent 19.6 percent of the population, which is more than the state of Oklahoma (15.7 percent). As seen in Table 2, the state of Oklahoma has a higher percentage of persons who have high school diplomas (or higher attainment) than Craig County (87.8 percent and 86.6 percent, respectively). (USCB 2020a)

1.2.2 Delaware County

Delaware County is a predominantly rural county in northeastern Oklahoma. The population density of the county was 56.2 persons per square mile in 2010. As seen in Table 2, since the previous decennial census in 2010, Delaware County has decreased from 41,487 to 40,397 persons in 2020. During the same time period, the state of Oklahoma has increased its population from 3,751,351 persons in 2010 to 3,959,353 persons in 2020. (USCB 2020a; USCB 2021) The population of Delaware County peaked in 1940 and started to decline, but had been increasing steadily since 1960 due to a surge in tourism, a tight labor market, aggressive action to attract employers, and a growing economy in northwestern Arkansas (OHS 2020). The latest decennial census indicates a decline in population. Based on the *Demographic State of the State* report, Delaware County is expected to experience an increase in population reaching 79,945 by 2075 (ODC 2015b).

In 2020, Delaware County had 20 percent of its population under 18 years of age, which is less than the state of Oklahoma (24.0 percent). From 2014 through 2018, Delaware County was estimated to have persons 65 years and over represent 25 percent of the population, which is more than the state of Oklahoma (15.7 percent). As seen in Table 2, the state of Oklahoma has a higher percentage of persons who have high school diplomas (or higher attainment) than Delaware County (87.8 percent and 83.9 percent, respectively). (USCB 2020a)

1.2.3 Mayes County

Mayes County is a predominantly rural county in northeastern Oklahoma. The population of Mayes County peaked in 1940 and started to decline, but has been increasing steadily since 1960. (ODC 2015b) The population density of the county was 63.0 persons per square mile in 2010, and the county experienced an increase in population between 2000 and 2010 (USCB 2020a; ODC 2015b). As described in Table 2, since the previous decennial census in 2010, Mayes County decreased from 41,259 to 39,046 persons as indicated the latest decennial census

of 2020. During the same time period, the state of Oklahoma has increased its population from 3,751,351 persons in 2010 to 3,959,353 persons in 2020. (USCB 2020a; USCB 2021) Based on the *Demographic State of the State* report, Mayes County is expected to experience an increase in population reaching 68,504 by 2075 (ODC 2015b).

In 2020, Mayes County was estimated to have 24.0 percent of its population under 18 years of age, which is the same as the state of Oklahoma (24.0 percent) (USCB 2021). As of 2014 through 2018, Mayes County was estimated to have persons 65 years and over represent 18.4 percent of the population, which is more than the state of Oklahoma (15.7 percent). As seen in Table 2, the state of Oklahoma has a higher percentage of persons who have high school diplomas (or higher attainment) than Mayes County (87.8 percent and 86.6 percent, respectively). (USCB 2020a)

1.2.4 Ottawa County

Ottawa County is a predominantly rural county in northeastern Oklahoma. The population density of the county is 67.6 persons per square mile, and the population experienced a slight decrease between 2000 and 2010 (USCB 2020a; ODC 2015b). As described in Table 2, since the previous decennial census in 2010, the population of Ottawa County has decreased from 31,848 to 30,285 persons in 2020. During the same time period, the state of Oklahoma has increased its population from 3,751,351 persons in 2010 to 3,959, 353 persons in 2020. (USCB 2020a) The population of Ottawa County declined until 1960, but had shown an increasing trend since that time. However, the latest three decennial censuses show a decline from 2000 through 2020. Based on the *Demographic State of the State* report, Ottawa County is expected to increase in population reaching 35,920 by 2075 (ODC 2015b).

In 2020, Ottawa County had 23.4 percent of its population under 18 years of age, which is less than the state of Oklahoma (24.0 percent) (USCB 2021). From 2014 through 2018, Ottawa County was estimated to have persons 65 years and over represent 18.3 percent of the population, which is more than the state of Oklahoma (15.7 percent). As listed in Table 2, the state of Oklahoma has a higher percentage of persons who have high school diplomas (or higher attainment) than Ottawa County (87.8 percent and 84.9 percent, respectively). (USCB 2020a)

1.3 Housing

As presented in Table 3, the availability of vacant housing in the ROI has been consistent since 2000. The 2020 percentage of available housing indicate that with any growth in population in the ROI, there are sufficient vacant homes available to keep up with any population increase. In 2020, availability of housing in Craig County was 14.8 percent, 30.8 percent in Delaware County, 16.7 percent in Mayes County and 13.5 percent in Ottawa County. When compared to the State of Oklahoma, all four counties had higher housing availability. (USCB 2020c)

Table 3: Housing

Name	2000	2010	2000 to 2010 Change (%)	2020	2010 to 2020 Change (%)
Craig County					
Total Housing Units	6,459	6,725	4.1	6,369	-5.3
Occupied Units	5,620	5,682	1.1	5,424	-4.5
Vacancy Units	839	1,043	24.3	945	-9.4
Vacancy (percent)	13	15.5	2.5	14.8	-0.7
Delaware County					
Total Housing Units	22,290	24,534	10.1	24,086	-1.8
Occupied Units	14,838	16,070	8.3	16,677	3.8
Vacancy Units	7,452	8,464	13.6	7,409	-12.5
Vacancy (percent)	33.4	34.5	1.1	30.8	-3.7
Mayes County					
Total Housing Units	17,423	19,015	9.1	18,263	-4.0
Occupied Units	14,823	16,073	8.4	15,219	-5.3
Vacancy Units	2,600	2,942	13.2	3,044	3.5
Vacancy (percent)	14.9	15.5	0.6	16.7	1.2
Ottawa County					
Total Housing Units	14,842	14,253	-4.0	13,714	-3.8
Occupied Units	12,984	12,164	-6.3	11,859	-2.5
Vacancy Units	1,858	2,089	12.4	1,855	-11.2
Vacancy (percent)	12.5	14.7	2.2	13.5	-1.2
Oklahoma					
Total Housing Units	1,514,400	1,666,205	10.0	1,746,807	4.8
Occupied Units	1,342,293	1,432,959	6.8	1,535,830	7.2
Vacancy Units	172,107	233,246	35.5	210,977	-9.5
Vacancy (percent)	11.4	14	2.6	12.1	-1.9

(USCB 2020c; USCB 2021)

Table 4 details the rise in median housing values that has taken place over the years. Between 2000 and 2010, the median house value rose by 67.0 percent in Craig County, 12.8 percent in Delaware County, 34.1 percent in Mayes County, and 66.7 percent in Ottawa County. Between 2010 and 2019 the median housing values in Craig County rose by 25.3 percent; 27.6 percent in

Delaware County, 26.5 percent in Mayes County and 9.7 percent in Ottawa County. Of the four counties, as of 2019 Delaware County median house values are the highest (\$117,900) and Ottawa County median house values are the lowest (\$86,300). The State of Oklahoma had higher median housing values than all four counties. (USCB 2020c)

Between 2000 and 2010, median monthly rents increased along with median housing values in the four counties. In Craig County, between 2000 and 2010 median monthly rents rose by 39.1 percent; and rose again by 36.5 percent between 2010 and 2019. Delaware County rose by 37.2 percent between 2000 and 2010, with an increase in the rise of median monthly rents between 2010 and 2019 of 28.6 percent. Median rent in Mayes County rose by 47.5 percent between 2000 and 2010, with an increase between 2010 and 2019 of 28.2 percent. In Ottawa County, between 2000 and 2010 median monthly rents rose by 46.5 percent and rose by 30.2 percent between 2010 and 2019. Of the four counties, Craig County has the highest median monthly rents (\$752) and Ottawa County has the lowest monthly rents (\$677). The State of Oklahoma had higher median monthly rent than all four of the counties. (USCB 2020c)

Table 4: Housing Value and Rent

Name	2000	2010	2000 to 2010 Change (%)	2019 Estimate	2010 to 2019 Change (%)
Craig County					
Median House Value (\$)	52,100	87,000	67.0	109,000	25.3
Median Rent (\$/month)	396	551	39.1	752	36.5
Delaware County					
Median House Value (\$)	81,900	92,400	12.8	117,900	27.6
Median Rent (\$/month)	390	535	37.2	688	28.6
Mayes County					
Median House Value (\$)	66,500	89,200	34.1	112,800	26.5
Median Rent (\$/month)	394	581	47.5	745	28.2
Ottawa County					
Median House Value (\$)	47,200	78,700	66.7	86,300	9.7
Median Rent (\$/month)	355	520	46.5	677	30.2
Oklahoma					
Median House Value (\$)	70,700	111,400	57.6	147,000	32.0
Median Rent (\$/month)	456	659	44.5	814	23.5

(USBC 2020c)

1.4 Economic Activity

The State of Oklahoma's gross domestic product (GDP) for 2020 was \$190.8 billion. In the last quarter of 2020, the top five non-farm industries contributing to earnings within Oklahoma were trade, transportation, and utilities (19.9 percent); government (19.8 percent); professional and business services (12.2 percent); educational and health services (12.17 percent); and

manufacturing (8.7 percent). Metropolitan areas contribute greatly to the state's real GDP; the cities of Enid, Tulsa, Lawton, and Oklahoma City contribute approximately 71.5 percent to the state's GDP, whereas the balance of the state contributes 28.5 percent. (OESC 2021) The job opportunities, low electricity rates (approximately 45 percent lower than the national average), and quality of life attract individuals to move to Oklahoma (ODC 2015a).

In 2018, the GDP of Craig County was \$437 million, Delaware County was \$781.9 million, Mayes County was \$1.4 billion, and Ottawa County \$889.8 million. Economic activity in the ROI differs from economic activity throughout the State of Oklahoma. Government and agriculture are the dominant industries for Craig, Delaware, Mayes, and Ottawa counties; manufacturing, retail, construction, real estate, health care, transportation, arts and entertainment, forestry and utilities contribute to the local employment base. (NaCo 2020) GRDA also creates a multitude of jobs and careers within the ROI (GRDA 2017a).

The popularity of water-based recreation at Grand Lake has resulted in significant economic development, particularly in real estate, goods, and services. Grand Lake is host to many marinas, resorts, and other commercial operations such as campgrounds and restaurants (GRDA 2017a). Grand Lake is the third largest reservoir in Oklahoma, with over one million visitors annually (GRDA 2017b). The primary reasons for visiting Grand Lake are camping, recreational fishing, boating, swimming, tournament fishing, off-roading, and canoeing or kayaking (GRDA 2017c). In 2018, total spending on travel in the ROI includes \$18.0 million in Craig County, \$194.6 million in Delaware County, \$49.8 million in Mayes County, and \$337 million in Ottawa County (OTRD 2019).

The Oklahoma Department of Commerce published *The Economic Impact of the Grand River Dam Authority* in March 2015. This economic impact study summarizes the economic benefits associated with operating, constructing, and positive externalities from GRDA. Between 2015 and 2020, the estimated impact of operating GRDA represents an annual economic activity of \$510 to \$581 million (ODC 2015a). These values result from the employment and payroll associated with operating the GRDA. In addition, the estimated economic impact resulting from construction and investment activities associated with the construction of the combined-cycle gas generation plant at the Grand River Energy Center, are projected to generate \$210 million in additional economic activity within the first year of construction and another \$214 million in the second year. The estimated economic impact resulting from tourism, quality of life, and relative power costs—all provided by GRDA, including its Grand Lake facility—are expected to contribute approximately \$240–\$260 million (ODC 2015a).

1.5 Employment

In 2016, the top specialized industry by employment in Craig (19.0 percent) and Ottawa (35.2 percent) counties was state and local government. Delaware County's top specialized industry by employment was agriculture at 8.4 percent, and manufacturing was the top specialized in Mayes County with 15.5 percent. (NACo 2020) In 2018, the largest total employment for the ROI was found in Mayes County (19,028), followed by Delaware County (17,360), Ottawa County (13,891), and Craig County (5,904). The largest labor force was found in Mayes County (19,694), followed by Delaware County (18,065), Ottawa County (14,389), and Craig County (6,115). (OKWorks 2020) Table 5 summarizes the top five specialized industries by employment for the four counties within the ROI.

Table 5: Top Specialized Industry by Employment

Industries	Percent	Jobs (thousands)
Craig County		
State and Local Government	19	1.7
Agriculture	14.3	1.3
Health and Social Assistance	10.6	.95
Transportation	2.7	.24
Utilities	2	.18
Delaware County		
Agriculture	8.4	1.4
Construction	8.3	1.4
Real Estate	4.8	.78
Arts and Entertainment	2.2	.35
Forestry and Fishing	0.5	.09
Mayes County		
Manufacturing	15.5	2.8
State and Local Government	13.6	2.5
Retail	12.4	2.2
Agriculture	9	1.6
Construction	9	1.6
Ottawa County		
State and Local Government	35.2	5.7
Agriculture	7.4	1.2
Manufacturing	7	1.1
Other Services	5.9	.96
Forestry and Fishing	0.5	.09

(NACo 2020)

As shown in Table 6, for 2014 through 2018, the four counties in the ROI all had a lower estimated population in the labor force than the state of Oklahoma (60.7 percent). Mayes County had the highest labor force participation (56.0 percent), followed by Ottawa County (55.5 percent), Craig County (51.9 percent), and Delaware County (48.1 percent). (USCB 2020a)

Based on the most recent data available (2015 and 2016), GRDA supports over 7,100 jobs in Oklahoma's economy. Of these 7,100 jobs, approximately 25 percent are directly related to construction of the Grand River Energy Center, approximately 40 percent of these jobs are day-to-day operational positions, and approximately 35 percent of these jobs are derived from tourism,

amenities, low power costs combined with high quality of life benefits associated with living in close proximity to GRDA (ODC 2015a).

1.6 Income and Poverty

As listed in Table 5, the median household income for the four counties in the ROI is lower than the state of Oklahoma. All four counties had a lower per capita income than the state of Oklahoma. In 2020, the State of Oklahoma reported a higher unemployment rate than Craig County, Delaware County, Mayes County and Ottawa County. As listed in Table 5, the employment status of the four counties was lower than the state. The annual unemployment rate has nearly doubled statewide since 2019. The monthly unemployment rate peaked in April of 2020 for Oklahoma and all four counties in the ROI declined (USBLS 2020). The United States has experienced higher unemployment rates due to the effects of Covid-19 mitigation; however, the peak occurred in January of 2020 (OSU 2021).

The percentage of people living below the poverty level is higher in Craig, Delaware, and Ottawa counties than in the state of Oklahoma. The percentage of people living below the poverty level in Mayes County is lower than the state. Figure 4 illustrates areas where the percent of people living below poverty exceed 20 percentage points above the state of Oklahoma's poverty level (15.6 percent).

Based on the most recent data available (2015 and 2016), disposable income, as a result from employment within GRDA, amounts to \$310–\$337 million. Approximately 50 percent of disposable income is generated from day-to-day operational positions. GRDA operations provide a wide variety of occupations, with an hourly rate ranging from \$11.39 through \$38.41 (ODC 2015a).

Table 6: Employment and Income

Measure	Craig County	Delaware County	Mayes County	Ottawa County	Oklahoma
2020 Unemployment Rate (annual average)	5.4	5.3	5.0	5.7	6.1
2019 Unemployment Rate (annual average)	3.3	3.6	2.9	3.2	3.1
Employment Status (civilian population 16 years and over in labor force)	51.9%	48.1%	56.0%	55.5%	60.7%
Median household income (in 2018 dollars)	\$41,701	\$39,742	\$48,853	\$39,070	\$51,424
Per capita income in past 12 months (in 2018 dollars)	\$20,704	\$22,976	\$23,861	\$20,209	\$27,432
Persons in poverty (percent)	19.5	20.7	15.5	20.6	15.6

(USBLS 2020; USCB 2020a)

2.0 Agency and Stakeholder Outreach

GRDA sent letters to various stakeholders, including local tribes, organizations, and businesses, in the ROI to request additional socioeconomic information. GRDA requested additional information on industry trends (e.g., goods and services, agricultural use), trends in land and resource values (e.g., hunting, fishing, ecotourism, outfitting, trapping, recreation, exploration, and mining activities), as well as other socioeconomic information that may be relevant to a socioeconomic analysis (GRDA 2020 letter). Responses were received from eight stakeholders and are included in Attachment B. A detailed list of stakeholders who were included in the outreach are provided in Table 7.

Table 7: List of Contacts

Organization	Contact	Date Mailed
Federal Agencies		
Advisory Council on Historic Preservation	Dr. John Eddins	7/15/20
U.S. Army Corps of Engineers	Mr. Andrew Commer, Chief	7/15/20
U.S. Bureau of Indian Affairs	Mr. Eddie Streater, Regional Director	7/15/20
U.S. Bureau of Land Management	Mr. Robert Pawelek, Field Manager	7/15/20
U.S. Department of the Army	U.S. Department of the Army	7/15/20
U.S. Department of the Interior	Mr. Conor Cleary, U.S. Department of the Interior	7/15/20
U S Environmental Protection Agency	Ms. Kimeka Price, NEPA Project Manager	7/15/20
U.S. Fish and Wildlife Service	Ms. Jonna Polk, U.S. Fish and Wildlife Service	7/15/20
U.S. Forest Service	Chief Tony Tooke, U.S. Forest Service	7/15/20
U.S. Geological Survey	Jason Lewis, U.S. Geological Survey	7/15/20
U.S. Natural Resources Conservation Service	Acting Chief Leonard Jordan, U.S. Natural Resources Conservation Service	7/15/20
National Park Service	Sue Masica, Regional Director	7/15/20
National Weather Service	Ms. Nicole McGavock, National Weather Service	7/15/20
State Agencies		
Oklahoma Archeological Survey	Dr. Kary Stackelbeck, State Archeologist	7/23/20
Oklahoma Department of Commerce	Ms. Deby Snodgrass, Executive Director	7/23/20
Oklahoma Conservation Commission	Mr. Brooks Tramell, Director of Monitoring, Assessment & Wetlands	7/23/20
Oklahoma Corporation Commission	Mr. Tim Rhodes, Director of Administration	7/23/20

Organization	Contact	Date Mailed
Oklahoma Department of Agriculture	Mr. Jim Reese, Commissioner	7/23/20
Oklahoma Department of Environmental Quality	Mr. Joe Long, Environmental Programs Manager	7/23/20
Oklahoma Office of Emergency Management	Mr. Charles Kerns, Oklahoma Office of Emergency Management	7/23/20
Oklahoma Department of Health	Ms. Valauna Grissom, Secretary	7/23/20
Oklahoma Department of Transportation	Mr. Mike Patterson, Executive Director	7/23/20
Oklahoma Tourism and Recreation Department	Mr. Dick Dutton, Executive Director	7/23/20
Oklahoma Department of Wildlife Conservation	Mr. JD Strong, Director	7/23/20
Oklahoma Historical Society	Ms. Lynda Ozan, Deputy State Historic Preservation Officer	7/23/20
Oklahoma Water Resources Board	Ms. Julie Cunningham, Executive Director	7/23/20
Office of State Fire Marshal	Mr. Luke Tallant, Office of State Fire Marshal	7/23/20
Tribal Organizations		
Inter-Tribal Council Inc.	Inter-Tribal Council Inc.	7/23/20
Alabama-Quassarte Tribal Town	Chief Nelson Harjo, Alabama-Quassarte Tribal Town	7/23/20
Apache Tribe of Oklahoma	Chairman Bobby Komardley, Apache Tribe of Oklahoma	7/23/20
Caddo Nation of Oklahoma	Chairman Tamara Francis-Fourkiller, Caddo Nation of Oklahoma	7/23/20
Caddo Nation	Derek Hill, 106 Specialist	7/23/20
Cherokee Nation	Chief Chuck Hoskins, Cherokee Nation	7/23/20
Delaware Nation	Ms. Deborah Dotson, President	7/23/20
Delaware Tribe of Indians	Chief Chester Brooks, Delaware Tribe of Indians	7/23/20
Eastern Shawnee Tribe of Oklahoma	Chief Glenna J. Wallace, Eastern Shawnee Tribe of Oklahoma	7/23/20
Iowa Tribe of Oklahoma	Chairman Bobby Walkup, Iowa Tribe of Oklahoma	7/23/20
Kiowa Tribe	Ms. Kellie Lewis, Acting Tribal Historic Preservation Officer	7/23/20
Little Traverse Bay Bands of Odawa Indians	Ms. Regina Gasco-Bentley, Little Traverse Bay Bands of Odawa Indians	7/23/20
Miami Tribe of Oklahoma	Chief Douglas G. Lankford, Miami Tribe of Oklahoma	7/23/20

Organization	Contact	Date Mailed
Miami Nation	Mr. Joe Halloran, Counsel for Miami Nation	7/23/20
Modoc Tribe of Oklahoma	Chief Bill Follis, Modoc Tribe of Oklahoma	7/23/20
Muscogee (Creek) Nation	Chief James Floyd, Muscogee (Creek) Nation	7/23/20
Osage Nation	Chief Geoffrey Standing Bear, Osage Nation	7/23/20
Ottawa Tribe of Oklahoma	Chief Ethel Cook, Ottawa Tribe of Oklahoma	7/23/20
Otoe-Missouria Tribe of Indians	Chairman John Shotton, Otoe-Missouria Tribe of Indians	7/23/20
Peoria Tribe of Oklahoma	Chief Craig Harper, Peoria Tribe of Oklahoma	7/23/20
Quapaw Tribe of Oklahoma	Chairman John Berrey, Quapaw Tribe of Oklahoma	7/23/20
Sac and Fox Nation of Oklahoma	Chief Kay Rhoads, Sac and Fox Nation of Oklahoma	7/23/20
Seneca-Cayuga Nation	Chief William Fisher, Seneca-Cayuga Nation	7/23/20
Shawnee Tribe of Oklahoma	Chief Ron Sparkman, Shawnee Tribe of Oklahoma	7/23/20
Tonkawa Tribe of Oklahoma	President Russell Martin, Tonkawa Tribe of Oklahoma	7/23/20
United Keetoowah Band of Cherokees	Chief Joe Bunch, United Keetoowah Band of Cherokees	7/23/20
Wichita and Affiliated Tribes	President Terri Parton, Wichita and Affiliated Tribes	7/23/20
Wyandotte Tribe of Oklahoma	Chief Billy Friend, Wyandotte Tribe of Oklahoma	7/23/20
Wyandotte Nation	Mr. Norman Hildebrand, Jr., Second Chief; Wyandotte Nation	7/23/20
Additional Tribal Names		
Cherokee Nation	Ms. Elizabeth Toombs, Cherokee Nation	7/23/20
Osage Nation Historic Preservation Office	Mr. James Munkres, Archaeologist	7/23/20
Osage Nation Historic Preservation Office	Dr. Andrea Hunter, Tribal Historic Preservation Officer	7/23/20
Ottawa Tribe of Oklahoma	Ms. Rhonda Hayworth, Tribal Historic Preservation Officer	7/23/20
Quapaw Tribe of Oklahoma	Mr. Everett Bandy, Quapaw Tribe of Oklahoma	7/23/20

Organization	Contact	Date Mailed
Congressional Delegation		
The Honorable James Mountain Inhofe United States Senate	The Honorable James Mountain Inhofe, United States Senate	7/23/20
The Honorable James Lankford United States Senate	The Honorable James Lankford, United States Senate	7/23/20
The Honorable Jim Bridenstine	The Honorable Jim Bridenstine	7/23/20
The Honorable Markwayne Mullin	The Honorable Markwayne Mullin	7/23/20
The Honorable Michael Bergstrom Oklahoma State Senate, District 1	The Honorable Michael Bergstrom, Oklahoma State Senate, District 1	7/23/20
The Honorable Marty Quinn Oklahoma State Senate, District 2	The Honorable Marty Quinn, Oklahoma State Senate, District 2	7/23/20
The Honorable Wayne Shaw Oklahoma State Senate, District 3	The Honorable Wayne Shaw, Oklahoma State Senate, District 3	7/23/20
The Honorable Josh West House of Representatives, District 5	The Honorable Josh West, House of Representatives, District 5	7/23/20
The Honorable Chuck Hoskin House of Representatives, District 6	The Honorable Chuck Hoskin, House of Representatives, District 6	7/23/20
The Honorable Ben Loring House of Representatives, District 7	The Honorable Ben Loring, House of Representatives, District 7	7/23/20
The Honorable Tom Gann House of Representatives, District 8	The Honorable Tom Gann, House of Representatives, District 8	7/23/20
Governor of Oklahoma	The Honorable Kevin Stitt, Governor of Oklahoma	7/23/20
Secretary of Energy and Environment	The Honorable Kenneth (Ken) Wagner, Secretary of Energy and Environment	7/23/20
Other Governmental Entities		
Afton Public Works Authority	Afton Public Works Authority	7/23/20
City of Grove	Mr. Bill Keefer, City Manager, City of Grove	7/23/20
City of Miami	Mayor Bless Parker, City of Miami	7/23/20
Davis Wright Tremaine LLP	Ms. Barbara S. Jost, Davis Wright Tremaine LLP	7/23/20
Coo-Y-Yah Museum	Coo-Y-Yah Museum	7/23/20
Craig County Commissioner, District 1	Mr. Lowell Walker, Craig County Commissioner District 1	7/23/20
Craig County Commissioner, District 2	Mr. Mike Fitzpatrick, Craig County Commissioner District 2	7/23/20
Craig County Commissioner, District 3	Mr. Dan Peetom, Craig County Commissioner District 3	7/23/20

Organization	Contact	Date Mailed
Craig County	Mr. Morris Bluejacket, Craig County Flood Plain Manager	7/23/20
Craig County Conservation District	Cambra Fields, District Conservationist	7/23/20
Delaware County Commissioners, District 1	Mr. David Poindexter, Delaware County Commissioner District 1	7/23/20
Delaware County Commissioners, District 2	Mr. Russell Martin, Delaware County Commissioner District 2	7/23/20
Delaware County Commissioners, District 3	Martin Kirk, Delaware County Commissioner District 3	7/23/20
Delaware County	Mr. Robert Real, Delaware County Floodplain Administrator	7/23/20
Delaware County Historical Society & Museum	Delaware County Historical Society & Museum	7/23/20
Delaware County Conservation District	Delaware County Conservation District	7/23/20
Eastern Trails Museum	Eastern Trails Museum	7/23/20
Integrus Health Center	Mr. Jonas Rabel, Administrator	7/23/20
Ketchum Public Works Authority	Ms. Jill Lambert, Ketchum Public Works Authority	7/23/20
Mayes County Commissioners, District 1	Mr. Matt Swift, Mayes County Commissioner District 1	7/23/20
Mayes County Commissioners, District 2	Ms. Meredith Frailey, Mayes County Commissioner District 2	7/23/20
Mayes County Commissioners, District 3	Mr. Ryan Ball, Mayes County Commissioner	7/23/20
Mayes County Conservation District	Mayes County Conservation District	7/23/20
Mayes County	Mr. Johnny Janzen, Mayes County Floodplain Manager	7/23/20
Miami Public Schools	Mr. Jeremy Hogan, Superintendent	7/23/20
Miami Regional Chamber of Commerce	Mr. Steve Gilbert, Director	7/23/20
NE Ward 1	Mr. David Davis, Council Member	7/23/20
NE Ward 2	Mr. Doug Weston, Council Member	7/23/20
SW Ward 3	Mr. Ryan Orcutt, Council Member	7/23/20
SE Ward 4	Ms. Vicki Lewis, Council Member	7/23/20
Ottawa County Emergency Management	Mr. Joe Dan Morgan, Ottawa County Emergency Management	7/23/20
Ottawa County Commissioners, District 1	Chairman John Clarke, Ottawa County Commissioner, District 1	7/23/20
Ottawa County Commissioners, District 2	Mr. Chad Masterson, Ottawa County Commissioner District #2	7/23/20

Organization	Contact	Date Mailed
Ottawa County Commissioners, District 3	Mr. Russell Earls, Ottawa County Commissioner District #3	7/23/20
Ottawa County Conservation District	Ottawa County Conservation District	7/23/20
Ottawa County Historical Society (Dobson Museum)	Ottawa County Historical Society, (Dobson Museum)	7/23/20
RWD #3 Delaware County	Mr. Matt Outhier, RWD #3 Delaware County	7/23/20
RWD #3 Mayes County – Disney	RWD #3 Mayes County – Disney	7/23/20
Town of Afton	Town of Afton	7/23/20
Town of Bernice	Town of Bernice	7/23/20
Town of Disney	Town of Disney	7/23/20
Town of Fairland	Town of Fairland	7/23/20
Town of Ketchum	Town of Ketchum	7/23/20
Town of Langley	Ms. Melissa Yarbrough, Town of Langley	7/23/20
City of Vinita	City of Vinita	7/23/20
Town of Wyandotte	Town of Wyandotte	7/23/20
Non-Governmental Organizations		
American Rivers	American Rivers	7/23/20
American Whitewater	American Whitewater	7/23/20
Ducks Unlimited	Dillon Schroeder, Ducks Unlimited	7/23/20
Grand Lake Audubon Society	Grand Lake Audubon Society	7/23/20
Grand Lake Sail and Power Squadron	Mr. Bruce Watson, Squadron Commander, Grand Lake Sail and Power Squadron	7/23/20
Grand Lake Watershed Alliance Foundation	Grand Lake Watershed Alliance Foundation	7/23/20
Local Environmental Action Demanded Inc.	Ms. Rebecca Jim, Local Environmental Action Demanded Inc.	7/23/20
The Nature Conservancy	Ms. Melissa Shackford, Director of Land Protection	7/23/20
The Nature Conservancy -Tulsa	Mike Fuhr	7/23/20
Trout Unlimited	Mr. Chris Wood, President, Trout Unlimited	7/23/20
Tulsa Audubon Society	Mr. John Kennington, President, Tulsa Audubon Society	7/23/20
Public Citizens		
Larry Bork	Larry Bork, GSEP	7/23/20

Organization	Contact	Date Mailed
Cherokee Grove Golf at Carey Bay	Mr. Clayton Garner, Cherokee Grove Golf at Carey Bay	7/23/20
Grand Bluffs Development	Grand Bluffs Development	7/23/20
Shangri-La Management	Mr. Jason Sheffield, Shangri-La Management	7/23/20
Spinnaker Point	Mr. Robert Steinkirchner, Spinnaker Point, Manager	7/23/20
Shoreline, LLC	Mr. Andy Stewart, Shoreline, LLC	7/23/20
Spinnaker Point Estates	Mr. Eric Grimshaw, Spinnaker Point Estates	7/23/20
Tera Miranda Shores Inc.	Mr. Bruce Hensley, Tera Miranda Shores Inc.	7/23/20
The University of Oklahoma	Dr. Robert Nairn, School of Civil Engineering	7/23/20
Oklahoma State University	Oklahoma State University, Burns Hargis, President	7/23/20
Northeastern Oklahoma A & M College	Mr. Kyle Stafford, President	7/23/20
OSU-A&M College Board of Regents	Mr. Steve Stephens, General Counsel	7/23/20
Rogers State University	Dr. Keith Martin, Dean, Professor of Biology	7/23/20
Miami Flood Mitigation Advisory Board	Miami Flood Mitigation Advisory Board	7/23/20
Grand Seaplanes, LLC	Grand Seaplanes, LLC	7/23/20
Anglers in Action	Anglers in Action	7/23/20
Grand Lake Association & Visitor Center	Grand Lake Association & Visitor Center	7/23/20
Grand Lakers United Enterprise	Rusty Fleming Executive Director	7/23/20
Grand Lake Association	Mr. Jay Cranke, Director Grand Lake Association	7/23/20
Grove Area Chamber of Commerce	Mr. Donnie Crain, President	7/23/20
South Grand Lake Area Chamber of Commerce	South Grand Lake Area Chamber of Commerce	7/23/20
Miami Area Chamber of Commerce	Director Michele Bolton, Miami Area Chamber of Commerce	7/23/20
Oklahoma Association of Realtors	Oklahoma Association of Realtors	7/23/20
Har-Ber Village	Har-Ber Village	7/23/20
Dr. Mark Osborn	Dr. Mark Osborn	7/23/20
Mr. Jack Dalrymple	Mr. Jack Dalrymple	7/23/20
Shangri-La Marina	Mr. Mike Williams, Director of Communications & Gov't Relations	7/23/20

Organization	Contact	Date Mailed
Cherokee Yacht Club Marina	Mr. Tom McKibben, General Manager	7/23/20
Port Carlos	Mr. Gary Stuart, Manager	7/23/20
Arrowhead Yacht Club (North & South)	Mr. Joe Harwood, Owner	7/23/20
Clearwater Bay Marina	Mr. Mike Whorton, Owner	7/23/20
Harbors View Marina	Ms. Robin Carpenter, General Manager	7/23/20
Safe Harbor Marinas	Mr. Jeff Rose, Regional Manager	7/23/20
Thunder Bay Marina LLC	Mr. Jason Macer, Manager	7/23/20
Cedar Port Marina	Mr. Jerry Cookson, Manager	7/23/20
Tera Miranda Marina Resort	Mr. Tom Berry, Manager	7/23/20
Honey Creek Landing Marina	Ms. April Cummins, Manager	7/23/20
Willow Park Marina	Mr. Greg Crenshaw	7/23/20
Southwinds Marina	Mr. Ted Peitz, Owner	7/23/20
The Landings Marina	Mr. Paul Staten, Owner	7/23/20
Scotty's Cove, Inc	Scotty's Cove, Inc	7/23/20
Hammerhead Marina	Mr. Nick Powell, Manager	7/23/20
Grand Lakeside Marina	Grand Lakeside Marina	7/23/20
Indian Hills Resort and Marina	Mr. Todd Elson, Manager	7/23/20
Hi-Lift Marina LLC	Mr. Kevin McClure, Manager	7/23/20
Dripping Springs Yacht Club	Mr. Harry Cole, Owner	7/23/20
Red Arrow Marina	Mr. Sam Chapman, Owner	7/23/20
Elk River Landing	Mr. Russ Allard, Owner	7/23/20

3.0 Cumulative Socioeconomic Impacts

Cumulative impacts analysis involves determining if there is an overlapping or compounding of the anticipated impacts of the continued operation of the Pensacola Dam during the proposed operating term with past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such actions.

GRDA considered potential cumulative impacts during the renewal period in its socioeconomic analysis associated with the resources discussed in the previous sections. For the purposes of this analysis, past actions are those related to the resources at the time of hydro-power plant licensing and construction or to the earliest date of available data, present actions are those related to the resources at the time of current operation of the hydro-power plant, and future actions are considered to be those that are reasonably foreseeable through the end of hydro-power plant operation. These criteria are in line with FERC guidance (FERC 2008). The geographic area over which past, present, and future actions would occur is dependent on the type of action considered and is described below for each impact area. The effects of past actions are already reflected in the socioeconomic analysis.

As discussed previously, the presence of the Pensacola Project provides significant economic benefit to the economy in the ROI. Existing and ongoing studies provide extensive information for use in evaluation of Project operations. In addition, the City of Miami, tribes, and other interested parties have raised the issue of flooding in the area and potential economic impacts on the community. The proposed operations model and hydraulic model will provide information to evaluate any reasonably foreseeable effect that has a reasonably close causal relationship to hydroelectric project operations or USACE flood control operations. Initially the dam was developed to provide power to the region. Currently, in addition to power, the dam provides flood control for the region and allows for tourism around Grand Lake (GRDA 2017a).

The cumulative socioeconomic impact analysis is described below in Section 3.1 through Section 3.6. The result of this analysis has concluded that the continued operation of the Pensacola Dam will result in continued significant economic benefits for the region.

3.1 General Land Use Patterns

As discussed in Section 1.1, land use has changed by less than one percent for most land use categories between 2001 and 2019 in the ROI. As listed in Table 1, the pasture and hay category has declined the most (2.02 percent) followed by deciduous forest (1.12 percent). It would be reasonable for economic stimulation and population changes to drive land use changes and it would be reasonable to expect a similar amount of change as listed in Table 1. There are no expected projects related to the Pensacola Dam hydroelectric project that would require any changes in land use or zoning, and the shoreline management plan mitigates impacts related to shoreline land use changes. As such, relicensing the Pensacola Dam hydroelectric project would not likely contribute to any reasonably foreseeable effect that has a reasonably close causal relationship to land use changes along the shoreline and in the ROI.

3.2 Population Trends

Population increases due to the construction of the Pensacola Dam have already occurred in the ROI and could account for the historic population peak in 1940 described in Section 1.2. The section further states the population of the ROI increased between 2000 and 2010 but decreased

between 2010 and 2020. Based on the State of the State report, the population of the ROI is expected to increase over the projection period presented (ODC 2015b). Because there are no expected changes in the number of jobs or changes in economic activity due to the operation of the Pensacola Dam, there are no expected additional impacts on population counts. As such, the continued operation of the Pensacola Dam hydroelectric project would not be expected to contribute to any reasonably foreseeable effect that has a reasonably close causal relationship that would drive population changes in the ROI.

3.3 Housing

As discussed in Section 1.3, housing availability is currently high and has increased since 2000 reducing the need for new housing. Median housing values and median rent in the ROI have been increasing since 2000. There are no expected projects related to the Pensacola Dam hydroelectric project that would drive any changes in vacancy, home values or rent prices beyond the changes that have already occurred. As such, any reasonably foreseeable effects on housing that has a reasonably close causal relationship to the hydroelectric project is not expected in the ROI.

3.4 Economic Activity

As discussed in Section 1.4 the economic activity of GRDA continues to contribute a large portion of the GDP in the ROI as well as a measurable contribution to the state. Job opportunities, low electricity rates, recreational opportunities, and quality of life will continue to attract individuals to Oklahoma and are expected to continue into the foreseeable future. As such, GRDA has a large beneficial impact to the local economy and, to a lesser extent, to the entire State of Oklahoma. Economic impacts due to additional local economic stimulation are expected to contribute to the large beneficial reasonably foreseeable effect that has a reasonably close causal relationship associated with the continued operation of the Pensacola Dam.

3.5 Employment

As stated in Section 1.5, GRDA operation will continue to support a large portion of direct and indirect jobs in the ROI. There are no expected projects related to the operation and ongoing maintenance of the Pensacola Dam hydroelectric project that would add any jobs to the jobs already present in the ROI. Impacts of other employers in the four-county area combined with jobs supported by GRDA will continue to be a beneficial reasonably foreseeable effect that has a reasonably close causal relationship.

3.6 Income and Poverty

Economic performance and employment opportunities provide pathways for higher wages and the reduction of poverty. Companies competing for workers drive wages up and produce disposable income that can be used to infuse additional industries with cash. As experienced by most of the United States, Oklahoma saw significant economic impacts associated with the COVID 19 pandemic including effect on employment. This is illustrated by the employment information for 2019 and 2020 as listed in Table 5 and discussed in Section 1.6. The beneficial economic impacts associated with continued operation of the Pensacola project combined with other economic activities will assist in the economic recovery of the state and ROI.

4.0 References

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GRDA (Grand River Dam Authority). 2008. Pensacola Project, (FERC 1494), Shoreline Management Plan. June 11, 2008.

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GRDA. 2017b. Pensacola Hydropower Project (FERC 1494), Estimating Lake Amenity Values on Grand Lake o' the Cherokees. June 2017.

GRDA. 2017c. Pensacola Hydropower Project (FERC 1494), Estimating Non-Market Value for the Grand River Watershed. May 2017.

GRDA. 2017d. Pensacola Hydropower Project (FERC 1494), Shoreline Management Plan for Grand Lake. June 2017. Retrieved from <<https://www.grda.com/shoreline-management-plan/>> (accessed August 31, 2021).

MRLC (Multi-Resolution Land Characteristic Consortium). 2021. National Land Cover Database (NLCD) 2019 Land Cover. Retrieved from <<https://mrlc.gov/data>> (accessed July 7, 2021).

NACo (National Association of Counties). 2020. County Profiles – Craig, Delaware, Mayes and Ottawa County, Oklahoma. Retrieved from <<http://www.naco.org/>> (accessed May 29, 2020).

ODC (Oklahoma Department of Commerce). 2015a. Economic Impact of the Grand River Dam Authority. Retrieved from < <https://www.okcommerce.gov/grand-river-dam-authority-part-of-oklahomas-economic-engine/>> (accessed May 29, 2020)

ODC. 2015b. Demographic State of the State Report. Retrieved from < <https://www.okcommerce.gov/wp-content/uploads/Population-Projections-Report-2012.pdf> > (accessed May 29, 2020)

OESC (Oklahoma Employment Security Commission). 2021. Oklahoma Economic Indicators. Retrieved from <https://oklahoma.gov/content/dam/ok/en/oesc/documents/labor-market/economic-indicators/oklahoma-economic-indicators-april-2021.pdf> (accessed July 9, 2021)

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OKWorks (Oklahoma Works). 2020. Northeast Oklahoma Workforce Area Briefing. Retrieved from <<https://oklahomaworks.gov/oklahoma-workforce-data/>> (accessed June 18, 2020).

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OTRD (Oklahoma Tourism and Recreation Department). 2019. The Economic Impact of Travel on Oklahoma, 2010-2018 State Estimates. December 2019.

TOK (Travel OK). 2021. Counties and Regions, Green Country. Retrieved from <https://www.travelok.com/regions/green_country> (accessed July 7, 2021).

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USCB. 2020b. American Community Survey – Oklahoma and Craig, Delaware, Mayes and Ottawa County, OK (poverty – individual and family). Retrieved from <<https://www.census.gov/acs/www/data/data-tables-and-tools/data-profiles/>> (accessed May 29, 2020).

USCB. 2020c. American Community Survey – Oklahoma and Craig, Delaware, Mayes and Ottawa County, OK (Profile of Selected Housing Characteristics). Retrieved from <<https://www.census.gov/acs/www/data/data-tables-and-tools/data-profiles/>> (accessed May 29, 2020).

USCB. 2020d. TIGERLine Shapefiles – 2019. Retrieved from <<https://www.census.gov/geographies/mapping-files/time-series/geo/tiger-line-file.2019.html>> (accessed May 29, 2020).

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USGS (U.S. Geological Survey). 2020. The Protected Areas Database of the United States (PAD-US). Version 2.1. Retrieved from <<https://mrlc.gov/data>> (accessed June 1, 2021).

USFWS (U.S. Fish and Wildlife Service). 2021. Ozark Plateau National Wildlife Refuge. Retrieved from <https://www.fws.gov/refuge/Ozark_Plateau/about.html> (accessed May 27, 2021).

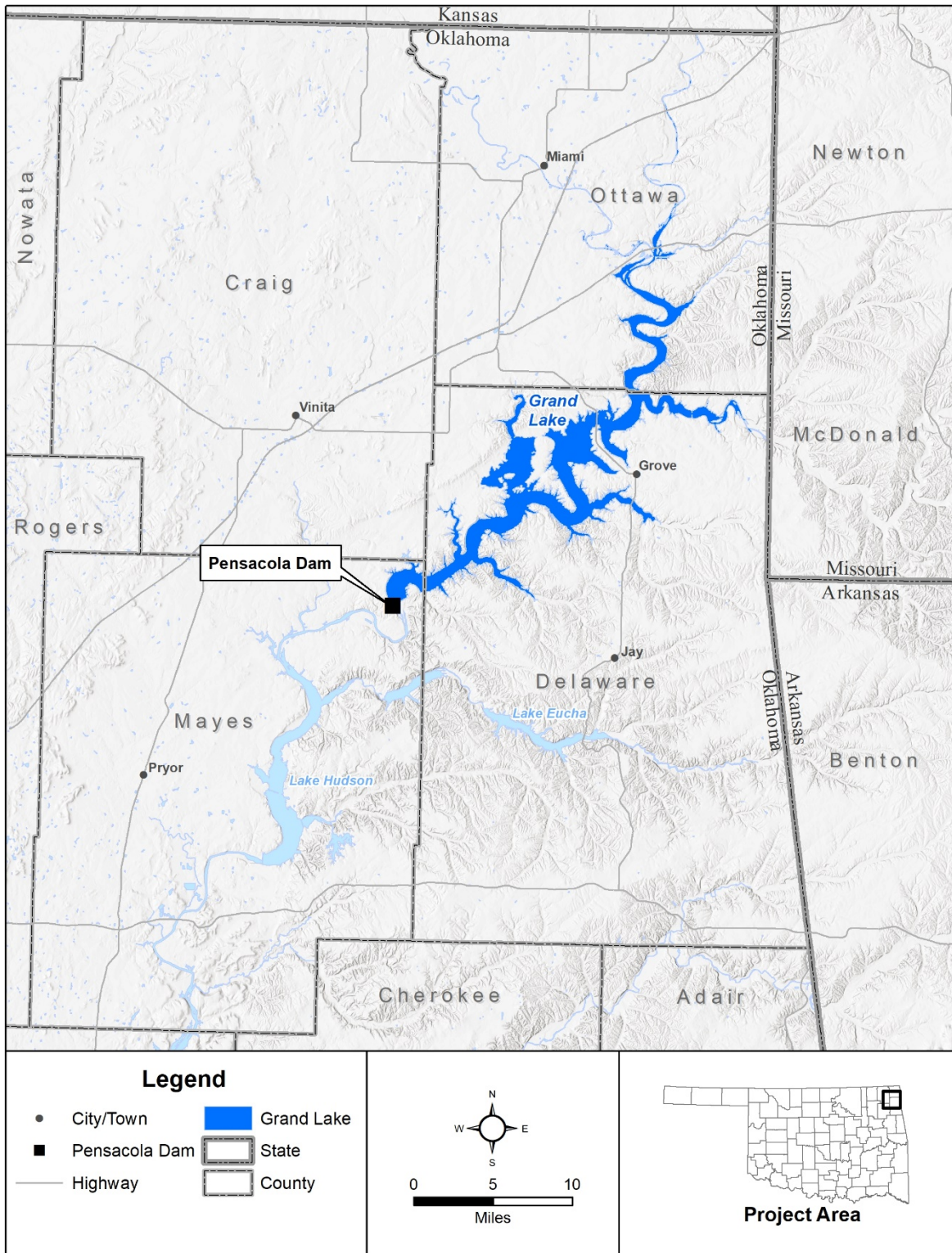


Figure 1: Project Area Map

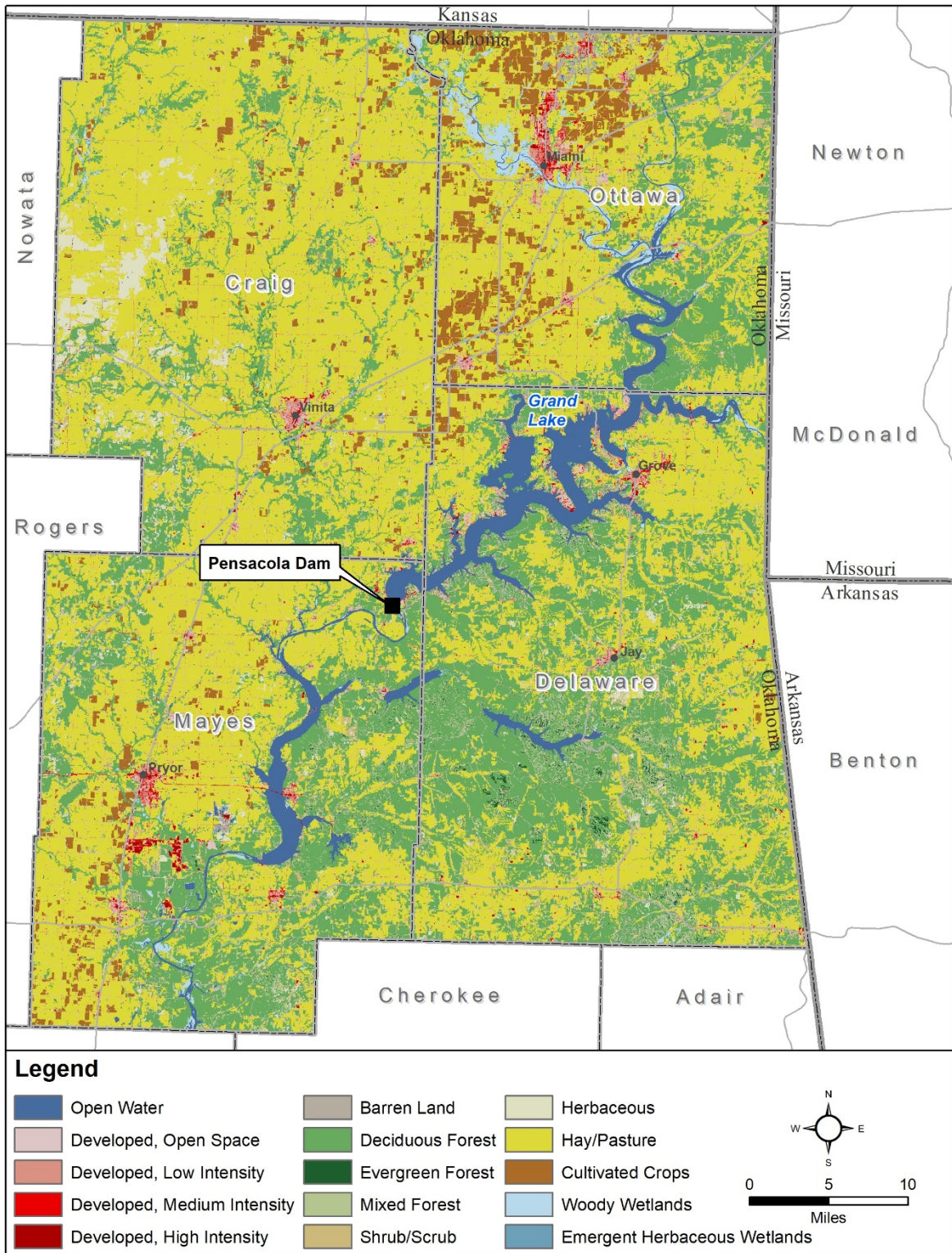


Figure 2: Land Use Land Cover

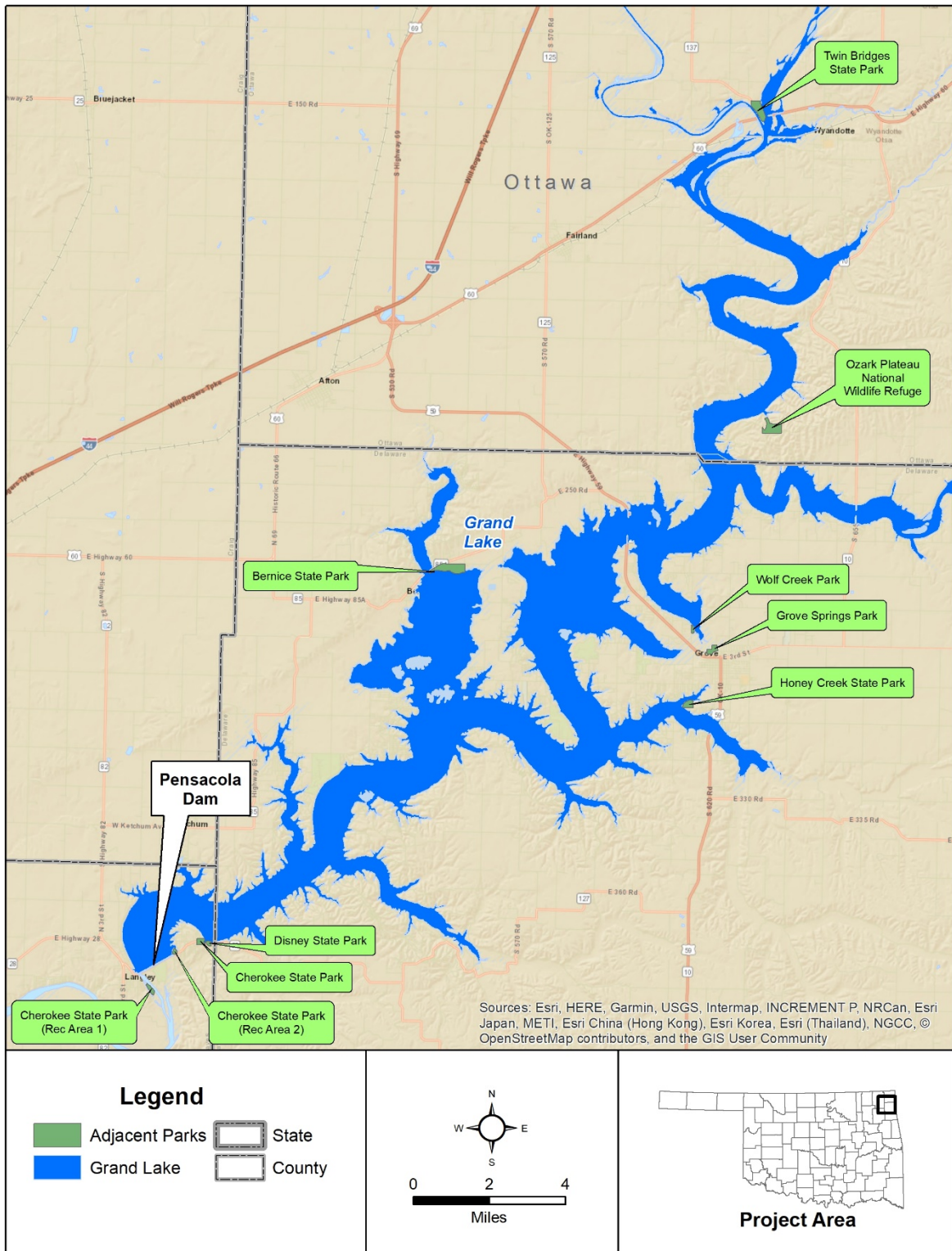


Figure 3: Adjacent Parks

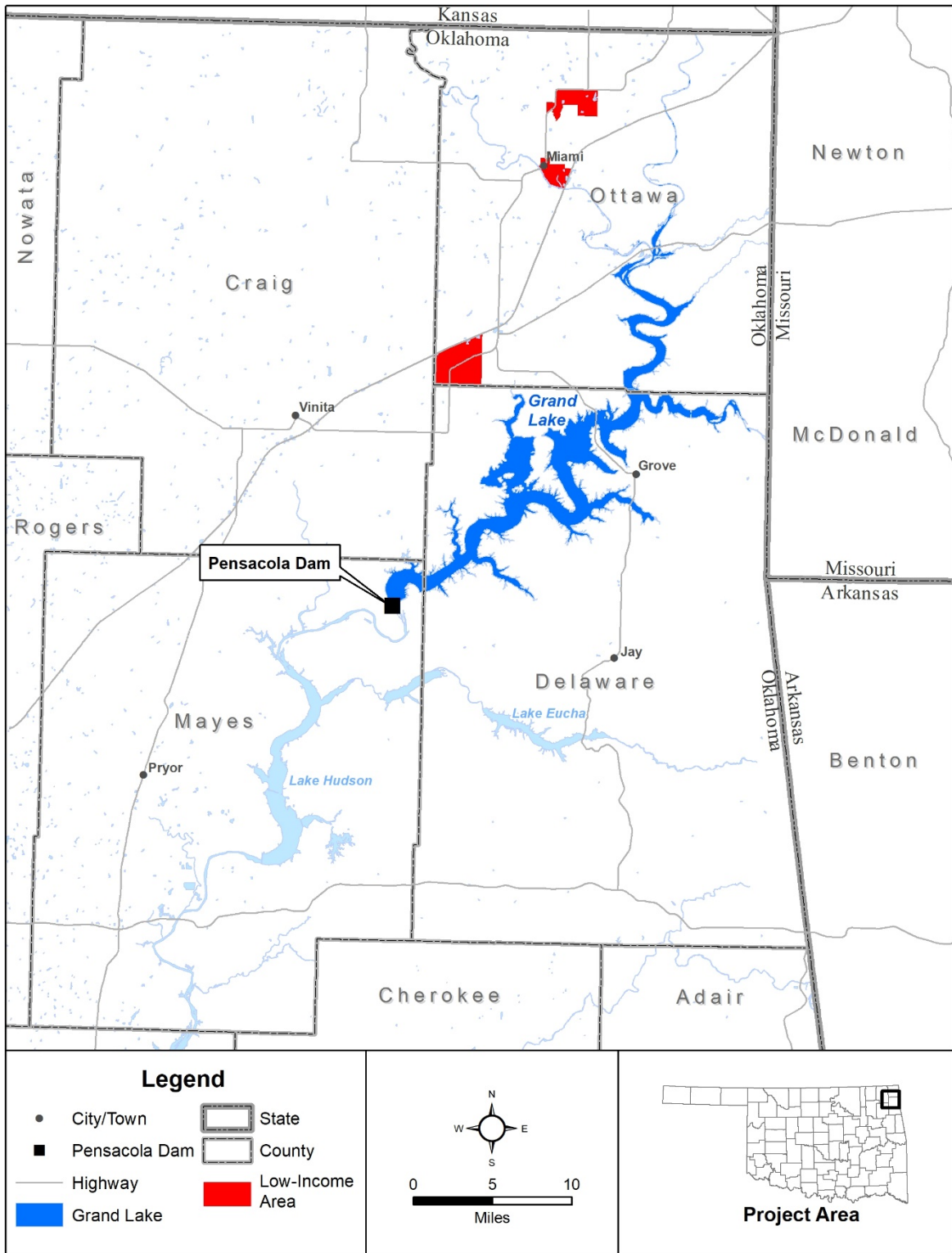


Figure 4: Poverty Map

Attachment A

Tract-Level Data

The index table below provides a guide to the tract-level data included with the socioeconomics report for the GRDA Pensacola Dam project.

Tract-Level Data Index

Subject	Census Table	File Name
Population and Race	B02001	B02001.xlsx
Ethnicity	B03001	B03001.xlsx
Poverty (Families)	B17017	B17017.xlsx
Poverty (Individual)	B17021	B17021.xlsx
Sex and Age	S0101	S0101.xlsx
Selected Housing Characteristics	DP04	DP04.xlsx
Education	S1501	S1501.xlsx
Employment Status (civilian population 16 years and over in labor force)	S2301	S2301.xlsx
Median Household Income	S1901	S1901.xlsx
Per Capita Income	S1902	S1902.xlsx
2019 Tract Tiger Files	(Shapefile)	TL2019Geo.zip

Note: File names refer to the .zip files enclosed in the "Tract-Level Data" folder.

Attachment B

Stakeholder Responses

Attachment B contains information that has been previously filed with the Commission and has not been reproduced here

APPENDIX E-31

Boat Ramp Contour Maps

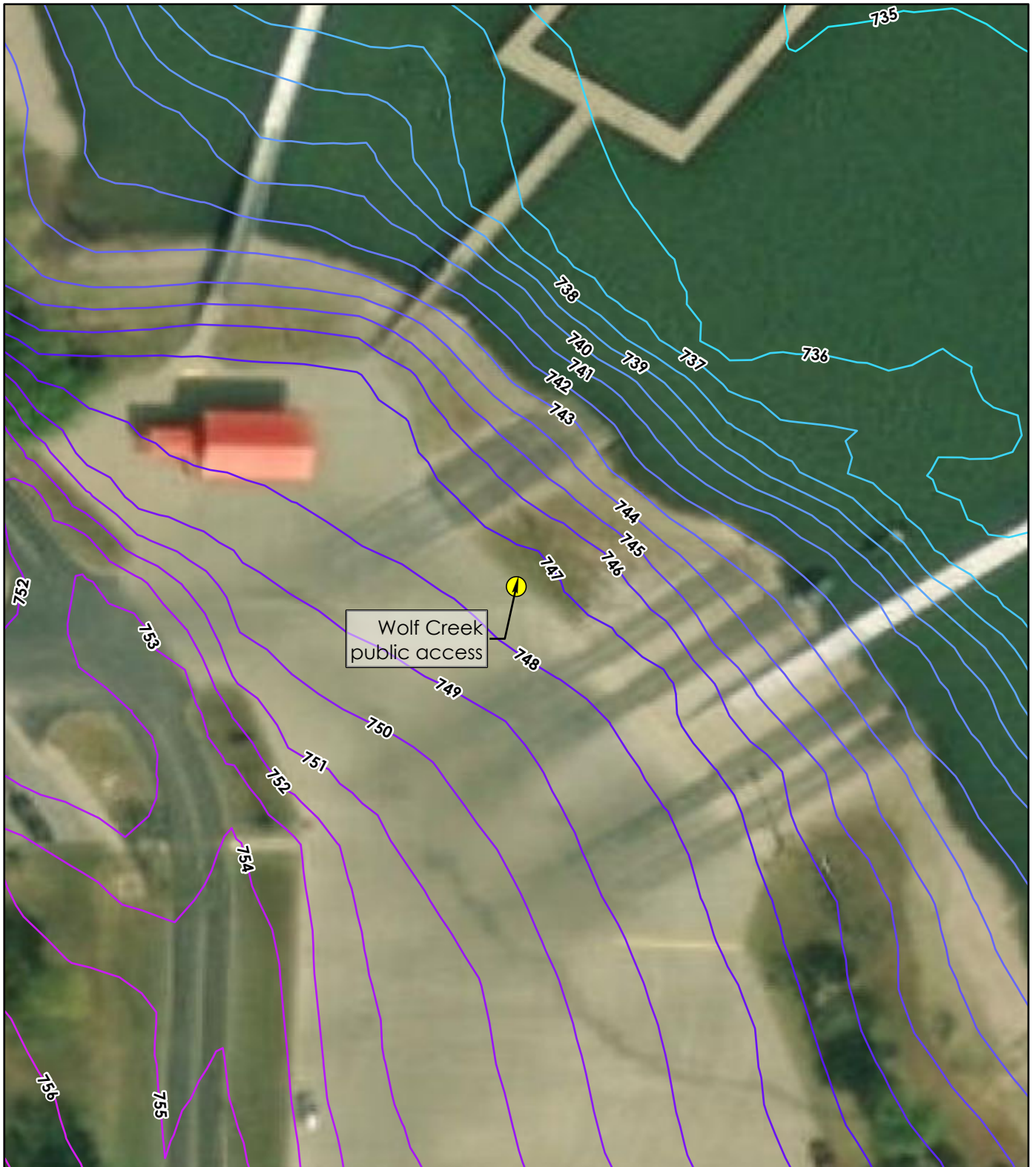


Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)

BOAT RAMP USABILITY

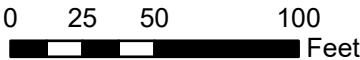
Wolf Creek public access

Upper Elev: 750 ft PD

Lower Elev: 737 ft PD

Legend

● Rec Site with Boat Ramp(s)



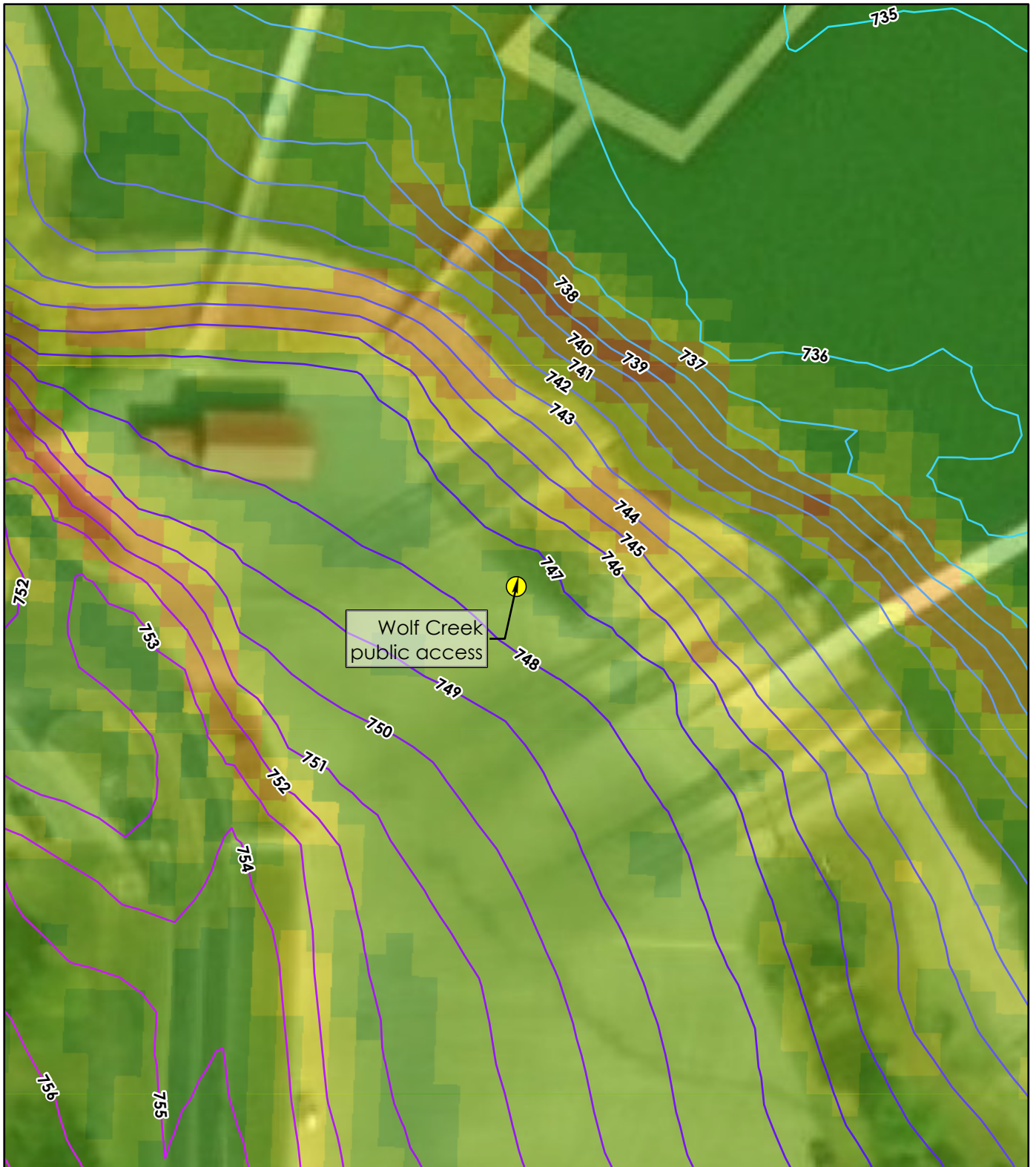


Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)









BOAT RAMP USABILITY

Wolf Creek public access

Upper Elev: 750 ft PD

Lower Elev: 737 ft PD

Legend

- | | |
|--|---|
|  Rec Site with Boat Ramp(s) |  7.5 - 10 |
| Percent Slope |  10 - 15 |
|  0 - 2.5 |  15 - 45 |
|  2.5 - 5 |  45 - 685.86 |
|  5 - 7.5 | |



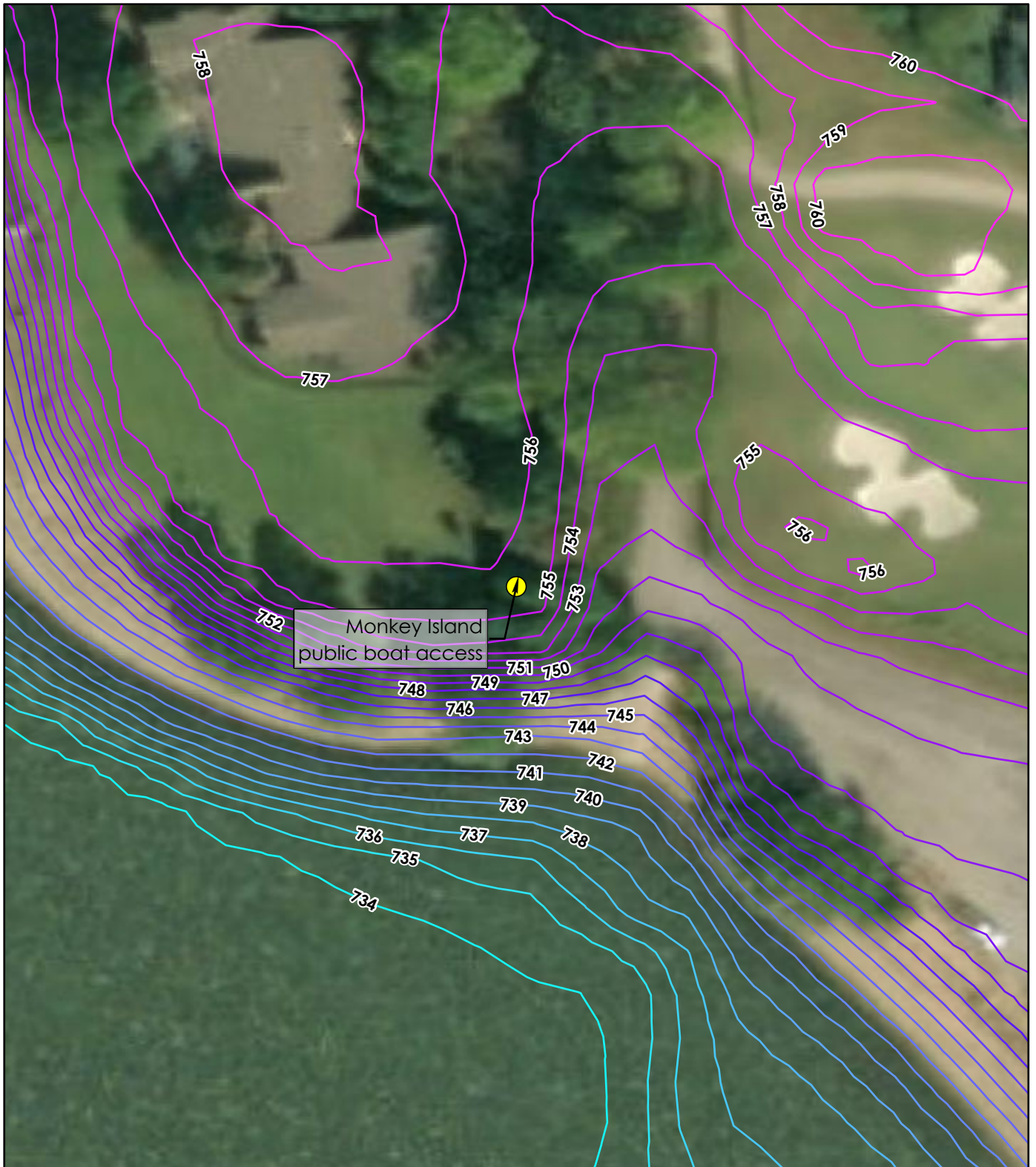


Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)


BOAT RAMP USABILITY

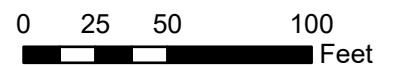
Monkey Island public boat access

Upper Elev: 751 ft PD

Lower Elev: 734 ft PD

Legend

 Rec Site with Boat Ramp(s)



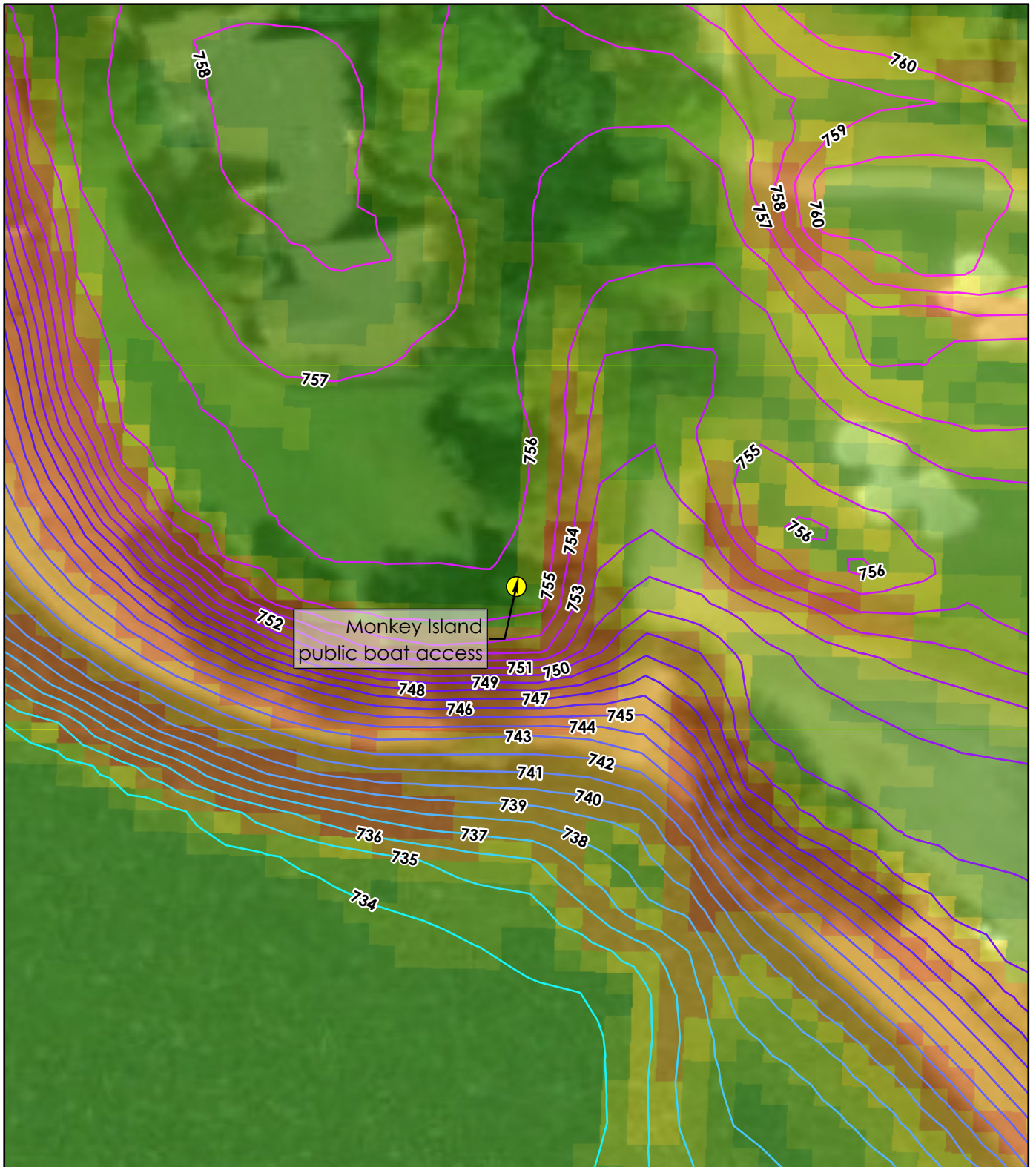


Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)









BOAT RAMP USABILITY

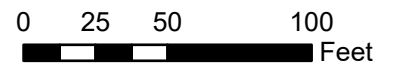
Monkey Island public boat access

Upper Elev: 751 ft PD

Lower Elev: 734 ft PD

Legend

- | | |
|--|---|
|  Rec Site with Boat Ramp(s) |  7.5 - 10 |
| Percent Slope |  10 - 15 |
|  0 - 2.5 |  15 - 45 |
|  2.5 - 5 |  45 - 685.86 |
|  5 - 7.5 | |



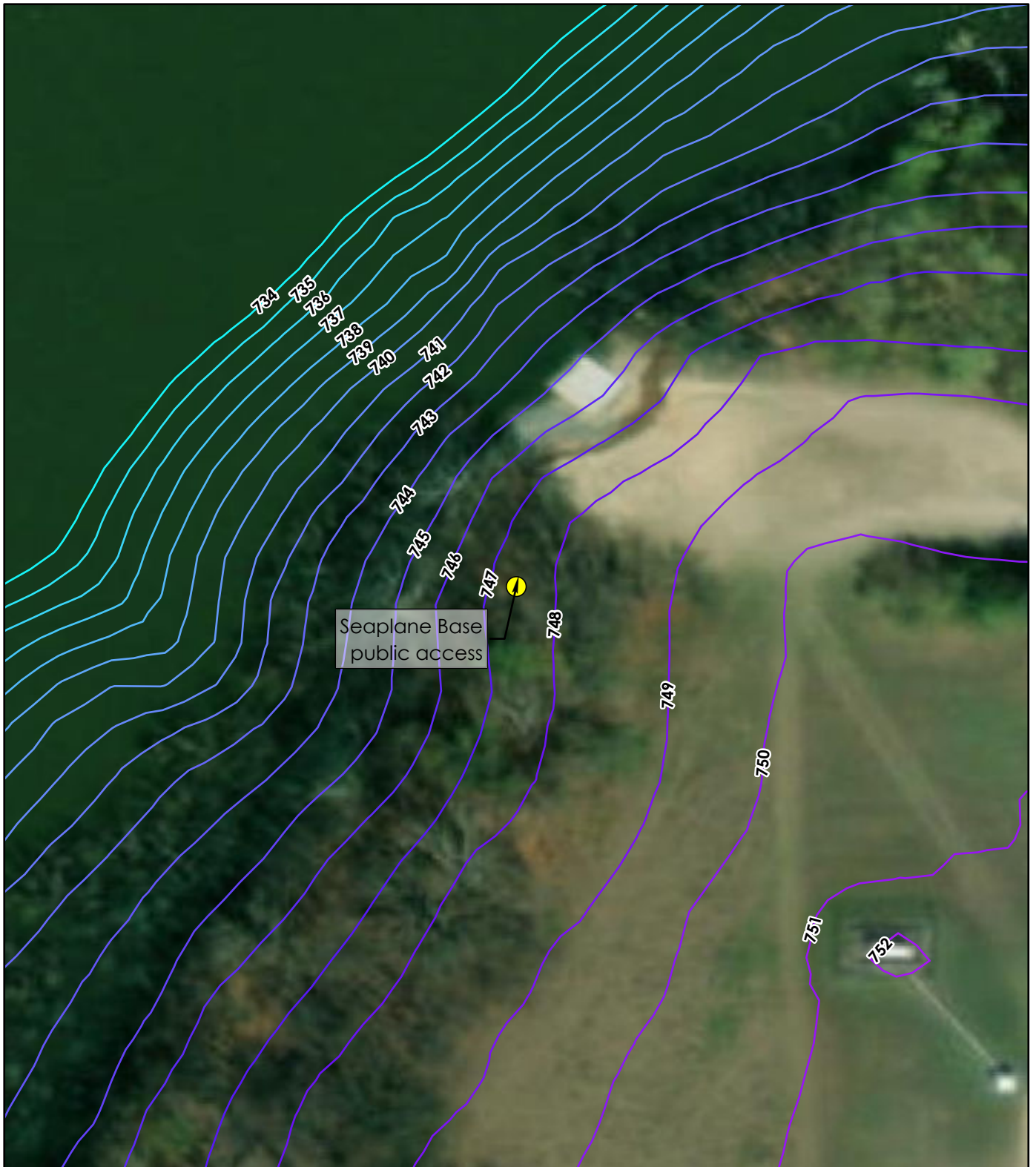



Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)

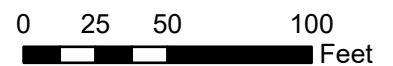
BOAT RAMP USABILITY

Seaplane Base public access

Upper Elev: 748 ft PD
 Lower Elev: 734 ft PD

Legend

 Rec Site with Boat Ramp(s)



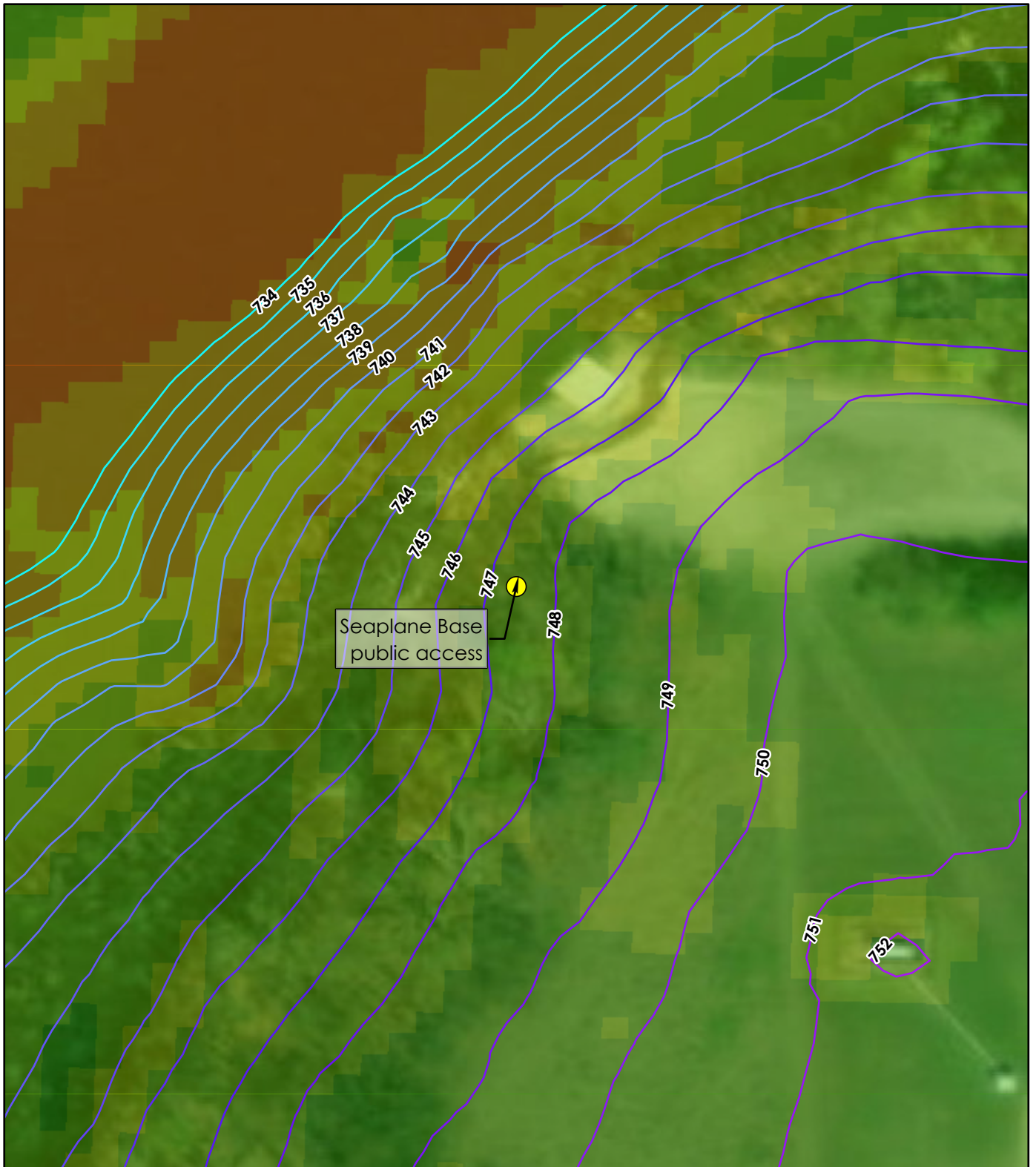










Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)

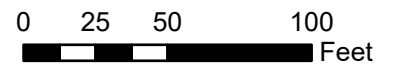
BOAT RAMP USABILITY

Seaplane Base public access

Upper Elev: 748 ft PD
 Lower Elev: 734 ft PD

Legend

- | | |
|--|---|
|  Rec Site with Boat Ramp(s) |  7.5 - 10 |
| Percent Slope |  10 - 15 |
|  0 - 2.5 |  15 - 45 |
|  2.5 - 5 |  45 - 685.86 |
|  5 - 7.5 | |



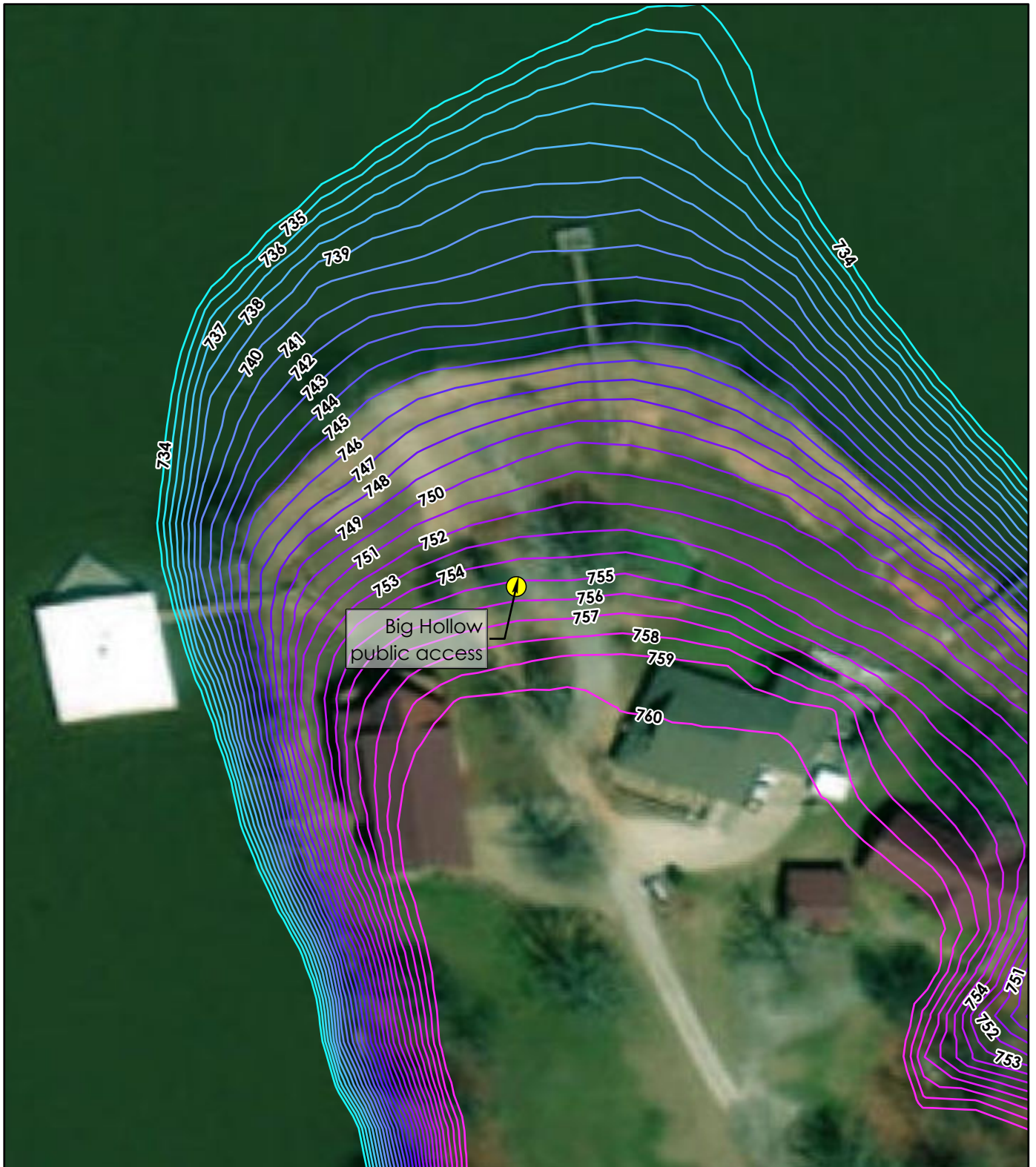


Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)

BOAT RAMP USABILITY

Big Hollow public access

Upper Elev: 755 ft PD

Lower Elev: 738 ft PD

Legend

 Rec Site with Boat Ramp(s)



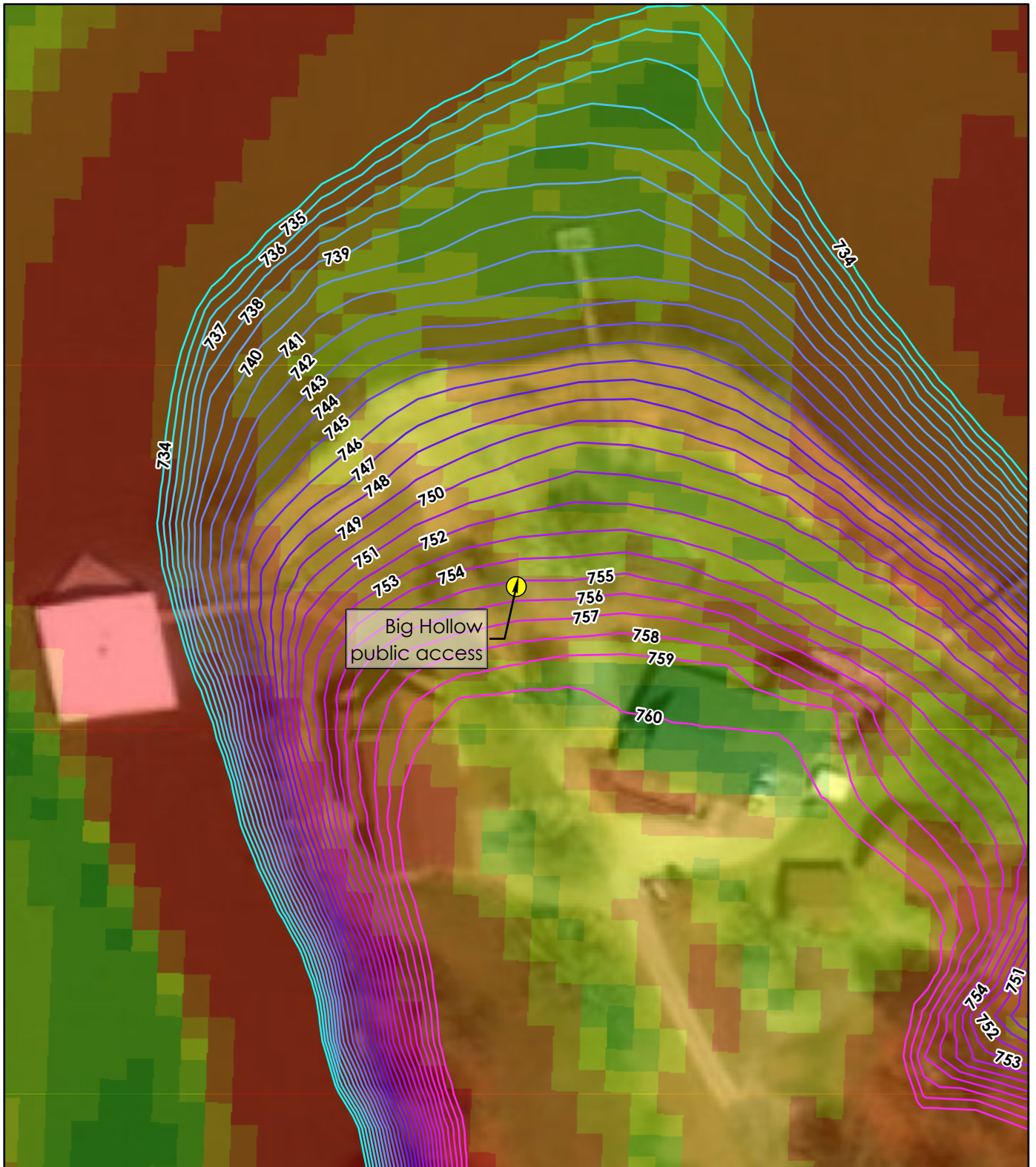


Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)









BOAT RAMP USABILITY

Big Hollow public access

Upper Elev: 755 ft PD

Lower Elev: 738 ft PD

Legend

- | | |
|--|---|
|  Rec Site with Boat Ramp(s) |  7.5 - 10 |
| Percent Slope |  10 - 15 |
|  0 - 2.5 |  15 - 45 |
|  2.5 - 5 |  45 - 685.86 |
|  5 - 7.5 | |

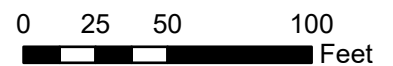




Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)

BOAT RAMP USABILITY

Duck Creek Bridge public access

Upper Elev: 748 ft PD
 Lower Elev: 742 ft PD

Legend

 Rec Site with Boat Ramp(s)



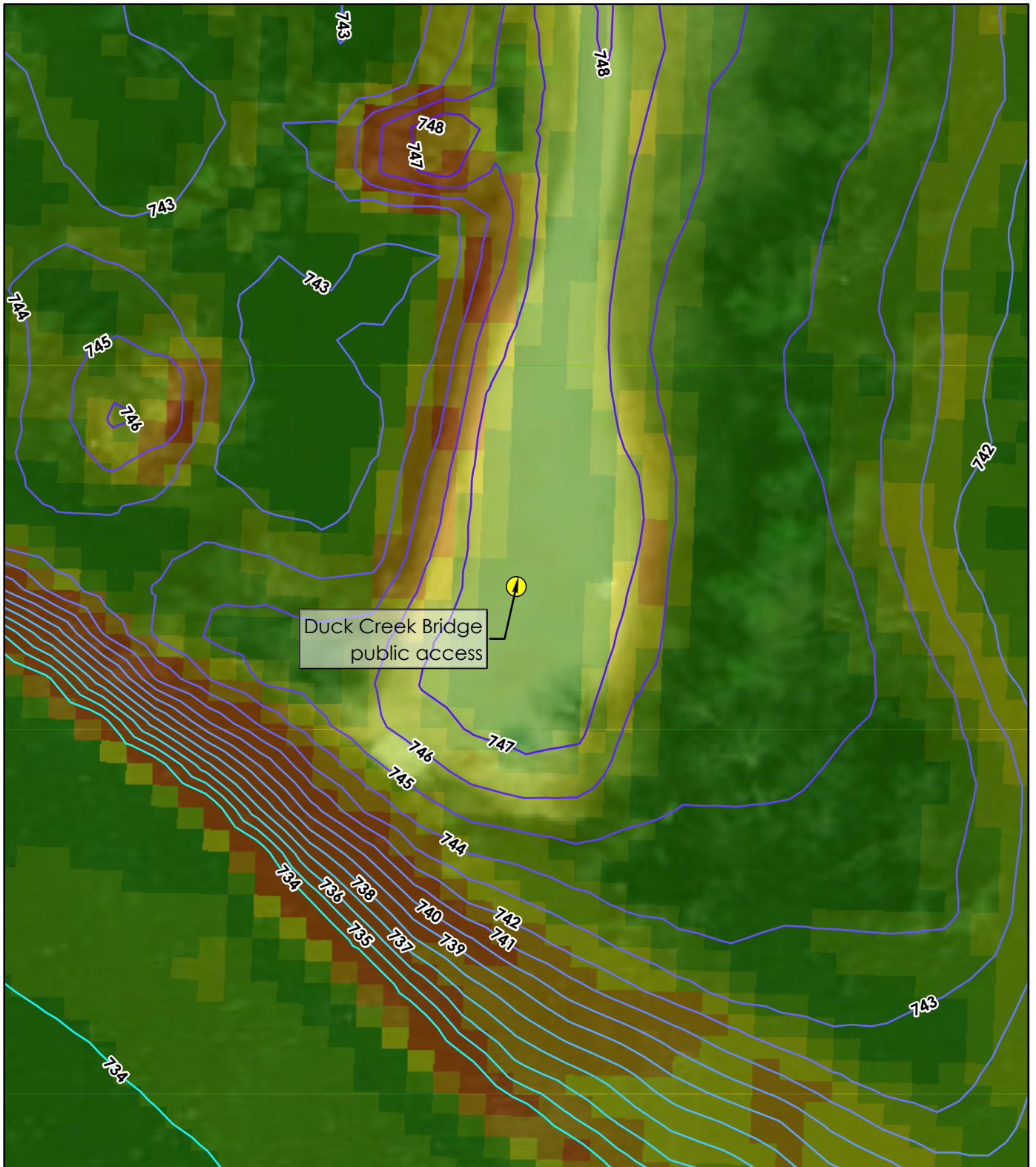


Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)

BOAT RAMP USABILITY

Duck Creek Bridge public access

Upper Elev: 748 ft PD
 Lower Elev: 742 ft PD

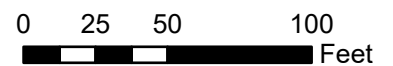
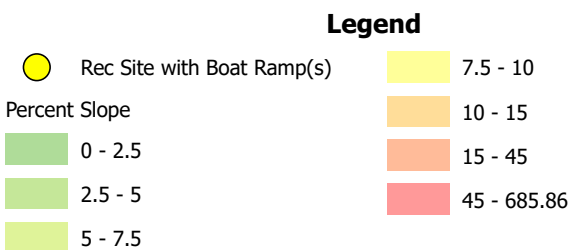




Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)


BOAT RAMP USABILITY

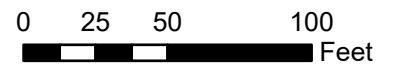
Twin Bridges State Park (lower)

Upper Elev: 748 ft PD

Lower Elev: 740 ft PD

Legend

 Rec Site with Boat Ramp(s)



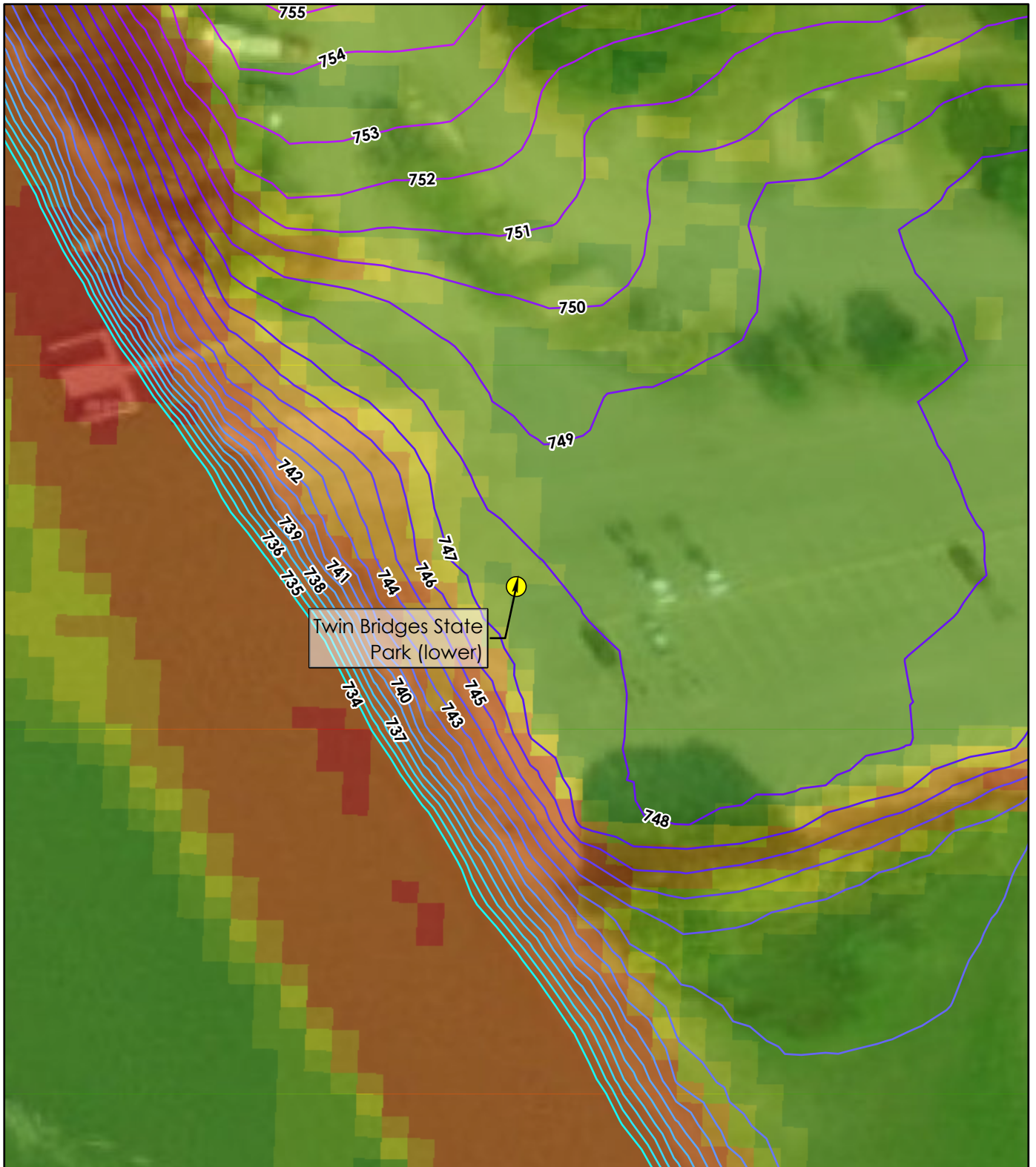


Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)









BOAT RAMP USABILITY

Twin Bridges State Park (lower)

Upper Elev: 748 ft PD

Lower Elev: 740 ft PD

Legend

- | | |
|--|---|
|  Rec Site with Boat Ramp(s) |  7.5 - 10 |
| Percent Slope |  10 - 15 |
|  0 - 2.5 |  15 - 45 |
|  2.5 - 5 |  45 - 685.86 |
|  5 - 7.5 | |

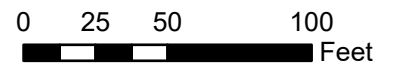




Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)


BOAT RAMP USABILITY

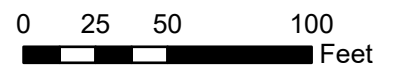
Honey Creek State Park

Upper Elev: 755 ft PD

Lower Elev: 738 ft PD

Legend

 Rec Site with Boat Ramp(s)



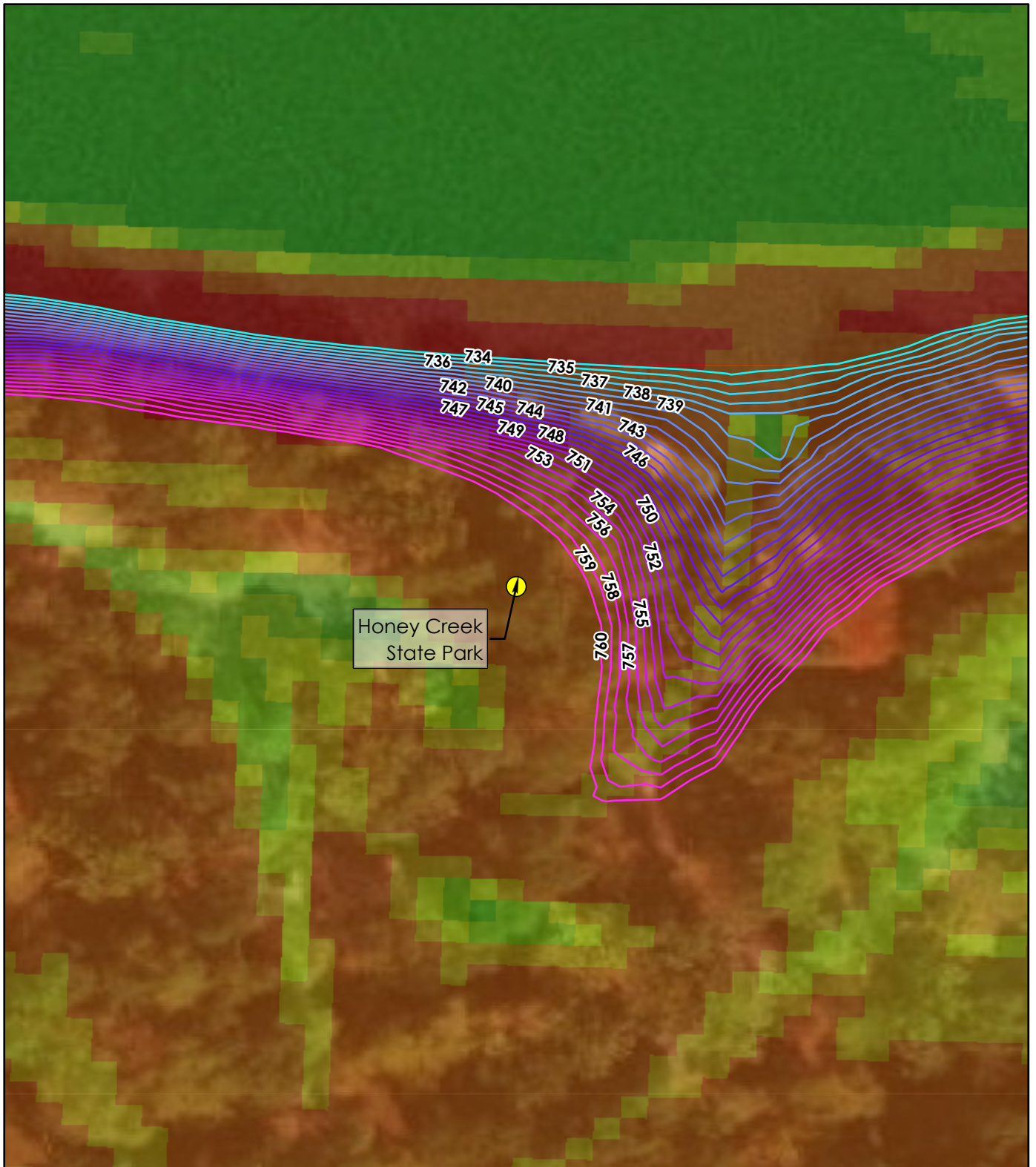


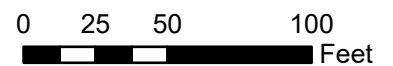
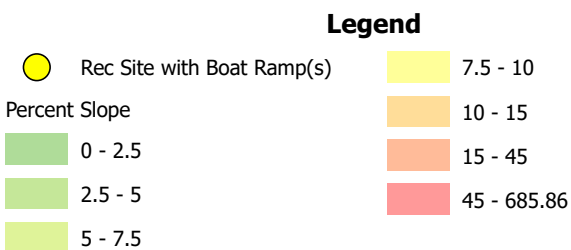
Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)

BOAT RAMP USABILITY

Honey Creek State Park

Upper Elev: 755 ft PD

Lower Elev: 738 ft PD



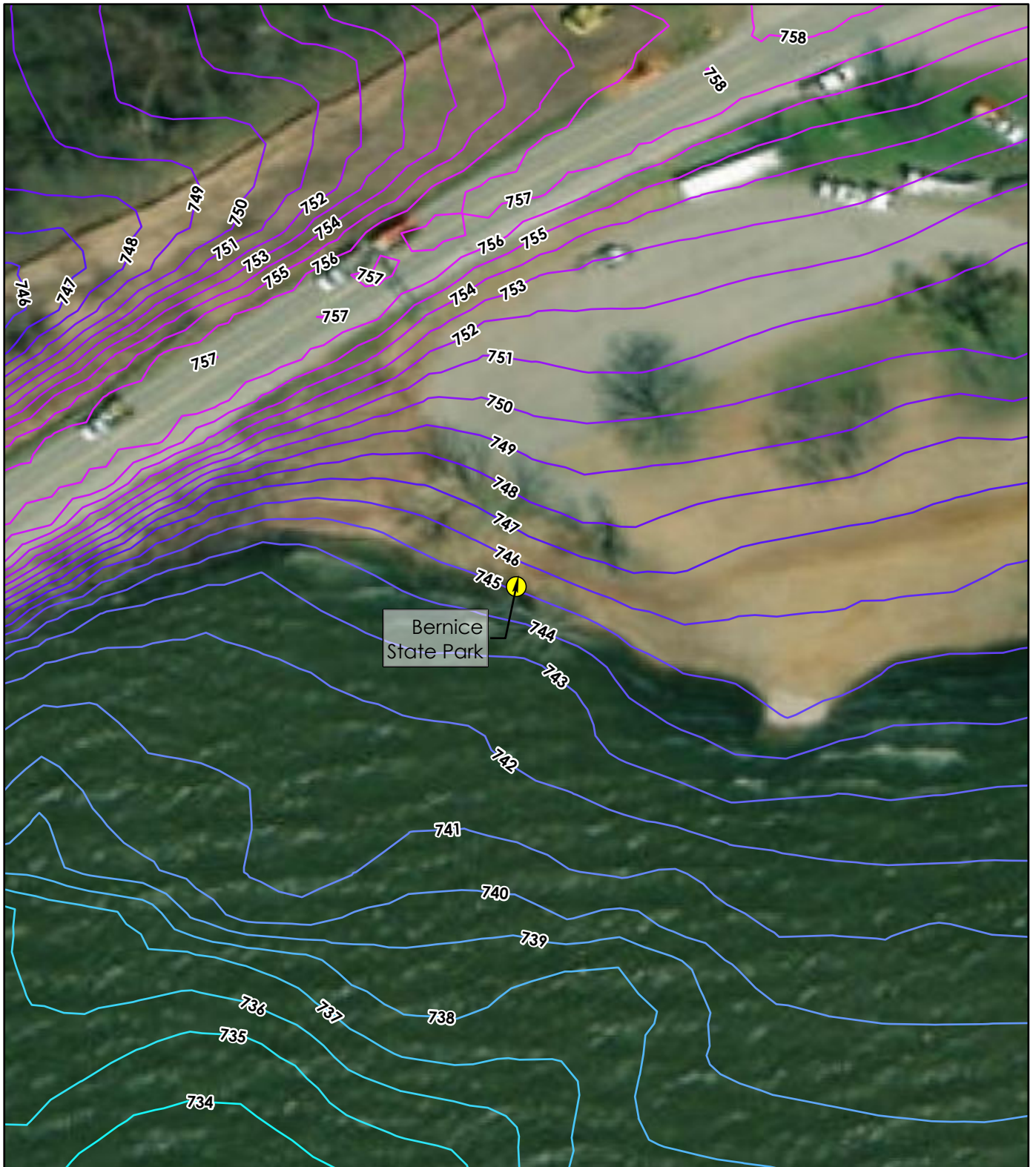


Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)

BOAT RAMP USABILITY

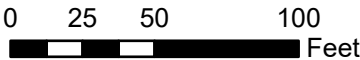
Bernice State Park

Upper Elev: 753 ft PD

Lower Elev: 736 ft PD

Legend

 Rec Site with Boat Ramp(s)



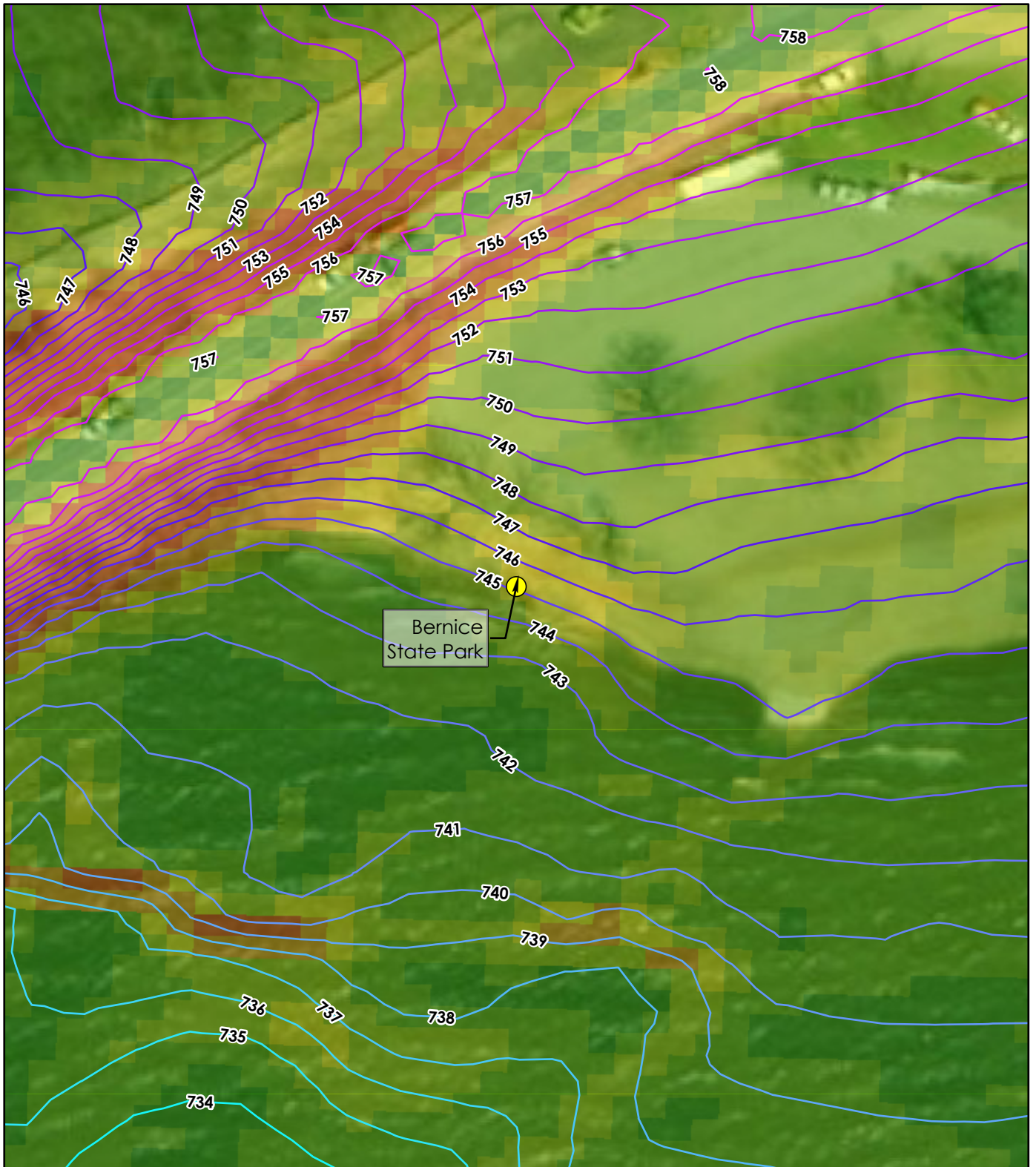


Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)









BOAT RAMP USABILITY

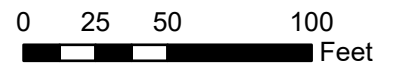
Bernice State Park

Upper Elev: 753 ft PD

Lower Elev: 736 ft PD

Legend

- | | |
|--|---|
|  Rec Site with Boat Ramp(s) |  7.5 - 10 |
| Percent Slope | |
|  0 - 2.5 |  10 - 15 |
|  2.5 - 5 |  15 - 45 |
|  5 - 7.5 |  45 - 685.86 |



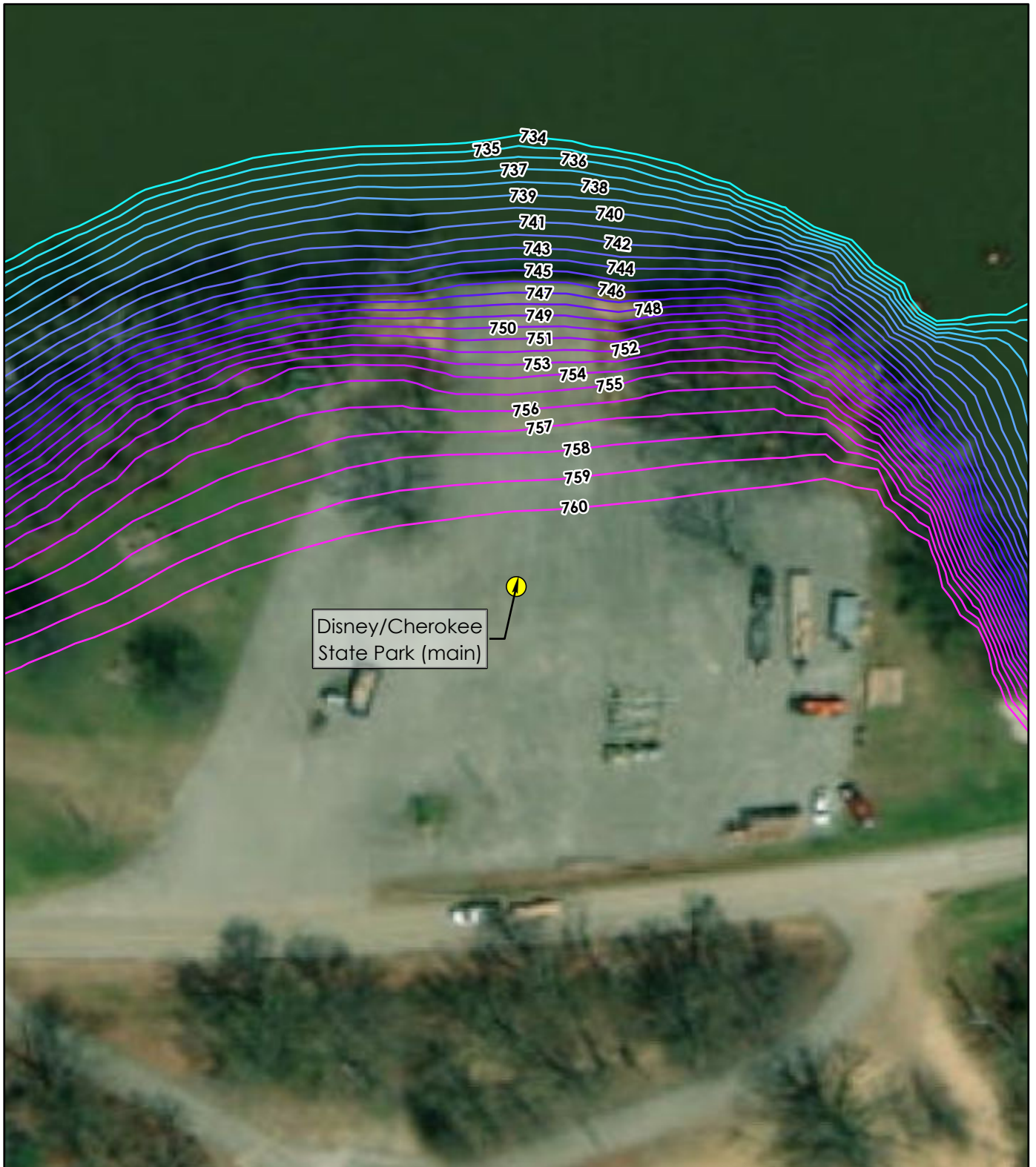



Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)

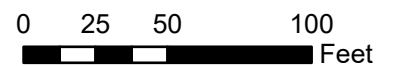
BOAT RAMP USABILITY

Disney/Cherokee State Park (main)

Upper Elev: 745 ft PD
 Lower Elev: 737 ft PD

Legend

 Rec Site with Boat Ramp(s)



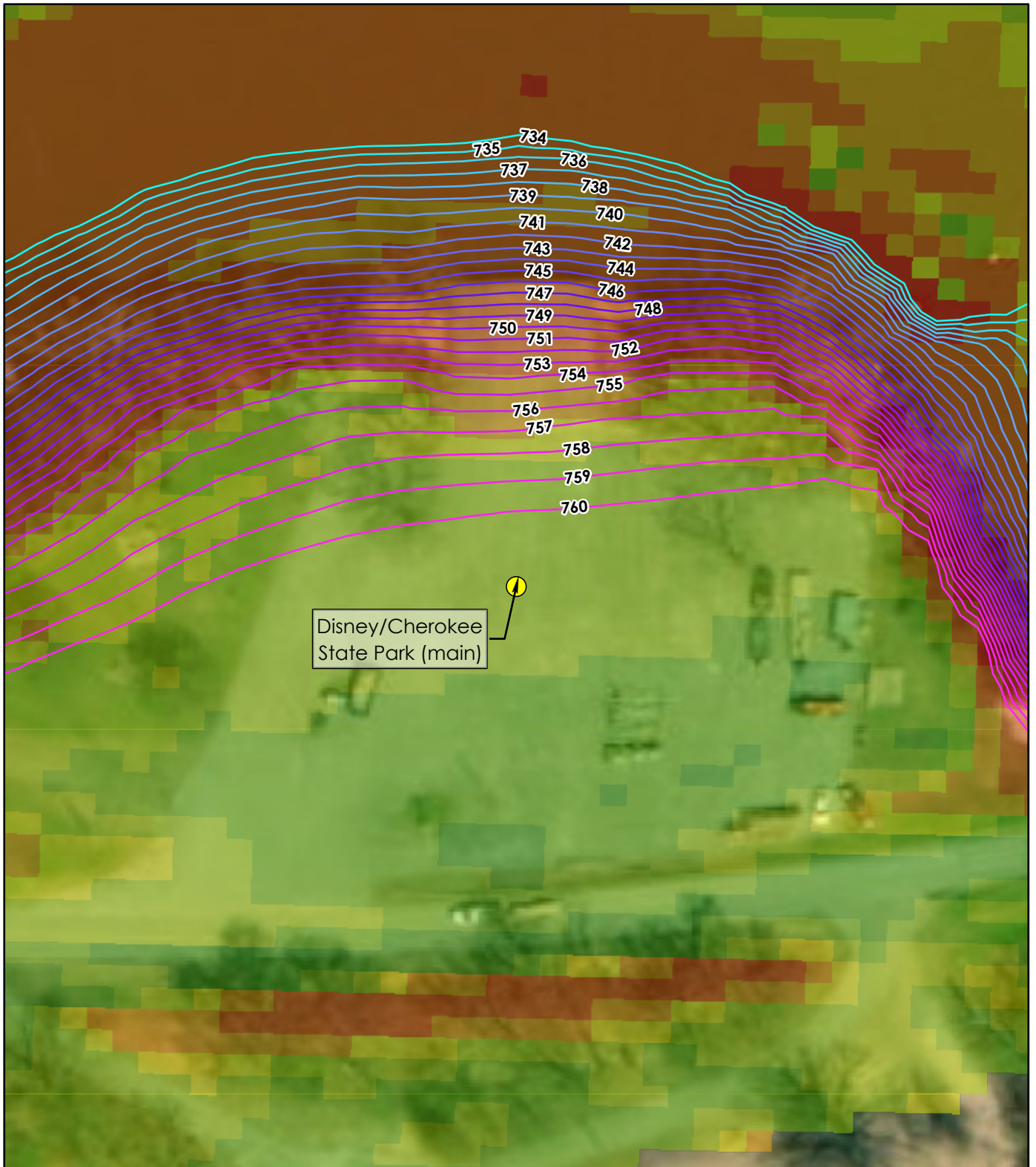










Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)

BOAT RAMP USABILITY

Disney/Cherokee State Park (main)

Upper Elev: 745 ft PD
 Lower Elev: 737 ft PD

Legend	
 Rec Site with Boat Ramp(s)	 7.5 - 10
Percent Slope	 10 - 15
 0 - 2.5	 15 - 45
 2.5 - 5	 45 - 685.86
 5 - 7.5	



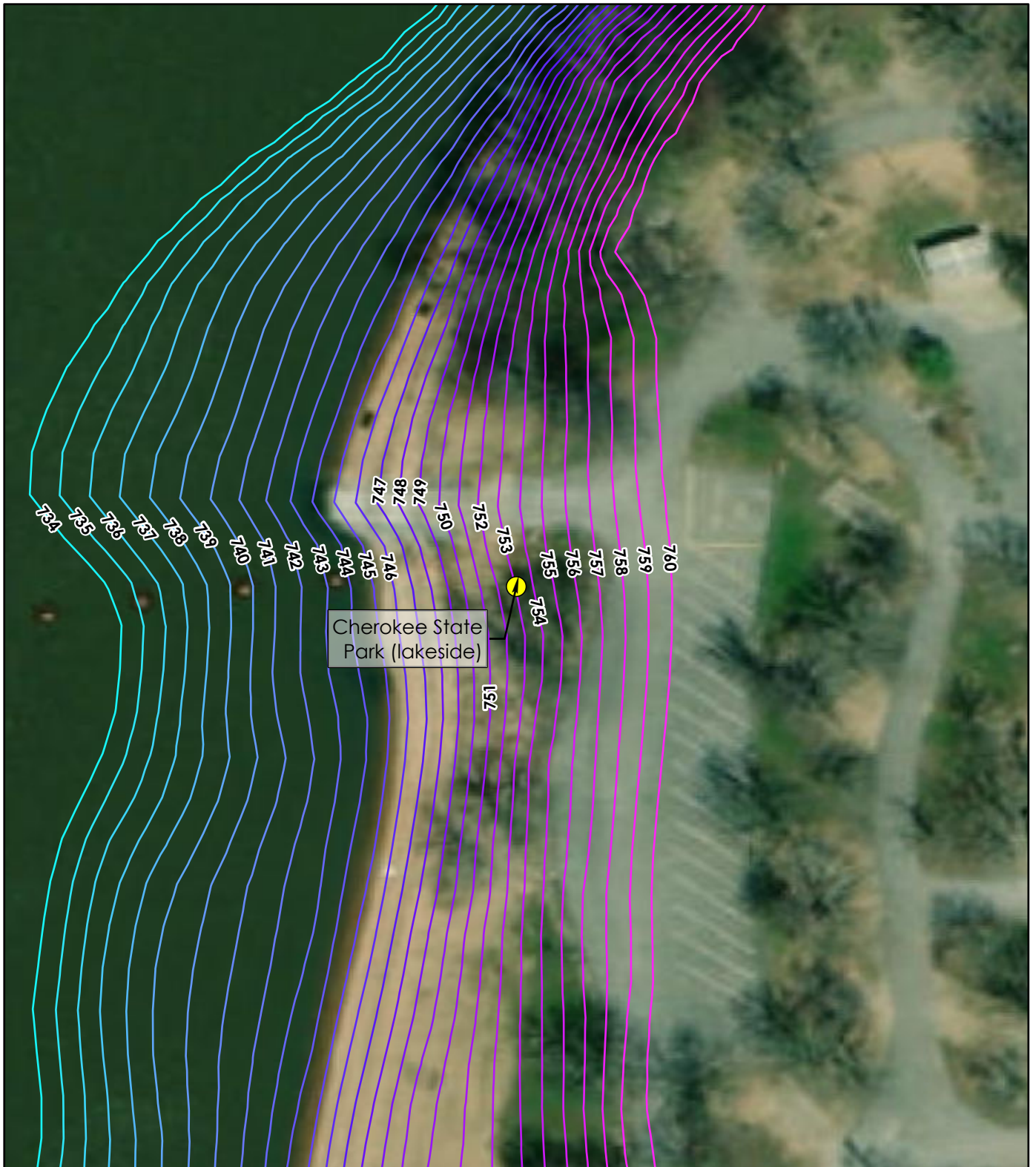


Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)


BOAT RAMP USABILITY

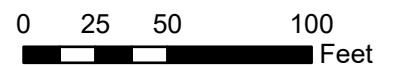
Cherokee State Park (lakeside)

Upper Elev: 745 ft PD

Lower Elev: 734 ft PD

Legend

 Rec Site with Boat Ramp(s)



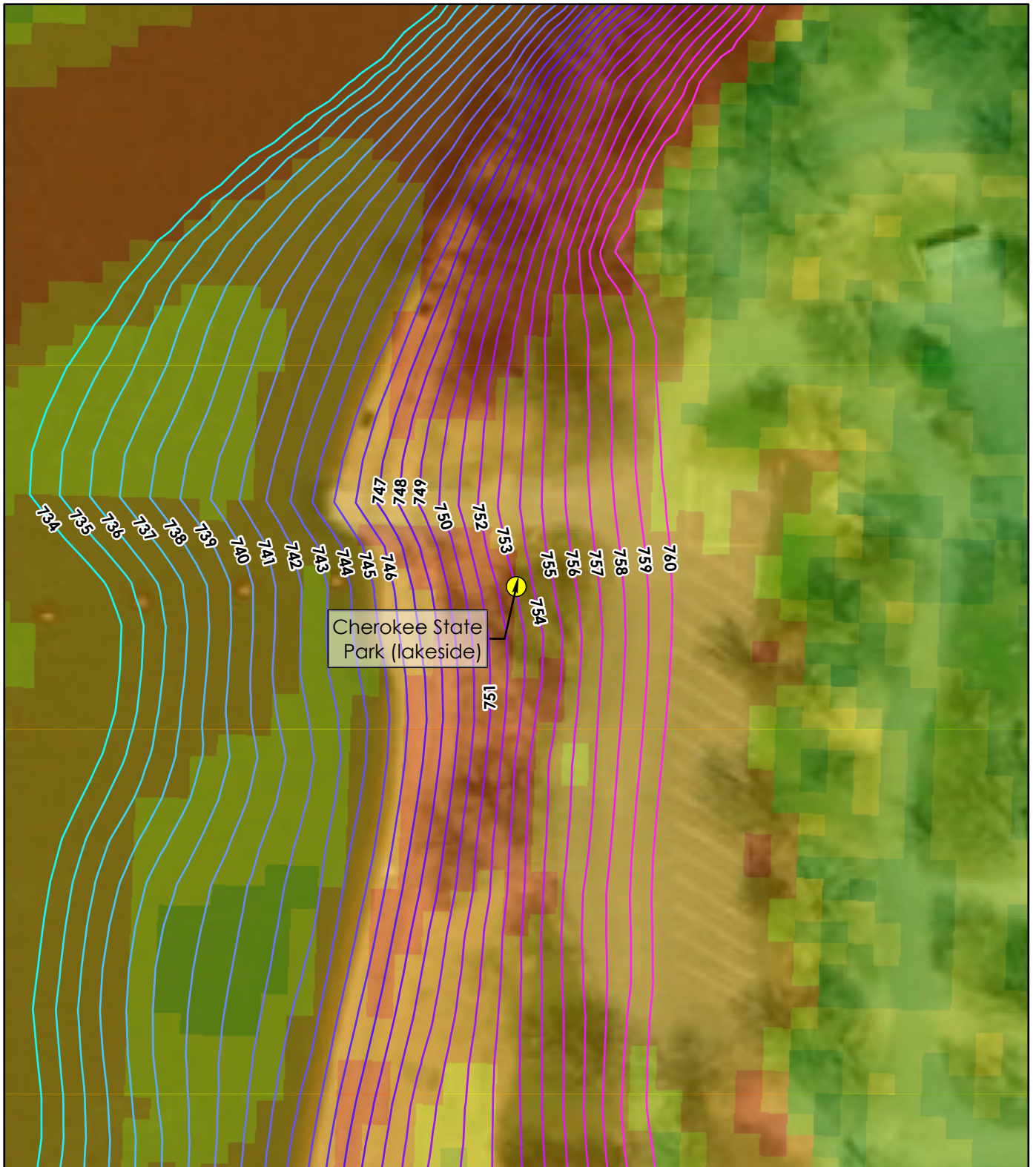


Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)

BOAT RAMP USABILITY Cherokee State Park (lakeside)

Upper Elev: 745 ft PD
 Lower Elev: 734 ft PD

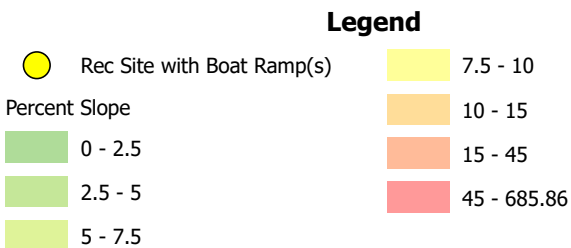




Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)


BOAT RAMP USABILITY

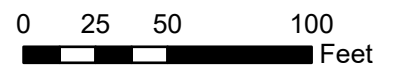
Spring River access

Upper Elev: 750 ft PD

Lower Elev: 741 ft PD

Legend

 Rec Site with Boat Ramp(s)



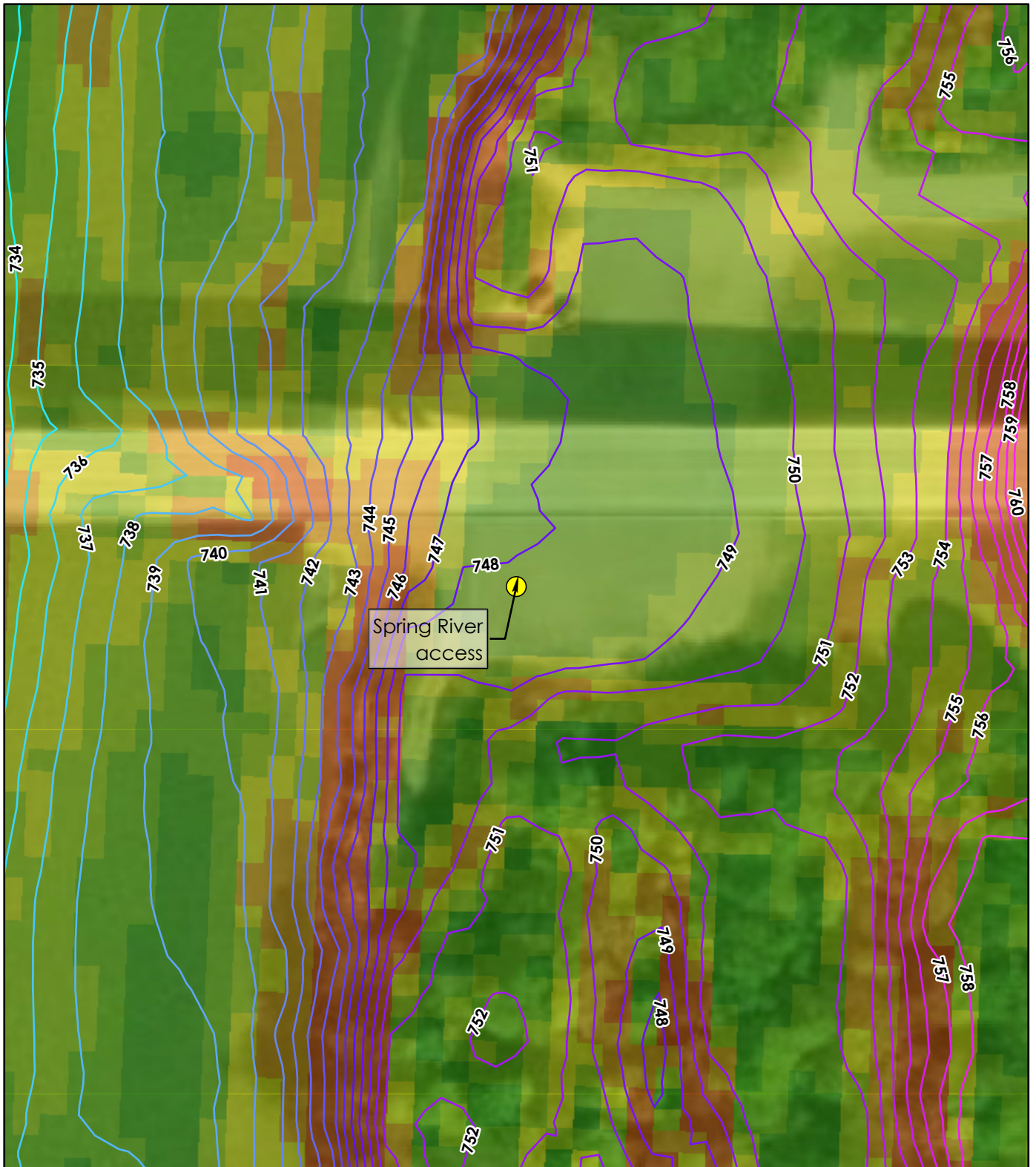


Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)









BOAT RAMP USABILITY

Spring River access

Upper Elev: 750 ft PD

Lower Elev: 741 ft PD

Legend

- | | |
|--|---|
|  Rec Site with Boat Ramp(s) |  7.5 - 10 |
| Percent Slope |  10 - 15 |
|  0 - 2.5 |  15 - 45 |
|  2.5 - 5 |  45 - 685.86 |
|  5 - 7.5 | |



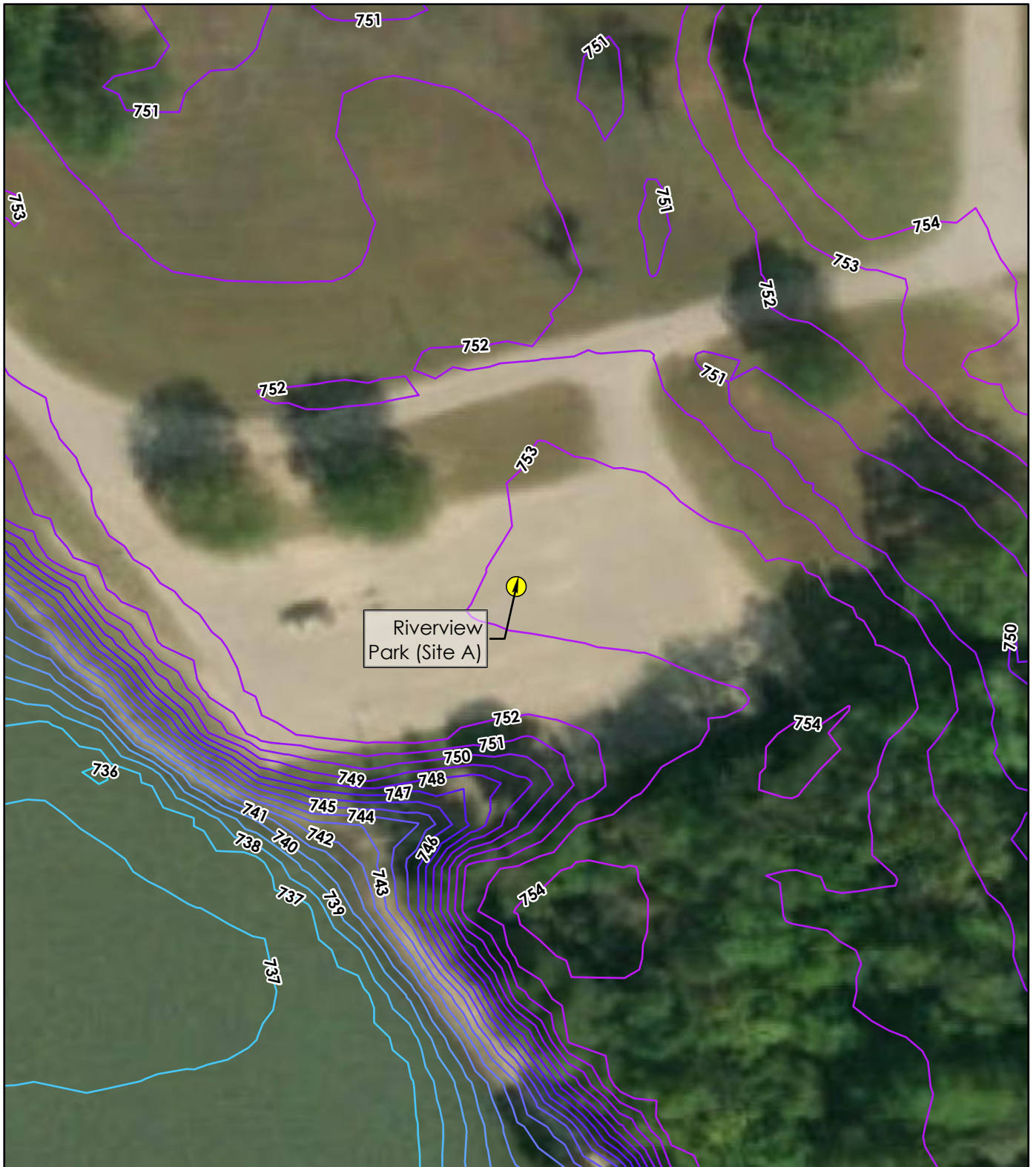


Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)

BOAT RAMP USABILITY

Riverview Park (Site A)

Upper Elev: 753 ft PD

Lower Elev: 740 ft PD

Legend


 Rec Site with Boat Ramp(s)





Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)









BOAT RAMP USABILITY

Riverview Park (Site A)

Upper Elev: 753 ft PD

Lower Elev: 740 ft PD

Legend

- | | |
|--|---|
|  Rec Site with Boat Ramp(s) |  7.5 - 10 |
| Percent Slope |  10 - 15 |
|  0 - 2.5 |  15 - 45 |
|  2.5 - 5 |  45 - 685.86 |
|  5 - 7.5 | |

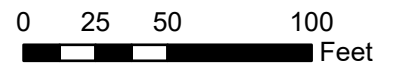




Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)


BOAT RAMP USABILITY

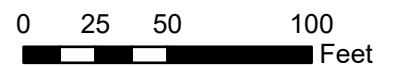
Riverview Park (Site B)

Upper Elev: 753 ft PD

Lower Elev: 739 ft PD

Legend

 Rec Site with Boat Ramp(s)



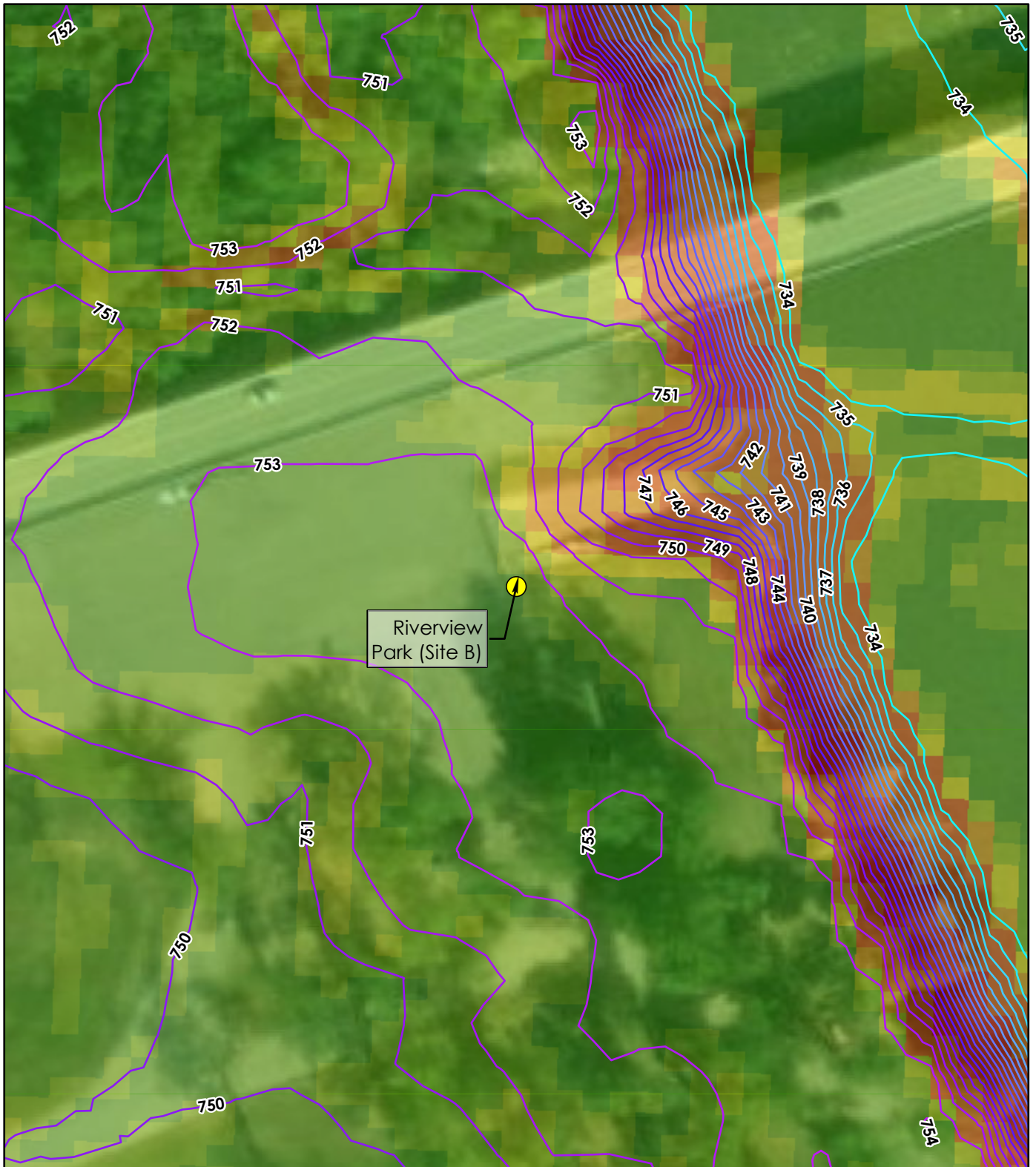


Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)









BOAT RAMP USABILITY

Riverview Park (Site B)

Upper Elev: 753 ft PD

Lower Elev: 739 ft PD

Legend

-  Rec Site with Boat Ramp(s)
-  7.5 - 10
-  0 - 2.5
-  10 - 15
-  2.5 - 5
-  15 - 45
-  5 - 7.5
-  45 - 685.86

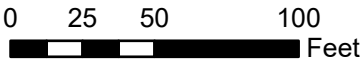




Image Source: ERSI Imagery, based on 2020 Maxar image, 0.50 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)

BOAT RAMP USABILITY

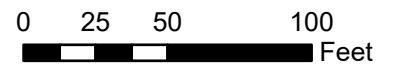
Connors Bridge Rec Site

Upper Elev: 747 ft PD

Lower Elev: 744 ft PD

Legend

 Rec Site with Boat Ramp(s)



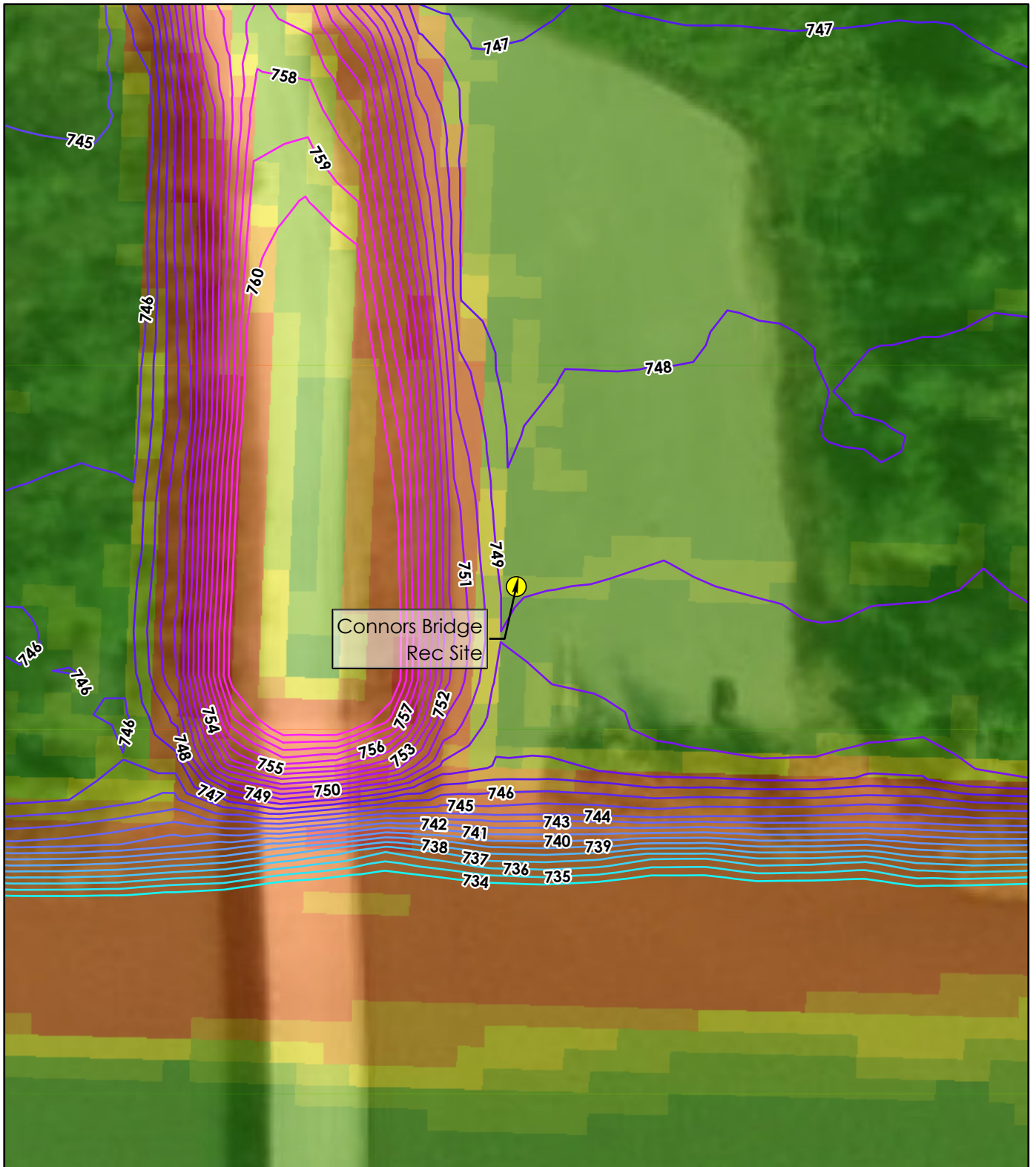


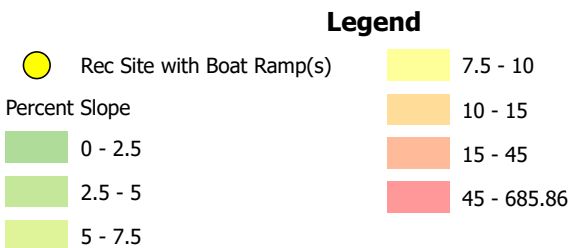
Image Source: ERSI Imagery, based on 2020 Maxar image, 0.50 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)

BOAT RAMP USABILITY

Connors Bridge Rec Site

Upper Elev: 747 ft PD

Lower Elev: 744 ft PD



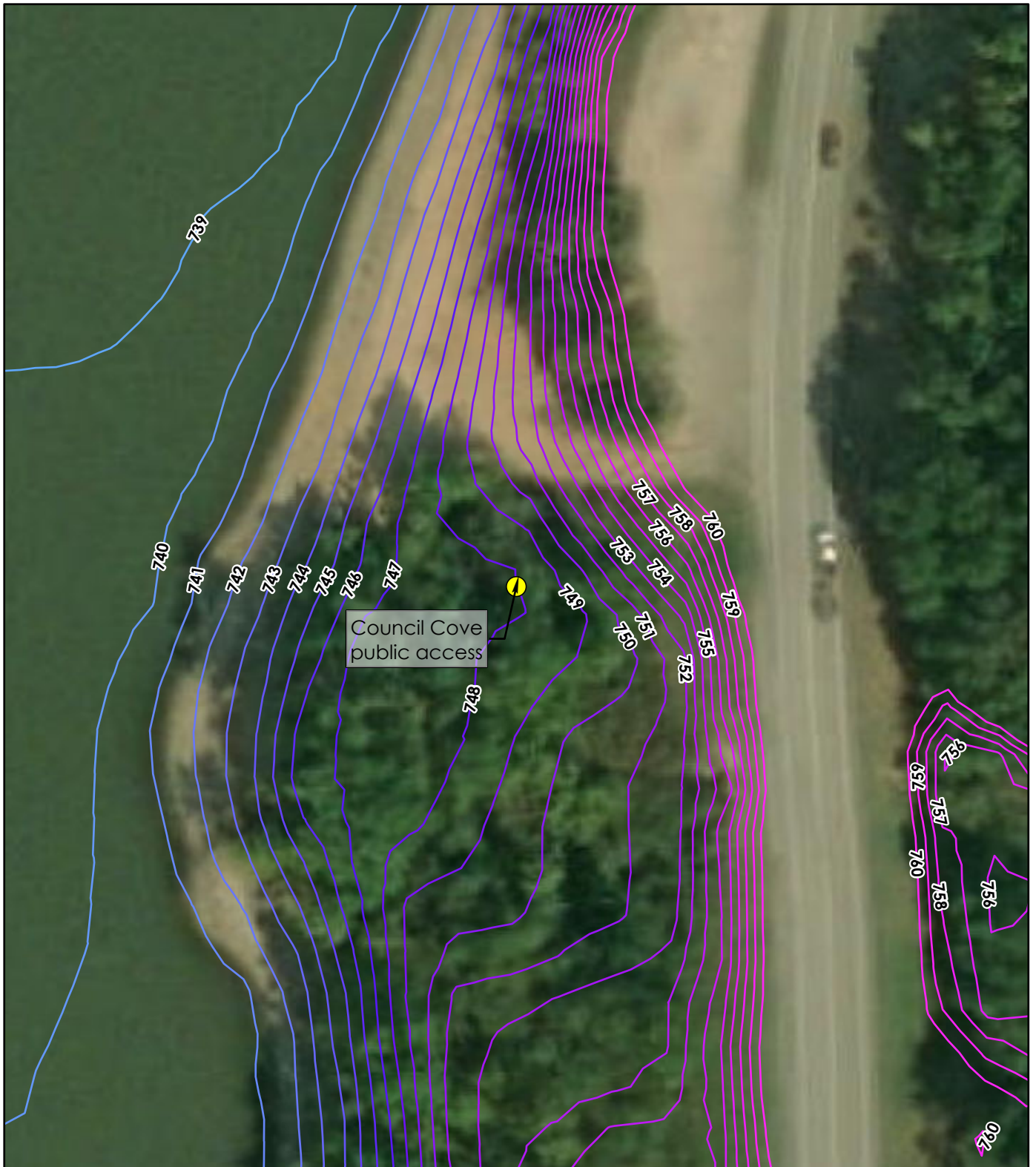


Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)

BOAT RAMP USABILITY

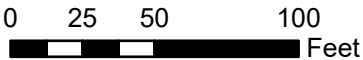
Council Cove public access

Upper Elev: 748 ft PD

Lower Elev: 739 ft PD

Legend

 Rec Site with Boat Ramp(s)



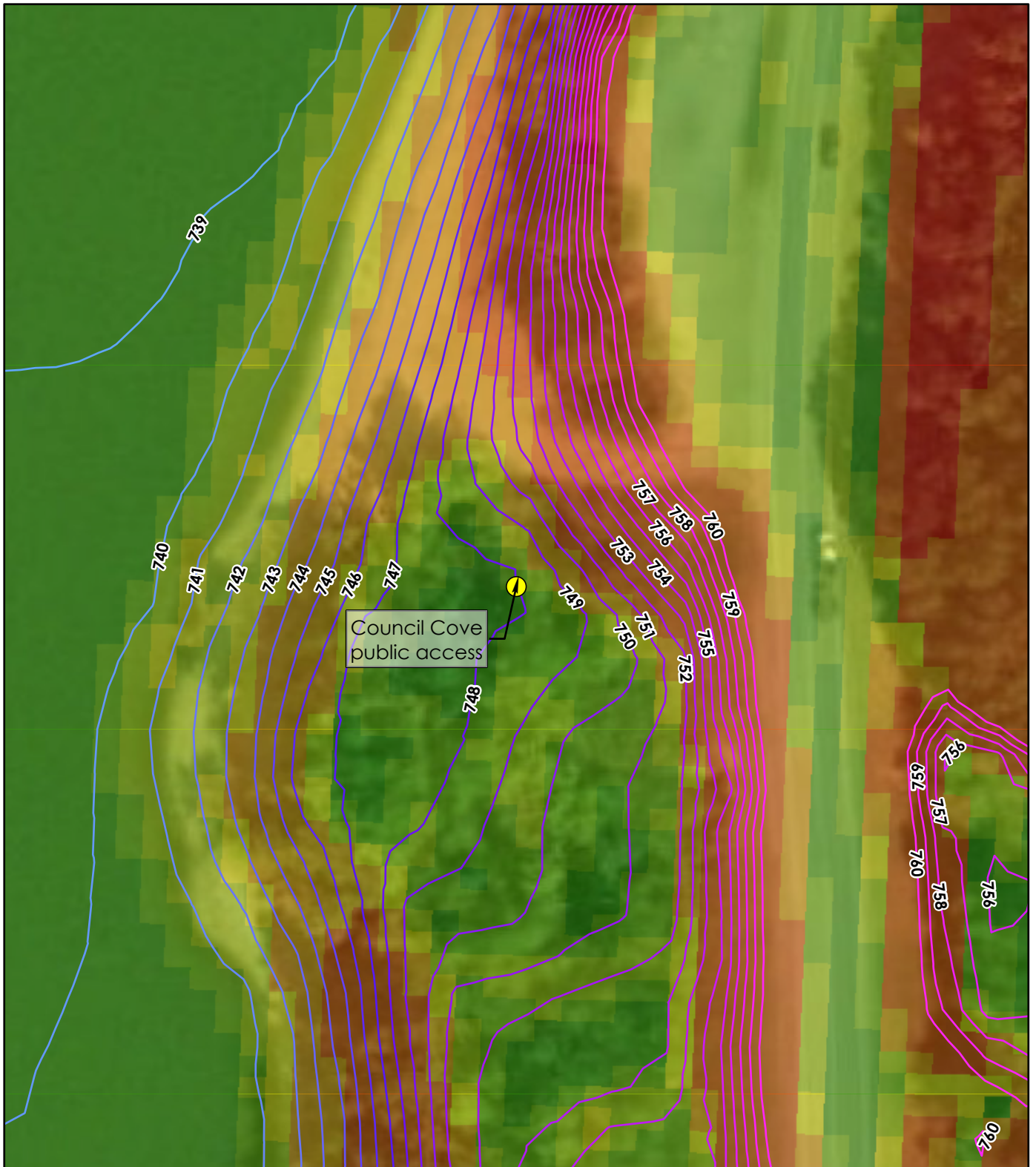


Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)

BOAT RAMP USABILITY

Council Cove public access

Upper Elev: 748 ft PD
 Lower Elev: 739 ft PD

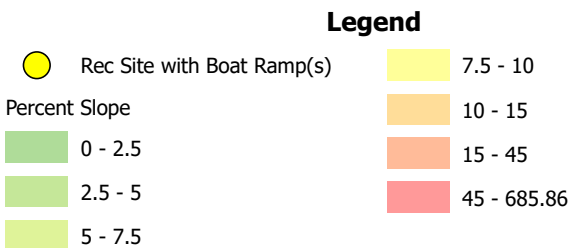




Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)


BOAT RAMP USABILITY

Willow Park

Upper Elev: 754 ft PD

Lower Elev: 740 ft PD

Legend

 Rec Site with Boat Ramp(s)

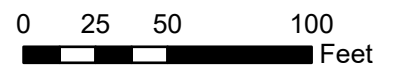












Image Source: ERSI Wayback Imagery, based on 2010 Microsoft image, 0.30 meters resolution
 Elevation Data: Contours are referenced to the Pensacola Datum (PD)

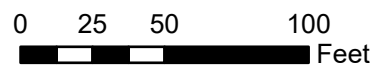
BOAT RAMP USABILITY

Willow Park

Upper Elev: 754 ft PD
 Lower Elev: 740 ft PD

Legend

 Rec Site with Boat Ramp(s)	 7.5 - 10
Percent Slope	 10 - 15
 0 - 2.5	 15 - 45
 2.5 - 5	 45 - 685.86
 5 - 7.5	



Recreation Management Plan

Pensacola Hydroelectric Project
FERC Project No. 1494

May 2023

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List of Abbreviations

Commission	Federal Energy Regulatory Commission
Corps	United States Army Corps of Engineers
FERC	Federal Energy Regulatory Commission
Grand Lake	Grand Lake O' the Cherokees
GRDA	Grand River Dam Authority
Licensee	Grand River Dam Authority
NDA 2020	National Defense Authorization Act for Fiscal Year 2020
O&M	Operation and Maintenance
OTRD	Oklahoma Tourism and Recreation Department
PD	Pensacola Datum
Pensacola Project	Pensacola Hydroelectric Project
Project	Pensacola Hydroelectric Project
RMP	Recreational Management Plan
RM	River Mile
Study	Recreation Facilities Inventory and Use Study
USACE	United States Army Corps of Engineers
Wolf Creek	Wolf Creek Public Access

The Grand River Dam Authority (GRDA, licensee) owns and operates the Pensacola Hydroelectric Project (Pensacola Project or Project) and is licensed by the Federal Energy Regulatory Commission (FERC or Commission) as Project No. 1494. As part of the Integrated Licensing Process being utilized to relicense the Project, the Licensee prepared a proposed study plan and subsequently a revised study plan that included a Recreation Facilities Inventory and Use Study (Study) to gather information as part of the relicensing process. The Commission issued a study plan determination approving the study on November 8, 2018.

1. Introduction

This Recreational Management Plan (RMP) is being developed as part of the Final License Application and includes the following:

- 1) A description of the Project.
- 2) A detailed description of the FERC-approved recreation facilities.
- 3) A detailed description of the proposed recreation enhancement measures.
- 4) A discussion of the purpose of each measure as it relates to the Project effects.
- 5) The estimated capital and annual Operation and Maintenance (O&M) costs for each proposed recreation enhancement.
- 6) Current and additional O&M costs for implementing the RMP.

2. Project Description

GRDA is an agency of the state of Oklahoma, created by the Oklahoma Legislature in 1935 to be a “conservation and reclamation district for the waters of the Grand River.” GRDA fulfills its statutory responsibilities under state law by operating the Pensacola Project, as well as the downstream Markham Ferry Project (FERC No. 2183), and Salina Pumped Storage Project (FERC No. 2524). In addition, GRDA manages the three lakes formed by the three Project dams, which include Pensacola Project’s Grand Lake O’ the Cherokees (Grand Lake), Markham Ferry Project’s Lake Hudson, and Salina Pumped Storage Project’s W.R. Holway Reservoir. GRDA produces and sells electricity that reaches into 75 of the 77 counties in Oklahoma (Grand River Dam Authority, 2017).

The Pensacola Project was the first hydroelectric project constructed in Oklahoma. Construction began in 1938 and concluded when the spillway gates were closed in March 1940, forming Grand Lake. GRDA has operated and maintained the Project since August 1946 when, pursuant to an act of Congress, the United States returned the Project to GRDA following World War II (Grand River Dam Authority, 2008).

The Pensacola Project is located on the Neosho and Grand Rivers in northeastern Oklahoma. The Neosho River originates in Kansas and flows into Oklahoma where it joins the Spring River to form the Grand River. The Project is located within Craig, Delaware, Mayes, and Ottawa Counties. Pensacola Dam is located between the towns of Langley and Disney at river mile (RM) 77. The Grand River flows south from the Pensacola Dam past the GRDA’s Markham Ferry Project Dam and the United States Army Corps of Engineers’ (USACE or Corps) Fort Gibson Dam to its confluence with the Arkansas River near Muskogee, Oklahoma.

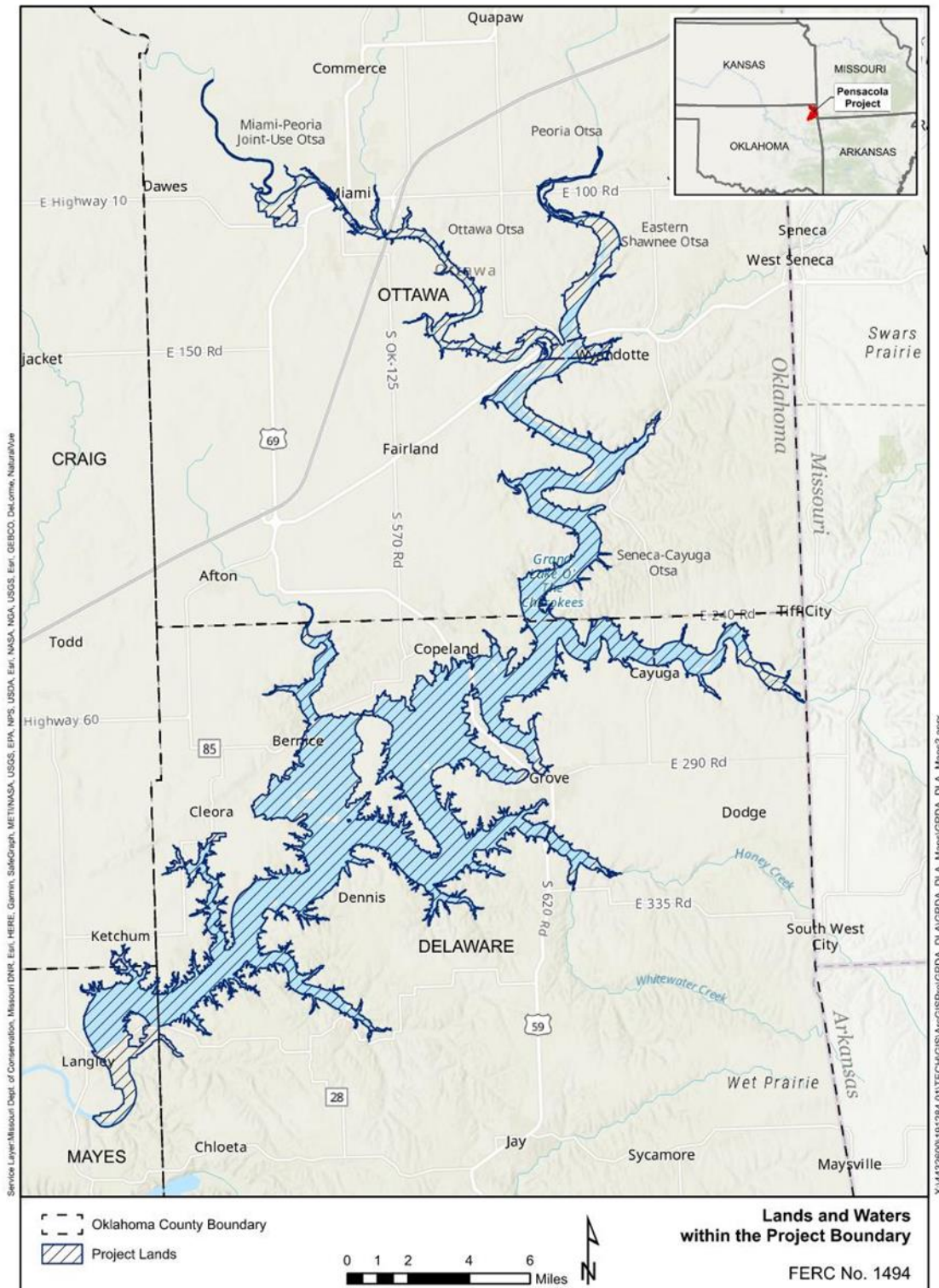
Unlike most other FERC-licensed hydropower projects, federal law establishes a Congressionally authorized regulatory structure at Grand Lake. Under section 7 of the Flood Control Act of 1944¹ and section 7612 of the National Defense Authorization Act for Fiscal Year 2020 (NDAA 2020).² Congress conferred upon the Corps “exclusive jurisdiction and responsibility for management of the flood pool for flood control operations at Grand Lake O’ the Cherokees.” Pursuant to the Corps’ Water Control Manual for Grand Lake, when reservoir elevations are either above elevation 745 feet Pensacola Datum (PD) or projected to rise above 745 feet PD (the flood pool minimum elevation), the Corps directs water releases from the Pensacola Dam. Outside of flood control operations, i.e., when water surface elevations at Grand Lake are within the conservation pool and not projected to rise above 745 feet PD, GRDA controls Project operations with regard to water surface elevations at Grand Lake. The NDAA 2020 expressly prohibits any federal or state agency from imposing requirements related to the surface elevations of the conservation pool, except for the Commission’s project safety and human health regulations.

Grand Lake encompasses 41,581 acres at a reservoir elevation of 742 feet PD (the bottom of the anticipated operating range). At a reservoir elevation of 745 feet PD, the reservoir encompasses 45,056 acres. Figure 1 depicts the lands and waters of the Project.

¹ 33 U.S.C. § 709.

² Pub. L. No. 116-92 (2019).

Figure 1 – Lands and Waters of the Project



A review of lands adjacent to Grand Lake showed 66.8% of lands are either forested or contain woody wetlands, 14.6% are designated as agricultural or crop lands, and 9.6% are developed areas (Grand River Dam Authority, 2021a).

Grand Lake is the premier recreational lake in northeast Oklahoma (Grand River Dam Authority, 2017). There are numerous public recreation facilities on Grand Lake, which offer local residents and visitors' opportunities for fishing, camping, swimming, picnicking, and other outdoor and water activities. GRDA operates and maintains five FERC-approved public access sites for the Pensacola Project. Fifteen other non-Project sites occur on Grand Lake. They are owned, operated, and maintained by the State of Oklahoma, local cities, or private owners.

There are three main types of recreation facilities within the Project vicinity. There are FERC-approved recreation sites, State Park recreation sites, and other non-Project recreation sites. Recreation site information for the FERC-approved recreation sites, the State Park recreation sites, and the other non-Project recreation sites are displayed in Tables 1 through 3, respectively.

Table 1 – FERC-Approved Recreation Site Information

Recreation Site	Type	County	Owner	Operator
Wolf Creek Public Access	FERC Approved	Delaware	GRDA	City of Grove
Monkey Island Public Boat Ramp	FERC Approved	Delaware	GRDA	GRDA
Seaplane Base Public Access	FERC Approved	Delaware	GRDA	GRDA
Big Hollow Public Access	FERC Approved	Delaware	GRDA	GRDA
Duck Creek Bridge Access Area	FERC Approved	Delaware	GRDA	GRDA

Table 2 – State Park Recreation Site Information

Recreation Site	Type	County	Owner	Operator
Twin Bridges State Park (Upper)	State Park	Ottawa	OTRD ³	OTRD
Twin Bridges State Park (Lower)	State Park	Ottawa	OTRD	OTRD
Honey Creek State Park	State Park	Delaware	OTRD	OTRD
Bernice State Park	State Park	Delaware	OTRD	OTRD
Disney State Park	State Park	Mayes	OTRD	OTRD
Cherokee State Park (Main)	State Park	Mayes	OTRD	OTRD
Cherokee State Park (Lakeside)	State Park	Mayes	OTRD	OTRD
Little Blue State Park	State Park	Delaware, Mayes	OTRD	OTRD
Cherokee State Park (Riverside)	State Park	Mayes	OTRD	OTRD

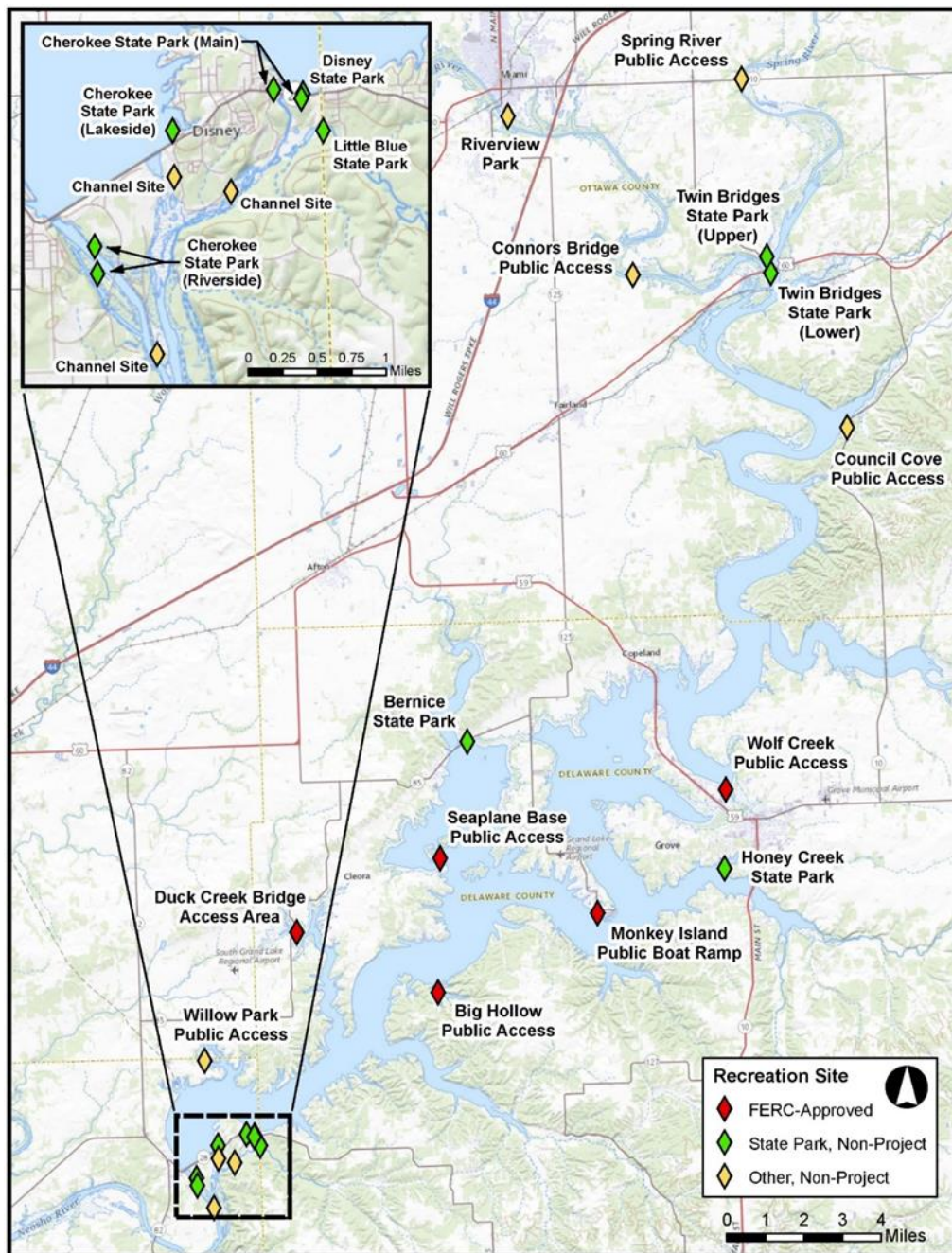
Table 3 – Other Non-Project Recreation Sites in the Project Vicinity Information

Recreation Site	Type	County	Owner	Operator
Spring River Public Access	Public Access Site	Ottawa	Ottawa County	Ottawa County
Riverview Park	Public Access Site	Ottawa	City of Miami	City of Miami
Connors Bridge Public Access	Public Access Site	Ottawa	Ottawa County	Ottawa County
Council Cove Public Access	Public Access Site	Ottawa	Ottawa County	OTRD
Willow Park Public Access	Public Access Site	Mayes	Town of Ketchum	Town of Ketchum
Channel Sites (Downstream)	Public Access Site	Mayes	GRDA	OTRD

³ Oklahoma Tourism and Recreation Department

The locations of each of the sites in the Project vicinity are shown in Figure 2.

Figure 2 – Location of the Recreation Sites in the Project Vicinity



A recreation facility inventory was completed at the recreation sites within the Project vicinity on September 22 or 23, 2020. Tables 4-6 display the facility amenities present as of 2020 at the FERC-approved, State Park, and other non-Project recreation sites respectively.

Table 4 – FERC-Approved Recreation Site Amenities

Grand Lake Area Recreation Site FERC-Approved	Number of Each Amenity Per Site						
	Boat Launch	Dock or Pier	Mooring Dock	Pavilion	Picnic Table	Restroom	Trash Receptacle
Wolf Creek Public Access	5	1	4	1	6	1	7
Monkey Island Public Boat Ramp	1	-	-	-	-	-	-
Seaplane Base Public Access	1	-	-	-	-	-	-
Big Hollow Public Access	1	-	-	-	-	-	-
Duck Creek Bridge Public Access	1	-	-	-	-	-	-

Table 5 – State Park Recreation Site Amenities

Grand Lake Area Recreation Site State Park (Non-Project)	Number of Each Amenity Per Site						
	Boat Launch	Dock or Pier	Mooring Dock	Pavilion	Picnic Table	Restroom	Trash Receptacle
Twin Bridges (Upper) State Park	-	-	-	5	Many	3	5
Twin Bridges (Lower) State Park	2	-	1	1	4	1	2
Honey Creek State Park	1	1	1	2	Many	3	5
Bernice State Park	2	1	-	-	2	-	-
Disney State Park	3	-	-	-	2	-	-
Cherokee Main State Park	-	-	-	1	4	1	2
Cherokee Lakeside State Park	1	-	-	1	3	1	3
Little Blue State Park	-	-	-	-	-	5	3
Cherokee Riverside State Park	-	-	-	1	1	3	4

Table 6 – Other Non-Project Recreation Sites in the Project Vicinity Amenities

Grand Lake Area Recreation Site State Park (Non-Project)	Number of Each Amenity Per Site						
	Boat Launch	Dock or Pier	Mooring Dock	Pavilion	Picnic Table	Restroom	Trash Receptacle
Twin Bridges (Upper) State Park	-	-	-	5	Many	3	5
Twin Bridges (Lower) State Park	2	-	1	1	4	1	2
Honey Creek State Park	1	1	1	2	Many	3	5
Bernice State Park	2	1	-	-	2	-	-
Disney State Park	3	-	-	-	2	-	-
Cherokee Main State Park	-	-	-	1	4	1	2
Cherokee Lakeside State Park	1	-	-	1	3	1	3
Little Blue State Park	-	-	-	-	-	5	3
Cherokee Riverside State Park	-	-	-	1	1	3	4

In addition to providing overall information on recreation opportunities within the Project vicinity, the purpose of the RMP is to provide a detailed description of the FERC-approved recreation facilities, a detailed description of the proposed recreation enhancement measures, a discussion of the purpose of each measure as it relates to the Project effects, the estimated capital and annual O&M costs for each proposed recreation enhancement, and the current and additional O&M costs for implementing the RMP.

3. Proposed Recreation Enhancement

A. Detailed Description of the FERC-Approved Recreation Facilities⁴

Wolf Creek Public Access

The Wolf Creek Public Access (Wolf Creek) is located on the northeastern portion of Grand Lake in the city of Grove and is maintained by the city. Site facilities include six concrete boat launch ramps, one dock/pier, four mooring docks, one pavilion with a weighing live tank, six picnic tables, one large restroom facility, and seven trash receptacles. This site includes three areas dominated by parking. The north area includes only parking. The south area includes parking, restrooms, and camping refuse depository. The area also includes parking sites, barrier-free ramps and docks, and a swimming area. The restrooms, trash receptacles, and one picnic table are also barrier-free.

The extensive parking areas are surfaced with both asphalt and concrete. There are a total of 413 parking spaces within the three areas. Most (353) of the parking spaces are double/trailer spaces; there are 51 standard parking spaces and 17 barrier-free parking spaces (standard and double sized). Signage at the site includes one Facility ID sign, six directional signs, and multiple regulation signs. Directional signs are also present along the major road (State Highway 59) outside the facility.

Photographs of the recreation site are shown in Figure 3.

Figure 3 – Photographs of the Wolf Creek Public Access



Wolf Creek was updated, with the amenities described above, in 2012 and is designed to handle recreation needs for large and small fishing tournaments.

The upper and lower elevation limits of usability for the boat ramp at this facility are 750 and 737 feet PD.

⁴ Detailed descriptions from the 2020 Recreation Facilities Inventory and Use Study (Grand River Dam Authority, 2021b).

Monkey Island Public Boat Ramp

The Monkey Island Public Boat Ramp is located along the shoreline of Grand Lake and is maintained by GRDA. The site is accessed through a housing development and is surrounded by private residences and a golf course. The access road is very narrow and in 2020 was in poor condition. The one facility at the site is a boat launch ramp which, in 2020, was rated as M and required maintenance. The parking area is paved with asphalt and unmarked with approximately 15 double/trailer parking spaces.

A Photograph of the recreation site is shown in Figure 4.

Figure 4 – Photograph of the Monkey Island Public Boat Ramp



The upper and lower elevation limits of usability for the boat ramp at this facility are 751 and 734 feet PD.

Seaplane Base Public Access

The Seaplane Base Public Access is located on the west side of Grand Lake in a rural neighborhood northeast of the town of Cleora. A gravel access road leads to the GRDA-maintained site. The one facility at the site is a concrete boat launch ramp with a gravel approach. The parking area has a gravel surface with approximately nine unmarked double/trailer parking spaces.

A photograph of the recreation site is shown in Figure 5.

Figure 5 – Photograph of the Seaplane Base Public Access



The upper and lower elevation limits of usability for the boat ramp at this facility are 748 and 734 feet PD.

Big Hollow Public Access

The Big Hollow Public Access is located on the east side of Grand Lake in a rural and relatively remote area in Delaware County. The site is maintained by GRDA. The one facility at this site is a concrete boat launch ramp with a gravel approach. There is no parking at the site. There are no signs directing the public to the site or at the site.

Photographs of the recreation site are shown in Figure 6.

Figure 6 – Photographs of the Big Hollow Public Access



The upper and lower elevation limits of usability for the boat ramp at this facility are 755 and 738 feet PD.

Duck Creek Bridge Public Access

The Duck Creek Bridge Public Access is located north of the town of Ketchum and is maintained by GRDA. The one facility at the site is a concrete boat launch ramp which, in September 2020, was rated as G and was in good condition. The boat ramp was resurfaced in late 2020. The gravel parking lot has approximately six double/trailer parking spaces. Signage includes one wooden Facility ID sign, one regulation sign regarding deep water, and two directional signs along State Highway 85.

A photograph of the recreation site is shown in Figure 7.

Figure 7 – Photograph of the Duck Creek Bridge Public Access



The upper and lower elevation limits of usability for the boat ramp at this facility are 748 and 742 feet PD.

B. Detailed Description of Proposed Recreation Enhancement Measures

The proposed recreation enhancement measures are shown in Table 7.

Table 7 – Proposed Recreation Improvements by Site

Grand Lake Recreation Site	Proposed Improvements	
Wolf Creek Public Access	Install Part 8 Sign	
Monkey Island Public Boat Ramp	Install Part 8 Sign	
Seaplane Base Public Access	Install Part 8 Sign	
Big Hollow Public Access	Install Part 8 Sign	
Duck Creek Bridge Public Access	Install “Steep Drop-Off” Sign	Install Part 8 Sign

C. Purpose of Each Measure as it Relates to the Project Effects

The proposed enhancements consist of installation of new signage. As one of the stated Project purposes is the safe recreational access to the Project waters, the new signage will improve the safety of the recreational experience, make it clear to the recreationists that the site is open to the public without discrimination, and provide contact information to report problems with the recreation site at each of the FERC-approved recreation sites.

D. Estimated Capital and Annual Operation and Maintenance Costs

The additional estimated capital and O&M costs associated with the proposed recreational enhancements are outlined in Table 8.

Table 8 – Estimated Additional Capital and O&M Costs Associated with the Proposed Enhancements

Grand Lake Recreation Site	Additional Capital Cost (2023 dollars)	Additional Annual Operations and Maintenance Costs (2023 dollars) ⁵
Wolf Creek Public Access	\$2,000	\$7,000
Monkey Island Public Boat Ramp	\$2,000	\$7,000
Seaplane Base Public Access	\$2,000	\$7,000
Big Hollow Public Access	\$2,000	\$7,000
Duck Creek Bridge Public Access	\$2,000	\$7,000
Recreation Facilities Inventory and Use Study in Year 25 of the New License		\$125,000

E. Current and Additional Operation and Maintenance Costs for Implementing the Recreation Management Plan

The current and additional O&M Implementing the RMP are shown in Table 9.

Table 9 – Estimated Current and Additional Capital and O&M Costs Associated with Implementing the RMP⁶

Current Capital Cost (2023 dollars)	Current Annual Operations and Maintenance Costs (2023 dollars)	Additional Capital Cost (2023 dollars)	Additional Annual Operations and Maintenance Costs (2023 dollars)
\$30,000	\$625,000	\$10,000	\$160,000 ⁷

⁵ This figure includes new signage installation and additional recreation site maintenance or management measures.
⁶ This figure includes \$30,000 for the cost of developing the RMP.
⁷ This figure also includes both the annual additional cost of sign installation and additional recreation site management measures and a one-time payment of \$125,000 in year 25 of the new license to repeat the recreation facilities inventory and use study.

F. Schedule

Signage improvements at all sites will be completed by the end of the 2024 recreation season. The additional recreation site maintenance or management measures will be implemented following the approval of the RMP.

G. Recreational Site Operational Maintenance

GRDA will implement a system where maintenance activities at the five FERC-approved recreation sites are scheduled on a regular basis during the recreation season based upon site type, maintenance needs, and use. Operational maintenance activities ensure the sites remain in acceptable condition and will include repairs, regular disposal of trash that has been deposited in both designated and undesignated areas, sign replacement, mowing, vegetation management⁸, painting, surface repair and grading (if needed), and replacement of nonrepairable items. Operational maintenance excludes activities or improvements aimed at increasing the capacity of a site or upgrading it to serve needs different from its original intended use.

Year Twenty-Five Recreation Facilities Inventory and Use Study Methodology

In year 25 of the new license issuance, GRDA will be implementing a Recreation Facilities Inventory and Use Study at the recreation sites listed in Table 10. The study is modeled after the 2020 study.

The specific objectives of the study are to:

- 1) Characterize current recreational use of the Project area;
- 2) Estimate future demand for public recreation use at the Project;
- 3) Gather information on the condition of GRDA's FERC-approved recreation facilities and identify any need for improvement.

The study methodology is outlined as follows:

Condition Assessment

GRDA will record the following information for each FERC-approved recreational facility including:

- 1) A description of the type and location of existing recreation facilities;
- 2) The type of recreation provided (boat access, angler access, picnicking, etc.);
- 3) Existing facilities and sanitation;
- 4) The type of vehicular access and parking (if any);
- 5) Suitability of facilities to provide recreational opportunities and access for persons with disabilities (i.e., compliance with current ADA standards for accessible design); and
- 6) Photographic documentation of recreation facilities.

Additionally, a qualitative assessment of the condition of the FERC-approved recreation facilities will be performed. Each FERC-approved recreation facility will be rated using the following criteria:

⁸ Subject to any additional vegetation management restrictions outlined in the new license.

- 1) (N) Needs replacement (broken or missing components, or non-functional);
- 2) (R) Needs repair (structural damage or otherwise in obvious disrepair);
- 3) (M) Needs maintenance (ongoing maintenance issue, primarily cleaning); or
- 4) (G) Good condition (functional and well maintained).

If a facility is given a rating of “N”, “R”, or “M”, an explanation for the rating will be provided. The age of the facilities and signs of overuse will also be noted.

The draft report will be provided to the Commission outlining any recommended changes based upon the results.

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Works Cited June 11, 2008.

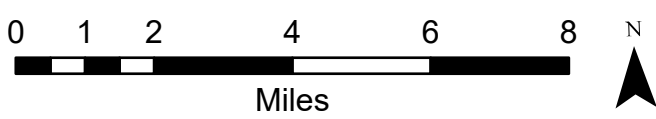
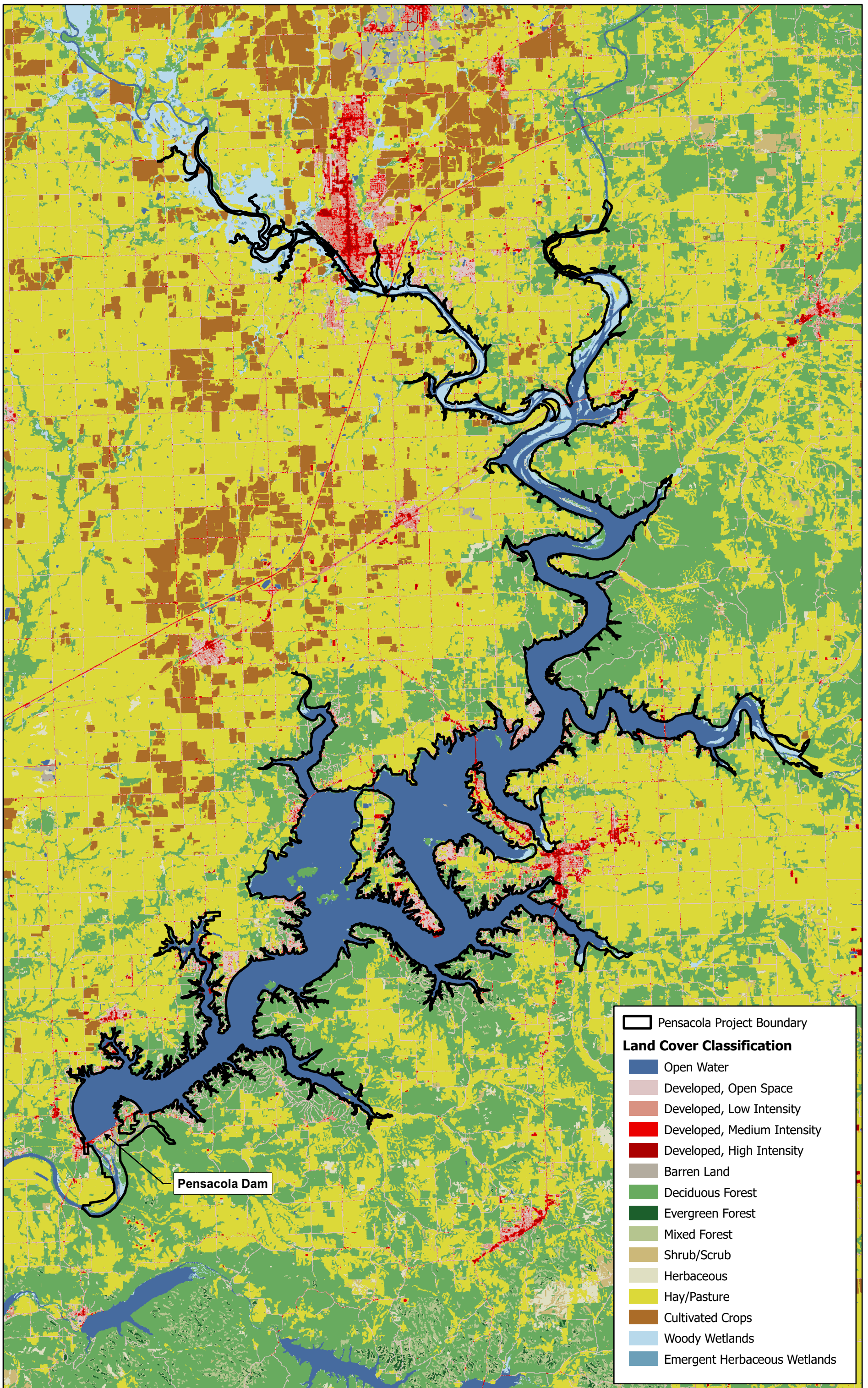
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APPENDIX E-33

Land Use in the Pensacola Project ROI



Pensacola Hydroelectric Project
Land Uses and Land Cover in the Project Vicinity

APPENDIX E-35

Infrastructure Study Report



Updated Study Report

Infrastructure Study

Pensacola Hydroelectric Project
Project No. 1494

September 30, 2022

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Executive Summary

Mead & Hunt, Inc. (Mead & Hunt) is assisting Grand River Dam Authority (GRDA, Licensee) in the relicensing of the Pensacola Hydroelectric Project (Project), which is regulated by the Federal Energy Regulatory Commission (FERC, Commission). Flood control operations at the Project are regulated by the United States Army Corps of Engineers (USACE).

The Commission recommended an Infrastructure Study (Study) to determine a range of inflow conditions for which hydraulic model results (separate study) show Project operations may influence the frequency or depth of flooding. Specifically, the Commission requested maps and tables identifying the frequency and depth of flooding for each item of infrastructure.

Mead & Hunt developed a hydraulic model of the area upstream of the Project along with a range of starting reservoir elevations. Inflow events representing a range of flood frequency were used for the Study. Hydraulic results were extracted at infrastructure locations. Infrastructure locations were mapped, and tabular data of inundation depth were developed. The difference in depth between different starting reservoir elevations was also tabulated.

According to analysis results, only 7% of the infrastructure locations studied experience an appreciable increase in maximum inundation depth for different starting reservoir elevations within GRDA's anticipated operational range of 742 feet PD to 745 feet PD. In addition, all appreciable increases in maximum inundation depth occur during high-flow conditions when the USACE controls the flood control operations under the Flood Control Act of 1944 and its other statutory mandates, except when the time of maximum inundation depth is solely a function of inflow event arrival time and not reservoir elevation, meaning the time of maximum depth at the infrastructure location was completely independent of the Project reservoir elevation. The inflow event moved down the river and then arrived at the infrastructure location completely independent of Project operations. Therefore, infrastructure locations are not adversely affected by GRDA's anticipated Project operations.

Additionally, except for two parks, a reduction in reservoir operational elevation to 734 feet PD would not decrease the loss of infrastructure use for any of the inflow events studied. The first park, Wolf Creek Park, was designed (and partially funded) by GRDA to avoid being impacted by inflow events, and only a low-lying portion of the park near Grand Lake would experience a difference in inundation for the October 2009 (3 year) inflow event. Therefore, any potential adverse impacts have already been mitigated by GRDA through their assistance in designing and funding the recent improvements to the park.

At the second park, Grove Springs Park, low-lying portions of the park would experience a difference in inundation for the October 2009 (3 year) inflow event. Decreasing the low end of the anticipated operation range from 742 to 734 feet PD, a difference of 8 feet in operational elevation, would only change infrastructure adverse impacts slightly at Grove Springs Park.

Because infrastructure such as parks are generally sited in areas that are subject to frequent flooding and are the most-resistant type of infrastructure being reviewed in this Study, the minor potential reduction in impacts to infrastructure identified through operating at an extreme, hypothetical elevation of 734 feet PD do not significantly decrease loss of infrastructure use at the Project.

Extreme, hypothetical operational levels up to and including 757 feet PD were analyzed. If GRDA operated at 757 feet PD, a reservoir elevation that is 12 feet higher than the top of GRDA's anticipated operational range and an elevation equal to the top of dam, infrastructure locations would be inundated by depths similar to or greater than those depths for operational levels within GRDA's anticipated operational range. Practically speaking, increasing the top of the operational range to 757 feet PD is simply not possible.

In summary, infrastructure locations are not adversely affected by GRDA's baseline or anticipated operations of the Project, which consist of reservoir levels within an operational range of 742 feet PD to 745 feet PD. Even under the hypothetical and extreme operational level of 734 feet PD, only two parks would experience a minor decrease in the loss of infrastructure use.

List of Abbreviations and Terms

Commission/FERC.....	Federal Energy Regulatory Commission
DHS.....	Department of Homeland Security
EPA.....	Environmental Protection Agency
FAA.....	Federal Aviation Administration
FEMA.....	Federal Emergency Management Agency
FRS.....	Facility Registry Service
FSA.....	Farm Service Agency
GIS.....	Geographic Information Systems
GNIS.....	Geographic Names Information System
Grand Lake.....	Grand Lake O' the Cherokees
GRDA.....	Grand River Dam Authority
HEC.....	Hydrologic Engineering Center
HIFLD.....	Homeland Infrastructure Foundation Level Database
ISR.....	Initial Study Report
Kerr Dam.....	Robert S. Kerr Dam
Licensee.....	Grand River Dam Authority
MESTA.....	Mayes Emergency Service Trust Authority
NAIP.....	National Agricultural Imagery Program
NAVD88.....	North American Vertical Datum of 1988
NGVD29.....	National Geodetic Vertical Datum of 1929
ODOT.....	Oklahoma Department of Transportation
PD.....	Pensacola Datum
Project.....	Pensacola Hydroelectric Project
PSP.....	Proposed Study Plan
RAS.....	River Analysis System
RM.....	River Mile
RSP.....	Revised Study Plan
SPD.....	Study Plan Determination
Study.....	Infrastructure Study
USR.....	Updated Study Report
USACE.....	United States Army Corps of Engineers
USGS.....	United States Geological Survey

1. Introduction and Background

1.1 Project Description

The Pensacola Hydroelectric Project is owned and operated by GRDA and regulated by the FERC, except that flood control operations at the Project are dictated and regulated by USACE under the authority of Section 7 of the 1944 Flood Control Act. In addition, section 7612(c) of NDAA 2020 clearly states that “The Secretary [of the Army] shall have exclusive jurisdiction and responsibility for management of the flood pool for flood control operations at Grand Lake O’ the Cherokees” (116th Congress, 2019). NDAA 2020 also forbids FERC or any other agency from regulating water surface elevations of Grand Lake O’ the Cherokees (Grand Lake), except with respect to USACE’s flood control operations and FERC’s regulations for dam safety and human health: “the Commission or any other Federal or State agency shall not include in any license for the project any condition or other requirement relating to—(i) surface elevations of the conservation pool; or (ii) the flood pool (except to the extent it references flood control requirements prescribed by the Secretary)” (116th Congress, 2019).

The Pensacola Dam is located in Mayes County, Oklahoma on the Grand-Neosho River. Pensacola Dam impounds Grand Lake. Construction of Pensacola Dam was completed in 1940. Downstream of Pensacola Dam, GRDA also owns and operates the Robert S. Kerr Dam (Kerr Dam) also known as the Markham Ferry Hydroelectric Project. Kerr Dam is also in Mayes County and impounds Lake Hudson, also known as Markham Ferry Reservoir. Flood control operations at both Pensacola Dam and Kerr Dam are regulated by USACE.

1.2 Vertical Datums

Data sources for this Study use a variety of vertical datums. Unless otherwise noted, data are presented in the Pensacola Datum (PD). To convert from PD to the National Geodetic Vertical Datum of 1929 (NGVD29), add 1.07 feet. To convert from NGVD29 to the North American Vertical Datum of 1988 (NAVD88), add 0.33 feet. **Figure 1**; displays datum transformations and conversions (Hunter, Trevisan, Villa, & Smith, 2020).

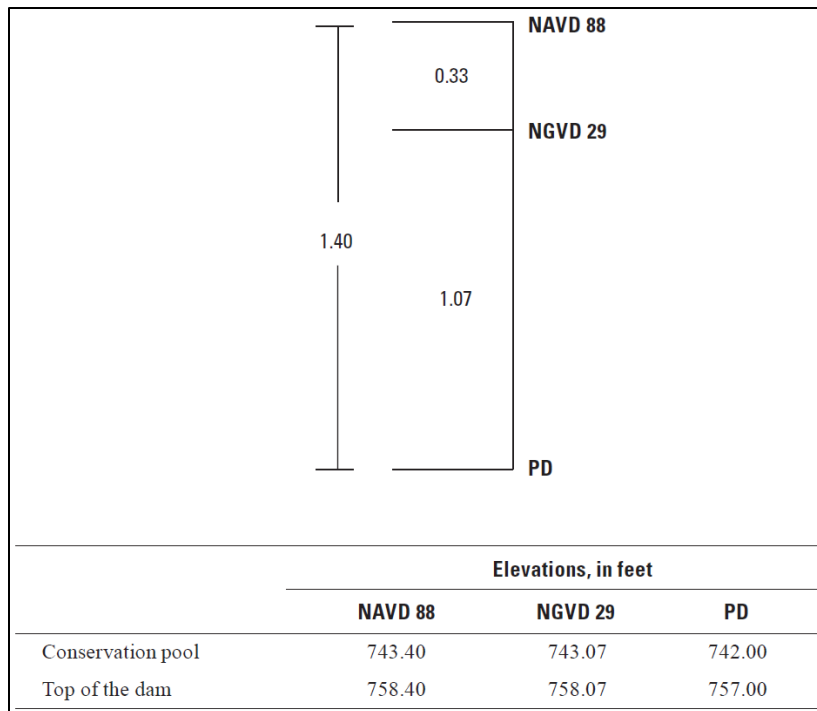


Figure 1. Datum transformations and conversions.

Source: (Hunter, Trevisan, Villa, & Smith, 2020).

1.3 Study Plan Proposals and Determination

GRDA is currently relicensing the Project. The timeline of study plan proposals and determination is as follows:

1. On April 27, 2018, GRDA filed its Proposed Study Plan (PSP) to address hydrologic and hydraulic modeling in support of its intent to relicense the Project.
2. On September 24, 2018, GRDA filed its Revised Study Plan (RSP).
3. On November 8, 2018, the FERC issued its Study Plan Determination (SPD) for the Project.
4. On January 23, 2020, the FERC issued an Order on the Request for Clarification and Rehearing, which clarified the timeline for certain milestones applicable to the relicensing study plan.
5. On September 30, 2021, GRDA filed its Initial Study Report (ISR).
6. On February 24, 2022, the FERC issued its Determination on Requests for Study Modifications and New Studies for the Project.
7. On September 30, 2022, GRDA filed this report, the Updated Study Report (USR).

The PSP and RSP did not include an infrastructure study. The SPD recommended the following strategy for assessing infrastructure impacts (FERC, 2018):

1. In consultation with the stakeholders, determine a list of infrastructure types to be included in the recommended infrastructure study. At a minimum, the list should include bridges, roads, structures, and other public amenities (e.g., recreation facilities) that have the potential to be flooded under all operating scenarios (e.g., by both the USACE-directed flood control operations and GRDA's Project operations).
2. Using output from the H&H modeling study, determine the range of inflow conditions for which model results show that Project operations for hydropower and other purposes under the Federal

Power Act in combination with USACE directed flood control operations are likely to have an effect on the frequency or depth of flooding. Based on the infrastructure identified in step 1, provide maps and tables identifying the frequency and depth of flooding for each item of infrastructure under baseline operations, as defined above, and for the range of inflow conditions where such operations may have an effect on flooding.

3. If needed based on H&H study results, provide additional maps and tables for anticipated operations.

The Study's purpose is to analyze the impact, if any, of Project operations on inundation of critical infrastructure such as bridges, roads, water systems, electric transmission, and information and communication technology.

GRDA's ISR concluded only a different inflow event, and not Project operation, can cause an appreciable difference in maximum water surface elevation and maximum inundation extent. Therefore, additional work on the Infrastructure Study was not proposed.

Despite these conclusions, FERC's February 2022 Determination recommended the following modifications to the Infrastructure Study:

1. On maps and in tabular format, for each affected infrastructure location, show the change in depth and frequency for the same starting elevations required in the H&H Study (*i.e.*, 734 feet PD through 757 feet PD).
2. Include maps and tabular data for the June 2004 (1-year event) and October 2009 (3-year event) inflow events. These maps and tabular data will be in addition to the September 1993 (21-year event), July 2007 (4-year event), and December 2015 (15-year event) inflow events.
3. On the tables and maps, clearly show the frequency of flooding (*i.e.*, return period) for each modeled event.

As documented in this report, GRDA has completed FERC's requested modifications.

2. Study Objectives and Schedule

Preliminary work for the Study occurred during the first study season. The Study and this report were updated during the second study season according to FERC’s February 2022 Determination. **Table 1** provides major tasks identified for each study season.

Table 1. Infrastructure study schedule and tasks.

STUDY SEASON	MAJOR TASKS
1	<ul style="list-style-type: none"> • Develop list of infrastructure types. • Begin developing Geographic Information Systems (GIS) tools to extract flooding characteristics from simulation results. • Consult with stakeholders to update list of infrastructure types. • Map infrastructure locations. • Determine a range of inflow conditions for which modeling results show that Project operations are likely to have an effect on frequency and depth of flooding. • Use GIS tools to process modeling results to determine frequency and depth of flooding at mapped infrastructure locations. • Prepare maps and tabular data as part of analysis. • Develop an ISR.
2	<p>Stakeholder comments on the ISR are addressed according to FERC’s determination in this USR by including the following:</p> <ul style="list-style-type: none"> • On maps and in tabular format, for each affected infrastructure location, show the change in depth and frequency for the same starting elevations required in the H&H Study (<i>i.e.</i>, 734 feet PD through 757 feet PD). • Include maps and tabular data for the June 2004 (1-year event) and October 2009 (3-year event) inflow events. These maps and tabular data will be in addition to the September 1993 (21-year event), July 2007 (4-year event), and December 2015 (15-year event) inflow events. • On the tables and maps, clearly show the frequency of flooding (<i>i.e.</i>, return period) for each modeled event.

3. Study Area

The Study area encompasses areas where Project operations are likely to influence the frequency or depth of flooding upstream of the Project. Infrastructure locations potentially impacted by Project operations are displayed in **Figure 2**.

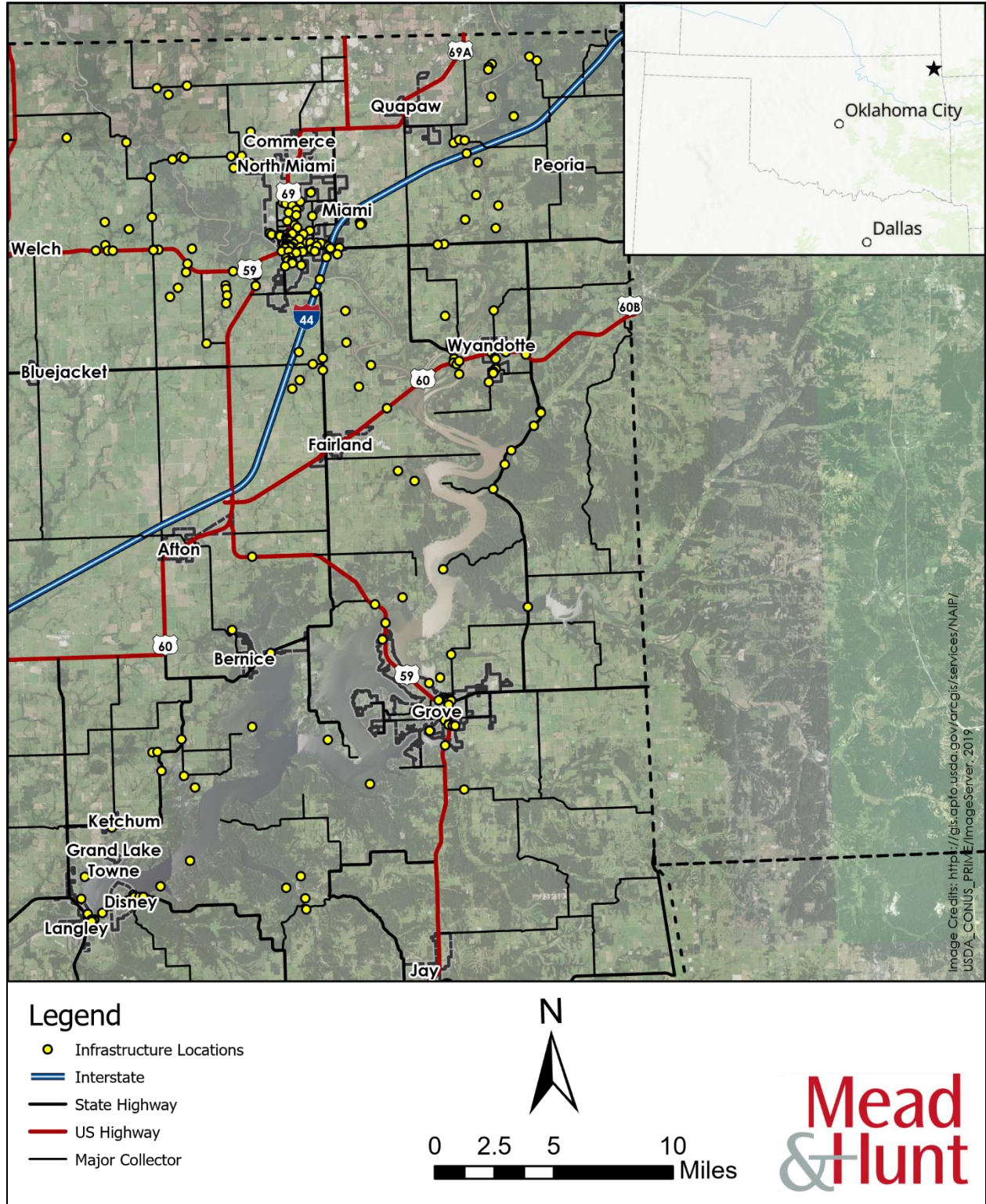


Figure 2. Infrastructure study area.

4. Methodology

Mead & Hunt defined a list of infrastructure types, gathered and mapped locations, consulted with stakeholders to refine the initial infrastructure list, and extracted inundation characteristics from simulation results. Historic inflows were examined to determine a range of conditions for which modeling results show Project operations potentially influence frequency and depth of flooding at the infrastructure locations. Maps showing the extent of inundation for multiple inflow events and starting reservoir elevations were developed. Tabular data for depth of inundation at each infrastructure location were developed for each simulated scenario.

4.1 Infrastructure Types and Data Sources

Infrastructure for the purposes of this Study is defined as facilities or structures that should be given consideration when there is potential for inundation due to Project operations. The Federal Emergency Management Agency (FEMA) includes hospitals, fire stations, police stations, and schools as examples of critical facilities (FEMA, 2020). The Department of Homeland Security (DHS) considers elements of transportation, clean water, and electricity to be of vital importance and identifies bridges and tunnels, energy infrastructure, and drinking water as key infrastructure elements (DHS, 2021).

The SPD (Federal Energy Regulatory Commission, 2018) states that:

Characterizing existing infrastructure that could be affected under flood conditions would help staff analyze the broad effect of project operation (including operation during flood conditions) on land uses, including uses related to infrastructure or municipal recreation areas.

An initial list of potential infrastructure types was developed based on examples cited above and the availability of location information from accessible data sources. These data sources include Oklahoma state sources and U.S. government sources such as the United States Geological Survey (USGS), Environmental Protection Agency (EPA), and DHS.

Mead & Hunt compiled infrastructure locations from available data sources. The primary data source for GIS features and location information was Oklahoma Digital Data Online (Oklahoma Geographic Information Council, 2021). Features obtained from this source were supplemented with data obtained from the USGS Geographic Names Information System (GNIS), EPA's Facility Registry Service (FRS), Federal Aviation Administration (FAA), and Homeland Infrastructure Foundation Level Database (HIFLD). **Table 2** presents the list of infrastructure types, features, and sources of data.

The location accuracy and original source data of these features may vary based on the data provider. Many locations were likely compiled from earlier sources of data and made available for download. Locations were cross-checked with independent mapping sources such as Google maps and county online mapping where available. Features were adjusted based on these independent sources as needed, and no ground-truthing was performed. Given multiple data sources for some of the infrastructure types, a review for duplicate features was completed and duplicates were removed.

Table 2. List of infrastructure types and data sources.

INFRASTRUCTURE TYPE	FEATURES	DATA SOURCE
Airports/Heliports	FAA public use airports	https://www.faa.gov/airports/airport_safety/airportdata_5010/
Bridges	ODOT ¹ On-system bridges	Oklahoma Digital Data Online (https://okmaps.org/OGI/search.aspx)
	ODOT Off-system bridges	Oklahoma Digital Data Online (https://okmaps.org/OGI/search.aspx)
Medical/Hospitals	Hospitals and Clinics	Oklahoma Digital Data Online (https://okmaps.org/OGI/search.aspx); USGS GNIS (https://www.usgs.gov/core-science-systems/ngp/board-on-geographic-names/download-gnis-data)
Law Enforcement	Police, State, Sheriff's, Patrol	Oklahoma Digital Data Online (https://okmaps.org/OGI/search.aspx)
Fire Stations	Fire Stations	Oklahoma Digital Data Online (https://okmaps.org/OGI/search.aspx); USGS GNIS (https://www.usgs.gov/core-science-systems/ngp/board-on-geographic-names/download-gnis-data)
Education/Schools	Public Schools	Oklahoma Digital Data Online (https://okmaps.org/OGI/search.aspx); USGS GNIS (https://www.usgs.gov/core-science-systems/ngp/board-on-geographic-names/download-gnis-data)
Recreation/Public Use Areas	Parks, Fairgrounds	Oklahoma Digital Data Online (https://okmaps.org/OGI/search.aspx); USGS GNIS (https://www.usgs.gov/core-science-systems/ngp/board-on-geographic-names/download-gnis-data)
Waste and Water Treatment	Plants	EPA's FRS (https://www.epa.gov/frs)
Power supply	Power plants, Substations, Electric Transmission Lines	Homeland Infrastructure Foundation Level Database (HIFLD) (https://gii.dhs.gov/HIFLD); U.S. Energy Information Administration
FM Transmission Towers		HIFLD (https://gii.dhs.gov/HIFLD)
Cell towers		HIFLD (https://gii.dhs.gov/HIFLD)

¹ Oklahoma Department of Transportation

4.2 Consultation with Stakeholders

4.2.1 Emergency Management Agencies

To refine and supplement the list of infrastructure, local emergency management agencies were contacted and given the opportunity to provide information on and/or the location of infrastructure features of concern to their jurisdictions. These contacts included county, city, and tribal emergency management entities, as well as the State of Oklahoma and USACE, Tulsa District Office.

Additional infrastructure locations identified through coordination with emergency management entities were added to the facilities GIS data layer. The list of entities contacted is provided in **Table 3**.

Table 3. Emergency management agencies contacted.

AGENCY
Miami Emergency Management
Ottawa County Emergency Management
Quapaw Tribe
Wyandotte Emergency Management
Delaware County Emergency Management
Grove Emergency Management
Seneca Cayuga Nation Emergency Management
Craig County Emergency Management
Vinita Emergency Management
Mayes Emergency Service Trust Authority (MESTA)
State of Oklahoma Risk Management
USACE Tulsa Office

A sample request email to emergency management agencies and the record of correspondence is included in **Appendix A**. Contact with each agency was initiated through email followed by a phone contact if there was no response to the initial email. A list of the agencies contacted is included in **Appendix B**.

4.2.2 Tribal Consultation

A certified return-receipt letter was sent for tribal consultation soliciting information on and/or the location of infrastructure features of concern to their jurisdictions on November 25, 2020. Additional certified letters were sent if no receipt was returned from the initial letter, followed by a phone call if the second receipt was not returned. A sample request letter is included in **Appendix C**. The list of entities to which a certified letter was sent is included in **Appendix D**.

4.3 Modeling Scenarios

Mead & Hunt developed a hydraulic model of the area upstream of the Project, using the USACE Hydrologic Engineering Center (HEC) River Analysis System (RAS) software. A separate report on the Hydrologic and Hydraulic Modeling Study is filed concurrently with this Study report. For more information on development of the HEC-RAS model and the simulations used in the Study, see the H&H Modeling Study: Upstream Hydraulic Model Report (Mead & Hunt, 2022).

For the Study, five inflow events were used in combination with eleven starting reservoir elevations. Estimated return periods of the inflow events ranged from 1 year (June 2004 event) up to 21 years (September 1993 event). Starting reservoir elevations were split into two categories:

1. Starting reservoir elevations within GRDA's anticipated operational range of 742 feet PD to 745 feet PD.
2. Hypothetical, extreme values of starting reservoir elevations well outside of GRDA's anticipated operational range. Values below and above GRDA's anticipated operational range were included in the Infrastructure Study based on FERC's February 2022 Determination.

Table 4 presents a summary of the inflow events and starting reservoir elevations simulated for the Infrastructure Study.

Table 4. List of inflow events and initial stages used in the Infrastructure Study.

Inflow Event	Estimated Return Period ¹	Pensacola Dam Starting Reservoir Elevation (ft, PD)	
		Anticipated Operational Range	Hypothetical, Extreme Range
Sept. 1993	21 years	742.0, 742.5, 743.0, 743.5, 744.0, 744.5, 745.0	734.0, 749.0, 753.0, 757.0
June 2004	1 year	742.0, 742.5, 743.0, 743.5, 744.0, 744.5, 745.0	734.0, 749.0, 753.0, 757.0
July 2007	4 years	742.0, 742.5, 743.0, 743.5, 744.0, 744.5, 745.0	734.0, 749.0, 753.0, 757.0
Oct. 2009	3 years	742.0, 742.5, 743.0, 743.5, 744.0, 744.5, 745.0	734.0, 749.0, 753.0, 757.0
Dec. 2015	15 years	742.0, 742.5, 743.0, 743.5, 744.0, 744.5, 745.0	734.0, 749.0, 753.0, 757.0

Each simulation included a historical inflow event with a modified reservoir starting elevation. What residents experienced in real life when the historical events took place, regarding maximum inundation depth, only occurred when USACE had assumed control of Project operations pursuant to its exclusive jurisdiction under federal law, except when the time of maximum inundation depth was solely a function of inflow event arrival time and not reservoir elevation¹, meaning that the time of maximum depth at the infrastructure location was completely independent of Project reservoir elevation. The inflow event moved down the river and then arrived at the infrastructure location completely independent of Project operations. During the June 2004 inflow event, the reservoir elevation never exceeded 745 feet PD and there was no inundation of identified infrastructure² during this inflow event.

Similarly, the maximum inundation depths reported in this study for the various inflow events and reservoir starting elevations only occur when the reservoir elevation is above 745 feet PD, in which circumstance the USACE would control Project operations, except when the time of maximum inundation depth was solely a function of inflow event arrival time and not reservoir elevation. An example of this function-of-inflow-event-arrival-time situation is presented in **Figure 3**. Regardless of the starting reservoir elevation, all the stage hydrographs at the infrastructure location were virtually identical. The time of maximum depth at the infrastructure location was completely independent of Project reservoir elevation.

¹ For more information on how inflow events impact maximum water surface elevations and maximum inundation extents, see the Hydraulic and Hydraulic Modeling: Upstream Hydraulic Model Initial Study Report.

² With the singular exception of Bacon's Heliport (ID 206). However, that structure is not physically "inundated" at any time because it floats on the surface of the reservoir.

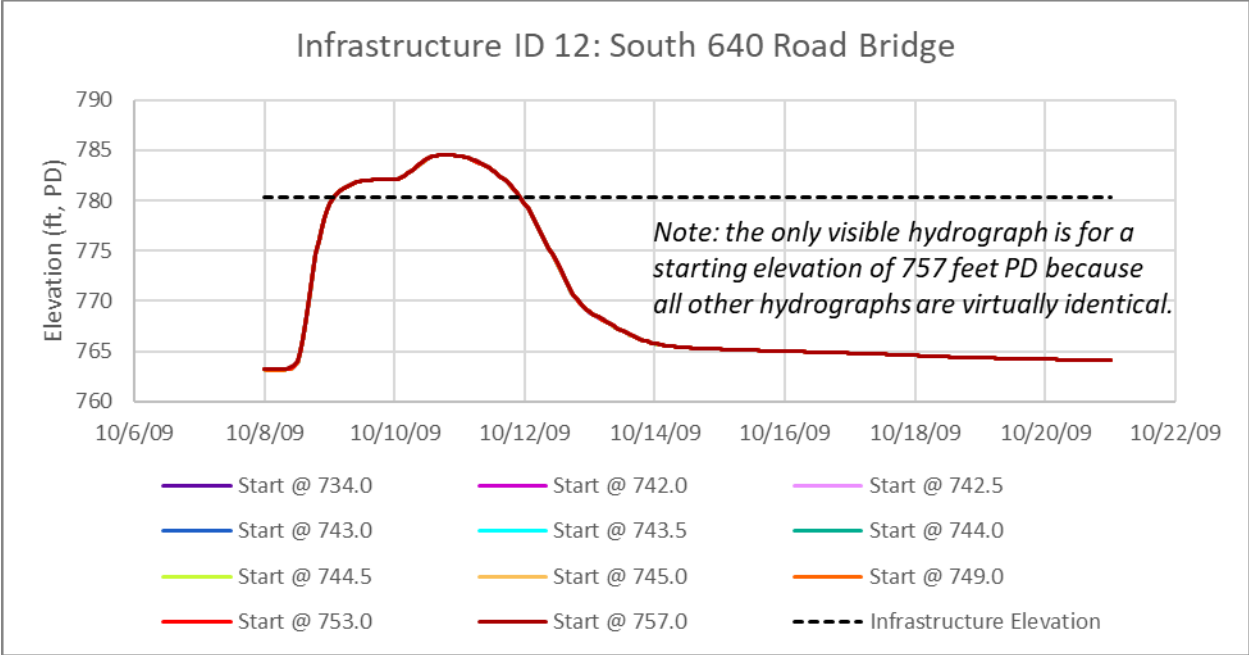


Figure 3. Example infrastructure location where time of maximum depth was completely independent of Project reservoir elevation.

As presented in **Table 4**, the simulated inflow events represent a variety of flood frequencies at the Project. All maps and tabular data included in the appendices of this report state the estimated return period of the inflow event. Calculating an estimated return period at each infrastructure location is not feasible because flow at each location is unique based on its position in the watershed. Reporting a unique return period at each infrastructure location would require a separate hydrologic study at each infrastructure location. However, estimated return periods at the Project can be considered when reviewing inundation depths and the criticality of each infrastructure location. For more information on the development of estimated return periods, see the H&H Modeling Study: Upstream Hydraulic Model Report (Mead & Hunt, 2022).

4.4 GIS Data Extraction

Infrastructure locations are represented as point locations in the GIS data. For each of the simulations used in the Study, maximum water depth values were extracted at each infrastructure location. The water depth values are compiled in tabular format for each infrastructure location and are presented along with the maps as described below.

4.5 Mapping and Tabular Data

4.5.1 Purpose of Maps

The infrastructure maps provided in **Appendix E** show which infrastructure locations may be impacted under different hydraulic conditions. The infrastructure locations and simulated inundation areas are displayed on the maps.

Base map information such as roads, municipal boundaries, and county boundaries were also collected to provide reference. The 2019 aerial images displayed on the maps are provided by the U.S. Department

of Agriculture's Farm Service Agency (FSA) National Agricultural Imagery Program (NAIP) (U.S. Department of Agriculture, 2021).

4.5.2 Map Description

A series of 37 maps at a scale of 1:24,000 (1 inch = 2000 ft) cover the upstream modeling area. This scale is sufficient for less developed areas. In **Appendix E**, one map set is presented for each simulated inflow event: September 1993 (21-year estimated return period), June 2004 (1-year estimated return period), July 2007 (4-year estimated return period), October 2009 (3-year estimated return period) and December 2015 (15-year estimated return period). The simulated inundation areas at all the starting reservoir elevations listed in **Table 4** are displayed on each map set.

Each 1:24,000-scale map sheet is divided further into four 1:12,000-scale map sheets for developed areas requiring more detail to present the infrastructure locations in relation to the modeled inundation area. For each simulated inflow event, five 1:12,000-scale map sheets are provided for the Miami, OK area which has the largest concentration of infrastructure locations in the study area.

An overview map provided in **Appendix E** details the 1:24,000 scale and 1:12,000 scale map sheet index, provides the infrastructure point legend, and describes the inundation scenario symbology used on each map sheet.

4.5.3 Tabular Data

Tabular data presented in **Appendix F** lists maximum water depths for all simulated scenarios at each infrastructure location. Tabular data is also provided for the difference in maximum water depth for starting reservoir elevations within GRDA's anticipated operational range of 742 feet PD to 745 feet PD and for hypothetical, extreme values of starting reservoir elevations outside of GRDA's anticipated operational range, as recommended in FERC's February 2022 Determination. The tables provide a description of the infrastructure type and list the map sheet where the infrastructure feature is located. Maximum water depths and differences in maximum depth are reported to the nearest tenth of a foot.

5. Study Results

The difference in inundation depth is discussed for simulations with starting reservoir elevations within GRDA's anticipated operational range of 742 feet PD to 745 feet PD.³ In addition to discussion of differences in depth for these simulations, Section 6 also discusses differences in depth for a starting reservoir elevation of 734 feet PD, a hypothetical operational condition considered extreme and well outside of GRDA's anticipated operational range.⁴ However, it is being reviewed to determine whether a reduction in reservoir operational elevation would decrease loss of infrastructure use. In accordance with FERC's February 2022 Determination, a hypothetical, extreme starting reservoir elevation of 757 feet PD was also analyzed. Results are presented in Appendices E and F. Results for that hypothetical, extreme starting reservoir elevation can be summarized as follows: if GRDA operated at 757 feet PD, a reservoir elevation that is 12 feet higher than the top of GRDA's anticipated operational range and an elevation equal to the top of dam, infrastructure locations would be inundated by depths similar to or greater than those depths for operational levels within GRDA's anticipated operational range. Practically speaking, increasing the top of the operational range to 757 feet PD is simply not possible.

Infrastructure locations with differences in depth greater than 0.1 feet for starting elevations within GRDA's anticipated operational range were divided into three classes for discussion:

1. Class 1 differences range from greater than 0.1 feet up to 0.3 feet.
2. Class 2 differences range from greater than or equal to 0.3 feet up to 0.5 feet.
3. Class 3 differences are greater than or equal to 0.5 feet.

Infrastructure locations meeting these criteria were placed in a class based on the greatest difference in depth for the inflow events.

5.1 Class 1 Differences

Table 5 lists infrastructure locations with Class 1 differences, which include the following:

- ID 57 is a bridge over Tar Creek. The bridge is on Rockdale Boulevard in the left overbank⁵ of the Neosho River at River Mile (RM) 134.0.
- ID 86 is a bridge over Little Elm Creek. The bridge is on State Highway 10/E 100 Road in the left overbank of the Neosho River at RM 133.0.
- ID 88 is a bridge over Tar Creek. The bridge is on State Highway 10/3rd Avenue SE in the left overbank of the Neosho River at RM 134.5.
- ID 94 is Lion Taylor Park in Miami, OK. It is in the left overbank of the Neosho River at RM 134.5.
- ID 97 is a bridge over Little Elm Creek. The bridge is on S 580 Road in the left overbank of the Neosho River at RM 133.0. The location is approximately 0.5 miles downstream of Interstate 44 (Will Rogers Turnpike).

³ Results were also analyzed for hypothetical, extreme values of starting reservoir elevations outside of GRDA's anticipated operational range, as recommended in FERC's February 2022 Determination. Mapped results are presented in Appendix E and tabular results are presented in Appendix F.

⁴ The Commission in its February 2022 Determination requested analysis of hypothetical, extreme elevations up to 757 feet PD. Elevations up to and including 757 feet have been analyzed and results are presented in Appendix E and Appendix F.

⁵ In hydraulic modeling terms, left and right sides of the river are based on the downstream direction. If you are floating down the river in a boat and you look to your left, that is the left bank of the river.

Table 5. Infrastructure locations with Class 1 differences under the anticipated operational range.

Infra-structure ID	Map Panel	Location	Difference in Depth (ft)				
			Sep. 1993 (21 year)	June 2004 (1 year)	July 2007 (4 year)	Oct. 2009 (3 year)	Dec. 2015 (15 year)
57	B4, B4-3	Rockdale Blvd Bridge over Tar Creek	0.2	0.0	0.1	0.0	0.0
86	B4, B4-4	SH 10 Bridge over Little Elm Creek	0.0	0.0	0.2	0.0	0.0
88	B4, B4-3	SH 10 Bridge over Tar Creek	0.2	0.0	0.1	0.0	0.0
94	B4, B4-3	Lion Taylor Park	0.2	0.0	0.1	0.0	0.0
97	B4, B4-4	S 580 Rd Bridge over Little Elm Creek	0.2	0.0	0.2	0.2	0.1

Note: Infrastructure ID 103, Riverview Park, was included as a Class 1 difference in the ISR. With FERC-required modifications to the Operations Model, the differences in depth are now less than or equal to 0.1 feet at that location. Infrastructure IDs 86 and 88 were not included as Class 1 differences in the ISR. With FERC-required modifications to the Operations Model, depth differences at Infrastructure IDs 86 and 88 now exceed 0.1 feet and are thus included in the USR.

5.2 Class 2 Differences

There were no infrastructure locations with Class 2 differences. Infrastructure ID 127, Hudson Creek Bridge, and ID 150, Wyandotte High School, were classified as Class 2 differences in the ISR. With FERC-required modifications to the Operations Model, these two infrastructure locations were reclassified as Class 3 differences in the USR.

5.3 Class 3 Differences

Table 6 lists infrastructure locations with Class 3 differences, which include the following:

- ID 127 is a bridge over Hudson Creek. The bridge is on S 580 Road in the right overbank of the Neosho River at RM 128.0.
- ID 139 is the Twin Bridges State Park at the confluence of the Neosho and Spring Rivers, along the left bank of the Neosho River at RM 122.5.
- ID 140 is a bridge over Shawnee Branch. The bridge is on S 645 Road in the left overbank of the Spring River at RM 3.0.
- ID 150 is Wyandotte High School in Wyandotte, OK. It is in the left overbank of the Neosho River at RM 122.0, slightly downstream of the BN Railroad bridge.
- ID 166 is a bridge over Fly Creek. The bridge is on E 262 Road in the right overbank of Grand Lake at RM 90.0.
- ID 167 is Bernice State Park, off E Highway 85A in the right overbank of Grand Lake at RM 90.0.
- ID 175 is the Cherokee Seaplane Base in Red Arrow, OK. It is in the right overbank of Grand Lake at RM 89.0.
- ID 181 is the Wolf Creek Park and Boat Ramp near Grove, OK. It is along the left edge of Grand Lake at RM 102.5, just upstream of Sailboat Bridge.

- ID 185 is Grove Springs Park in Grove, OK. It is in the left overbank of Grand Lake at RM 102.5, just upstream of Sailboat Bridge.
- ID 206 is Bacon's Heliport. It is along the left edge of Grand Lake at RM 82.8.

Table 6. Infrastructure locations with Class 3 differences under the anticipated operational range.

Infra-structure ID	Map Panel	Location	Difference in Depth (ft)				
			Sep. 1993 (21 year)	June 2004 (1 year)	July 2007 (4 year)	Oct. 2009 (3 year)	Dec. 2015 (15 year)
127	C4	Hudson Creek Bridge	0.1	0.0	0.5	0.4	0.0
139	C5	Twin Bridges State Park	0.1	0.0	1.1	0.5	0.0
140	C6	Shawnee Branch Bridge	0.1	0.0	1.1	0.0	0.0
150	C6	Wyandotte High School	0.1	0.0	0.8	0.0	0.0
166	E3	Fly Creek Bridge	0.0	0.0	0.6	0.0	0.0
167	E3	Bernice State Park	0.0	0.0	0.6	0.0	0.0
175	F3	Cherokee Seaplane Base	0.0	0.0	0.6	0.0	0.0
181	F5	Wolf Creek Park	0.0	0.0	0.5	0.8	0.1
185	F5	Grove Springs Park	0.0	0.0	0.5	0.8	0.1
206	G3	Bacon's Heliport	0.0	0.4	0.6	0.8	0.0

6. Discussion of Results

Locations where difference in maximum depth between different starting reservoir elevations is 0.1 feet or less have not been described in this study because they are not appreciable for the purpose of studying impacts on infrastructure.

Only 15 out of 228 infrastructure locations (7% of locations) studied show an appreciable increase in inundation depth for different starting reservoir elevations within GRDA's anticipated operational range. Of the fifteen infrastructure locations, five are categorized as Class 1 differences, none are classified as a Class 2 difference, and ten are categorized as Class 3 differences.

For a given infrastructure location, the inflow event that causes the largest difference in depth is discussed first, followed by discussion of difference in depth for the other inflow events. For simplicity, figures in Section 6 present inundation areas for the inflow event that causes the largest difference in depth. In each figure, inundation areas for a starting reservoir elevation of 742 feet PD (the lowest elevation in GRDA's anticipated operational range) and 745 feet PD (the highest elevation in GRDA's anticipated operational range) are presented. Full sets of maps, which include all inflow events and starting reservoir elevations within GRDA's anticipated operational range and hypothetical, extreme starting reservoir elevations outside of GRDA's anticipated operational range, are presented in **Appendix E**.

6.1 Class 1 Differences

Class 1 differences range from greater than 0.1 feet up to 0.3 feet in this study. Class 1 differences are located at Rockdale Boulevard Bridge over Tar Creek, State Highway 10/E 100 Road Bridge over Little Elm Creek, State Highway 10/3rd Avenue SE Bridge over Tar Creek, Lion Taylor Park, and S 580 Road Bridge over Little Elm Creek.

6.1.1 Rockdale Boulevard Bridge Over Tar Creek (ID 57)

Within GRDA's anticipated operational range, Rockdale Boulevard Bridge over Tar Creek is inundated by 1.3 to 1.5 feet of water for the September 1993 (21 year) inflow event. The inundation, displayed in **Figure 4**, extends well beyond the bridge. Within the anticipated operational range, the bridge is unusable regardless of starting reservoir elevation.

Within the anticipated operational range, for the July 2007 (4 year) inflow event, the location is inundated by 6.8 to 6.9 feet of water and will be impassible regardless of the starting reservoir elevation. For the June 2004 (1 year) inflow event, the October 2009 (3 year) inflow event, and the December 2015 (15 year) inflow event, the infrastructure location is not inundated. For all events, starting reservoir elevations within the anticipated operational range do not result in additional loss of infrastructure use at this location.

If GRDA operated at 734 feet PD, this infrastructure location would still be inundated by the same inflow events and would be inundated by depths similar to those depths for operational levels within GRDA's anticipated operational range. For the September 1993 (21 year) inflow event, the location would still be inundated by 1.1 feet of water. For the July 2007 (4 year) event, the location would still be inundated by 6.7 feet of water. Reducing the operational range to 734 feet PD would still result in the same loss of infrastructure use at this location.

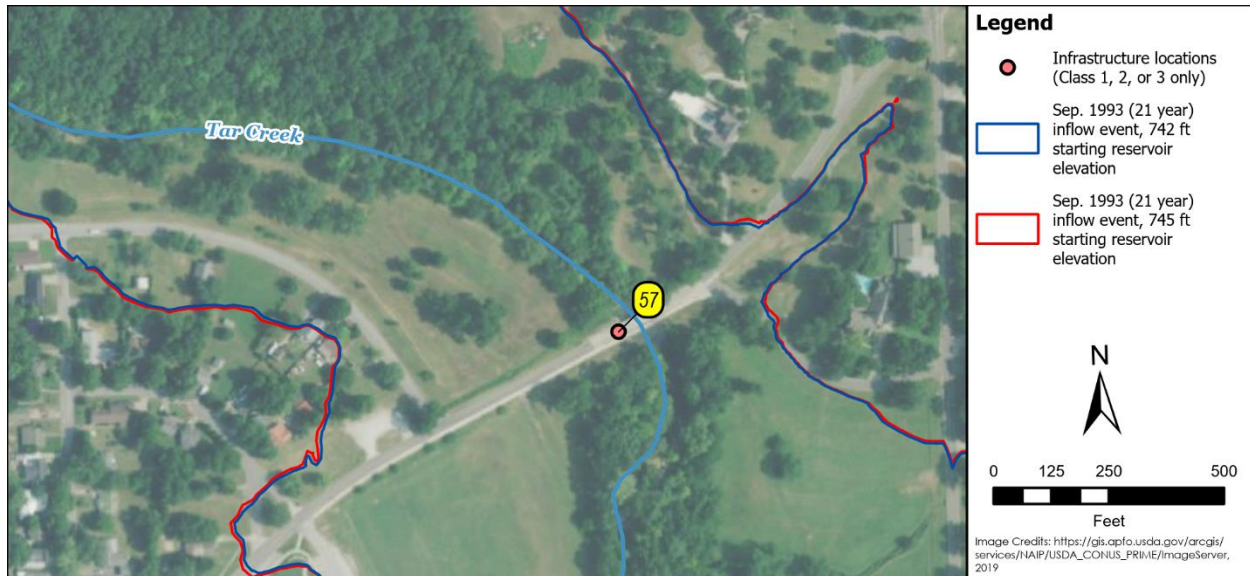


Figure 4. September 1993 event inundation extents at Rockdale Boulevard Bridge (ID 57).

6.1.2 State Highway 10/E 100 Road Bridge Over Little Elm Creek (ID 86)

Within GRDA's anticipated operational range, State Highway 10/E 100 Road Bridge over Little Elm Creek is inundated by 4.7 to 4.9 feet of water for the July 2007 (4 year) inflow event. Inundation extends beyond the bridge and is displayed in **Figure 5**. Within the anticipated operational range, the bridge is unusable regardless of starting reservoir elevation for the July 2007 (4 year) inflow event.

Within the anticipated operational range, the infrastructure location is not inundated for the September 1993 (21 year), June 2004 (1 year), October 2009 (3 year), and December 2015 (15 year) inflow events. For all events, starting reservoir elevations within the anticipated operational range do not result in additional loss of infrastructure use at this location.

If GRDA operated at 734 feet PD, this infrastructure location would still be inundated by the same inflow event and would be inundated by depths similar to those depths for operational levels within GRDA's anticipated operational range. For the July 2007 (4 year) inflow event, the location would still be inundated by 4.7 feet of water. Reducing the operational range to 734 feet PD would still result in the same loss of infrastructure use at this location.

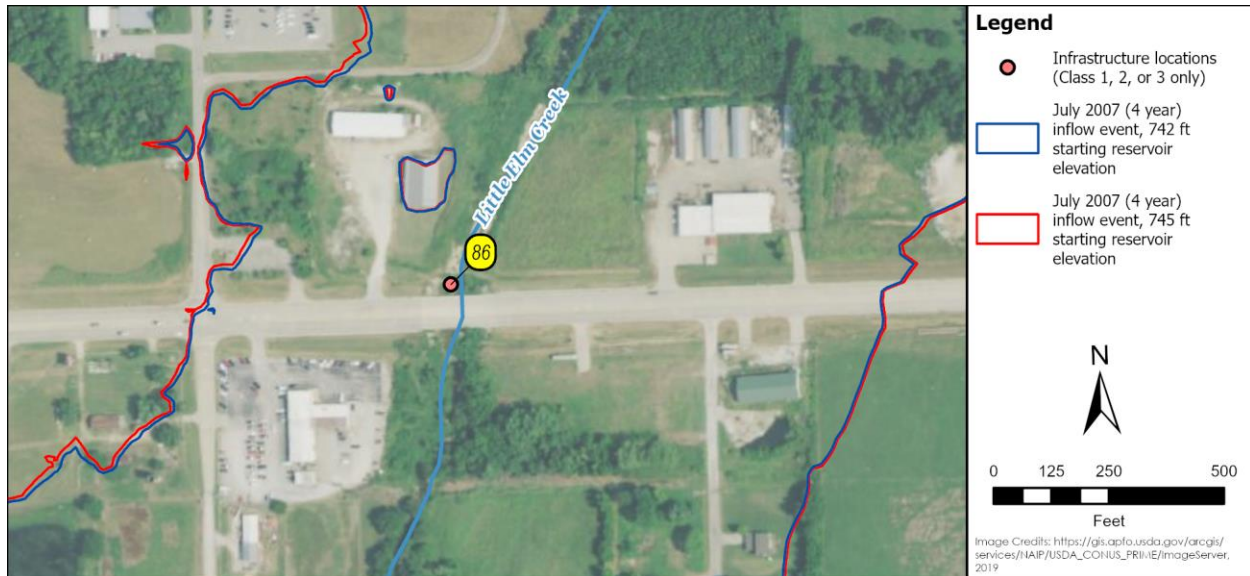


Figure 5. July 2007 event inundation extents at State Highway 10/E 100 Road Bridge (ID 86).

6.1.3 State Highway 10/3rd Avenue SE Bridge Over Tar Creek (ID 88)

Within GRDA's anticipated operational range, the State Highway 10/3rd Avenue SE Bridge over Tar Creek is inundated by 2.1 to 2.3 feet of water for the September 1993 (21 year) inflow event. Inundation is displayed in **Figure 6** and extends well beyond the bridge. Within the anticipated operational range, the bridge is unusable regardless of starting reservoir elevation.

The location is inundated by 7.6 to 7.7 feet of water for the July 2007 (4 year) inflow event and will be unusable regardless of starting reservoir elevation within the anticipated operational range. The infrastructure location is not inundated for the June 2004 (1 year), October 2009 (3 year), and December 2015 (15 year) inflow events. For all events, starting reservoir elevations within the anticipated operational range do not result in additional loss of infrastructure use at this location.

If GRDA operated at 734 feet PD, this infrastructure location would still be inundated by the same inflow events and would be inundated by depths similar to those depths for operational levels within GRDA's anticipated operational range. For the September 1993 (21 year) inflow event, the location would still be inundated by 1.9 feet of water. For the July 2007 (4 year) event, the location would still be inundated by 7.5 feet of water. Reducing the operational range to 734 feet PD would still result in the same loss of infrastructure use at this location.

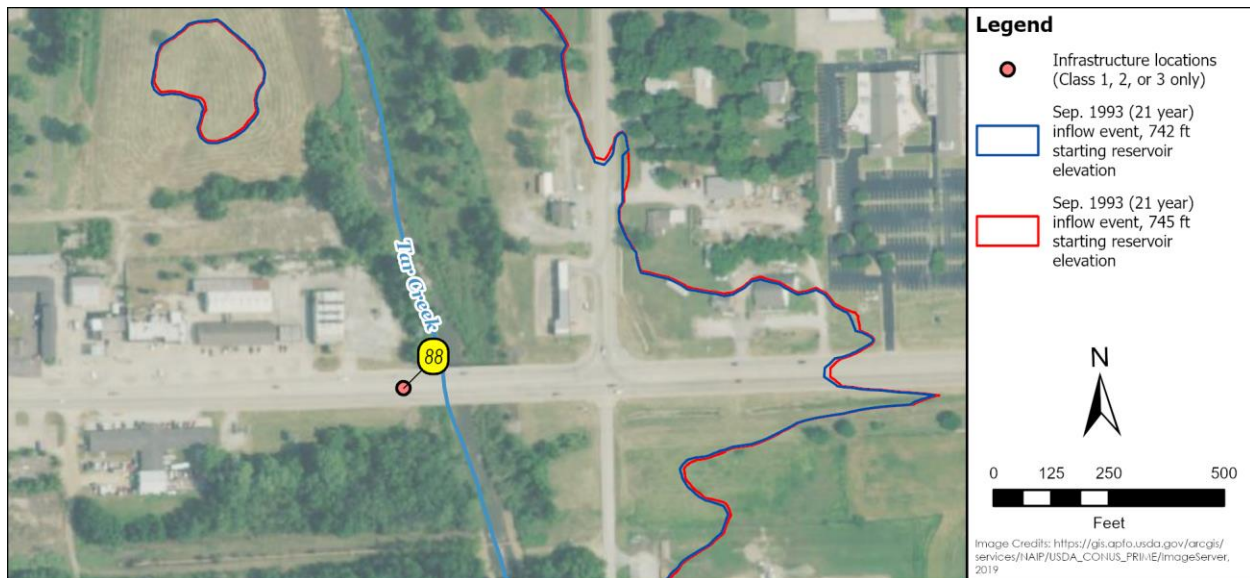


Figure 6. September 1993 event inundation extents at State Highway 10/3rd Avenue SE Bridge (ID 88).

6.1.4 Lion Taylor Park (ID 94)

Within GRDA's anticipated operational range, Lion Taylor Park is inundated by 0.3 to 0.5 feet of water for the September 1993 (21 year) inflow event. While the maximum depths are relatively shallow, the park is mostly inundated regardless of starting reservoir elevation within the anticipated operational range, as displayed in **Figure 7**.

For the July 2007 (4 year) inflow event, the park is inundated by 5.8 to 5.9 feet of water within the anticipated operational range. The location is not inundated for the June 2004 (1 year), October 2009 (3 year), and December 2015 (15 year) inflow events. Within the anticipated operational range, starting reservoir elevations do not result in additional loss of infrastructure use at this location.

If GRDA operated at 734 feet PD, this infrastructure location would still be inundated by the same inflow events and would be inundated by depths similar to those depths for operational levels within GRDA's anticipated operational range. For the September 1993 (21 year) inflow event, the location would still be inundated by 0.1 feet of water, a relatively shallow depth similar to the 0.3 feet of depth that would occur for an operational level of 742 feet PD. For the July 2007 (4 year) event, the location would still be inundated by 5.7 feet of water. Reducing the operational range to 734 feet PD would still result in the same loss of infrastructure use at this location.



Figure 7. September 1993 event inundation extents at Lion Taylor Park (ID 94).

6.1.5 S 580 Road Bridge Over Little Elm Creek (ID 97)

Within GRDA's anticipated operational range, S 580 Road Bridge over Little Elm Creek is inundated by 15.1 to 15.3 feet of water for the July 2007 (4 year) inflow event. The July 2007 (4 year) inflow event inundation extends well beyond the bridge and is displayed in **Figure 8**. For the September 1993 (21 year) inflow event, the bridge is inundated by 10.1 to 10.3 feet of water. For the October 2009 (3 year) inflow event, it is inundated by 1.9 to 2.1 feet of water. For the December 2015 (15 year) inflow event, the bridge is inundated by 5.4 to 5.5 feet of water. Within the anticipated operational range, the bridge is unusable regardless of starting reservoir elevation for the July 2007 (4 year), September 1993 (21 year), October 2009 (3 year), and December 2015 (15 year) inflow events.

For the June 2004 (1 year) inflow event, the infrastructure location is not inundated. For all events, starting reservoir elevations within the anticipated operational range do not result in additional loss of infrastructure use at this location.

If GRDA operated at 734 feet PD, this infrastructure location would still be inundated by the same inflow events and would be inundated by depths similar to those depths for operational levels within GRDA's anticipated operational range. For the July 2007 (4 year) inflow event, the location would still be inundated by 15.1 feet of water. For the September 1993 (21 year) event, the depth would be 9.9 feet. For the October 2009 (3 year) event, the depth would be 1.5 feet. For the December 2015 (15 year) event, the depth would be 4.1 feet. Reducing the operational range to 734 feet PD would still result in the same loss of infrastructure use at this location.



Figure 8. July 2007 event inundation extents at S 580 Road Bridge (ID 97).

6.2 Class 2 Differences

Class 2 differences range from greater than or equal to 0.3 feet up to 0.5 feet in this study. There were no infrastructure locations with Class 2 differences.

6.3 Class 3 Differences

Class 3 differences are greater than or equal to 0.5 feet in this study. Class 3 differences are located at Hudson Creek Bridge, Twin Bridges State Park, Shawnee Branch Bridge, Wyandotte High School, Fly Creek Bridge, Bernice State Park, Cherokee Seaplane Base, Wolf Creek Park, Grove Springs Park, and Bacon's Heliport.

6.3.1 Hudson Creek Bridge (ID 127)

Within GRDA's anticipated operational range, Hudson Creek Bridge is inundated by 17.8 to 18.3 feet of water for the July 2007 (4 year) inflow event. Inundation is displayed in **Figure 9** and extends well beyond the bridge. Within the anticipated operational range, the bridge is unusable regardless of starting reservoir elevation.

Within GRDA's anticipated operational range, this location is inundated by 15.0 to 15.1 feet of water for the September 1993 (21 year) inflow event. For the October 2009 (3 year) inflow event, the location is inundated by 6.5 to 6.9 feet of water. For the December 2015 (15 year) inflow event, the location is inundated by 12.6 feet of water. The location is not inundated for the June 2004 (1 year) inflow event. For all events, starting reservoir elevations within the anticipated operational range do not result in additional loss of infrastructure use at this location.

If GRDA operated at 734 feet PD, this infrastructure location would still be inundated by the same inflow events and would be inundated by depths similar to those depths for operational levels within GRDA's anticipated operational range. For the July 2007 (4 year) inflow event, the location would still be inundated by 17.8 feet of water. For the September 1993 (21 year) event, the depth would be 14.9 feet. For the October 2009 (3 year) event, the depth would be 5.9 feet. For the December 2015 (15 year)

event, the depth would be 10.6 feet. Reducing the operational range to 734 feet PD would still result in the same loss of infrastructure use at this location.



Figure 9. July 2007 event inundation extents at Hudson Creek Bridge (ID 127).

6.3.2 Twin Bridges State Park (ID 139)

Within GRDA's anticipated operational range, Twin Bridges State Park is inundated by 7.8 to 8.9 feet of water for the July 2007 (4 year) inflow event. As displayed in **Figure 10**, the infrastructure location is completely inundated and will be unusable regardless of starting reservoir elevation within the anticipated operational range.

For the September 1993 (21 year) inflow event, the location is inundated by 12.4 to 12.5 feet of water. For the October 2009 (3 year) inflow event, the location is inundated by 3.2 to 3.7 feet of water. For the December 2015 (15 year) inflow event, the location is inundated by 10.3 feet of water. The location is not inundated for the June 2004 (1 year) inflow event. For all events, starting reservoir elevations within the anticipated operational range do not result in additional loss of infrastructure use at this location.

If GRDA operated at 734 feet PD, this infrastructure location would still be inundated by the same inflow events and would be inundated by depths similar to those depths for operational levels within GRDA's anticipated operational range. For the July 2007 (4 year) inflow event, the location would still be inundated by 7.1 feet of water. For the September 1993 (21 year) event, the depth would be 12.3 feet. For the October 2009 (3 year) event, the depth would be 2.5 feet. For the December 2015 (15 year) event, the depth would be 8.1 feet. Reducing the operational range to 734 feet PD would still result in the same loss of infrastructure use at this location.



Figure 10. July 2007 event inundation at Twin Bridges State Park (ID 139).

6.3.3 Shawnee Branch Bridge (ID 140)

Within GRDA's anticipated operational range, Shawnee Branch Bridge is inundated by 2.4 to 3.5 feet of water for the July 2007 (4 year) inflow event. Inundation is displayed in **Figure 11**. Within the anticipated operational range, the bridge is unusable regardless of starting reservoir elevation for the July 2007 (4 year) inflow event.

For the September 1993 (21 year) inflow event, the location is inundated by 10.5 to 10.6 feet of water. For the December 2015 (15 year) inflow event, the location is inundated by 6.5 feet of water. For both the September 1993 (21 year) and December 2015 (15 year) inflow events, the bridge will be impassible regardless of the starting reservoir elevation within the anticipated operational range. The infrastructure location is not inundated for the June 2004 (1 year) and October 2009 (3 year) inflow events. For all events, starting reservoir elevations within the anticipated operational range do not result in additional loss of infrastructure use at this location.

If GRDA operated at 734 feet PD, this infrastructure location would still be inundated by the same inflow events and would be inundated by depths similar to those depths for operational levels within GRDA's anticipated operational range. For the July 2007 (4 year) inflow event, the location would still be inundated by 1.7 feet of water. For the September 1993 (21 year) event, the depth would be 10.5 feet. For the December 2015 (15 year) event, the depth would be 5.7 feet. Reducing the operational range to 734 feet PD would still result in the same loss of infrastructure use at this location.

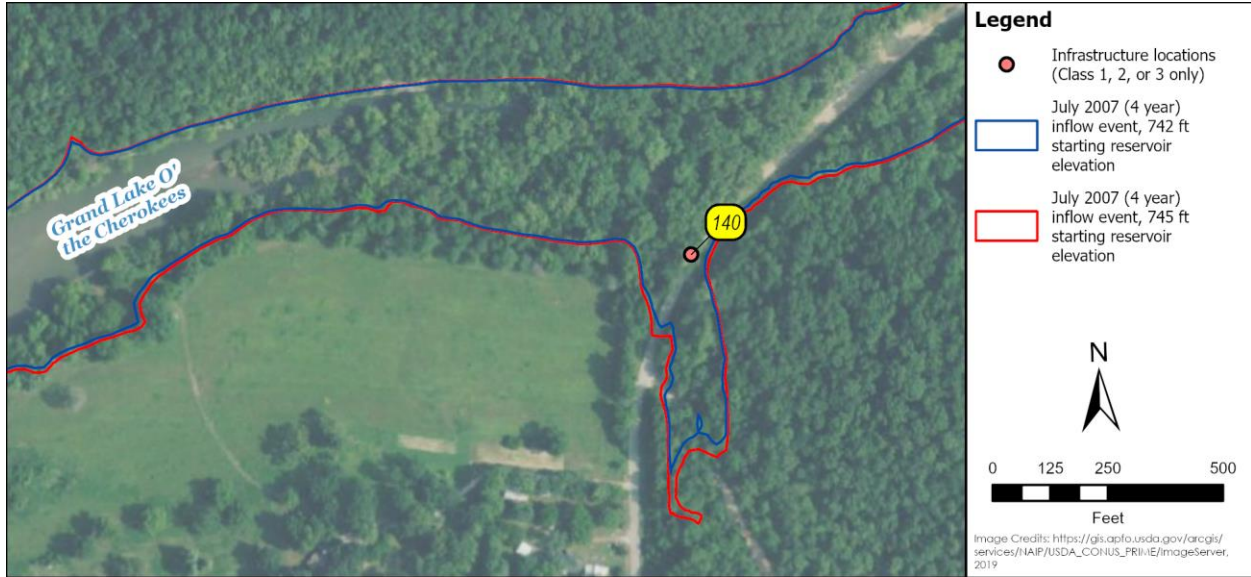


Figure 11. July 2007 event inundation at Shawnee Branch Bridge (ID 140).

6.3.4 Wyandotte High School (ID 150)

The school property is protected by an embankment that is maintained by GRDA. As displayed in **Figure 12**, there is a break in inundation due to the embankment. The inundation polygon that includes the school is disconnected from the main inundation polygon. This is a limitation of the study data and indicates that the school should not be inundated because the embankment prevents overland flow from entering the school property.

GRDA already maintains the embankment, which assures it will continue to function correctly by blocking any overland flow from entering the infrastructure. Thus, Wyandotte High School is protected from any potential adverse impacts on the infrastructure that could occur as a result of Project operations.

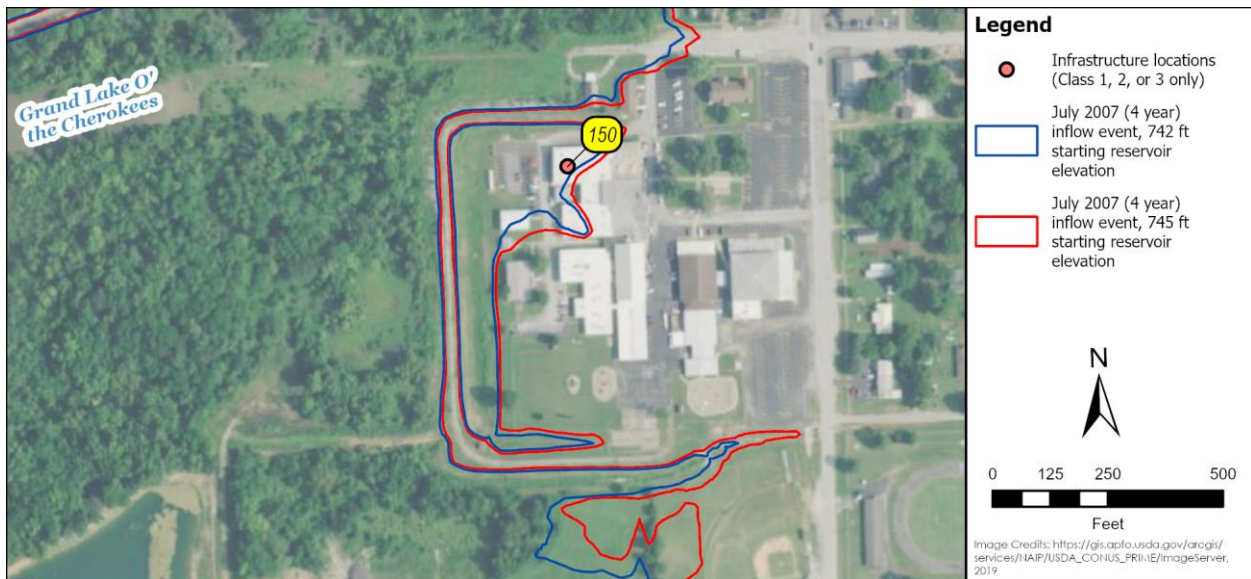


Figure 12. July 2007 event inundation at Wyandotte High School (ID 150).

6.3.5 Fly Creek Bridge (ID 166)

Within GRDA's anticipated operational range, Fly Creek Bridge is inundated by 3.0 to 3.6 feet of water for the July 2007 (4 year) inflow event and will be impassible regardless of the starting reservoir elevation within the anticipated operational range as displayed in **Figure 13**.

For the September 1993 (21 year) and December 2015 (15 year) inflow events, the bridge is inundated by 3.6 feet of water. The bridge is not inundated for the June 2004 (1 year) and October 2009 (3 year) inflow events. For all events, starting reservoir elevations within the anticipated operational range do not result in additional loss of infrastructure use at this location.

If GRDA operated at 734 feet PD, this infrastructure location would still be inundated by the same inflow events and would be inundated by depths similar to those depths for operational levels within GRDA's anticipated operational range. For the July 2007 (4 year) inflow event, the location would still be inundated by 2.8 feet of water. For the September 1993 (21 year) event, the depth would be 2.9 feet. For the December 2015 (15 year) event, the depth would be 3.3 feet. Reducing the operational range to 734 feet PD would still result in the same loss of infrastructure use at this location.

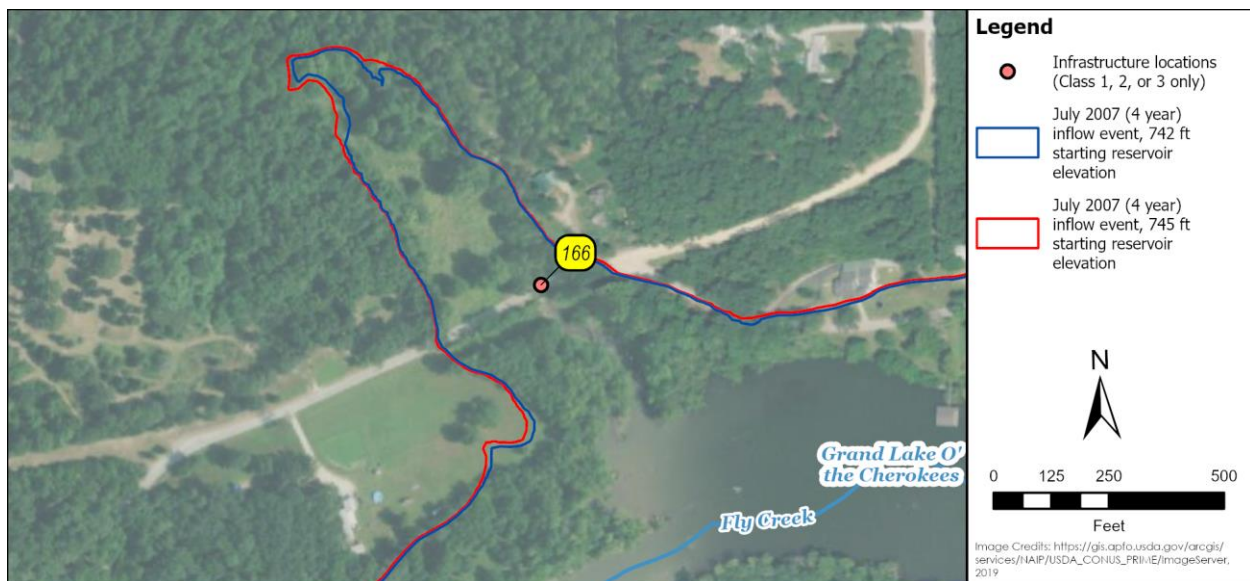


Figure 13. July 2007 event inundation at Fly Creek Bridge (ID 166).

6.3.6 Bernice State Park (ID 167)

Within GRDA's anticipated operational range, Bernice State Park is inundated by 2.3 to 2.9 feet of water for the July 2007 (4 year) inflow event. As shown in **Figure 14**, most of the park is inundated within the anticipated operational range and would be unusable regardless of starting reservoir elevation.

For the September 1993 (21 year) and December 2015 (15 year) inflow events, the location is inundated by 2.9 feet of water. The location is not inundated for the June 2004 (1 year) and October 2009 (3 year) inflow events. For all events, starting reservoir elevations within the anticipated operational range do not result in additional loss of infrastructure use at this location.

If GRDA operated at 734 feet PD, this infrastructure location would still be inundated by the same inflow events and would be inundated by depths similar to those depths for operational levels within GRDA's

anticipated operational range. For the July 2007 (4 year) inflow event, the location would still be inundated by 2.1 feet of water. For the September 1993 (21 year) event, the depth would be 2.2 feet. For the December 2015 (15 year) event, the depth would be 2.6 feet. Reducing the operational range to 734 feet PD would still result in the same loss of infrastructure use at this location.



Figure 14. July 2007 event inundation at Bernice State Park (ID 167).

6.3.7 Cherokee Seaplane Base (ID 175)

Within GRDA's anticipated operational range, Cherokee Seaplane Base is inundated by 2.9 to 3.5 feet of water for the July 2007 (4 year) inflow event. As shown in **Figure 15**, the location is unusable within the anticipated operational range regardless of starting reservoir elevation.

For the September 1993 (21 year) and December 2015 (15 year) inflow events, the location is inundated by 3.5 feet of water. This location is not inundated for the June 2004 (1 year) and October 2009 (3 year) inflow events. For all events, starting reservoir elevations within the anticipated operational range do not result in additional loss of infrastructure use at this location.

If GRDA operated at 734 feet PD, this infrastructure location would still be inundated by the same inflow events and would be inundated by depths similar to those depths for operational levels within GRDA's anticipated operational range. For the July 2007 (4 year) inflow event, the location would still be inundated by 2.7 feet of water. For the September 1993 (21 year) event, the depth would be 2.8 feet. For the December 2015 (15 year) event, the depth would be 3.2 feet. Reducing the operational range to 734 feet PD would still result in the same loss of infrastructure use at this location.



Figure 15. July 2007 event inundation at Cherokee Seaplane Base (ID 175).

6.3.8 Wolf Creek Park (ID 181)

Within GRDA's anticipated operational range, Wolf Creek Park is inundated by 0.8 to 1.6 feet of water for the October 2009 (3 year) inflow event. As displayed in **Figure 16**, only the low-lying areas are unusable for the October 2009 (3 year) inflow event regardless of starting reservoir elevation. The structures subject to flooding are outside the inundation for all studied inflow events. This site was designed (and funded) by GRDA to not be impacted by inflow events.

For the September 1993 (21 year) inflow event, the location is inundated by 5.5 feet of water. For the July 2007 (4 year) inflow event, the location is inundated by 5.0 to 5.5 feet of water. For the December 2015 (15 year) inflow event, the location is inundated by 5.5 to 5.6 feet of water. The location is not inundated for the June 2004 (1 year) inflow event. For all events, starting reservoir elevations within the anticipated operational range do not result in additional loss of infrastructure use at this location.

If GRDA operated at 734 feet PD, this infrastructure location would still be inundated by the same inflow events and would be inundated by depths similar to those depths for operational levels within GRDA's anticipated operational range, except for the October 2009 (3 year) inflow event, for which no inundation would occur. For the September 1993 (21 year) inflow event, the depth would be 4.8 feet. For the July 2007 (4 year) event, the depth would be 4.7 feet. For the December 2015 (15 year) event, the depth would be 5.2 feet. Because the site was designed (and funded) by GRDA to not be impacted by inflow events, only the low-lying areas near Grand Lake are inundated. Reducing the operational range to 734 feet PD would still result in the same impact to infrastructure use at this location.



Figure 16. October 2009 event inundation at Wolf Creek Park (ID 181).

6.3.9 Grove Springs Park (ID 185)

Within GRDA's anticipated operational range, Grove Springs Park is inundated by 0.8 to 1.6 feet of water for the October 2009 (3 year) inflow event. The inundation, as displayed in **Figure 17**, extends out quite far and will make most of the park unusable for the October 2009 (3 year) inflow event regardless of anticipated starting reservoir elevation being 742 feet PD or 745 feet PD. This park does not contain structures that can be damaged if exposed to periodic flooding.

For the September 1993 (21 year) inflow event, the location is inundated by 5.5 feet of water. For the July 2007 (4 year) inflow event, the location is inundated by 5.0 to 5.5 feet of water. For the December 2015 (15 year) inflow event, the location is inundated by 5.5 to 5.6 feet of water. The location is not inundated for the June 2004 (1 year) inflow event. For all events, starting reservoir elevations within the anticipated operational range do not result in additional loss of infrastructure use at this location.

If GRDA operated at 734 feet PD, this infrastructure location would still be inundated by the same inflow events and would be inundated by depths similar to those depths for operational levels within GRDA's anticipated operational range, except for the October 2009 (3 year) inflow event, for which no inundation would occur. For the September 1993 (21 year) inflow event, the depth would be 4.8 feet. For the July 2007 (4 year) event, the depth would be 4.7 feet. For the December 2015 (15 year) event, the depth would be 5.2 feet. Except for the October 2009 (3 year) inflow event, for which no inundation would occur if GRDA operated at 734 feet PD, reducing the operational range to 734 feet PD would still result in the same impact to infrastructure use at this location.

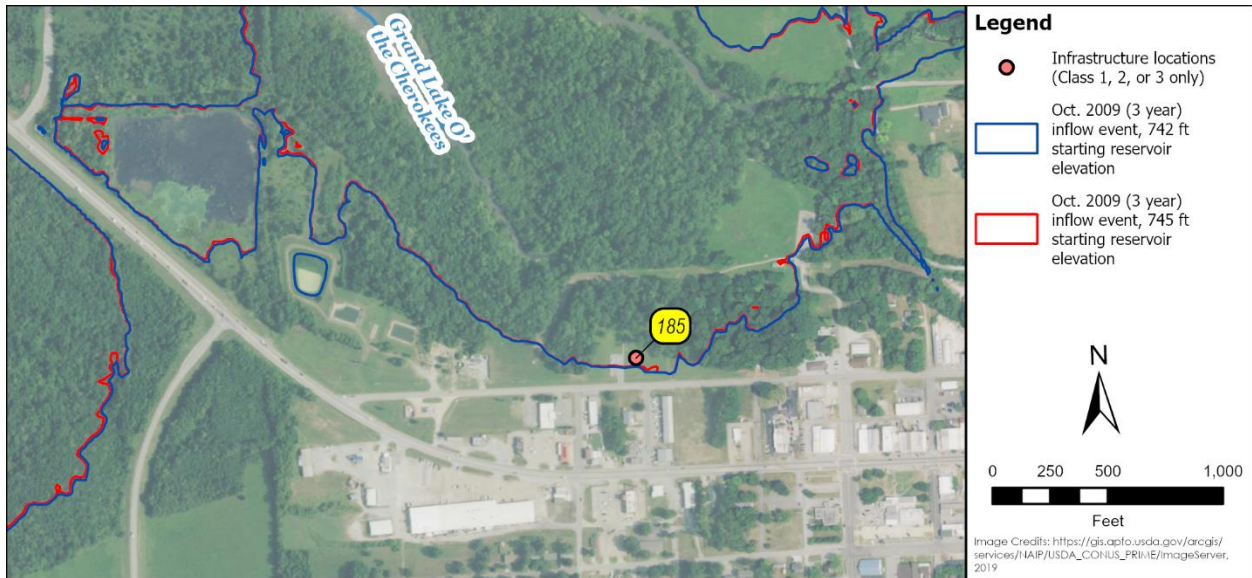


Figure 17. October 2009 event inundation at Grove Springs Park (ID 185).

6.3.10 Bacon's Heliport (ID 206)

Bacon's Heliport is a floating structure. Therefore, it does not become inundated during any of the inflow events studied. Reducing the operational range to 734 feet PD would still result in the same impact to infrastructure use at this location.



Figure 18. October 2009 event inundation at Bacon's Heliport (ID 206).

7. Conclusions

According to the analysis results, only 7% of the infrastructure locations studied experience an appreciable increase (greater than 0.1 feet) in maximum inundation depth for different starting reservoir elevations within GRDA's anticipated operational range of 742 feet PD to 745 feet PD. In addition, all appreciable increases in maximum inundation depth occur during high-flow conditions when the USACE controls the flood control operations under federal law, except when the time of maximum inundation depth is solely a function of inflow event arrival time and not reservoir elevation, meaning that the time of maximum depth at the infrastructure location was completely independent of the Project reservoir elevation. Therefore, infrastructure locations are not adversely affected by GRDA's anticipated Project operations.

Except for two parks, a reduction in reservoir operational elevation to 734 feet PD would not decrease the loss of infrastructure use for any of the inflow events studied. The first park, Wolf Creek Park, was designed (and partially funded) by GRDA to avoid being impacted by inflow events. Only a low-lying portion of the park near Grand Lake would experience a difference in inundation for the October 2009 (3 year) inflow event. Therefore, any potential adverse impacts have already been mitigated by GRDA during their assistance in the design and funding of the improvements to the park.

At the second park, Grove Springs Park, low-lying portions of the park would experience a difference in inundation for the October 2009 (3 year) inflow event. Decreasing the low end of the anticipated operation range from 742 to 734 feet PD, a difference of 8 feet in operational elevation, would only change infrastructure adverse impacts slightly at Grove Springs Park.

Because infrastructure such as parks are generally sited in areas that are subject to frequent flooding and are the most-resistant type of infrastructure being reviewed in this Study, the minor potential reduction in impacts to infrastructure identified through operating at an extreme, hypothetical elevation of 734 feet PD do not significantly decrease loss of infrastructure use at the Project. The results do not provide a significant benefit to consider an elevation of 734 feet PD as a realistic option for reducing flooding impacts on infrastructure.

Extreme, hypothetical operational levels up to and including 757 feet PD were analyzed. If GRDA operated at 757 feet PD, a reservoir elevation that is 12 feet higher than the top of GRDA's anticipated operational range and an elevation equal to the top of dam, infrastructure locations would be inundated by depths similar to or greater than those depths for operational levels within GRDA's anticipated operational range. Practically speaking, increasing the top of the operational range to 757 feet PD is simply not possible.

In summary, infrastructure locations are not adversely affected by GRDA's baseline or anticipated operations of the Project, which consist of reservoir levels within an operational range of 742 feet PD to 745 feet PD. Even under the hypothetical and extreme operational level of 734 feet PD, only two parks would experience a minor decrease in the loss of infrastructure use.

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APPENDIX A:
SAMPLE EMAIL TO LOCAL EMERGENCY MANAGEMENT AGENCIES

Brauna Hartzell

From: Jesse Piotrowski
Sent: Thursday, June 18, 2020 3:44 PM
To: tanderson@miamiokla.net
Cc: Shawn Puzen
Subject: Grand Lake Infrastructure Study

Categories: Important, Filed by Newforma

Mr. Anderson,

Mead & Hunt is performing a study at the direction of the Federal Energy Regulatory Commission (FERC) in support of the Grand River Dam Authority's intent to relicense the Pensacola Hydroelectric Project. The study is an effort to identify if hydrologic events could potentially have an effect on the frequency or depth of flooding for critical infrastructure such as:

1. Bridges and roads
2. Structures (fire stations, hospitals, substations, schools, wastewater treatment plants, etc.)
3. Public amenities (e.g. parks)

We have already compiled publicly available data sources such as shelters, airports, bridges, churches, fire stations, hospitals, law enforcement facilities, parks, power plants, substations, schools, wastewater treatment facilities, and water treatment facilities.

We are respectfully requesting your assistance in helping us identify any additional critical infrastructure that will not be included in the above datasets that could be affected by Pensacola Dam operations. To help you answer our question above, please answer the following questions to yourself:

1. Do you maintain a list of infrastructure that could potentially be affected by Pensacola Dam operations?
2. Do you have an emergency response plan?
3. Do you have a list of critical road intersections or road segments that are necessary for emergency response?

Answering the above questions may help you identify additional critical information that could assist with the study.

We greatly appreciate your assistance in this matter. If you would like, we can set up a teleconference to discuss our request. Please direct all responses to jesse.piotrowski@meadhunt.com. We would like to complete the identification of critical infrastructure by July 20, 2020.

Thank you in advance for your time and effort,
Jesse Piotrowski

JESSE PIOTROWSKI, PE, CFM
ENGINEER, WATER
Mead & Hunt
Direct: 608-443-0434 | Transfer Files
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 120 YEARS OF SHAPING THE FUTURE

APPENDIX B:
LIST OF EMERGENCY MANAGEMENT AGENCIES CONTACTED

Emergency Management Contact List

Oklahoma Emergency Management Directory

Ottawa							
Jurisdiction	Director	Address	City	St	ZIP	W-Phone	Email
Miami Emergency Mgmt	Thomas Anderson	129 5th Ave NW	Miami	OK	74354	918-541-2302	tanderson@miamiokla.net
Ottawa County Emergency Mgmt	Chad Holcomb	123 East Central Suite 1	Miami	OK	74354	918-961-1676	ottawacountvem@gmail.com
Quapaw Tribe	Jeff Reeves	P.O. Box 200	Quapaw	OK	74344	918-675-4200	picherchief1@yahoo.com
	Randy Jackson					918-533-4359	rjackson@quapawnation.com
Wyandotte Emergency Mgmt	Leon Crow	P.O. Box 240	Wyandotte	OK	74370	918-542-1853	leoncrow@yahoo.com
Delaware							
Jurisdiction	Director	Address	City	St	ZIP	W-Phone	Email
Delaware County Emergency Mgmt	Travis Beesley	P.O. Box 309	Jay	OK	74342	918-353-2041	delawarecountvem@yahoo.com
Grove Emergency Management	Frank Close	104 West 3rd Street	Grove	OK	74344	918-787-4357	fclose@cityofgroveok.gov
	Main line (City Hall)					918-786-6107	
	Calvin Igney					918-290-1975 (cell)	cigney@cityofgroveok.gov
	Russ Schmidt (GIS)					918-964-3002 (cell)	rschmidt@cityofgroveok.gov
Seneca Cayuga Nation Emergency	Chris Arnold	P.O. Box 453220	Grove	OK	74345	918-787-9272	carold@sctribe.com
Craig County							
Jurisdiction	Director	Address	City	St	ZIP	W-Phone	Email
Craig Co Emergency Mgmt	Morris Bluejacket	210 W Delaware Suite 1	Vinita	OK	74301	918-323-0055	craigco.em1@gmail.com
Vinita Emergency Mgmt	Morris Bluejacket	210 W Delaware Suite 1	Vinita	OK	74301	918-323-0055	craigco.em1@gmail.com
Mayes County							
Jurisdiction	Director	Address	City	St	ZIP	W-Phone	Email
Mayes County Emergency Mgmt	Johnny Janzen	1 Court Pl Suite 140	Pryor	OK	74361	918-825-4650	mayescountvem@yahoo.com
Pryor Emergency Mgmt	Johnny Janzen	12 North Rowe Street	Pryor	OK	74361	918-825-4650	mayescountvem@yahoo.com

GRDA Contact List

Agency	Phone	Email
Mayes Emergency Service Trust Authority (MESTA)	918-825-1155	info@mestaems.org
Oklahoma Department of Civil Emergency Management (OCEM)	800-800-2481 (24-hours)	
	405-521-2481 (main)	
	405-833-3159 (Allison)	allison.whitsitt@oem.ok.gov
State of Oklahoma Risk Management	405-521-4999 (main)	
Gene Lidyard, Administrator		
Janet Morrow	405-521-6051	
U.S. Army Corps of Engineers (USACE) Tulsa Office: Kerri Parks Stark	918-669-7431	kerri.stark@usace.army.mil

APPENDIX C:
SAMPLE CERTIFIED LETTER



November 25, 2020

Chief Nelson Harjo
Alabama-Quassarte Tribal Town
PO Box 187
Wetumka, OK 74883

Subject: Grand Lake Infrastructure Study

Dear Chief Nelson Harjo:

Mead & Hunt is performing a study at the direction of the Federal Energy Regulatory Commission (FERC) in support of the Grand River Dam Authority's intent to relicense the Pensacola Hydroelectric Project. The study is an effort to identify if hydrologic events could potentially have an effect on the frequency or depth of flooding for critical infrastructure such as:

1. Bridges and roads
2. Structures (fire stations, hospitals, substations, schools, wastewater treatment plants, etc.)
3. Public amenities (e.g. parks)

We have already compiled publicly available data sources such as shelters, airports, bridges, churches, fire stations, hospitals, law enforcement facilities, parks, power plants, substations, schools, wastewater treatment facilities, and water treatment facilities.

We are respectfully requesting your assistance in helping us identify any additional critical infrastructure that may not be available in publicly available data sources, but which could be affected by Pensacola Dam operations. To help you consider whether you may be aware of any such critical infrastructure, please consider the following questions:

1. Do you maintain a list of infrastructure that could potentially be affected by Pensacola Dam operations?
2. Do you have an emergency response plan?
3. Do you have a list of critical road intersections or road segments that are necessary for emergency response?

If you are aware of any critical infrastructure that could be affected by Pensacola Dam operations, please send a description of the infrastructure and locational information, so that we can include it in our study.

Chief Nelson Harjo
November 25, 2020
Page 2

We greatly appreciate your assistance in this matter. If you would like, we can set up a teleconference to discuss our request. Please direct all responses to shawn.puzen@meadhunt.com. We would like to complete the identification of critical infrastructure by January 8, 2020.

Thank you in advance for your time and effort,

Sincerely,

MEAD & HUNT, Inc.



Shawn Puzen
FERC Hydropower Relicensing and Compliance

SAMPLE

APPENDIX D:
MAILING LIST FOR CERTIFIED LETTERS

Emergency Management Contact List

Socioeconomic Study Distribution List Tribal Organizations

Organization	Name	Address	City	St	ZIP	Phone	Email
Alabama-Quassart Tribal Town	Chief Nelson Harjo	PO Box 187	Wetumka	OK	74883		
Apache Tribe of Oklahoma	Chairman Bobby Komardley	511 E Colorado	Anadarko	OK	73005		
Caddo Nation	Derek Hill	PO Box 487	Binger	OK	73009		dhill@caddonation.org
Caddo Nation of Oklahoma	Chairman Tamara Francis-Fourkiller	PO Box 487	Binger	OK	73009		caddochair.cn@gmail.com
Cherokee Nation	Chief Chuck Hoskins	PO Box 948	Tahlequah	OK	74465		
Cherokee Nation	Elizabeth Toombs	PO Box 948	Tahlequah	OK	74465		elizabeth-toombs@cherokee.org
Delaware Nation	Deborah Dotson	PO Box 825	Anadarko	OK	73005		ddotson@delawarenation.com
Delaware Tribe of Indians	Chief Chester Brooks	170 NE Barbara	Bartlesville	OK	74006		cbrooks@delawaretribe.org
Eastern Shawnee Tribe of Oklahoma	Chief Glenna J. Wallace	70500 E 128 Road	Wyandotte	OK	74370		gwallace@estoo.net
Inter-Tribal Council Inc.		21 N S Eight Tribe Trail, Suite C	Miami	OK	74354		
Iowa Tribe of Oklahoma	Chairman Bobby Walkup	335588 E 750 Road	Perkins	OK	74059		
Jacobson Law Group (Counsel for Miami Nation)	Joe Halloran	180 East 5th Street, Suite 940	St. Paul	MN	55101		jhalloran@thecobsonlawgroup.com
Kiowa Tribe Office of Historic Preservation	Kellie Lewis	PO Box 369	Carnegie	OK	73015		kellie@tribaladminsivices.org
Little Traverse Bay Bands of Odawa Indians	Regina Gasco-Bentley	7500 Odawa Circle	Harbor Springs	MI	49740		
Miami Tribe of Oklahoma	Chief Douglas G. Lankford	PO Box 1326	Miami	OK	74354		dlankford@miamination.com
Modoc Tribe of Oklahoma	Chief Bill Follis	515 G Street SE	Miami	OK	74354		modoctribe@cableone.net
Muscogee (Creek) Nation	Chief James Floyd	PO Box 580	Okmulgee	OK	74447		jfloyd@mcn-nsn.gov
Osage Nation	Chief Geoffrey Standing Bear	627 Grandview Avenue	Pawhuska	OK	74056		
Osage Nation Historic Preservation Office	James Munkres	627 Grandview Avenue	Pawhuska	OK	74056		jmunkres@osagenation-nsn.gov
Osage Nation Historic Preservation Office	Andrea Hunter	627 Grandview Avenue	Pawhuska	OK	74056		ahunter@osagenation-nsn.gov
Otoe-Missouria Tribe of Indians	Chairman John Shotton	8151 Hwy 177	Red Rock	OK	74651		jshotton@omtribe.org
Ottawa Tribe of Oklahoma	Chief Ethel Cook	PO Box 110	Miami	OK	74354		cethel.oto@gmail.com
Ottawa Tribe of Oklahoma	Rhonda Hayworth	PO Box 110	Miami	OK	74355		rhonda.oto@gmail.com
Peoria Tribe of Oklahoma	Chief Craig Harper	118 South Eight Tribes Trail	Miami	OK	74354	918-540-2535	chiefharper@peoriatribe.com
Quapaw Tribe of Oklahoma	Chairman John Berrey	PO Box 765	Quapaw	OK	74363		
Quapaw Tribe of Oklahoma	Everett Bandy	PO Box 765	Quapaw	OK	74363		ebandy@quapatribes.com
Sac and Fox Nation of Oklahoma	Chief Kay Rhoads	920963 S Hwy 99, Building A	Stroud	OK	74079		
Seneca-Cayuga Nation	Chief William Fisher	PO Box 453220	Grove	OK	74345-3220		wfisher@sctribe.com
Shawnee Tribe of Oklahoma	Chief Ron Sparkman	PO Box 189	Miami	OK	74354		rondede1@gmail.com
	Office	29 S. Hwy 69A	Miami	OK	74354	918-542-2441 x101	agnes@shawnee-tribe.com
Tonkawa Tribe of Oklahoma	President Russel Martin	1 Rush Buffalo Road	Tonkawa	OK	74653	580-628-2561	
United Keetoowah Band of Cherokees	Chief Joe Bunch	PO Box 746	Tahlequah	OK	74465		
Wichita and Affiliated Tribes	President Terri Parton	PO Box 729	Anadarko	OK	735005		terri.parton@wichitatribe.com
Wyandotte Nation	Norman Hildebrand, Jr.	64700 East Highway 60	Wyandotte	OK	74370		nhildebrand@wyandotte-nation.org
Wyandotte Tribe of Oklahoma	Chief Billy Friend	64700 East Highway 60	Wyandotte	OK	74370		bfriend@wyandotte-nation.org

APPENDIX E: INFRASTRUCTURE MAPS

Note: This appendix is included as a separate set of PDF files and is presented in combination with the Hydrologic and Hydraulic Modeling Study Upstream Hydraulic Model Inundation Maps.



APPENDIX F:
TABULAR DATA SHEETS



PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
SEPTEMBER 1993 INFLOW EVENT (21-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft. PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.											Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft	757.0 ft		
1	A1	Bridge,Off-sys	782.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	A2	Church	789.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	A2	Bridge,Off-sys	783.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	A2	Bridge,Off-sys	772.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	0.0	0.0
5	A3	Bridge,Off-sys	782.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	A3	Bridge,Off-sys	783.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	A5	Bridge,Off-sys	769.7	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	0.0	0.0
8	A6	Bridge,Off-sys	797.0	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	0.0	0.0
9	A6	Bridge,Off-sys	787.7	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	0.0	0.0
10	A6	Bridge,Off-sys	796.0	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	0.0	0.0
11	A6	Bridge,Off-sys	781.3	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	0.0	0.0
12	A6	Bridge,Off-sys	780.3	22.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1	0.0	0.0
13	A6	Park	776.0	23.2	23.2	23.2	23.2	23.2	23.2	23.2	23.2	23.2	23.2	23.2	0.0	0.0
14	A6	Bridge,Off-sys	800.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	A6	Bridge,Off-sys	794.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	A6	Bridge,Off-sys	779.5	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	0.0	0.0
17	B2	Bridge,Off-sys	766.6	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	5.0	5.0	5.1	0.0	0.2
18	B2	Bridge,Off-sys	765.8	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.5	5.5	5.6	5.6	0.1	0.2
19	B2	Bridge,Off-sys	770.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
20	B2	Bridge,Off-sys	786.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	B2	Bridge,Off-sys	781.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	B2	Bridge,Off-sys	785.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	B2	Bridge,On-sys	796.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	B2	Bridge,On-sys	790.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	B2	Bridge,On-sys	795.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	B2	Bridge,On-sys	779.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	B2	School	788.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	B2	Church	788.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	B3	Bridge,Off-sys	773.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	B3	Bridge,Off-sys	778.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	B3	Bridge,Off-sys	779.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	B3	Bridge,Off-sys	767.8	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.8	3.9	0.0	0.2
33	B3	Bridge,Off-sys	793.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	B3	Bridge,Off-sys	775.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35	B3, B3-4	Church	780.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36	B3	Bridge,Off-sys	764.3	5.2	5.2	5.2	5.2	5.3	5.3	5.3	5.3	5.4	5.5	5.6	0.1	0.4
37	B3	Bridge,On-sys	778.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38	B3, B3-4	Bridge,On-sys	764.2	5.1	5.2	5.2	5.2	5.2	5.2	5.3	5.3	5.3	5.5	5.6	0.1	0.5
39	B4, B4-1	Park	789.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
SEPTEMBER 1993 INFLOW EVENT (21-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.											Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft	757.0 ft		
40	B4, B4-1	Shelter - Evac Only	781.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41	B4, B4-1	Church	788.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
42	B4, B4-1	Church	792.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
43	B4, B4-1	Bridge,Off-sys	781.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
44	B4, B4-1	Bridge,Off-sys	788.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45	B4, B4-1	Church	788.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
46	B4, B4-1	School	781.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
47	B4, B4-3	Park	770.4	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	0.0	0.0
48	B4, B4-3	Bridge,On-sys	779.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
49	B4, B4-3	Bridge,Off-sys	769.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	0.0	0.0
50	B4, B4-3	Bridge,Off-sys	776.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
51	B4, B4-3	Fire Station	788.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	B4, B4-4	Church	787.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
53	B4, B4-3	Church	778.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
54	B4, B4-4	Bridge,Off-sys	783.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55	B4, B4-4	Bridge,Off-sys	785.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
56	B4, B4-3	Cell Tower	769.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
57	B4, B4-3	Bridge,Off-sys	765.2	1.1	1.3	1.3	1.3	1.3	1.4	1.4	1.5	1.5	1.7	1.8	0.2	0.7
58	B4, B4-3	Cell Tower	787.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
59	B4, B4-3	Church	778.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60	B4, B4-3	Church	794.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
61	B4, B4-3	School	796.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
62	B4, B4-3	Church	795.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
63	B4, B4-3	Church	792.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
64	B4, B4-3	School	768.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65	B4, B4-3	Law Enforcement	775.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
66	B4, B4-3	School	781.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
67	B4, B4-3	Church	786.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
68	B4, B4-3	Church	793.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70	B4, B4-3	Church	784.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
71	B4, B4-3	School	784.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
72	B4, B4-3	Church	787.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
73	B4, B4-3	Bridge,Off-sys	771.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
74	B4, B4-3	Church	785.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
75	B4, B4-3	Church	791.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
76	B4, B4-3	Shelter - Evac Only	794.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
77	B4, B4-4	School	788.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
78	B4, B4-3	Church	794.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
79	B4, B4-3	Church	791.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
SEPTEMBER 1993 INFLOW EVENT (21-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.											Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)	
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft	757.0 ft			
80	B4, B4-3	Hospital	788.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
81	B4, B4-3	Hospital	789.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
82	B4, B4-3	Church	791.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
83	B4, B4-4	Law Enforcement	783.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
84	B4, B4-3	Church	774.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
85	B4, B4-3	Airport	784.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
86	B4, B4-4	Bridge,On-sys	765.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.2
87	B4, B4-4	Bridge,On-sys	808.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
88	B4, B4-3	Bridge,On-sys	764.3	1.9	2.1	2.1	2.1	2.1	2.2	2.2	2.3	2.3	2.5	2.6	0.2	0.7	0.7
89	B4, B4-3	Shelter - Evac Only	780.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
90	B4, B4-3	Church	780.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
91	B4, B4-3	Bridge,On-sys	782.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
92	B4, B4-3	School	780.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
93	B4, B4-3	School	769.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
94	B4, B4-3	Park	766.1	0.1	0.3	0.3	0.3	0.3	0.4	0.4	0.5	0.5	0.7	0.8	0.2	0.7	0.7
95	B4, B4-3	Substation	774.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
96	B4, B4-3	Substation	777.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
97	B4, B4-4	Bridge,Off-sys	755.6	9.9	10.1	10.1	10.1	10.2	10.2	10.2	10.3	10.4	10.5	10.6	0.2	0.7	0.7
98	B4, B4-3	Fire Station	771.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
99	B4, B4-3	Bridge,RR	771.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100	B4, B4-4	Bridge,On-sys	801.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
101	B4, B4-3	Bridge,On-sys	776.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
102	B4, B4-3	Park	760.8	7.0	7.2	7.2	7.2	7.2	7.2	7.3	7.3	7.4	7.5	7.6	0.1	0.6	0.6
103	B4, B4-3	Park	754.1	13.6	13.8	13.8	13.8	13.8	13.8	13.8	13.9	13.9	14.1	14.2	0.1	0.6	0.6
104	B4, B4-3	WW Treatment	773.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
105	B4, B4-3	Park	759.6	8.2	8.3	8.3	8.3	8.4	8.4	8.4	8.4	8.5	8.6	8.8	0.1	0.6	0.6
106	B5	Bridge,On-sys	776.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
107	B5	Bridge,On-sys	806.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
108	B6	Bridge,On-sys	808.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
109	B6	Bridge,Off-sys	781.1	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	0.0	0.0	0.0
110	B6	Bridge,Off-sys	778.4	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	0.0	0.0
111	B6	Bridge,Off-sys	773.1	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	0.0	0.0	0.0
112	B6	Bridge,Off-sys	768.6	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	0.0	0.0	0.0
113	B6	Bridge,Off-sys	773.9	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	0.0	0.0	0.0
114	C2	Bridge,Off-sys	786.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
115	C3	Bridge,Off-sys	772.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
116	C3	Bridge,On-sys	809.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
117	C3	Bridge,Off-sys	763.3	6.1	6.2	6.2	6.2	6.2	6.2	6.3	6.3	6.3	6.5	6.6	0.1	0.5	0.5
118	C3	Bridge,Off-sys	778.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
SEPTEMBER 1993 INFLOW EVENT (21-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.											Anticipated Operational Range Depth Difference ² (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft	757.0 ft		
119	C3	Bridge,On-sys	789.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
120	C3	Bridge,Off-sys	765.7	3.6	3.7	3.7	3.7	3.7	3.7	3.8	3.8	3.8	4.0	4.1	0.1	0.5
121	C3	Bridge,Off-sys	770.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
122	C3	Bridge,Off-sys	774.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
123	C3	Bridge,Off-sys	792.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
124	C4	Bridge,On-sys	784.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125	C4, C4-1	Bridge,On-sys	810.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
126	C4	Bridge,Off-sys	772.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
127	C4	Bridge,Off-sys	746.7	14.9	15.0	15.0	15.0	15.0	15.0	15.0	15.1	15.2	15.6	15.9	0.1	1.0
128	C4	Bridge,Off-sys	775.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
129	C4	Bridge,On-sys	765.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
130	C4	Bridge,Off-sys	771.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
131	C4	Church	793.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
132	C4	Bridge,Off-sys	772.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
133	C4	Bridge,Off-sys	775.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
134	C4	Bridge,Off-sys	769.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
135	C5	Bridge,Off-sys	780.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
136	C5	Park	806.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
137	C5	Bridge,Off-sys	766.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
138	C5	Bridge,On-sys	765.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
139	C5	Park	748.4	12.3	12.4	12.4	12.4	12.4	12.4	12.5	12.5	12.6	13.0	13.3	0.1	1.0
140	C6	Bridge,Off-sys	753.9	10.5	10.5	10.5	10.5	10.6	10.6	10.6	10.6	10.7	11.0	11.3	0.1	0.8
141	C6	Law Enforcement	773.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
142	C6	Bridge,On-sys	778.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
143	C6	Bridge,On-sys	763.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
144	C6	Bridge,On-sys	795.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
145	C6	School	784.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
146	C6	Bridge,Off-sys	763.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
147	C6	Bridge,On-sys	765.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
148	C6	Fire Station	761.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
149	C6	Church	759.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
150	C6	School	754.9	1.9	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.3	3.1	3.8	0.1	1.9
151	C6	School	759.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
152	C6	Shelter - Both	761.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
153	C6	School	759.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
154	C6	Bridge,RR	758.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
155	C6	WW Treatment	777.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
156	D5	Bridge,On-sys	774.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
157	D5	Bridge,Off-sys	769.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
SEPTEMBER 1993 INFLOW EVENT (21-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.											Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft	757.0 ft		
158	D5	Bridge,Off-sys	763.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
159	D6	Bridge,On-sys	774.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
160	D6	Bridge,On-sys	770.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
161	D6	Bridge,On-sys	773.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
162	D6	Bridge,On-sys	763.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
163	D6	Bridge,On-sys	764.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
164	D6	Bridge,On-sys	768.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
165	E3	Bridge,On-sys	773.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
166	E3	Bridge,Off-sys	751.3	2.9	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	5.8	0.0	2.9
167	E3	Park	751.9	2.2	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	5.1	0.0	2.9
168	E5	Fire Station	770.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
169	E5	Bridge,Off-sys	756.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
170	E5	Substation	766.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
171	E5	Bridge,On-sys	804.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
172	E5	Church	766.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
173	E6	Bridge,On-sys	772.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
174	F3	Bridge,On-sys	756.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.7
175	F3	Airport	751.3	2.8	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	5.7	0.0	2.9
176	F3	Fire Station	766.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
177	F3	Airport	770.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
178	F4	Airport	759.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
179	F5	Bridge,Off-sys	768.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
180	F5	WW Treatment	798.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
181	F5	Park	749.3	4.8	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	7.7	0.0	2.9
182	F5	Church	758.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
183	F5	Bridge,Off-sys	759.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
184	F5	Church	760.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
185	F5	Park	749.4	4.8	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	7.7	0.0	2.9
186	F5	Fire Station	761.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
187	F5	Bridge,Off-sys	760.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
188	F5	Church	759.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
189	F5	Church	775.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
190	F5	Law Enforcement	772.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
191	F5	Bridge,On-sys	766.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
192	F5	Shelter - Both	783.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
193	F5	Shelter - Both	836.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
194	F5	Water Treatment	771.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
195	F5	Bridge,On-sys	767.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
196	F5	Shelter - Evac Only	768.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
SEPTEMBER 1993 INFLOW EVENT (21-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.											Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)	
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft	757.0 ft			
197	F5	Bridge,Off-sys	770.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
198	F5	Bridge,Off-sys	769.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
199	F5	Park	812.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
200	F5	Bridge,On-sys	769.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
201	G2	Bridge,Off-sys	757.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
202	G2	Bridge,Off-sys	766.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
203	G2	Bridge,On-sys	756.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2
204	G2	Shelter - Evac Only	761.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
205	G3	Fire Station	798.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
206	G3	Airport	721.1	33.1	33.8	33.8	33.8	33.8	33.8	33.8	33.8	33.8	33.8	36.0	0.0	0.0	2.9
207	G4	Bridge,Off-sys	763.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
208	G4	Bridge,Off-sys	761.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
209	G4	Church	767.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
210	G5	Airport	915.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
211	G6	Bridge,Off-sys	757.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
212	H1	Park	806.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
213	H2	Airport	815.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
214	H2	Airport	771.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
215	H2	Park	767.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
216	H2	Bridge,On-sys	757.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
217	H2	Bridge,On-sys	757.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
218	H2	Fire Station	793.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
219	H2	Park	769.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
220	H2	Fire Station	786.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
221	H2	Law Enforcement	786.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
222	H2	Law Enforcement	799.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
223	H2	Bridge,On-sys	757.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
224	H2	Substation	764.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
225	H2	Power Plant	764.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
226	H2	Substation	783.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
227	H2	Substation	778.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
228	H4	Bridge,Off-sys	758.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
JUNE 2004 INFLOW EVENT (1-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.											Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft	757.0 ft		
1	A1	Bridge,Off-sys	782.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	A2	Church	789.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	A2	Bridge,Off-sys	783.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	A2	Bridge,Off-sys	772.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	A3	Bridge,Off-sys	782.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	A3	Bridge,Off-sys	783.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	A5	Bridge,Off-sys	769.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	A6	Bridge,Off-sys	797.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	A6	Bridge,Off-sys	787.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	A6	Bridge,Off-sys	796.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	A6	Bridge,Off-sys	781.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	A6	Bridge,Off-sys	780.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	A6	Park	776.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	A6	Bridge,Off-sys	800.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	A6	Bridge,Off-sys	794.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	A6	Bridge,Off-sys	779.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	B2	Bridge,Off-sys	766.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	B2	Bridge,Off-sys	765.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	B2	Bridge,Off-sys	770.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	B2	Bridge,Off-sys	786.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	B2	Bridge,Off-sys	781.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	B2	Bridge,Off-sys	785.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	B2	Bridge,On-sys	796.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	B2	Bridge,On-sys	790.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	B2	Bridge,On-sys	795.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	B2	Bridge,On-sys	779.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	B2	School	788.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	B2	Church	788.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	B3	Bridge,Off-sys	773.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	B3	Bridge,Off-sys	778.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	B3	Bridge,Off-sys	779.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	B3	Bridge,Off-sys	767.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33	B3	Bridge,Off-sys	793.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	B3	Bridge,Off-sys	775.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35	B3, B3-4	Church	780.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36	B3	Bridge,Off-sys	764.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37	B3	Bridge,On-sys	778.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38	B3, B3-4	Bridge,On-sys	764.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39	B4, B4-1	Park	789.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
JUNE 2004 INFLOW EVENT (1-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.											Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft	757.0 ft		
40	B4, B4-1	Shelter - Evac Only	781.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41	B4, B4-1	Church	788.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
42	B4, B4-1	Church	792.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
43	B4, B4-1	Bridge,Off-sys	781.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
44	B4, B4-1	Bridge,Off-sys	788.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45	B4, B4-1	Church	788.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
46	B4, B4-1	School	781.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
47	B4, B4-3	Park	770.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
48	B4, B4-3	Bridge,On-sys	779.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
49	B4, B4-3	Bridge,Off-sys	769.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50	B4, B4-3	Bridge,Off-sys	776.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
51	B4, B4-3	Fire Station	788.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	B4, B4-4	Church	787.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
53	B4, B4-3	Church	778.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
54	B4, B4-4	Bridge,Off-sys	783.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55	B4, B4-4	Bridge,Off-sys	785.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
56	B4, B4-3	Cell Tower	769.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
57	B4, B4-3	Bridge,Off-sys	765.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
58	B4, B4-3	Cell Tower	787.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
59	B4, B4-3	Church	778.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60	B4, B4-3	Church	794.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
61	B4, B4-3	School	796.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
62	B4, B4-3	Church	795.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
63	B4, B4-3	Church	792.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
64	B4, B4-3	School	768.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65	B4, B4-3	Law Enforcement	775.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
66	B4, B4-3	School	781.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
67	B4, B4-3	Church	786.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
68	B4, B4-3	Church	793.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70	B4, B4-3	Church	784.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
71	B4, B4-3	School	784.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
72	B4, B4-3	Church	787.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
73	B4, B4-3	Bridge,Off-sys	771.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
74	B4, B4-3	Church	785.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
75	B4, B4-3	Church	791.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
76	B4, B4-3	Shelter - Evac Only	794.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
77	B4, B4-4	School	788.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
78	B4, B4-3	Church	794.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
79	B4, B4-3	Church	791.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
JUNE 2004 INFLOW EVENT (1-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.											Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft	757.0 ft		
80	B4, B4-3	Hospital	788.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
81	B4, B4-3	Hospital	789.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
82	B4, B4-3	Church	791.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
83	B4, B4-4	Law Enforcement	783.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
84	B4, B4-3	Church	774.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
85	B4, B4-3	Airport	784.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
86	B4, B4-4	Bridge,On-sys	765.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
87	B4, B4-4	Bridge,On-sys	808.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
88	B4, B4-3	Bridge,On-sys	764.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
89	B4, B4-3	Shelter - Evac Only	780.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
90	B4, B4-3	Church	780.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
91	B4, B4-3	Bridge,On-sys	782.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
92	B4, B4-3	School	780.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
93	B4, B4-3	School	769.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
94	B4, B4-3	Park	766.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
95	B4, B4-3	Substation	774.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
96	B4, B4-3	Substation	777.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
97	B4, B4-4	Bridge,Off-sys	755.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	1.5
98	B4, B4-3	Fire Station	771.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
99	B4, B4-3	Bridge,RR	771.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100	B4, B4-4	Bridge,On-sys	801.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
101	B4, B4-3	Bridge,On-sys	776.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
102	B4, B4-3	Park	760.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
103	B4, B4-3	Park	754.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	2.9	2.9
104	B4, B4-3	WW Treatment	773.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
105	B4, B4-3	Park	759.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
106	B5	Bridge,On-sys	776.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
107	B5	Bridge,On-sys	806.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
108	B6	Bridge,On-sys	808.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
109	B6	Bridge,Off-sys	781.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
110	B6	Bridge,Off-sys	778.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
111	B6	Bridge,Off-sys	773.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
112	B6	Bridge,Off-sys	768.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
113	B6	Bridge,Off-sys	773.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
114	C2	Bridge,Off-sys	786.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
115	C3	Bridge,Off-sys	772.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
116	C3	Bridge,On-sys	809.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
117	C3	Bridge,Off-sys	763.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
118	C3	Bridge,Off-sys	778.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
JUNE 2004 INFLOW EVENT (1-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.											Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft	757.0 ft		
119	C3	Bridge,On-sys	789.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
120	C3	Bridge,Off-sys	765.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
121	C3	Bridge,Off-sys	770.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
122	C3	Bridge,Off-sys	774.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
123	C3	Bridge,Off-sys	792.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
124	C4	Bridge,On-sys	784.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125	C4, C4-1	Bridge,On-sys	810.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
126	C4	Bridge,Off-sys	772.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
127	C4	Bridge,Off-sys	746.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	6.3	10.3	0.0	10.3
128	C4	Bridge,Off-sys	775.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
129	C4	Bridge,On-sys	765.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
130	C4	Bridge,Off-sys	771.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
131	C4	Church	793.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
132	C4	Bridge,Off-sys	772.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
133	C4	Bridge,Off-sys	775.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
134	C4	Bridge,Off-sys	769.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
135	C5	Bridge,Off-sys	780.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
136	C5	Park	806.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
137	C5	Bridge,Off-sys	766.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
138	C5	Bridge,On-sys	765.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
139	C5	Park	748.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	4.6	8.6	0.0	8.6
140	C6	Bridge,Off-sys	753.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2	0.0	3.2
141	C6	Law Enforcement	773.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
142	C6	Bridge,On-sys	778.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
143	C6	Bridge,On-sys	763.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
144	C6	Bridge,On-sys	795.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
145	C6	School	784.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
146	C6	Bridge,Off-sys	763.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
147	C6	Bridge,On-sys	765.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
148	C6	Fire Station	761.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
149	C6	Church	759.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
150	C6	School	754.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	0.0	2.1
151	C6	School	759.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
152	C6	Shelter - Both	761.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
153	C6	School	759.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
154	C6	Bridge,RR	758.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
155	C6	WW Treatment	777.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
156	D5	Bridge,On-sys	774.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
157	D5	Bridge,Off-sys	769.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
JUNE 2004 INFLOW EVENT (1-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.											Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft	757.0 ft		
158	D5	Bridge,Off-sys	763.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
159	D6	Bridge,On-sys	774.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
160	D6	Bridge,On-sys	770.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
161	D6	Bridge,On-sys	773.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
162	D6	Bridge,On-sys	763.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
163	D6	Bridge,On-sys	764.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
164	D6	Bridge,On-sys	768.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
165	E3	Bridge,On-sys	773.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
166	E3	Bridge,Off-sys	751.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	5.8	0.0	5.8
167	E3	Park	751.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	5.1	0.0	5.1
168	E5	Fire Station	770.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
169	E5	Bridge,Off-sys	756.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
170	E5	Substation	766.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
171	E5	Bridge,On-sys	804.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
172	E5	Church	766.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
173	E6	Bridge,On-sys	772.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
174	F3	Bridge,On-sys	756.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.7
175	F3	Airport	751.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	5.7	0.0	5.7
176	F3	Fire Station	766.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
177	F3	Airport	770.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
178	F4	Airport	759.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
179	F5	Bridge,Off-sys	768.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
180	F5	WW Treatment	798.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
181	F5	Park	749.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7	7.7	0.0	7.7
182	F5	Church	758.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
183	F5	Bridge,Off-sys	759.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
184	F5	Church	760.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
185	F5	Park	749.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7	7.7	0.0	7.7
186	F5	Fire Station	761.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
187	F5	Bridge,Off-sys	760.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
188	F5	Church	759.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
189	F5	Church	775.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
190	F5	Law Enforcement	772.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
191	F5	Bridge,On-sys	766.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
192	F5	Shelter - Both	783.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
193	F5	Shelter - Both	836.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
194	F5	Water Treatment	771.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
195	F5	Bridge,On-sys	767.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
196	F5	Shelter - Evac Only	768.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
JUNE 2004 INFLOW EVENT (1-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.										Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)	
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft			757.0 ft
197	F5	Bridge,Off-sys	770.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
198	F5	Bridge,Off-sys	769.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
199	F5	Park	812.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
200	F5	Bridge,On-sys	769.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
201	G2	Bridge,Off-sys	757.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
202	G2	Bridge,Off-sys	766.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
203	G2	Bridge,On-sys	756.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2
204	G2	Shelter - Evac Only	761.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
205	G3	Fire Station	798.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
206	G3	Airport	721.1	23.2	23.6	23.6	23.7	23.8	23.8	23.7	24.0	28.0	32.0	36.0	0.4	12.8
207	G4	Bridge,Off-sys	763.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
208	G4	Bridge,Off-sys	761.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
209	G4	Church	767.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
210	G5	Airport	915.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
211	G6	Bridge,Off-sys	757.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
212	H1	Park	806.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
213	H2	Airport	815.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
214	H2	Airport	771.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
215	H2	Park	767.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
216	H2	Bridge,On-sys	757.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
217	H2	Bridge,On-sys	757.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
218	H2	Fire Station	793.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
219	H2	Park	769.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
220	H2	Fire Station	786.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
221	H2	Law Enforcement	786.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
222	H2	Law Enforcement	799.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
223	H2	Bridge,On-sys	757.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
224	H2	Substation	764.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
225	H2	Power Plant	764.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
226	H2	Substation	783.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
227	H2	Substation	778.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
228	H4	Bridge,Off-sys	758.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
JULY 2007 INFLOW EVENT (4-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.											Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft	757.0 ft		
1	A1	Bridge,Off-sys	782.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	A2	Church	789.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	A2	Bridge,Off-sys	783.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	A2	Bridge,Off-sys	772.4	5.0	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	0.0	0.1
5	A3	Bridge,Off-sys	782.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	A3	Bridge,Off-sys	783.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	A5	Bridge,Off-sys	769.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	A6	Bridge,Off-sys	797.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	A6	Bridge,Off-sys	787.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	A6	Bridge,Off-sys	796.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	A6	Bridge,Off-sys	781.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	A6	Bridge,Off-sys	780.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	A6	Park	776.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	A6	Bridge,Off-sys	800.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	A6	Bridge,Off-sys	794.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	A6	Bridge,Off-sys	779.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	B2	Bridge,Off-sys	766.6	9.0	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	0.0	0.1
18	B2	Bridge,Off-sys	765.8	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.8	9.8	9.8	0.0	0.1
19	B2	Bridge,Off-sys	770.7	4.4	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.6	0.0	0.2
20	B2	Bridge,Off-sys	786.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	B2	Bridge,Off-sys	781.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	B2	Bridge,Off-sys	785.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	B2	Bridge,On-sys	796.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	B2	Bridge,On-sys	790.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	B2	Bridge,On-sys	795.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	B2	Bridge,On-sys	779.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	B2	School	788.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	B2	Church	788.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	B3	Bridge,Off-sys	773.8	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	0.0	0.1
30	B3	Bridge,Off-sys	778.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	B3	Bridge,Off-sys	779.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	B3	Bridge,Off-sys	767.8	7.8	7.8	7.9	7.9	7.9	7.8	7.8	7.9	7.9	7.9	7.9	0.1	0.1
33	B3	Bridge,Off-sys	793.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	B3	Bridge,Off-sys	775.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35	B3, B3-4	Church	780.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36	B3	Bridge,Off-sys	764.3	10.1	10.1	10.2	10.2	10.2	10.1	10.1	10.2	10.2	10.2	10.3	0.1	0.2
37	B3	Bridge,On-sys	778.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38	B3, B3-4	Bridge,On-sys	764.2	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.2	10.2	10.2	0.0	0.1
39	B4, B4-1	Park	789.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
JULY 2007 INFLOW EVENT (4-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.											Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)	
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft	757.0 ft			
40	B4, B4-1	Shelter - Evac Only	781.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
41	B4, B4-1	Church	788.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
42	B4, B4-1	Church	792.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
43	B4, B4-1	Bridge,Off-sys	781.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
44	B4, B4-1	Bridge,Off-sys	788.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
45	B4, B4-1	Church	788.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
46	B4, B4-1	School	781.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
47	B4, B4-3	Park	770.4	1.5	1.6	1.7	1.7	1.7	1.6	1.7	1.7	1.7	1.7	1.8	1.8	0.1	0.3
48	B4, B4-3	Bridge,On-sys	779.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
49	B4, B4-3	Bridge,Off-sys	769.7	2.1	2.2	2.3	2.3	2.3	2.2	2.3	2.3	2.3	2.3	2.4	2.4	0.1	0.3
50	B4, B4-3	Bridge,Off-sys	776.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
51	B4, B4-3	Fire Station	788.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	B4, B4-4	Church	787.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
53	B4, B4-3	Church	778.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
54	B4, B4-4	Bridge,Off-sys	783.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55	B4, B4-4	Bridge,Off-sys	785.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
56	B4, B4-3	Cell Tower	769.9	1.9	2.0	2.1	2.1	2.1	2.0	2.1	2.1	2.1	2.1	2.2	2.2	0.1	0.3
57	B4, B4-3	Bridge,Off-sys	765.2	6.7	6.8	6.9	6.9	6.9	6.8	6.9	6.9	6.9	6.9	7.0	7.0	0.1	0.3
58	B4, B4-3	Cell Tower	787.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
59	B4, B4-3	Church	778.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60	B4, B4-3	Church	794.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
61	B4, B4-3	School	796.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
62	B4, B4-3	Church	795.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
63	B4, B4-3	Church	792.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
64	B4, B4-3	School	768.7	3.2	3.3	3.4	3.4	3.4	3.3	3.4	3.4	3.4	3.4	3.5	3.5	0.1	0.3
65	B4, B4-3	Law Enforcement	775.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
66	B4, B4-3	School	781.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
67	B4, B4-3	Church	786.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
68	B4, B4-3	Church	793.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70	B4, B4-3	Church	784.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
71	B4, B4-3	School	784.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
72	B4, B4-3	Church	787.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
73	B4, B4-3	Bridge,Off-sys	771.4	0.4	0.5	0.6	0.6	0.6	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.1	0.3
74	B4, B4-3	Church	785.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
75	B4, B4-3	Church	791.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
76	B4, B4-3	Shelter - Evac Only	794.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
77	B4, B4-4	School	788.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
78	B4, B4-3	Church	794.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
79	B4, B4-3	Church	791.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
JULY 2007 INFLOW EVENT (4-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.											Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft	757.0 ft		
80	B4, B4-3	Hospital	788.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
81	B4, B4-3	Hospital	789.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
82	B4, B4-3	Church	791.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
83	B4, B4-4	Law Enforcement	783.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
84	B4, B4-3	Church	774.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
85	B4, B4-3	Airport	784.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
86	B4, B4-4	Bridge,On-sys	765.9	4.7	4.7	4.8	4.8	4.8	4.7	4.8	4.9	4.9	4.9	5.0	0.2	0.3
87	B4, B4-4	Bridge,On-sys	808.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
88	B4, B4-3	Bridge,On-sys	764.3	7.5	7.6	7.7	7.7	7.7	7.6	7.7	7.7	7.7	7.8	7.8	0.1	0.3
89	B4, B4-3	Shelter - Evac Only	780.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
90	B4, B4-3	Church	780.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
91	B4, B4-3	Bridge,On-sys	782.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
92	B4, B4-3	School	780.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
93	B4, B4-3	School	769.8	2.8	2.8	2.9	2.9	2.9	2.9	2.9	2.9	3.0	3.0	3.0	0.1	0.2
94	B4, B4-3	Park	766.1	5.7	5.8	5.9	5.9	5.9	5.8	5.9	5.9	6.0	6.0	6.0	0.1	0.3
95	B4, B4-3	Substation	774.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
96	B4, B4-3	Substation	777.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
97	B4, B4-4	Bridge,Off-sys	755.6	15.1	15.1	15.2	15.2	15.2	15.1	15.2	15.3	15.3	15.3	15.4	0.2	0.3
98	B4, B4-3	Fire Station	771.6	1.6	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.9	0.1	0.3
99	B4, B4-3	Bridge,RR	771.6	1.6	1.6	1.7	1.7	1.7	1.6	1.7	1.7	1.7	1.8	1.8	0.1	0.2
100	B4, B4-4	Bridge,On-sys	801.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
101	B4, B4-3	Bridge,On-sys	776.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
102	B4, B4-3	Park	760.8	12.3	12.3	12.4	12.4	12.4	12.3	12.4	12.4	12.4	12.5	12.5	0.1	0.2
103	B4, B4-3	Park	754.1	18.9	18.9	19.0	19.0	19.0	18.9	19.0	19.0	19.0	19.1	19.1	0.1	0.2
104	B4, B4-3	WW Treatment	773.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
105	B4, B4-3	Park	759.6	13.5	13.5	13.6	13.6	13.6	13.5	13.5	13.6	13.6	13.6	13.7	0.1	0.2
106	B5	Bridge,On-sys	776.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
107	B5	Bridge,On-sys	806.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
108	B6	Bridge,On-sys	808.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
109	B6	Bridge,Off-sys	781.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
110	B6	Bridge,Off-sys	778.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
111	B6	Bridge,Off-sys	773.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
112	B6	Bridge,Off-sys	768.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
113	B6	Bridge,Off-sys	773.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
114	C2	Bridge,Off-sys	786.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
115	C3	Bridge,Off-sys	772.2	2.3	2.3	2.4	2.4	2.4	2.3	2.3	2.4	2.4	2.4	2.5	0.1	0.2
116	C3	Bridge,On-sys	809.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
117	C3	Bridge,Off-sys	763.3	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.2	11.2	11.2	0.0	0.1
118	C3	Bridge,Off-sys	778.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
JULY 2007 INFLOW EVENT (4-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.											Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft	757.0 ft		
119	C3	Bridge,On-sys	789.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
120	C3	Bridge,Off-sys	765.7	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.7	8.7	8.7	0.0	0.1
121	C3	Bridge,Off-sys	770.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.8	3.8	3.8	0.0	0.1
122	C3	Bridge,Off-sys	774.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
123	C3	Bridge,Off-sys	792.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
124	C4	Bridge,On-sys	784.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125	C4, C4-1	Bridge,On-sys	810.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
126	C4	Bridge,Off-sys	772.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
127	C4	Bridge,Off-sys	746.7	17.8	17.8	18.3	18.3	18.3	18.0	18.3	18.3	18.4	18.4	18.5	0.5	0.7
128	C4	Bridge,Off-sys	775.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
129	C4	Bridge,On-sys	765.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
130	C4	Bridge,Off-sys	771.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
131	C4	Church	793.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
132	C4	Bridge,Off-sys	772.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
133	C4	Bridge,Off-sys	775.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
134	C4	Bridge,Off-sys	769.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
135	C5	Bridge,Off-sys	780.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
136	C5	Park	806.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
137	C5	Bridge,Off-sys	766.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
138	C5	Bridge,On-sys	765.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
139	C5	Park	748.4	7.1	7.8	8.9	8.9	8.9	8.2	8.9	8.9	8.9	8.9	9.0	1.1	1.9
140	C6	Bridge,Off-sys	753.9	1.7	2.4	3.5	3.5	3.5	2.8	3.5	3.5	3.5	3.6	3.6	1.1	1.9
141	C6	Law Enforcement	773.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
142	C6	Bridge,On-sys	778.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
143	C6	Bridge,On-sys	763.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
144	C6	Bridge,On-sys	795.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
145	C6	School	784.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
146	C6	Bridge,Off-sys	763.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
147	C6	Bridge,On-sys	765.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
148	C6	Fire Station	761.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
149	C6	Church	759.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
150	C6	School	754.9	0.0	0.6	1.4	1.4	1.4	1.0	1.4	1.4	1.4	1.4	2.1	0.8	2.1
151	C6	School	759.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
152	C6	Shelter - Both	761.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
153	C6	School	759.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
154	C6	Bridge,RR	758.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
155	C6	WW Treatment	777.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
156	D5	Bridge,On-sys	774.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
157	D5	Bridge,Off-sys	769.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
JULY 2007 INFLOW EVENT (4-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.											Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft	757.0 ft		
158	D5	Bridge,Off-sys	763.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
159	D6	Bridge,On-sys	774.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
160	D6	Bridge,On-sys	770.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
161	D6	Bridge,On-sys	773.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
162	D6	Bridge,On-sys	763.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
163	D6	Bridge,On-sys	764.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
164	D6	Bridge,On-sys	768.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
165	E3	Bridge,On-sys	773.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
166	E3	Bridge,Off-sys	751.3	2.8	3.0	3.6	3.6	3.6	3.5	3.6	3.6	3.6	3.6	5.8	0.6	3.0
167	E3	Park	751.9	2.1	2.3	2.9	2.9	2.9	2.8	2.9	2.9	2.9	2.9	5.1	0.6	3.0
168	E5	Fire Station	770.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
169	E5	Bridge,Off-sys	756.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
170	E5	Substation	766.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
171	E5	Bridge,On-sys	804.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
172	E5	Church	766.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
173	E6	Bridge,On-sys	772.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
174	F3	Bridge,On-sys	756.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.7
175	F3	Airport	751.3	2.7	2.9	3.5	3.5	3.5	3.4	3.5	3.5	3.5	3.5	5.7	0.6	3.0
176	F3	Fire Station	766.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
177	F3	Airport	770.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
178	F4	Airport	759.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
179	F5	Bridge,Off-sys	768.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
180	F5	WW Treatment	798.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
181	F5	Park	749.3	4.7	5.0	5.5	5.5	5.5	5.4	5.5	5.5	5.5	5.5	7.7	0.5	3.0
182	F5	Church	758.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
183	F5	Bridge,Off-sys	759.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
184	F5	Church	760.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
185	F5	Park	749.4	4.7	5.0	5.5	5.5	5.5	5.4	5.5	5.5	5.5	5.5	7.7	0.5	3.0
186	F5	Fire Station	761.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
187	F5	Bridge,Off-sys	760.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
188	F5	Church	759.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
189	F5	Church	775.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
190	F5	Law Enforcement	772.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
191	F5	Bridge,On-sys	766.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
192	F5	Shelter - Both	783.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
193	F5	Shelter - Both	836.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
194	F5	Water Treatment	771.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
195	F5	Bridge,On-sys	767.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
196	F5	Shelter - Evac Only	768.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
JULY 2007 INFLOW EVENT (4-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.											Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)	
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft	757.0 ft			
197	F5	Bridge,Off-sys	770.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
198	F5	Bridge,Off-sys	769.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
199	F5	Park	812.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
200	F5	Bridge,On-sys	769.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
201	G2	Bridge,Off-sys	757.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
202	G2	Bridge,Off-sys	766.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
203	G2	Bridge,On-sys	756.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2
204	G2	Shelter - Evac Only	761.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
205	G3	Fire Station	798.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
206	G3	Airport	721.1	33.0	33.2	33.8	33.8	33.8	33.7	33.8	33.8	33.8	33.8	36.0	0.6	3.0	3.0
207	G4	Bridge,Off-sys	763.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
208	G4	Bridge,Off-sys	761.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
209	G4	Church	767.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
210	G5	Airport	915.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
211	G6	Bridge,Off-sys	757.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
212	H1	Park	806.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
213	H2	Airport	815.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
214	H2	Airport	771.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
215	H2	Park	767.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
216	H2	Bridge,On-sys	757.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
217	H2	Bridge,On-sys	757.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
218	H2	Fire Station	793.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
219	H2	Park	769.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
220	H2	Fire Station	786.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
221	H2	Law Enforcement	786.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
222	H2	Law Enforcement	799.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
223	H2	Bridge,On-sys	757.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
224	H2	Substation	764.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
225	H2	Power Plant	764.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
226	H2	Substation	783.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
227	H2	Substation	778.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
228	H4	Bridge,Off-sys	758.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
OCTOBER 2009 INFLOW EVENT (3-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.											Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft	757.0 ft		
1	A1	Bridge,Off-sys	782.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	A2	Church	789.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	A2	Bridge,Off-sys	783.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	A2	Bridge,Off-sys	772.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.0	0.0
5	A3	Bridge,Off-sys	782.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	A3	Bridge,Off-sys	783.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	A5	Bridge,Off-sys	769.7	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	0.0	0.0
8	A6	Bridge,Off-sys	797.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	A6	Bridge,Off-sys	787.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	A6	Bridge,Off-sys	796.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	A6	Bridge,Off-sys	781.3	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	0.0	0.0
12	A6	Bridge,Off-sys	780.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	0.0	0.0
13	A6	Park	776.0	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.2	0.0	0.1
14	A6	Bridge,Off-sys	800.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	A6	Bridge,Off-sys	794.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	A6	Bridge,Off-sys	779.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	B2	Bridge,Off-sys	766.6	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	0.0	0.0
18	B2	Bridge,Off-sys	765.8	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	0.0	0.0
19	B2	Bridge,Off-sys	770.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	B2	Bridge,Off-sys	786.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	B2	Bridge,Off-sys	781.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	B2	Bridge,Off-sys	785.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	B2	Bridge,On-sys	796.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	B2	Bridge,On-sys	790.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	B2	Bridge,On-sys	795.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	B2	Bridge,On-sys	779.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	B2	School	788.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	B2	Church	788.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	B3	Bridge,Off-sys	773.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	B3	Bridge,Off-sys	778.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	B3	Bridge,Off-sys	779.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	B3	Bridge,Off-sys	767.8	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
33	B3	Bridge,Off-sys	793.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	B3	Bridge,Off-sys	775.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35	B3, B3-4	Church	780.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36	B3	Bridge,Off-sys	764.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37	B3	Bridge,On-sys	778.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38	B3, B3-4	Bridge,On-sys	764.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39	B4, B4-1	Park	789.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM

GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
OCTOBER 2009 INFLOW EVENT (3-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.											Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft	757.0 ft		
40	B4, B4-1	Shelter - Evac Only	781.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41	B4, B4-1	Church	788.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
42	B4, B4-1	Church	792.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
43	B4, B4-1	Bridge,Off-sys	781.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
44	B4, B4-1	Bridge,Off-sys	788.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45	B4, B4-1	Church	788.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
46	B4, B4-1	School	781.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
47	B4, B4-3	Park	770.4	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.0	0.0
48	B4, B4-3	Bridge,On-sys	779.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
49	B4, B4-3	Bridge,Off-sys	769.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50	B4, B4-3	Bridge,Off-sys	776.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
51	B4, B4-3	Fire Station	788.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	B4, B4-4	Church	787.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
53	B4, B4-3	Church	778.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
54	B4, B4-4	Bridge,Off-sys	783.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55	B4, B4-4	Bridge,Off-sys	785.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
56	B4, B4-3	Cell Tower	769.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
57	B4, B4-3	Bridge,Off-sys	765.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
58	B4, B4-3	Cell Tower	787.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
59	B4, B4-3	Church	778.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60	B4, B4-3	Church	794.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
61	B4, B4-3	School	796.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
62	B4, B4-3	Church	795.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
63	B4, B4-3	Church	792.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
64	B4, B4-3	School	768.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65	B4, B4-3	Law Enforcement	775.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
66	B4, B4-3	School	781.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
67	B4, B4-3	Church	786.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
68	B4, B4-3	Church	793.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70	B4, B4-3	Church	784.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
71	B4, B4-3	School	784.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
72	B4, B4-3	Church	787.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
73	B4, B4-3	Bridge,Off-sys	771.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
74	B4, B4-3	Church	785.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
75	B4, B4-3	Church	791.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
76	B4, B4-3	Shelter - Evac Only	794.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
77	B4, B4-4	School	788.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
78	B4, B4-3	Church	794.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
79	B4, B4-3	Church	791.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
OCTOBER 2009 INFLOW EVENT (3-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.											Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft	757.0 ft		
80	B4, B4-3	Hospital	788.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
81	B4, B4-3	Hospital	789.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
82	B4, B4-3	Church	791.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
83	B4, B4-4	Law Enforcement	783.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
84	B4, B4-3	Church	774.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
85	B4, B4-3	Airport	784.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
86	B4, B4-4	Bridge,On-sys	765.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
87	B4, B4-4	Bridge,On-sys	808.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
88	B4, B4-3	Bridge,On-sys	764.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
89	B4, B4-3	Shelter - Evac Only	780.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
90	B4, B4-3	Church	780.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
91	B4, B4-3	Bridge,On-sys	782.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
92	B4, B4-3	School	780.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
93	B4, B4-3	School	769.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
94	B4, B4-3	Park	766.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
95	B4, B4-3	Substation	774.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
96	B4, B4-3	Substation	777.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
97	B4, B4-4	Bridge,Off-sys	755.6	1.5	2.0	1.9	2.0	2.0	2.0	2.0	2.1	2.3	3.2	4.0	0.2	2.5
98	B4, B4-3	Fire Station	771.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
99	B4, B4-3	Bridge,RR	771.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100	B4, B4-4	Bridge,On-sys	801.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
101	B4, B4-3	Bridge,On-sys	776.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
102	B4, B4-3	Park	760.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.7	0.0	0.7
103	B4, B4-3	Park	754.1	5.6	5.9	5.9	5.9	5.9	5.9	5.9	6.0	6.1	6.7	7.3	0.1	1.7
104	B4, B4-3	WW Treatment	773.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
105	B4, B4-3	Park	759.6	0.2	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.7	1.2	1.8	0.1	1.6
106	B5	Bridge,On-sys	776.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
107	B5	Bridge,On-sys	806.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
108	B6	Bridge,On-sys	808.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
109	B6	Bridge,Off-sys	781.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
110	B6	Bridge,Off-sys	778.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
111	B6	Bridge,Off-sys	773.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
112	B6	Bridge,Off-sys	768.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
113	B6	Bridge,Off-sys	773.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
114	C2	Bridge,Off-sys	786.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
115	C3	Bridge,Off-sys	772.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
116	C3	Bridge,On-sys	809.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
117	C3	Bridge,Off-sys	763.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
118	C3	Bridge,Off-sys	778.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
OCTOBER 2009 INFLOW EVENT (3-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.											Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft	757.0 ft		
119	C3	Bridge,On-sys	789.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
120	C3	Bridge,Off-sys	765.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
121	C3	Bridge,Off-sys	770.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
122	C3	Bridge,Off-sys	774.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
123	C3	Bridge,Off-sys	792.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
124	C4	Bridge,On-sys	784.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125	C4, C4-1	Bridge,On-sys	810.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
126	C4	Bridge,Off-sys	772.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
127	C4	Bridge,Off-sys	746.7	5.9	6.5	6.5	6.7	6.6	6.7	6.6	6.9	7.5	9.1	10.5	0.4	4.6
128	C4	Bridge,Off-sys	775.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
129	C4	Bridge,On-sys	765.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
130	C4	Bridge,Off-sys	771.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
131	C4	Church	793.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
132	C4	Bridge,Off-sys	772.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
133	C4	Bridge,Off-sys	775.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
134	C4	Bridge,Off-sys	769.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
135	C5	Bridge,Off-sys	780.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
136	C5	Park	806.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
137	C5	Bridge,Off-sys	766.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
138	C5	Bridge,On-sys	765.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
139	C5	Park	748.4	2.5	3.3	3.2	3.5	3.4	3.5	3.4	3.7	4.5	6.4	8.8	0.5	6.3
140	C6	Bridge,Off-sys	753.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	3.4	0.0	3.4
141	C6	Law Enforcement	773.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
142	C6	Bridge,On-sys	778.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
143	C6	Bridge,On-sys	763.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
144	C6	Bridge,On-sys	795.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
145	C6	School	784.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
146	C6	Bridge,Off-sys	763.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
147	C6	Bridge,On-sys	765.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
148	C6	Fire Station	761.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
149	C6	Church	759.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
150	C6	School	754.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	0.0	2.3
151	C6	School	759.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
152	C6	Shelter - Both	761.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
153	C6	School	759.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
154	C6	Bridge,RR	758.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
155	C6	WW Treatment	777.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
156	D5	Bridge,On-sys	774.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
157	D5	Bridge,Off-sys	769.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
OCTOBER 2009 INFLOW EVENT (3-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.											Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft	757.0 ft		
158	D5	Bridge,Off-sys	763.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
159	D6	Bridge,On-sys	774.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
160	D6	Bridge,On-sys	770.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
161	D6	Bridge,On-sys	773.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
162	D6	Bridge,On-sys	763.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
163	D6	Bridge,On-sys	764.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
164	D6	Bridge,On-sys	768.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
165	E3	Bridge,On-sys	773.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
166	E3	Bridge,Off-sys	751.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	2.3	5.8	0.0	5.8
167	E3	Park	751.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	1.6	5.1	0.0	5.1
168	E5	Fire Station	770.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
169	E5	Bridge,Off-sys	756.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
170	E5	Substation	766.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
171	E5	Bridge,On-sys	804.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
172	E5	Church	766.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
173	E6	Bridge,On-sys	772.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
174	F3	Bridge,On-sys	756.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.7
175	F3	Airport	751.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	2.2	5.7	0.0	5.7
176	F3	Fire Station	766.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
177	F3	Airport	770.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
178	F4	Airport	759.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
179	F5	Bridge,Off-sys	768.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
180	F5	WW Treatment	798.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
181	F5	Park	749.3	0.0	1.0	1.6	1.6	0.8	0.8	0.8	0.9	2.9	4.2	7.7	0.8	7.7
182	F5	Church	758.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
183	F5	Bridge,Off-sys	759.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
184	F5	Church	760.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
185	F5	Park	749.4	0.0	1.0	1.6	1.6	0.8	0.8	0.8	0.9	2.9	4.2	7.7	0.8	7.7
186	F5	Fire Station	761.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
187	F5	Bridge,Off-sys	760.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
188	F5	Church	759.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
189	F5	Church	775.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
190	F5	Law Enforcement	772.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
191	F5	Bridge,On-sys	766.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
192	F5	Shelter - Both	783.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
193	F5	Shelter - Both	836.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
194	F5	Water Treatment	771.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
195	F5	Bridge,On-sys	767.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
196	F5	Shelter - Evac Only	768.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
OCTOBER 2009 INFLOW EVENT (3-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.										Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)	
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft			757.0 ft
197	F5	Bridge,Off-sys	770.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
198	F5	Bridge,Off-sys	769.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
199	F5	Park	812.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
200	F5	Bridge,On-sys	769.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
201	G2	Bridge,Off-sys	757.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
202	G2	Bridge,Off-sys	766.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
203	G2	Bridge,On-sys	756.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2
204	G2	Shelter - Evac Only	761.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
205	G3	Fire Station	798.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
206	G3	Airport	721.1	26.4	29.3	29.9	29.9	29.1	29.1	29.1	29.2	31.2	32.5	36.0	0.8	9.6
207	G4	Bridge,Off-sys	763.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
208	G4	Bridge,Off-sys	761.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
209	G4	Church	767.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
210	G5	Airport	915.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
211	G6	Bridge,Off-sys	757.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
212	H1	Park	806.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
213	H2	Airport	815.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
214	H2	Airport	771.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
215	H2	Park	767.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
216	H2	Bridge,On-sys	757.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
217	H2	Bridge,On-sys	757.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
218	H2	Fire Station	793.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
219	H2	Park	769.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
220	H2	Fire Station	786.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
221	H2	Law Enforcement	786.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
222	H2	Law Enforcement	799.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
223	H2	Bridge,On-sys	757.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
224	H2	Substation	764.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
225	H2	Power Plant	764.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
226	H2	Substation	783.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
227	H2	Substation	778.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
228	H4	Bridge,Off-sys	758.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
DECEMBER 2015 INFLOW EVENT (15-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.										Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)	
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft			757.0 ft
1	A1	Bridge,Off-sys	782.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	A2	Church	789.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	A2	Bridge,Off-sys	783.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	A2	Bridge,Off-sys	772.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.0	0.0
5	A3	Bridge,Off-sys	782.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	A3	Bridge,Off-sys	783.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	A5	Bridge,Off-sys	769.7	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	0.0	0.0
8	A6	Bridge,Off-sys	797.0	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	0.0	0.0
9	A6	Bridge,Off-sys	787.7	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	0.0	0.0
10	A6	Bridge,Off-sys	796.0	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	0.0	0.0
11	A6	Bridge,Off-sys	781.3	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	0.0	0.0
12	A6	Bridge,Off-sys	780.3	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	0.0	0.0
13	A6	Park	776.0	17.7	17.7	17.7	17.7	17.7	17.7	17.7	17.7	17.7	17.7	17.7	0.0	0.0
14	A6	Bridge,Off-sys	800.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	A6	Bridge,Off-sys	794.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	A6	Bridge,Off-sys	779.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	0.0	0.0
17	B2	Bridge,Off-sys	766.6	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.3	1.3	1.3	0.0	0.1
18	B2	Bridge,Off-sys	765.8	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	0.0	0.0
19	B2	Bridge,Off-sys	770.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	B2	Bridge,Off-sys	786.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	B2	Bridge,Off-sys	781.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	B2	Bridge,Off-sys	785.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	B2	Bridge,On-sys	796.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	B2	Bridge,On-sys	790.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	B2	Bridge,On-sys	795.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	B2	Bridge,On-sys	779.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	B2	School	788.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	B2	Church	788.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	B3	Bridge,Off-sys	773.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	B3	Bridge,Off-sys	778.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	B3	Bridge,Off-sys	779.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	B3	Bridge,Off-sys	767.8	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.0	0.2
33	B3	Bridge,Off-sys	793.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	B3	Bridge,Off-sys	775.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35	B3, B3-4	Church	780.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36	B3	Bridge,Off-sys	764.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2
37	B3	Bridge,On-sys	778.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38	B3, B3-4	Bridge,On-sys	764.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39	B4, B4-1	Park	789.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
DECEMBER 2015 INFLOW EVENT (15-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.											Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft	757.0 ft		
40	B4, B4-1	Shelter - Evac Only	781.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41	B4, B4-1	Church	788.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
42	B4, B4-1	Church	792.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
43	B4, B4-1	Bridge,Off-sys	781.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
44	B4, B4-1	Bridge,Off-sys	788.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45	B4, B4-1	Church	788.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
46	B4, B4-1	School	781.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
47	B4, B4-3	Park	770.4	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.0	0.0
48	B4, B4-3	Bridge,On-sys	779.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
49	B4, B4-3	Bridge,Off-sys	769.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50	B4, B4-3	Bridge,Off-sys	776.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
51	B4, B4-3	Fire Station	788.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	B4, B4-4	Church	787.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
53	B4, B4-3	Church	778.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
54	B4, B4-4	Bridge,Off-sys	783.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55	B4, B4-4	Bridge,Off-sys	785.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
56	B4, B4-3	Cell Tower	769.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
57	B4, B4-3	Bridge,Off-sys	765.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
58	B4, B4-3	Cell Tower	787.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
59	B4, B4-3	Church	778.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60	B4, B4-3	Church	794.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
61	B4, B4-3	School	796.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
62	B4, B4-3	Church	795.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
63	B4, B4-3	Church	792.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
64	B4, B4-3	School	768.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65	B4, B4-3	Law Enforcement	775.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
66	B4, B4-3	School	781.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
67	B4, B4-3	Church	786.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
68	B4, B4-3	Church	793.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70	B4, B4-3	Church	784.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
71	B4, B4-3	School	784.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
72	B4, B4-3	Church	787.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
73	B4, B4-3	Bridge,Off-sys	771.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
74	B4, B4-3	Church	785.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
75	B4, B4-3	Church	791.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
76	B4, B4-3	Shelter - Evac Only	794.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
77	B4, B4-4	School	788.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
78	B4, B4-3	Church	794.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
79	B4, B4-3	Church	791.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
DECEMBER 2015 INFLOW EVENT (15-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.											Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft	757.0 ft		
80	B4, B4-3	Hospital	788.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
81	B4, B4-3	Hospital	789.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
82	B4, B4-3	Church	791.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
83	B4, B4-4	Law Enforcement	783.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
84	B4, B4-3	Church	774.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
85	B4, B4-3	Airport	784.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
86	B4, B4-4	Bridge,On-sys	765.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
87	B4, B4-4	Bridge,On-sys	808.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
88	B4, B4-3	Bridge,On-sys	764.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
89	B4, B4-3	Shelter - Evac Only	780.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
90	B4, B4-3	Church	780.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
91	B4, B4-3	Bridge,On-sys	782.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
92	B4, B4-3	School	780.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
93	B4, B4-3	School	769.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
94	B4, B4-3	Park	766.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
95	B4, B4-3	Substation	774.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
96	B4, B4-3	Substation	777.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
97	B4, B4-4	Bridge,Off-sys	755.6	4.1	5.4	5.4	5.4	5.4	5.4	5.4	5.5	5.6	5.7	6.2	0.1	2.1
98	B4, B4-3	Fire Station	771.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
99	B4, B4-3	Bridge,RR	771.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100	B4, B4-4	Bridge,On-sys	801.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
101	B4, B4-3	Bridge,On-sys	776.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
102	B4, B4-3	Park	760.8	0.7	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.7	1.8	2.3	0.1	1.6
103	B4, B4-3	Park	754.1	7.3	8.1	8.1	8.1	8.1	8.1	8.1	8.2	8.3	8.4	8.9	0.1	1.6
104	B4, B4-3	WW Treatment	773.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
105	B4, B4-3	Park	759.6	1.8	2.6	2.6	2.6	2.6	2.6	2.6	2.7	2.9	2.9	3.4	0.1	1.6
106	B5	Bridge,On-sys	776.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
107	B5	Bridge,On-sys	806.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
108	B6	Bridge,On-sys	808.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
109	B6	Bridge,Off-sys	781.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
110	B6	Bridge,Off-sys	778.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
111	B6	Bridge,Off-sys	773.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	0.0	0.0
112	B6	Bridge,Off-sys	768.6	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	0.0	0.0
113	B6	Bridge,Off-sys	773.9	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	0.0	0.0
114	C2	Bridge,Off-sys	786.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
115	C3	Bridge,Off-sys	772.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
116	C3	Bridge,On-sys	809.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
117	C3	Bridge,Off-sys	763.3	0.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.5	0.5	1.0	0.0	1.0
118	C3	Bridge,Off-sys	778.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
DECEMBER 2015 INFLOW EVENT (15-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.											Anticipated Operational Range Depth Difference ² (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft	757.0 ft		
119	C3	Bridge,On-sys	789.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
120	C3	Bridge,Off-sys	765.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
121	C3	Bridge,Off-sys	770.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
122	C3	Bridge,Off-sys	774.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
123	C3	Bridge,Off-sys	792.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
124	C4	Bridge,On-sys	784.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125	C4, C4-1	Bridge,On-sys	810.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
126	C4	Bridge,Off-sys	772.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
127	C4	Bridge,Off-sys	746.7	10.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.7	12.7	13.5	0.0	2.9
128	C4	Bridge,Off-sys	775.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
129	C4	Bridge,On-sys	765.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
130	C4	Bridge,Off-sys	771.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
131	C4	Church	793.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
132	C4	Bridge,Off-sys	772.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
133	C4	Bridge,Off-sys	775.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
134	C4	Bridge,Off-sys	769.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
135	C5	Bridge,Off-sys	780.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
136	C5	Park	806.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
137	C5	Bridge,Off-sys	766.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
138	C5	Bridge,On-sys	765.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
139	C5	Park	748.4	8.1	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.4	11.2	0.0	3.1
140	C6	Bridge,Off-sys	753.9	5.7	6.5	6.5	6.5	6.5	6.5	6.5	6.5	7.1	7.2	8.1	0.0	2.4
141	C6	Law Enforcement	773.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
142	C6	Bridge,On-sys	778.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
143	C6	Bridge,On-sys	763.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
144	C6	Bridge,On-sys	795.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
145	C6	School	784.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
146	C6	Bridge,Off-sys	763.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
147	C6	Bridge,On-sys	765.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
148	C6	Fire Station	761.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
149	C6	Church	759.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
150	C6	School	754.9	0.1	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.6	0.0	2.5
151	C6	School	759.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
152	C6	Shelter - Both	761.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
153	C6	School	759.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
154	C6	Bridge,RR	758.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
155	C6	WW Treatment	777.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
156	D5	Bridge,On-sys	774.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
157	D5	Bridge,Off-sys	769.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
DECEMBER 2015 INFLOW EVENT (15-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.											Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft	757.0 ft		
158	D5	Bridge,Off-sys	763.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
159	D6	Bridge,On-sys	774.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
160	D6	Bridge,On-sys	770.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
161	D6	Bridge,On-sys	773.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
162	D6	Bridge,On-sys	763.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
163	D6	Bridge,On-sys	764.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
164	D6	Bridge,On-sys	768.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
165	E3	Bridge,On-sys	773.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
166	E3	Bridge,Off-sys	751.3	3.3	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	5.8	0.0	2.5
167	E3	Park	751.9	2.6	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	5.1	0.0	2.5
168	E5	Fire Station	770.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
169	E5	Bridge,Off-sys	756.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
170	E5	Substation	766.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
171	E5	Bridge,On-sys	804.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
172	E5	Church	766.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
173	E6	Bridge,On-sys	772.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
174	F3	Bridge,On-sys	756.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.7
175	F3	Airport	751.3	3.2	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	5.7	0.0	2.5
176	F3	Fire Station	766.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
177	F3	Airport	770.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
178	F4	Airport	759.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
179	F5	Bridge,Off-sys	768.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
180	F5	WW Treatment	798.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
181	F5	Park	749.3	5.2	5.5	5.5	5.5	5.5	5.5	5.6	5.6	5.5	5.5	7.7	0.1	2.5
182	F5	Church	758.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
183	F5	Bridge,Off-sys	759.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
184	F5	Church	760.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
185	F5	Park	749.4	5.2	5.5	5.5	5.5	5.5	5.5	5.6	5.6	5.6	5.6	7.7	0.1	2.5
186	F5	Fire Station	761.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
187	F5	Bridge,Off-sys	760.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
188	F5	Church	759.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
189	F5	Church	775.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
190	F5	Law Enforcement	772.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
191	F5	Bridge,On-sys	766.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
192	F5	Shelter - Both	783.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
193	F5	Shelter - Both	836.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
194	F5	Water Treatment	771.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
195	F5	Bridge,On-sys	767.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
196	F5	Shelter - Evac Only	768.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

PENSACOLA DAM
GRAND RIVER DAM AUTHORITY

INFRASTRUCTURE DEPTH DATA SHEET
DECEMBER 2015 INFLOW EVENT (15-YEAR EVENT)

Infra-structure ID	Map Panel	Location	Ground Elev. (ft, PD)	Maximum depth (ft) for the simulation with a starting reservoir WSEL (PD datum) listed immediately below.											Anticipated Operational Range Depth Difference ¹ (ft)	Extreme, Hypothetical Range Depth Difference ² (ft)	
				734.0 ft	742.0 ft	742.5 ft	743.0 ft	743.5 ft	744.0 ft	744.5 ft	745.0 ft	749.0 ft	753.0 ft	757.0 ft			
197	F5	Bridge,Off-sys	770.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
198	F5	Bridge,Off-sys	769.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
199	F5	Park	812.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
200	F5	Bridge,On-sys	769.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
201	G2	Bridge,Off-sys	757.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
202	G2	Bridge,Off-sys	766.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
203	G2	Bridge,On-sys	756.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2
204	G2	Shelter - Evac Only	761.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
205	G3	Fire Station	798.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
206	G3	Airport	721.1	33.5	33.8	33.8	33.8	33.8	33.8	33.8	33.8	33.8	33.8	33.8	36.0	0.0	2.5
207	G4	Bridge,Off-sys	763.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
208	G4	Bridge,Off-sys	761.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
209	G4	Church	767.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
210	G5	Airport	915.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
211	G6	Bridge,Off-sys	757.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
212	H1	Park	806.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
213	H2	Airport	815.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
214	H2	Airport	771.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
215	H2	Park	767.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
216	H2	Bridge,On-sys	757.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
217	H2	Bridge,On-sys	757.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
218	H2	Fire Station	793.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
219	H2	Park	769.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
220	H2	Fire Station	786.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
221	H2	Law Enforcement	786.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
222	H2	Law Enforcement	799.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
223	H2	Bridge,On-sys	757.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
224	H2	Substation	764.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
225	H2	Power Plant	764.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
226	H2	Substation	783.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
227	H2	Substation	778.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
228	H4	Bridge,Off-sys	758.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.

2 Max difference in max depth from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.