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RECLAMATION

# Construction Noise Test Results for Hyrum Dam Spillway Replacement Project

Cache County, Utah



**Interior Region 7 – Upper Colorado Basin  
Provo Area Office  
Provo, Utah**

# Mission Statements

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The Department of the Interior conserves and manages the Nation's natural resources and cultural heritage for the benefit and enjoyment of the American people, provides scientific and other information about natural resources and natural hazards to address societal challenges and create opportunities for the American people, and honors the Nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities to help them prosper.

## **Bureau of Reclamation**

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

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# 1 Ambient Sound Results

Ambient levels were recorded at the bald eagle nest site and the yellow-billed cuckoo (YBC) suitable habitat.

## 1.1 Bald Eagle Nest

The bald eagle nest site's  $L_{50}$  median was 50 decibels (dB) and had levels varying from 43.5-59 dB while taking ambient readings.

The bald eagle nest site has a lot of potential for human produced background noise, and the readings seem to confirm this. The area is surrounded by farm fields, two major roadways (State Road 101 & Meridian Road) for Hyrum, and unpaved roads that were utilized by ATVs and other vehicles while on site. Road traffic (semi-trucks, ATVs, vehicle traffic) could be heard by the observer that was stationed at the nest site during the ambient noise collection period. Additionally, during early investigations for the eagle nest location, farm workers were observed carrying a chainsaw out of the area near a private property line at the river. Presumably cutting trees/brush. Chainsaws can produce 110 dB, while other farm equipment (tractors, combines, etc.) can produce between 80-112 dB. Since the site is also near the Little Bear River, this would also cause a higher ambient sound level.

## 1.2 Yellow-billed Cuckoo

The YBC habitat  $L_{50}$  median was 42.5 dB and had levels between 25-54.5 dB.

The nearest yellow-billed cuckoo suitable habitat is somewhat more remote than the eagle nest, partially due to it being immediately below the hillside on the west side of the reservoir. The east side of the reservoir is also steep and climbs approximately 100 ft in elevation from the reservoir's edge. This puts much of the YBC habitat in a "bowl" apart from its surroundings. The shape of the reservoir and the location of the dam also puts the cuckoo habitat out of Line of Sight (LOS) for the spillway modification project. Essentially, two barriers (dam & hillside) dampen the noise levels that would come from the spillway demolition work.

During ambient level recording, several noise observations were noted. The loudest being a helicopter flying overhead, making several passes across the reservoir. During this time, the  $L_{50}$  jumped from 26.5 dB to 46 dB, with an  $L_{max}$  of 67.9 dB for this single noise event. Other observations heard were gunshots, intermittent hammering, and airplanes.

## 2 Noise Test Results

Using the excavator and demolition hammer, the test did not reach 120 dB as intended. An  $L_{max}$  of 96 dB was reached for the tests, with peaks between 100 and 106 dB. Since the proposed noise level wasn't reached in the attempts, further research was done to determine where the 120 dB number came from for the equipment. After looking at several other sources, it appears the 120 dB source may not have been the most accurate. There are several other sources (FHWA, FTA, WSDOT) that give more accurate numbers for this equipment. The sources found range from 95 to 110 dB. Reclamation's industrial hygienist found similar information, as did the USFWS' noise tool.

Unfortunately, the meters set at the other locations did not capture data during the test. These locations were going to be used for reference and comparison only and were not in areas of suitable habitat or near the eagle nest. The meters set up at the spillway sites, the bald eagle nest, and the yellow-billed cuckoo habitat were working as planned.

### 2.1 Bald Eagle Nest Results

So, using the following parameters for the eagle nest:

$$L_{max} = 96 \text{ dB}$$

$$L_{50} = 50 \text{ dB}$$

Distance from source (lower spillway test) to nest site: 3,115 ft

Distance from source (upper spillway test) to nest site: 4,100 ft

Inverse Square Law (sound attenuation calculator):  $L_p(R2) = L_p(R1) - 20 \cdot \log_{10}(R2/R1)$

$L_p(R1)$  = Known sound pressure level at the first location (96 dB)

$L_p(R2)$  = Unknown sound pressure level at the second location

R1 = Distance from the noise source to location of known sound pressure level (50 ft)

R2 = Distance from noise source to the second location

#### 2.1.1 Lower Spillway Test

Using a sound attenuation calculation, the  $L_{50}$  prediction for the eagle nest noise would be 60.1 dB at a distance of 3,115 ft. The lower spillway noise test gave us an  $L_{50}$  of 51.14. Since the location is considered a "soft site", one could estimate at least 5 dB of that number can be attributed to the vegetation. It's possible to attribute the remaining difference to the vegetation/topography as well since dense vegetation can reduce noise by as much as 5 dB for every 100 ft of veg, up to a max of 10 dB over 200 ft (USDOT 1995).

## 2.1.2 Upper Spillway Test

Using a sound attenuation calculation, the  $L_{50}$  prediction for the eagle nest noise would be 57.7 dB with a source creating 96 dB at 4,100 ft. The upper spillway noise test gave us an  $L_{50}$  of 49 dB. As this is still considered a soft site, much of the difference would be due to vegetation and topography. The upper section of the spillway is approximately 100 ft higher in elevation than the lower end. Despite the levels being less than the lower spillway test (49 dB vs 51.14 dB), it is possible that noise decay is not quite as high as at the lower spillway since the lower spillway sits in a “bowl” below the dam and close vegetation creates a more effective barrier.

## 2.2 Yellow-billed Cuckoo Results

$L_{\max} = 96$  dB

$L_{50} = 42.5$  dB

Distance from source (upper spillway test) to nest site: 7,600 ft

Distance from source (lower spillway test) to nest site: 8,585 ft

### 2.2.1 Lower Spillway Test

Using a sound attenuation calculation, the  $L_{50}$  prediction for the YBC habitat noise would be 52.4 dB at a 7,600 ft distance. The lower spillway noise test gave us an  $L_{50}$  of 46.5 dB. The reservoir is considered a “hard site” and would allow noise to travel further than it would over a vegetated area. However, as noise levels stayed well within the ambient levels at the habitat site, it can likely be attributed to multiple LOS breaks between the spillway and the habitat. As noise travels from a point source, it radiates out in all directions. The first barrier is the dam itself; the lowest portion of the spillway sits in a bowl approximately 100 ft lower than the highest point, the road across the dam. Generally, noise barriers nearer to the source are shown to be more effective (HUD 2009). The dam acts as a wall to reflect the noise created from the test. The second barrier is the topography around the reservoir leading to the habitat area. Similar to noise barriers used to mitigate traffic noise, the high berm on the southern side of the reservoir breaks the LOS between the test noise and the habitat, as well as reflecting the noise away from the habitat over a few thousand feet before it tapers nearer to the inlet or the reservoir.

### 2.2.2 Upper Spillway Test

Using a sound attenuation calculation, the  $L_{50}$  prediction for the YBC habitat noise would be 51.3 dB with a source creating 96 dB at 8,585 ft. The upper spillway noise test produced an  $L_{50}$  of 47.4 dB. Similar to the lower spillway test, this test has one LOS break, caused by the topography and higher elevation berm/hillside that blocks the habitat from the spillway work.

At no time during either testing was the observer at the YBC habitat able to hear the hammering at the spillway.

## 3 Discussion

Although the noise levels for the test didn't reach the upper threshold of 110 dB, Reclamation believes that the test was able to show that the levels are less than what an attenuation calculation predicts. The vegetation, riparian corridor, LOS breaks (difference in elevation, dam, berm), will dampen the noise produced by project construction.

### 3.1 Bald Eagle

Though it was faint and stayed within the  $L_{50}$  ambient range for the location, the observer located at the bald eagle nest site indicated they were able to detect the hammering during each test, though it was extremely faint. The observer also stated that other noises heard (road noise, vehicles, ATVs, etc.) during ambient level recording sounded louder than the test noise.

Additionally, as the bald eagle nest is surrounded by farm fields and two roads nearer to it than the project boundaries, it is likely the eagles are relatively tolerant to human activity at this nest site. Farm equipment that would be used in fields located just over 200 ft away could produce similar, or higher, levels of noise as the construction project, and at different times throughout the nesting season.

There would not be any disturbance to vegetation in the riparian corridor and this area would help by serving as a noise and visual buffer to the project, as recommended in the National Bald Eagle Management Guidelines (USFWS 2007).

Additionally, USFWS guidance for incidental take permits mentions that if project activity is more than half a mile away for loud activities, a permit may not be recommended (USFWS 2022). The nearest spillway work for this project is 0.59 miles from the eagle nest. Owing to these factors, Reclamation does not believe this project would cause nest abandonment or take for the bald eagle.

### 3.2 Yellow-billed Cuckoo

The YBC habitat area is quite secluded compared to the bald eagle nest site, creating a lower average of ambient/background sound while an observer was in the area and meters were recording data. This was only the second time biologists had visited the site, the first time was to conduct habitat suitability surveys on August 31, 2022. No agricultural noise was observed during these site visits, though it was late in the season. However, there are active farm fields within 300 ft of the YBC habitat. These areas are higher in elevation than the habitat, but there is no other break in LOS. Much like the bald eagle nest site, it is likely that heavy equipment will be used in the nearby fields and would increase background noise during much of the nesting season.

There are also unpaved public and private roads within 400 ft of the YBC habitat. As many of these roads are leading to and from farm fields and to access the reservoir, it can be presumed that the

vehicles using the roads would be farm equipment, trucks, and ATVs. This noise would also contribute to increased background levels during the nesting season.

During the noise test, levels stayed within the ambient range for the YBC habitat. The  $L_{\max}$  at the YBC habitat did not go beyond 59 dB during either test, though it reached higher levels several separate times during ambient readings (maximum of 67.4 dB during helicopter flyover). As noted above, there are many factors that will increase the ambient and background noise in the area. Reclamation does not believe the project would cause enough additional noise to adversely affect the yellow-billed cuckoo.

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