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April 14, 2017

Kimberly D. Bose, Secretary  
Federal Energy Regulatory Commission  
Mail Code: DHAC, PJ-12  
888 First Street, N.E.  
Washington, D.C. 20426

**RE: Priest Rapids Hydroelectric Project No. 2114-217  
License Compliance Filing – Article 411 Transmission Line Avian Collision Protection Plan  
2016 Annual Report**

Dear Secretary Bose,

Public Utility District No. 2 of Grant County, Washington (Grant PUD) respectfully submits to the Federal Energy Commission Regulatory Commission (FERC) its 2016 Transmission Line Avian Collision Protection Plan Annual Report.

On April 15, 2010, Grant PUD filed its Transmission Line Avian Collision Protection Plan (Plan) with FERC. On August 24, 2010, FERC issued an approving and modifying Order<sup>1</sup>, and on May 6, 2014, FERC approved Grant PUD's December 23, 2013 request to amend the Plan<sup>2</sup>. Per the Plan and 2014 amendment, Grant PUD is required to install bird flight diverters (BFDs) upon transmission line spans from 2011 – 2015, conduct avian surveys from 2011 – 2016 and every fifteen years thereafter, and provide annual reports to the U.S. Fish and Wildlife Service (USFWS), Washington Department of Fish and Wildlife (WDFW) and FERC by April 17 of each reporting year.

Pursuant to the Plan and the 2014 amendment, Grant PUD scheduled the installation of BFDs upon the overhead ground wires (OHGW) at the following corridors and years: 1) South Moran Slough (2011), 2) North Moran Slough (2012), 3) Wanapum Switchyard (2013, 4) Wanapum – Columbia/Moses Coulee (2014), and Midway/Columbia River (2015). All BFDs were installed in the corridors as originally scheduled except for the Midway/Columbia River corridor, which was rescheduled and installed in 2016 in accordance with the 2014 amendment to the Plan.

Avian surveys were conducted seasonally each year at all five transmission line corridors to record avian interactions within 0.25 miles of each of the transmission lines. The Wanapum-Columbia/Moses Coulee transmission line corridor was general characterized as a raptor location, having a high number (>10) of ledges and alcove on the cliffs. The South Moran Slough, North Moran Slough, Wanapum Switchyard,

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<sup>1</sup> FERC Order modifying and approving original plan: 132 FERC ¶ 62,127 (2010).

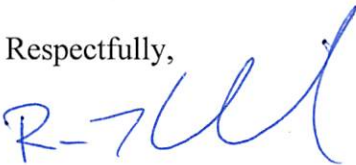
<sup>2</sup> FERC Order modifying and approving original plan: 147 FERC ¶ 62,093 (2014).

and the Midway/Columbia River corridors were all generally characterized as waterfowl locations with open water, nesting habitat, and brood cover.

This report completes the annual pre-BFD and post-BFD bird interaction behavior assessments required by the Plan, and additional surveys will now be completed every 15 years per the Plan, with the next scheduled avian surveys being completed in calendar year 2031 and an annual report provided to the U.S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, and FERC by April 17, 2032. However, Grant PUD is also proposing supplemental post-BFD avian surveys be performed at the Midway/Columbia River corridor site in 2017 for all seasons due to the rescheduling of the BFD installations at this site from 2015 to 2016 which resulted in lack of post-BFD bird behavior data for statistical comparisons in this current, 2016 report. After the supplemental surveys are completed in 2017, a supplemental report specific to the Midway/Columbia River corridor site that incorporates statistical comparisons of the pre-BFD and post-BFD bird flight behavior data will be provided to the U.S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, and FERC by April 17, 2018.

FERC staff with any questions should contact Tom Dresser at 509-754-5088, ext. 2312 or by email at [tdresse@gcpud.org](mailto:tdresse@gcpud.org).

Respectfully,



Ross Hendrick  
Manager – License & Environmental Compliance

Enclosures: Final 2016 Transmission Line Avian Collision Protection Plan Report

Cc: Jessica Gonzales, USFWS  
Steve Lewis, USFWS  
Patrick Verhey, WDFW

**Priest Rapids Project – FERC No. 2114**  
**Transmission Line Collision Protection Plan**  
**2016 Annual Report**  
**License Article 411**



Environmental Assessment Services, LLC  
Richland, Washington

For:

Grant County Public Utility District

**April 2017**

## Executive Summary

On August 24, 2010, the Federal Energy Regulatory Commission (FERC) issued the order modifying and approving the Transmission Line Avian Collision Protection Plan (Plan) pursuant to Article 411 of the license for the Priest Rapids Project No. 2114 (Project). Per FERC's approval of the Plan, Public Utility District No. 2 of Grant County, Washington (Grant PUD) is required to ensure that 10 of its transmission line spans are compliant with the guidelines set forth in "Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006" or an updated publication. In 2010, Grant PUD proposed to install bird flight diverters (BFDs) on transmission line spans within five transmission line corridors from 2011–2015, conduct avian surveys from 2011–2016 and every 15 years thereafter, and provide annual reports to the U.S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, and FERC by April 17 of each report year.

Pursuant to the Plan, Grant PUD scheduled the installation of BFDs upon the overhead ground wires (OHGW) at the following corridors and years: 1) South Moran Slough (2011), 2) North Moran Slough (2012), 3) Wanapum Switchyard (2013), 4) Wanapum-Columbia/Moses Coulee (2014), and Midway/Columbia River (2015). All BFDs were installed in the corridors as originally scheduled except for the Midway/Columbia River corridor, which was rescheduled to and installed in 2016.

Avian surveys have been conducted seasonally each year at all five transmission line corridors to record avian interactions within 0.25 miles of each of the transmission lines. The Wanapum-Columbia/Moses Coulee transmission line corridor was generally characterized as a raptor location, having a high number (>10) of ledges and alcoves on the cliffs. The South Moran Slough, North Moran Slough, Wanapum Switchyard, and the Midway/Columbia River corridors were all generally characterized as waterfowl locations with open water, nesting habitat, and brood cover.

A total of 60 avian interaction surveys were conducted during 2016 and included a total of 3,433 bird observations. At least fifty different bird species were identified during 2016, including one species, American White Pelican (*Pelecanus erythrorhynchos*), which is listed as endangered by the State of Washington.

Bird flight behaviors recorded at the South Moran Slough, North Moran Slough, Wanapum Switchyard, and Wanapum-Columbia corridors were examined for differences associated with BFD installations. No statistical differences at the 95% confidence interval were observed for altered flight behaviors at the sites for pre-BFD and post-BFD comparisons, however, two of the sites showed significant differences in pre-BFD and post-BFD unaltered flight behavior for certain types of birds. At South Moran Slough, the unaltered flight behavior of passerine birds significantly increased after BFDs were installed. At North Moran Slough, the unaltered flight behavior of wading birds, such as herons, significantly decreased after the BFDs were installed.

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## 1.0 Introduction

On August 24, 2010, the Federal Energy Regulatory Commission (FERC) issued the order modifying and approving the Transmission Line Avian Collision Protection Plan (Plan) pursuant to Article 411 of the license for the Priest Rapids Project No. 2114 (Project)<sup>1</sup>. FERC's approval of the Article 411 requires the Public Utility District No. 2 of Grant County, Washington (Grant PUD) to insure that its transmission line spans within five transmission line corridors are compliant with the guidelines set forth in "Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006" or an updated publication. In 2010, Grant PUD proposed to install bird flight diverters (BFDs) within five transmission line corridors from 2011–2015, conduct avian surveys from 2011–2016 and every 15 years thereafter, and provide annual reports to the U.S. Fish and Wildlife Service (USFWS), Washington Department of Fish and Wildlife (WDFW), and FERC by April 17 of each report year.

In 2001, Grant PUD assessed the potential for avian collisions with its transmission system. Avian surveys were conducted at a total of 28 transmission line corridors and included substations and switchyards (Framatome ANP 2003). In general, the primary source of birds collisions within the transmission system are birds colliding with the overhead ground wires (OHGW), and the installation of BFDs upon the OHGWs have reduced bird collisions in the range of 57-89% (Koops and De Jong 1982; Koops 1987).

Within the approved Plan, Grant PUD will mark five 230 kV transmission line corridors with BFDs. Grant PUD will install BFDs upon OHGW and any guy wires associated with the transmission line spans within the five transmission line corridors. It is not necessary to mark the transmission lines (T-lines); because, the 230 kV T-lines are thicker and have a line diameter equal to or greater than one inch in diameter (APLIC 1994, 2012). Additionally, most BFDs and devices cannot be installed on energized conductors with voltages over 230 kV (APLIC 1994).

## 2.0 Materials and Methods

### 2.1 Bird Flight Diverter Installation

Pursuant to the Plan, Grant PUD scheduled the BFD installation upon the OHGW at the following corridors and years: 1) South Moran Slough (2011), 2) North Moran Slough (2012), 3) Wanapum Switchyard (2013), 4) Wanapum-Columbia/Moses Coulee (2014), and Midway/Columbia River downriver from Priest Rapids Dam (2015). All outages were scheduled to occur during the months of September and October for the marking years.

### 2.2 Avian Surveys

Pursuant to the approved Plan, avian surveys were conducted at the five corridors (South Moran South, North Moran Slough, Wanapum Switchyard, Wanapum-Columbia/Moses Coulee, and Midway/Columbia River downriver from Priest Rapids Dam). The transmission line corridor surveys recorded data in three categories: 1) Site Information, 2) Avian Location Type, and 3) Avian Interaction Survey to incorporate information within 0.25 miles of the transmission lines. See Appendix A for the datasheets used to record the data.

#### 2.2.1 Site Information Data

The Site Information included the following data:

- Date
- Surveyor
- Site Name
- Survey Period: Spring Migration (February–March); Nesting (April–May); Summer (July–August); Fall/Winter (Mid-September–November)
- Day Time Period: AM (survey started at civil twilight), Mid-Day, PM (survey concluded at civil twilight)
- Survey Start Time
- Survey End Time
- Bird Flight Diverter Status (Installed or Not Installed)
- Raptor Perches (Present/Absent)

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<sup>1</sup> 132 FERC ¶ 62,127 (2010)

- Large Migratory Flights (Present/Absent)
- Geographic Funnel (Present/Absent). River valleys and canyons are examples of geographic funnels.

### **2.2.2 Avian Location Types**

The Avian Location Types were classified at Raptor Locations or Waterfowl Locations. Raptor Locations noted the presence of ledges and alcoves on cliffs as not applicable (N/A), Low (0-5), Moderate (6-10), or High (>10). The presence or absence of updrafts and thermals were also recorded for Raptor Locations.

Waterfowl Locations Types recorded data on open water, nesting habitat, and brood cover. Open water data were recorded as present or absent. Nesting habitat data were recorded as present or absent during the nesting survey period only. Nesting habitat data were not applicable during the other survey periods. Brood cover data were recorded as present or absent during the Nesting and Summer Survey Periods. Brood cover data were not applicable during the other survey periods.

### **2.2.3 Avian Interaction Survey Data**

The avian interaction survey collected data within 0.25 miles of the transmission line spans. The avian interaction survey recorded data for observation time, bird category, number of birds, listing status, vertical plane interaction, weather, and behavior. The survey time lengths were two hours during the nesting, summer, and fall/winter survey periods and three hours for the spring migration survey period. Observation time was recorded as military time. Bird categories were recorded as the following: A) Birds of Prey, B) Waterfowl, C) Wading Birds (herons), D) Shorebirds (plovers, sandpipers), E) Aerialists (pelicans, gulls, terns), F) Fowl-Like Birds, G) Passerine (songbirds, etc.), H) Misc. Non-Passerine Birds (doves, swifts, hummingbirds, woodpeckers, kingfishers). Listing status included any state or federal listing status for the particular bird species. The vertical plane interaction data were recorded in the following four vertical zones: 1) N/A (Did Not Intersect T-Line), 2) below transmission lines, 3) between transmission lines and OHGWs, and 4) above OHGWs. The vertical plane distance was recorded as the following: N/A (Did Not Intersect T-Line), 0–10 ft, 11–25 ft, 26–50 ft, 51–100 ft, and >101 ft. Weather data included notes relating to cloud cover, precipitation, and wind speed. Behavior data were recorded as Unaltered Flight, Flight Among Wires, Altered Flight, Abrupt Altered Flight, Flushed, Perched on Tower, Perched on Wire, Perched on Other, and On Water/Ground (Table 1; Framatome ANP 2003).



**Table 1 A description of the behavior data recorded during avian interaction surveys.**

Unaltered Flight	Flight above or below (but not among) the transmission lines that includes no observable alterations in flight altitude, direction, speed or other flight characteristic that could be construed as a response to the transmission line structures, wires, or OHGW.
Flight Among Lines	Flight between transmission line wires, OHGW, or both that exhibited no observable alterations in flight altitude, direction, speed or other flight characteristic that could be construed as a response to the transmission line structures, wires, or OHGW.
Altered Flight	Any change in flight altitude, direction, speed, or other flight characteristic in apparent response to a transmission line structure, wire, or OHGW. The behavior occurs as the bird approaches the structure, wire or OHGW giving the individual the time necessary to make a relatively minor flight adjustment and avoid the structure.
Abrupt Altered Flight	Any change in flight altitude, direction, speed, or other flight characteristic in apparent response to a transmission line structure, wire, or OHGW occurring in very close proximity to a transmission line structure and involving a rapid and/or major flight adjustment to avoid the structure.
Flushed	Rapid take off from vegetative cover, water, or ground that was construed as being a direct result of disturbance (usually by the observer, but also including passing vehicles).
Perched on Tower	Perching on any transmission line tower, OHGW support, or structure that supports a wire, including those associated with a substation or switchyard.
Perched on Wire	Perching on any wire associated with the transmission line, substations, or switchyards, or adjacent distribution lines including OHGW or support (guy) wires.
Perched on Other	Perching on vegetation, fences or posts, autos and other machinery, cliffs, distribution poles, or any other man-made structures.
On Water/Ground	Stationary or moving on the ground, or on water (e.g., loafing, foraging on the surface, diving, or swimming).

### 2.2.4 Avian Interaction Statistical Analyses

Statistical comparisons [two-tailed Student’s t-Test ( $\alpha \leq 0.05$ )] of altered and unaltered bird flight behavior were performed for pre-BFD and post-BFD treatment groups when conditions were the following:

- 1). at least three altered flight or unaltered flight observations per treatment group,
- 2). at least 20 total bird observations for a given bird category within both the pre-BFD and post-BFD treatment groups, and
- 3). at least three seasons of both pre-BFD and post-BFD treatment group surveys.

For treatment groups and bird categories that satisfied the above conditions, the number of birds that exhibited altered flight and unaltered flight were divided by the total numbers of birds observed for their respective bird category for each survey period and the aforementioned statistical comparisons were performed.

## 3.0 Results and Discussion

### 3.1 Bird Flight Diverter Installation

A complete list of BFD installation progress is presented in Table 2. BFDs installation upon the OHGW’s at South Moran Slough was completed on October 10, 2011. The North Moran Slough was completed on November 9, 2012. The Wanapum Switchyard corridor BFD’s were installed on September 30, 2013. The Wanapum-Columbia/Moses Coulee BFD’s were installed on October 03, 2014. The installation of the Midway/Columbia River BFD’s downriver from Priest Rapids Dam were re-scheduled to 2016 and installed on October 04, 2016.

**Table 2 The bird flight diverter installation completion dates for transmission line corridors.**

Date of Completion	Span of BFD Installation	Corridor
8/30/2011	Priest Rapids - Midway 230kV Line #3 between Structures #211 and #212	South Moran Slough
9/12/2011	Priest Rapids - Midway 230kV Line #1 between Structures #11 and #12	South Moran Slough
10/10/2011	Priest Rapids - Midway 230kV Line #2 between Structures #111 and #112	South Moran Slough
11/9/2012	Priest Rapids 230kV Line between Structures #76 and #77	North Moran Slough
9/30/2013	Wanapum-Priest Rapids 230kV Line, Structures #1 and #2	Wanapum Switchyard
10/3/2014	Wanapum-Columbia 230kV Line, Structures #132 and #133	Wanapum-Columbia / Moses Coulee
10/4/2016	Midway-Columbia 230kV Line #2 between Structures #144 and #145	Midway/Columbia River downriver from Priest Rapids Dam

### 3.2 Avian Surveys

#### 3.2.1 Site Information Data & Avian Location Types

The five transmission line corridors were characterized by site information and avian location descriptions. The transmission line corridor site information data of avian location type, raptor perch presence/absence, geographic funnel presence/absence, and large migratory flight presence/absence were presented in Table 3. The Wanapum-Columbia/Moses Coulee transmission line corridor was the only raptor location, and the site was characterized as having a high number (>10) of ledges and alcoves on the cliffs with intermittent updrafts present on warm sunny days. The South Moran Slough, North Moran Slough, Wanapum Switchyard, and the Midway/Columbia River corridors were all characterized as waterfowl locations. The waterfowl site characterization data of open water, nesting habitat, and brood cover were presented in Table 4, Table 5, and Table 6, respectively. The surveys conducted during 2016 were presented for all five transmission line corridors survey sites with respect to the survey season and daytime period as shown in Table 7. During 2016, the spring migration surveys were performed March 07-31, the nesting season surveys were conducted May 11-23, the summer season surveys were conducted August 15-30, and the fall/winter season surveys were conducted October 04-14 (Table 7).

**Table 3 Avian location type and site descriptive data of raptor perches, geographic funnel, and large migratory flights for the five transmission line corridors.**

Corridor	Avian Location Type	Raptor Perches	Geographic Funnel	Large Migratory Flights
South Moran Slough	Waterfowl	Present	Absent	Absent
North Moran Slough	Waterfowl	Present	Absent	Absent
Wanapum Switchyard	Waterfowl	Absent	Absent	Absent
Wanapum-Columbia/Moses Coulee	Raptor	Present	Present	Absent
Midway/Columbia River downriver from Priest Rapids Dam	Waterfowl	Absent	Present	Absent

**Table 4 Open water habitat waterfowl characterization data for the four waterfowl transmission line corridors.**

Corridor	Open Water			
	Spring Migration	Nesting	Summer	Fall/Winter
South Moran Slough	Present	Present	Present	Present
North Moran Slough	Present	Present	Present	Present
Wanapum Switchyard	Present	Present	Absent	Absent
Midway/Columbia River downriver from Priest Rapids Dam	Present	Present	Present	Present

**Table 5 Nesting habitat characterization data for the four waterfowl transmission line corridors.**

Corridor	Nesting Habitat			
	Spring Migration	Nesting	Summer	Fall/Winter
South Moran Slough	N/A	Present	N/A	N/A
North Moran Slough	N/A	Present	N/A	N/A
Wanapum Switchyard	N/A	Present	N/A	N/A
Midway/Columbia River downriver from Priest Rapids Dam	N/A	Present	N/A	N/A

**Table 6 Brood cover habitat characterization data for the four waterfowl transmission line corridors.**

Corridor	Brood Cover			
	Spring Migration	Nesting	Summer	Fall/Winter
South Moran Slough	N/A	Present	Present	N/A
North Moran Slough	N/A	Present	Present	N/A
Wanapum Switchyard	N/A	Present	Present	N/A
Midway/Columbia River downriver from Priest Rapids Dam	N/A	Present	Present	N/A

**Table 7 Avian survey dates conducted during 2016 at the five transmission line corridors with respect to survey period and daytime period.**

Survey Period	Corridor	AM	Mid-Day	PM
Spring Migration	South Moran Slough	03/15/16	03/08/16	03/24/16
	North Moran Slough	03/08/16	03/07/16	03/31/16
	Wanapum Switchyard	03/14/16	03/15/16	03/23/16
	Wanapum-Columbia	03/10/16	03/14/16	03/22/16
	Midway	03/07/16	03/10/16	03/21/16
Nesting	South Moran Slough	05/21/16	05/13/16	05/20/16
	North Moran Slough	05/20/16	05/13/16	05/19/16
	Wanapum Switchyard	05/18/16	05/12/16	05/17/16
	Wanapum-Columbia	05/15/16	05/11/16	05/14/16
	Midway	05/23/16	05/12/16	05/13/16
Summer	South Moran Slough	08/16/16	08/15/16	08/15/16
	North Moran Slough	08/17/16	08/15/16	08/16/16
	Wanapum Switchyard	08/30/16	08/30/16	08/29/16
	Wanapum-Columbia	08/21/16	08/20/16	08/20/16
	Midway	08/18/16	08/16/16	08/17/16
Fall/Winter	South Moran Slough	10/13/16	10/06/16	10/12/16
	North Moran Slough	10/06/16	10/07/16	10/05/16
	Wanapum Switchyard	10/07/16	10/05/16	10/06/16
	Wanapum-Columbia	10/05/16	10/05/16	10/04/16
	Midway	10/14/16	10/06/16	10/13/16

### 3.2.2 Avian Interaction Surveys

A total of 60 avian interaction surveys were conducted during 2016 at the five transmission line corridors. Fifty different bird species were identified during 2016, and their state and federal listing statuses is presented in Table 8. The American white pelican (*Pelecanus erythrorhynchos*) was the only species observed that currently has a state and/or federal Threatened or Endangered species listing status (Table 8). A total of 3,433 bird observations were recorded during the 2016 survey period. Bird observations were summarized by corridor (Table 9) and survey period (Table 10). Passerine species continue to be the most abundant birds for all sites. In 2016, the most abundant passerines were the European starling (*Sturnus vulgaris*; n = 1,716) and the red-winged blackbird (*Agelaius phoeniceus*; n = 382). The Red-tailed hawk (*Buteo jamaicensis*; n = 14) was the most abundant bird of prey species. Mallard ducks (*Anas platyrhynchos*; n = 130) were the most abundant waterfowl species. Gull species (*Larus sp.*; n = 28) were the most abundant aerialists observed. Northern flickers (*Colaptes auratus*; n = 16) were the most abundant non-passerine bird species observed.

The bird interaction behavior data were presented in with respect to their flight across the transmission lines (i.e., above the OHGW, between OHGW and the T-Lines, or below T-Lines; Table 11). Of the 3,433 observations made during 2016, no bird collisions were documented; however, a number of altered flight patterns were documented (Table 12).

Table 13 illustrates the number of seasons currently available for comparing changes in bird responses (altered or unaltered flight patterns) that may be associated with installing BFDs on the transmission lines. Based on these minimum sample size criteria, statistical comparisons of the bird flight behavior data were available at South Moran Slough (Table 14), North Moran Slough (Table 15), Wanapum Switchyard (Table 16), and the Wanapum-Columbia (Table 17) sites.

No statistical differences were observed for altered flight behaviors at the sites for pre-BFD and post-BFD comparisons for all bird categories. Two significant differences in pre-BFD and post-BFD unaltered flight behavior were observed. At South Moran Slough, the unaltered flight behavior of passerine birds significantly increased after BFDs were installed. At North Moran Slough, the unaltered flight behavior of wading birds, such as herons, significantly decreased after the BFDs were installed (Table 15). A lack of flight behavior difference with birds of prey could reveal that these species already observed the OHGWs prior to BFD installation. Birds of prey (i.e., raptors) and passerine birds (i.e., songbirds) are reported to have the keenest sight of all birds, and they can resolve details at distances 2.5-3 times the distance that humans can (Gill 2007). A decrease in the frequency of unaltered flights for wading birds suggests that the BFDs are increasing the visual profile of the static wires. In 2016, the numbers of birds observed were fewer than half the number of birds observed in 2015 (Table 18). The numbers of birds observed in 2016 were similar to the numbers of birds observed in survey years 2013 and 2014.

**Table 8 Bird species identified during the 2016 avian interaction surveys with their state and federal listing statuses.**

<b>Bird Category</b>	<b>Species</b>	<b>State Listing</b>	<b>Federal Listing</b>
Birds of Prey	American Kestrel		
	Bald Eagle	Sensitive	Species of Concern
	Northern Harrier		
	Osprey	Monitored	
	Red-Tailed Hawk		
Waterfowl	American Coot		
	Canada Goose		
	Common Goldeneye		
	Common Merganser		
	Cinnamon Teal		
	Double-Crested Cormorant		
	Gadwall		
	Mallard		
	Northern Pintail		
Pied-Billed Grebe			
Wading Bird	Black-Crowned Night Heron	Monitored	
	Great Blue Heron	Monitored	
	Great Egret	Monitored	
Aerialists	American White Pelican	Endangered	
Fowl-Like Birds	California Quail		
Passerines	American Crow		
	American Goldfinch		
	American Robin		
	Bank Swallow		
	Barn Swallow		
	Black-Billed Magpie		
	Brewer's Blackbird		
	Brown-Headed Cowbird		
	Bullock's Oriole		
	Cedar Waxwing		
	Cliff Swallow		
	Common Raven		
	Eastern Kingbird		
	Dark-Eyed Junco		
	European Starling		
	House Finch		
	House Sparrow		
	Lark Sparrow		
	Mourning Dove		
	Red-Winged Blackbird		
	Tree Swallow		
	Western Kingbird		
	Western Meadowlark		
White-Crowned Sparrow			
Rock Pigeon			
Dark-Eyed Junco			
Non-Passerines Misc.	Belted Kingfisher		
	Common Nighthawk		
	Mourning Dove		
	Northern Flicker		

**Table 9 Summary of bird observations at each transmission line corridor during 2016.**

Bird Category	Species	Midway	North Moran Slough	South Moran Slough	Wanapum Switchyard	Wanapum-Columbia	Grand Total
Birds of Prey	American Kestrel		1		3	1	5
	Northern Harrier		6	2			8
	Osprey	1	1				2
	Misc. Owl	2					2
	Red-Tailed Hawk	2	2	3	5	2	14
	Unknown					1	2
<b>Birds of Prey Total</b>		<b>5</b>	<b>10</b>	<b>6</b>	<b>8</b>	<b>4</b>	<b>32</b>
Waterfowl	American Coot	6	10	19			35
	Canada Goose	4	12	9			25
	Cinnamon Teal			1			1
	Common Goldeneye			1			1
	Common Merganser	1	9				10
	Double-Crested Cormorant	16	8	4			28
	Gadwall		23				23
	Mallard	30	79	17	4		130
	Misc. Duck		26	1			27
	Northern Pintail		5				5
	Pied-Billed Grebe		11	10			21
	Unknown		13				13
<b>Waterfowl Total</b>		<b>57</b>	<b>200</b>	<b>61</b>	<b>4</b>		<b>322</b>
Wading Birds	Black-Crowned Night Heron	1	3	2			6
	Great Blue Heron	8	14	7			29
	Great Egret		4	2			6
<b>Wading Birds Total</b>		<b>9</b>	<b>21</b>	<b>11</b>			<b>41</b>
Aerialists	American White Pelican	12	6				18
	Misc. Gull	22		6			28
<b>Aerialists Total</b>		<b>34</b>	<b>6</b>	<b>6</b>			<b>46</b>
Fowl-Like Birds	California Quail		9				9
<b>Fowl-Like Birds Total</b>			<b>9</b>				<b>9</b>
Passerines	American Crow	16	2	1	20	2	41
	American Goldfinch		1				1
	American Robin	9		3		14	26
	Bank Swallow	3	51	83			137
	Barn Swallow				8		8
	Black-billed Magpie	24	33	7	33		97
	Brewer's Blackbird			101			101
	Brown-Headed Cowbird			7			7
	Bullock's Oriole	16		1			17
	Cliff Swallow		12		16	43	71
	Common Raven	11	1	40	5	4	61
	Eastern Kingbird	2	3	6			11
	European Starling	15	64	1,461	176		1,716
	House Finch	1	2	9		48	60
	Lark Sparrow		4	2		1	7
	Misc. Duck			2			2
	Misc. Sparrow	1		3		2	6
	Misc. Swallow			3			3
	Red-winged Blackbird	6	43	291	42		382
	Unknown	4	27	13		37	81
	Western Kingbird	3		3	1		7
	Western Meadowlark	1		1			2
	White-Crowned Sparrow		7		2	1	10
Misc. Finch					1	1	
Rock Pigeon				3		3	
Dark-Eyed Junco			2			2	
House Sparrow		1				1	
<b>Passerines Total</b>		<b>112</b>	<b>251</b>	<b>2,039</b>	<b>306</b>	<b>128</b>	<b>2,861</b>
Non-Passerines Misc.	Belted Kingfisher		2	1			3
	Common Nighthawk		2	1			3
	Mourning Dove			4		3	7
	Northern Flicker	3		9	1	3	16
	Unknown		1	1			2
<b>Non-Passerines Total</b>		<b>3</b>	<b>5</b>	<b>15</b>	<b>1</b>	<b>6</b>	<b>31</b>
Unknown		25	33	16	9	8	91
<b>Unknown Total</b>		<b>25</b>	<b>33</b>	<b>16</b>	<b>9</b>	<b>8</b>	<b>91</b>
<b>Grand Total</b>		<b>245</b>	<b>535</b>	<b>2,154</b>	<b>328</b>	<b>171</b>	<b>3,433</b>

**Table 10 Summary of bird observations for each survey period during 2016.**

Bird Category	Species	Fall/Winter	Nesting	Spring Migration	Summer	Grand Total
Birds of Prey	American Kestrel	1	4			5
	Northern Harrier	6		2		8
	Osprey		2			2
	Red-tailed Hawk	7	1	5	1	14
	Misc. Owl		2			2
	Unknown		1			1
<b>Birds of Prey Total</b>		<b>14</b>	<b>10</b>	<b>8</b>	<b>1</b>	<b>32</b>
Waterfowl	American Coot	6	1	22	6	35
	Canada Goose		7	18		25
	Cinnamin Teal			4		4
	Common Goldeneye			1		1
	Common Merganser	9		1		10
	Double-crested Cormorant	9	15		4	28
	Gadwall	19	2	2		23
	Mallard	50	6	67	7	130
	Misc. Duck		18		9	27
	Northern Pintail				5	5
	Pied-Billed Grebe	12		9		21
	Unknown	12			1	13
<b>Waterfowl Total</b>		<b>117</b>	<b>49</b>	<b>124</b>	<b>32</b>	<b>322</b>
Wading Birds	Black-Crowned Night Hero	3	2	1		6
	Great Blue Heron	9	8	6	6	29
	Great Egret	6				6
<b>Wading Birds Total</b>		<b>18</b>	<b>10</b>	<b>7</b>	<b>6</b>	<b>41</b>
Aerialists	American White Pelican	2	12	2	2	18
	Misc. Gull	25	3			28
<b>Aerialists Total</b>		<b>27</b>	<b>15</b>	<b>2</b>	<b>2</b>	<b>46</b>
Fowl-Like Birds	California Quail	9				9
<b>Fowl-Like Birds Total</b>		<b>9</b>				<b>9</b>
Passerines	American Crow			37	4	41
	American Goldfinch				1	1
	American Robin	7	11	7	1	26
	Bank Swallow		25	107	5	137
	Barn Swallow			8		8
	Black-billed Magpie	24	11	53	9	97
	Brewer's Blackbird			101		101
	Brown-Headed Cowbird		1	6		7
	Bullock's Oriole		17			17
	Cliff Swallow		16	26	29	71
	Common Raven	48	13			61
	Dark-Eyed Junco	2				2
	Eastern Kingbird				11	11
	European Starling	1,671	2	20	23	1,716
	House Finch	43	1	9	7	60
	House Sparrow	1				1
	Lark Sparrow	6	1			7
	Misc. Duck	2				2
	Misc. Finch		1			1
	Misc. Sparrow		2	2	2	6
	Misc. Swallow		3			3
	Red-winged Blackbird	7	15	315	45	382
Rock Pigeon		3			3	
Western Kingbird	1	3	1	2	7	
Western Meadowlark			1	1	2	
White-Crowned Sparrow	4	1	2	3	10	
Unknown	80	1			81	
<b>Passerines Total</b>		<b>1,871</b>	<b>127</b>	<b>695</b>	<b>143</b>	<b>2,861</b>
Non-Passerines Misc.	Belted Kingfisher	1		1	1	3
	Common Nighthawk	1			1	3
	Mourning Dove			3	4	7
	Northern Flicker	13	1	2		16
	Unknown		2			2
<b>Non-Passerines Total</b>		<b>15</b>	<b>3</b>	<b>6</b>	<b>6</b>	<b>31</b>
Unknown	Unknown		52		39	91
<b>Unknown Total</b>			<b>52</b>		<b>39</b>	<b>91</b>
<b>Grand Total</b>		<b>2,096</b>	<b>266</b>	<b>842</b>	<b>229</b>	<b>3,433</b>

**Table 11 Flight distribution of birds intersecting the transmission line spans presented by bird category during 2016.**

Type and Proximity of Transmission Line	Vertical Plane (ft)	Birds of Prey	Waterfowl	Wading Birds	Shorebirds	Aerialists	Fowl-like Birds	Passerines	Non-Passerine Misc.	Unknown	Grand Total
Above OHGW	>101	1	2			6					9
	0-10		1	1				15	1		18
	11-25		13	6				44	2	8	73
	26-50	4	11	1		4		24	1		45
	51-100	1	19	3		15		89	6		133
<b>Above OHGW Total</b>		<b>6</b>	<b>46</b>	<b>11</b>	<b>0</b>	<b>25</b>		<b>172</b>	<b>10</b>	<b>8</b>	<b>278</b>
Below T-Lines	>101	0	7	1		1					9
	0-10	4	32	7				45			88
	11-25	3	8	1		3		166		4	185
	26-50	3	11	2		1		79		21	117
	51-100	3	19	3		6		127		12	170
<b>Below T-Lines Total</b>		<b>14</b>	<b>77</b>	<b>14</b>	<b>0</b>	<b>11</b>		<b>394</b>		<b>37</b>	<b>547</b>
Between	0-10		9	1				76	1	1	88
	11-25		9	2		1		660	1	23	696
	26-50	1	6					7	2		16
<b>Between Total</b>		<b>1</b>	<b>24</b>	<b>3</b>	<b>0</b>	<b>1</b>		<b>743</b>	<b>4</b>	<b>24</b>	<b>800</b>
Did Not Intersect	N/A	11	175	13		9	9	1,527	17	22	1,783
<b>Did Not Intersect Total</b>		<b>11</b>	<b>175</b>	<b>13</b>	<b>0</b>	<b>9</b>	<b>9</b>	<b>1,527</b>	<b>17</b>	<b>22</b>	<b>1,783</b>
<b>Grand Total</b>		<b>32</b>	<b>322</b>	<b>41</b>	<b>0</b>	<b>46</b>	<b>9</b>	<b>2,861</b>	<b>31</b>	<b>91</b>	<b>3,433</b>



**Table 12 Bird flight behaviors observed during 2016.**

Bird Category	Abrupt Altered Flight	Altered Flight	Flight Among Wires	Flushed	Perched on Other	Perched on Tower	Perched on Wire	Unaltered Flight	On Ground/Water	Grand Total
Birds of Prey								32		32
Waterfowl	5	6	15	14				145	137	322
Wading Birds		1			1			34	5	41
Shorebirds										
Aerialists			1					41	4	46
Fowl-Like Birds				9						9
Passerines		13	698		118	601	88	1,314	4	2,836
Non-Passerine Misc.	1				17	2		11		31
Unknown			5		1	3		99	8	116
<b>Grand Total</b>	<b>6</b>	<b>20</b>	<b>719</b>	<b>23</b>	<b>137</b>	<b>606</b>	<b>88</b>	<b>1,676</b>	<b>158</b>	<b>3,433</b>

**Table 13 Seasons of available data for 2016 statistical comparison.**

Corridor	# Seasons of Pre-BFD data	# Seasons of Post-BFD data	Installation Year
South Moran Slough	3	21	2011
North Moran Slough	7	17	2012
Wanapum Switchyard	11	13	2013
Wanapum-Columbia	15	9	2014
Midway	23	1	2016

**Table 14 Comparison of pre-BFD installation and post-BFD installation bird flight behavior data at South Moran Slough (2011 through 2016).**

Bird Category	Pre-BFD Observation Summary				Post-BFD Observation Summary				Altered Behavior Statistics			Unaltered Behavior Statistics		
	# Seasons	# alt (0.96%)	# unalt (17.87%)	Total Obs.	# Seasons	# alt (3.49%)	# unalt (41.45%)	Total Obs.	P(T<=t)	df	Significant	P(T<=t)	df	Significant
<b>A: Birds of Prey</b>	3	2	8	20	21	7	31	47				0.10	3	no
<b>B: Waterfowl</b>	3	4	43	110	21	28	343	1,025	0.808	21	no	0.69	2	no
<b>C: Wading Birds</b>	3	1	7	8	21	15	54	86						
<b>D: Shorebirds</b>	3	0	1	3	21	0	1	7						
<b>E: Aerialists</b>	3	0	2	2	21	1	31	33						
<b>F: Fowl-Like Birds</b>	3	0	0	0	21	0	0	24						
<b>G: Passerine Birds</b>	3	14	309	2,004	21	142	3,702	9,223	0.993	3	no	<b>0.03</b>	6	yes
<b>H: Non-Passerine Misc.</b>	3	0	19	30	21	3	92	142				0.87	5	no
<b>Total</b>		<b>21</b>	<b>389</b>	<b>2,177</b>		<b>196</b>	<b>4,254</b>	<b>10,587</b>						

**Table 15 Comparison of pre-BFD installation and post-BFD installation bird flight behavior data at North Moran Slough (2011 through 2016).**

Bird Category	Pre-BFD Observation Summary				Post-BFD Observation Summary				Altered Behavior Statistics			Unaltered Behavior Statistics		
	# Seasons	# alt (2.07%)	# unalt (37.28%)	Total Obs.	# Seasons	# alt (4.04%)	# unalt (62.52%)	Total Obs.	P(T<=t)	df	Significant	P(T<=t)	df	Significant
<b>A: Birds of Prey</b>	7	0	30	43	17	0	40	52				0.350	12	no
<b>B: Waterfowl</b>	7	40	468	530	17	98	947	1,357	0.767	8	no	0.581	10	no
<b>C: Wading Birds</b>	7	7	44	53	17	9	77	117	0.700	19	no	<b>0.005</b>	20	yes
<b>D: Shorebirds</b>	7	0	7	8	17	0	1	3						
<b>E: Aerialists</b>	7	3	30	38	17	6	68	74	0.448	12	no	0.413	8	no
<b>F: Fowl-Like Birds</b>	7	0	0	0	17	0	0	9						
<b>G: Passerine Birds</b>	7	21	676	2,728	17	61	1,594	2,686	0.229	20	no	0.431	9	no
<b>H: Non-Passerine Misc.</b>	7	0	21	23	17	3	56	83				0.147	9	no
<b>Total</b>		<b>71</b>	<b>1,276</b>	<b>3,423</b>		<b>177</b>	<b>2,783</b>	<b>4,381</b>						

**Table 16 Comparison of pre-BFD installation and post-BFD installation bird flight behavior data at Wanapum Switchyard (2011 through 2016).**

Bird Category	Pre-BFD Observation Summary				Post-BFD Observation Summary				Altered Behavior Statistics			Unaltered Behavior Statistics		
	# Seasons	# alt (3.86%)	# unalt (51.96%)	Total Obs.	# Seasons	# alt (0.66%)	# unalt (60.16%)	Total Obs.	P(T<=t)	df	Significant	P(T<=t)	df	Significant
<b>A: Birds of Prey</b>	11	2	53	106	13	0	19	32				0.484	16	no
<b>B: Waterfowl</b>	11	4	186	193	13	0	21	21				0.363	5	no
<b>C: Wading Birds</b>	11	0	0	0	13	0	0	0						
<b>D: Shorebirds</b>	11	0	0	0	13	0	0	0						
<b>E: Aerialists</b>	11	0	0	0	13	0	0	0						
<b>F: Fowl-Like Birds</b>	11	0	13	19	13	0	0	2						
<b>G: Passerine Birds</b>	11	73	764	1,643	13	0	1,119	1,863	0.236	13	no	0.078	18	no
<b>H: Non-Passerine Misc.</b>	11	1	60	110	13	0	34	65				0.250	12	no
<b>Total</b>		<b>80</b>	<b>1,076</b>	<b>2,071</b>		<b>0</b>	<b>1,193</b>	<b>1,983</b>						

**Table 17 Comparison of pre-BFD installation and post-BFD installation bird flight behavior data at Wanapum-Columbia (2011 through 2016).**

	Pre-BFD Observation Summary				Post-BFD Observation Summary				Altered Behavior Statistics			Unaltered Behavior Statistics		
	# Seasons	# alt (0.20%)	# unalt (46.85%)	Total Obs.	# Seasons	# alt (4.75%)	# unalt (69.97%)	Total Obs.	P(T<=t)	df	Significant	P(T<=t)	df	Significant
<b>A: Birds of Prey</b>	15	0	42	64	9	0	18	24				0.098	19	no
<b>B: Waterfowl</b>	15	0	0	0	9	0	28	28						
<b>C: Wading Birds</b>	15	0	0	0	9	0	0	0						
<b>D: Shorebirds</b>	15	0	0	0	9	0	0	0						
<b>E: Aerialists</b>	15	0	0	0	9	0	0	0						
<b>F: Fowl-Like Birds</b>	15	0	0	30	9	0	0	1						
<b>G: Passerine Birds</b>	15	3	606	1,304	9	56	778	1,120	0.917	17	no	0.237	12	no
<b>H: Non-Passerine Misc.</b>	15	0	52	96	9	0	1	6						
<b>Total</b>		<b>3</b>	<b>700</b>	<b>1,494</b>		<b>56</b>	<b>825</b>	<b>1,179</b>						

**Table 18 Trends in Total Number of Bird Observations (2011 through 2016).**

<b>Corridor</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>Grand Total</b>
Midway	2,148	883	1,101	783	1,051	245	6,211
North Moran Slough	2,687	1,498	680	946	1,505	535	7,851
South Moran Slough	2,429	2,066	1,150	1,355	3,628	2,154	12,782
Wanapum Switchyard	834	1,015	459	531	899	328	4,066
Wanapum-Columbia	669	390	267	203	994	171	2,694
<b>Grand Total</b>	<b>8,767</b>	<b>5,852</b>	<b>3,657</b>	<b>3,818</b>	<b>8,077</b>	<b>3,433</b>	<b>33,604</b>

#### **4.0 Next Steps**

This report completes the pre-BFD and post-BFD bird interaction behavior assessments at South Moran Slough, North Moran Slough, Wanapum Switchyard, and the Wanapum-Columbia sites. With additional surveys required every 15 years hence forward per the Plan, it is suggested that avian surveys be initiated in calendar year 2031 at all sites with the intent to provide an annual report to the U.S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, and FERC by April 17, 2032. It is also suggested that supplemental post-BFD avian surveys be performed at the Midway/Columbia River corridor site in 2017 for all seasons due to the rescheduling of the BFD installations at this site from 2015 to 2016 which resulted in lack of post-BFD bird behavior data for statistical comparisons in this report. As a result, it is suggested that a supplemental report specific to the Midway/Columbia River corridor site that incorporates statistical comparisons of the pre-BFD and post-BFD bird flight behavior data will be provided to the U.S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, and FERC by April 17, 2018.

#### **5.0 Acknowledgements**

Grant PUD appreciates Environmental Assessment Services, LLC assistance in conducting the avian surveys and quality assurance and quality control for the data collected during 2016, as well as annual report preparation pursuant to the Plan.

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**Appendix A**  
**Article 411 Survey Forms**

**Article 411 Transmission Line Collision Protection Plan Survey**  
**Site Description Survey Form**

**Date:** \_\_\_\_\_

**Surveyor:** \_\_\_\_\_

- Site:**  Wanapum – Columbia (Span 1)  
Type D1 Towers,  
3 T-Lines  
2 OHGW's
- North Moran Slough (Span 3)  
Type TR1 & Tangent A1 Towers,  
3 T-Lines  
2 OHGW's
- Priest – Midway (Span 5, 7, and 9)  
Type B2 Special Towers,  
3 T-Lines/Span  
2 OHGW's/Span

- Wanapum Switchyard (Span 2)  
Type A2 Tangent & DS Towers,  
3 T-Lines  
2 OHGW's
- South Moran Slough (Span 4, 6, and 8)  
Type A1 Tangent Towers,  
3 T-Lines/Span  
1 OHGW/Span
- Midway – Frenchman (Span 10)  
Type SC Special Towers,  
3 T-Lines  
2 OHGW's

**Survey Period**

- Spring Migration (Feb – Mar)       Nesting (April – May)  
 Summer (July – Aug)                       Fall/Winter (Mid-Sept – Nov)

**Day Time Period**

- AM     Mid-Day     PM

Start Time: \_\_\_\_\_ End Time: \_\_\_\_\_

**Bird Flight Diverters Installed?**

- Yes     No

**Miscellaneous Information (Presence/Absence)**

- Raptor Perches  
 Large Migratory Flights  
 Geographic Funnel (i.e., Canyons/Valleys)

**Avian Location Type:**

- Raptor Location Type
- Ledges & Alcoves on Cliffs  
 N/A  
 Low (0-5)  
 Moderate (6-10)  
 High (>10)
- Updrafts/Thermals  
 Present     Absent

- Waterfowl Location Type
- Open Water  
 Present     Absent
- Nesting Habitat (Nesting Survey Only)  
 Present     Absent     N/A
- Brood Cover (Nesting/Summer Survey)  
 Present     Absent     N/A

Page \_\_ of \_\_

