WELLS PROJECT 230 KV TRANSMISSION LINE AVIAN PROTECTION PLAN

WELLS HYDROELECTRIC PROJECT

FERC NO. 2149

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Prepared by:
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EXECUTIVE SUMMARY

The Wells 230kV Transmission Line Corridor Avian Protection Plan (APP) was developed to protect resident and migrant birds that interact with the Wells 230 kV transmission lines. Public Utility District No. 1 of Douglas County (Douglas PUD) is committed to maintaining the reliability of the transmission lines in a cost effective manner while meeting the regulatory requirements to conserve migratory species; rare, threatened and endangered species; and raptors. The APP considers both avian migrants interacting with the transmission lines crossing the Columbia River and birds nesting on the transmission line structures. Douglas PUD prepared the APP in consultation with the U.S. Fish and Wildlife Service (USFWS) and the Washington Department of Fish and Wildlife (WDFW).

Beginning in year one of the new license, Douglas PUD will implement the following practices and protocols under the APP:

- Reporting Protocol: All avian mortalities found in the transmission line corridor will be reported to the appropriate parties;

- Nest Management Protocol: Douglas PUD will implement a Nest Management Protocol in compliance with federal and state bird protection laws;

- Tree Removal Protocol: Tree removal as part of transmission corridor maintenance will only occur between August 31 and January 31 to protect migratory birds;

- Training Protocol: All appropriate utility personnel will be trained to evaluate avian issues when performing maintenance on the transmission lines and corridor.

1.0 INTRODUCTION

The Wells 230kV Transmission Line Corridor Avian Protection Plan (APP) was developed to reduce the potential for bird collisions with the Wells 230kV transmission lines and structures. Public Utility District No. 1 of Douglas County (Douglas PUD) is committed to maintaining the reliability of the transmission lines in a cost effective manner while meeting the regulatory requirements to conserve migratory species; rare, threatened and endangered species; and raptors. The APP considers both avian migrants interacting with the transmission lines crossing the Columbia River and nesting on the transmission line structures. Douglas PUD prepared the avian protection plan in consultation with the U.S. Fish and Wildlife Service (USFWS) and Washington Department of Fish and Wildlife (WDFW).

1.1 Wells Hydroelectric Project

Wells Dam was constructed between 1963 and 1967. The dam is located at river mile (RM) 515.6 on the Columbia River in Washington State, approximately 30 miles (48 km) downstream of Chief Joseph Dam and 42 miles (68 km) upstream of Rocky Reach Dam. Wells Dam has ten generating units with an installed nameplate capacity of 774,300 kilowatts (kW) and a maximum generating capability of 840,000 kW. Power from the Wells Hydroelectric Project (Wells Project) serves both Douglas PUD's owners/customers and utilities throughout the Northwest.

1.2 230 kV Transmission Lines

Two 230 kV single-circuit transmission lines were built for the Wells Project (Figure 1.2-1). Each of the 230 kV transmission lines is capable of transmitting the entire output of the Wells Project. The lines run 41 miles (65.6 km) from the switchyard atop the dam to the Douglas Switchyard operated by Douglas PUD. The lines run parallel to each other on 45-85 foot steel towers along a common 235-foot wide right-of-way. Each phase has two parallel conductors suspended 96 inches to 105 inches (2.4 to 2.6 m) below the bridge and approximately 24 feet (7.3 m) between phases. The transmission lines begin at Wells Dam and cross the Columbia River from Carpenter Island in Chelan County to Douglas County (Figure 1.2-2). After crossing the river, the transmission lines travel southeast to the Boulder Park area then turn southwest across wheat fields, past the town of Waterville and over Badger Mountain. The Douglas Switchyard is located in close proximity to the Rocky Reach Switchyard, operated by Public Utility District No. 1 of Chelan County (Chelan PUD) and the Sickler Substation, operated by the Bonneville Power Administration (BPA). The 230 kV lines connect to the regional transmission grid at BPA's Sickler Substation.

Figure 1.2-1 Wells Project Transmission Line

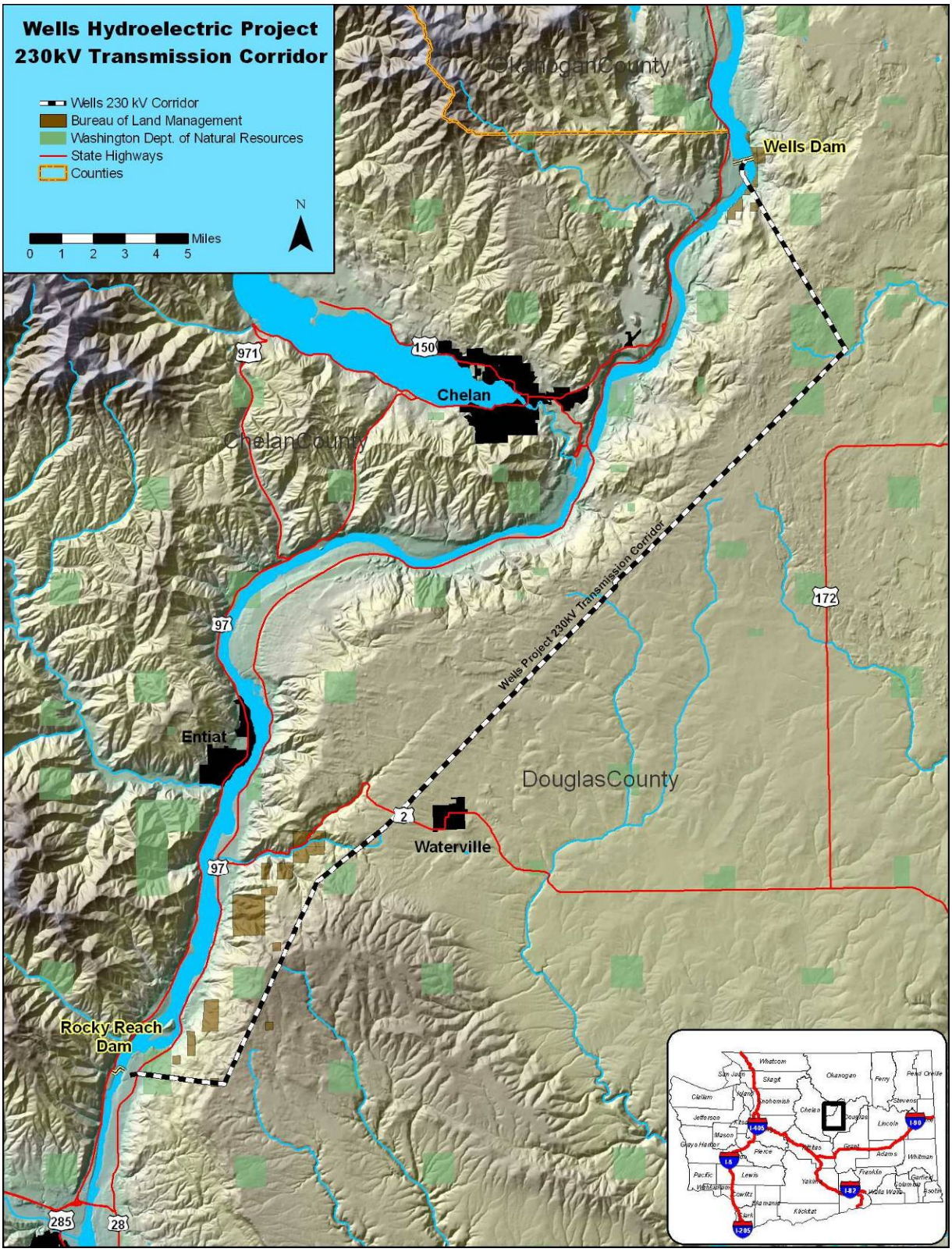

Figure 1.2-2 Wells Project 230 kV Transmission Line Corridor

2.0 BACKGROUND

Utility poles and transmission line structures can benefit raptors by providing perch and /or nesting structures in areas where few natural perches or nest sites are available. These same structures can pose a threat to raptors and migratory birds through electrocution and collision with conductors. Avian electrocutions and collisions with power lines have been documented nearly as long as utilities have provided power to the public and industry (APLIC, 2006, 1996 and 1994; APLIC and USFWS, 2005). Since the 1970s, utilities, USFWS and the National Audubon Society have worked together to document avian mortalities and to develop methods to reduce electrocutions and line collisions. In 2005, the Avian Power Line Interaction Committee and the USFWS jointly published Avian Protection Plan Guidelines to assist utilities in developing voluntary APPs.

Surveys of the transmission corridor were conducted in 2008 to identify evidence of avian collisions with the transmission line and associated structures. The process of collecting avian collision data consisted of two components: (1) a focused survey of two segments determined likely to have waterfowl and water birds flying through, and (2) observations of avian carcasses incidental to all other wildlife and botanical studies along the entire corridor. Three bird carcasses were found during focused surveys, and three other carcasses were found incidentally to other survey efforts. No direct evidence of collision was noted from these six carcasses (Parametrix, 2009).

During the Terrestrial Resource Work Group meeting on August 26, 2008, Douglas PUD and WDFW agreed to conduct additional surveys of raptor migration activity along the transmission line corridor. Between September 16 and 30, biologists from both entities collected observations of raptors from prominent ridges by Landingham Hill above Wells Dam, near McGinnis Canyon, and on Badger Mountain above Rocky Reach Dam. During that period, biologists spent two to three hours at these locations during the morning (9:00 to 11:00 am) and afternoon hours (2:00 to 4:00 pm), for a total of 10 observation periods.

Raptor migration activity surveys resulted in 37 observations, comprised of six identified raptor species, and three unidentified individuals. Raptors observed along the transmission line corridor were: northern harrier (*Circus cyaneus*), Cooper's hawk (*Accipiter cooperii*), red-tailed hawk (*Buteo jamaicensis*), golden eagle (*Aquila chrysaetos*), merlin (*Falco columbarius*), and prairie falcon (*Falco mexicanus*). Thirteen raptors were observed crossing over or under the transmission lines and an additional 13 were seen perching on towers. Biologists found no indication of raptors avoiding or being adversely affected by the transmission lines or towers (WDFW, unpublished data).

3.0 MANAGEMENT PLAN GOAL

The goal of the Avian Protection Plan is to protect resident and migrant birds that interact with the Wells 230 kV transmission lines.

4.0 FEDERAL AND STATE BIRD PROTECTION LAWS

Federal laws protecting birds include the Migratory Bird Treaty Act of 1918 (MBTA) (16 U.S.C. 703-712), the Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. 668-668d) and the Endangered Species Act (ESA) (16 U.S.C. 1531-1543). These three laws are administered by the USFWS and are the cornerstone of modern bird conservation on a national level. There are only a few birds that are not protected by these laws including introduced species: house sparrow (*Passer domesticus*), European starling *(Sturnus vulgaris)* and rock dove (*Columba liviaor*) and escaped exotic pet trade species (parrots, finches and canaries**).** Non-migratory species of birds (e.g. upland game birds) are not protected by these acts.

The MBTA, BGEPA and ESA are strict liability laws; the USFWS does not have to show intent to cause harm to a bird to charge an individual or company with a take under these laws. Violation of any of these laws can result in mandated remedial obligations, fines and/or imprisonment.

State RCW 77.15.130 protects fish and wildlife from unlawful take. Fish and wildlife eggs and nests are also protected by this law. Violation of this law is a misdemeanor.

5.0 AVIAN MORTALITY

5.1 Electrocution

5.1.1 Direct contact

Electrocutions occur when birds are large enough to span the distance between conductors or between an energized component and a ground. Sandhill cranes (*Grus canadensis*) are the largest migrant bird to stop over in fields in Douglas County but are not normally found in the vicinity of the transmission line. Bald eagles (*Haliaeetus leucocephalus*) and golden eagles are the largest birds anticipated to interact on the Wells 230 kV transmission line.

Suggested Practices for Avian Protection on Power Lines – The State of the Art in 2006 recommends 60 inches (152 cm) of separation between energized parts to protect eagle sized birds from electrocution (APLIC, 2006). The Wells 230 kV transmission lines were constructed to meet the National Electric Safety Code (NESC) conductor clearances. The transmission line exceeds the minimum eagle separation recommendation with a phase to ground separation of 8 feet (2.4 m) and horizontal separation of 24 feet (7.3 m) between phases. The phase to phase separation exceeds the maximum wing span for an adult female eagle of 8 feet (2.4 m) (APLIC, 2006). The use of suspension insulators contribute to the safety margin for eagles by suspending the conductor under the tower bridge preventing wing tip to wing tip contact between the phase and ground.

5.1.2 Bird Streamers

Large raptors, vultures and large wading birds can expel long streams of excrement called streamers in the utility industry. These streamers can cause flashovers and short-outages when they provide an electrical path from an energized conductor or hardware to ground. Streamer related faults are not normally lethal to the bird since streamers are often released as the bird flies from the structure though lethal injuries can occur (APLIC, 2006). Bird streamer flashovers are usually identified by fecal buildup and flash marks on insulators and structures. Douglas PUD has not identified bird streamer caused faults on the Wells 230 kV transmission lines (pers. comm. Arlen Simon, Douglas PUD).

5.2 Collisions

Factors that influence avian collision risk can be divided into three categories: those factors related to avian species, those related to the environment, and those related to the configuration or location of lines (APLIC and USFWS, 2005). Species-related factors include habitat use, body size, flight behavior, age, sex, and flocking behavior. Heavy-bodied, less agile birds or birds within large flocks may lack the ability to quickly negotiate obstacles, making them more likely to collide with overhead lines (e. g., herons and swans). Likewise, inexperienced birds as well as those distracted by territorial or courtship activities may collide with lines. Environmental factors influencing collision risk include the effects of weather and time of day on line visibility, surrounding land use practices that may attract birds, and human activities that may flush birds into lines. Line-related factors influencing collision risk include the configuration and location of the line and line placement with respect to other structures or topographic features. Collisions often occur with the overhead shield (ground) wire, which is smaller diameter and less visible than the primary conductors (APLIC and USFWS, 2005).

The height that birds fly is an important factor for evaluating a transmission line's avian collision potential. Birds migrate at elevations above the height of most transmission lines. Birds migrating at night have been recorded to fly from 800 to 3,700 feet (241 to 1127 m) above the ground (APLIC, 1994). Spring and fall radar studies of nocturnal migrating birds in Douglas County show the majority of birds fly at elevations of 750 to 3,350 feet (230.m to 990 m) above the ground (Hamer et. al, 2003). However, small nimble passerines (songbirds) can be detected migrating a few meters above the ground during inclement weather or daytime migrations (APLIC, 1994).

It is unlikely that the transmission line is a collision risk for migrating birds for the reasons described below.

The major portion of the transmission line runs for approximately 31 miles (50 km) from the Boulder Park area to south Badger Mountain. This portion of the line parallels the north and south flight paths of birds migrating through Douglas County. This portion of the transmission line also parallels the transmission right of way for two BPA 500 kV transmission lines and two 230 kV BPA transmission lines.

The Wells transmission lines run in parallel with the four BPA lines from Boulder Park southwest for 10.5 miles, where one 500 kV and two 230 kV lines turn west and cross the Columbia River near Earthquake Point. BPA's second 500 kV transmission line parallels the Wells transmission lines to substations near Rocky Reach dam. The 500 kV transmission lines, built to NESC standards, have greater ground to phase separation requiring taller lattice tower structures than the Wells 230 kV lines. Birds avoiding the BPA transmission lines fly well above the Wells transmission lines; the parallel location of multiple lines creates a greater visual structure, and is recommended by USFWS to reduce the potential for bird collisions (APLIC 2006).

The first 6.8 miles (10.9 km) of the transmission line travels southeast from Wells Dam to the Waterville Plateau near the Boulder Park area and the last 3.2 miles (5.1 km) of the transmission line travels southwest from Badger Mountain to the Columbia River near Rocky Reach Dam. The topography of these two slopes reduces the chance that migrating birds may collide with the lines, but raptors soaring and hunting along the slopes may be vulnerable.

Birds flying south along the Columbia River must fly above Wells Dam, approximately 14 feet (4.3 m) above the reservoir forebay and potentially above the gantry cranes and substation bus work, approximately 85 feet (25.9 m) above the forebay and 170 feet (51.8 m) above the dam tailwater. The bus work is heavily constructed and very visible during the day. The bus work has red aircraft marker lights on the top of the structure and the project is well lighted making the bus work very visible at night. Birds flying south over the dam are high enough to clear the transmission crossing below the dam. Birds flying north along the Columbia River must fly over the less visible transmission line crossing before encountering Wells Dam; light from the dam may help to make the line more visible under low light conditions.

The Wells 230 kV transmission lines were designed with two bundled conductors for each phase of the circuit. The bundled conductors, 1 1/4 inches (3.2 cm) diameter, are suspended below the lattice tower bridge by suspension insulators. The first and last mile of the transmission lines have shield wires 3/8 inch (95 mm) diameter located 18 to 22 feet (5.5 to 6.7 m) above the conductors. The shield wires protect the transmission line from lightning strikes.

The two Wells 230 kV transmission lines cross the Columbia River approximately one-half mile (0.8 km) downstream of Wells Dam. The crossing is approximately 2,400 feet (732 m) from tower to tower. APLIC (1994) reports that aerial marker balls on overhead lines reduce avian collisions by 40 to 54 percent. Fifteen round aircraft marker balls (36 inch (91 cm)) are spaced 600 feet (182 m) apart on each of the four shield wires. The markers are uniformly staggered across the four shield wires to provide an apparent spacing of 150 feet (46 m) between markers. Blinking, red aircraft warning lights are mounted on river crossing towers at the height of the shield wire.

Young birds or those unfamiliar with the area are more vulnerable to collisions with overhead lines than more experienced birds (APLIC, 1994). The crossing is potentially the most hazardous section of line for young resident birds learning to fly, raptors hunting in unfamiliar terrain, and piscivorous birds feeding below Wells Dam. Gulls, terns, cormorants and other piscivorous birds have fed below Wells Dam for years while avoiding gull wires (3/64 inch

diameter) stretched across the tail water to reduce predation on salmonids. These piscivorous birds should be able to easily avoid the shield wire under all but low light conditions. Young osprey (*Pandion haliaetus*), and bald eagles searching for fish along the river course and other young raptors are also susceptible to collision with the lines during predation attempts. Great blue herons (*Ardea herodias*) are easily flushed by human activity and could fly into the ground wire if disturbed near the river crossing.

5.2.1 Bird Flight Diverters

Bird flight diverters (BDs) have been used in Europe and the United States since the early 1970s (APLIC, 1994). BDs are a preformed high impact plastic spiral which wraps around the shield wire to make the wire more visible (Figure 5.2-1). BDs increase the apparent shield wire diameter to 2.5 to 5.5 inches (6.4 to 13.9 cm) making the line more visible to birds. BDs are normally installed at a 49 foot (15 m) spacing. Reductions in bird collisions of 65 to 74 percent have been experienced using BDs.

Following receipt of a new license, Douglas PUD will do the following:

BDs will be installed on the Wells transmission line river crossing in the event that the transmission line is reconductored, or if the static wire or aviation markers are replaced. BDs will be spaced between the aerial marker balls to increase visibility of the shield wire. If available, light emitting BDs will be installed to improve low light visibility; Puget Sound Energy is working with Tyco Electronics to develop BDs that store solar energy and emit visible light during low light conditions.

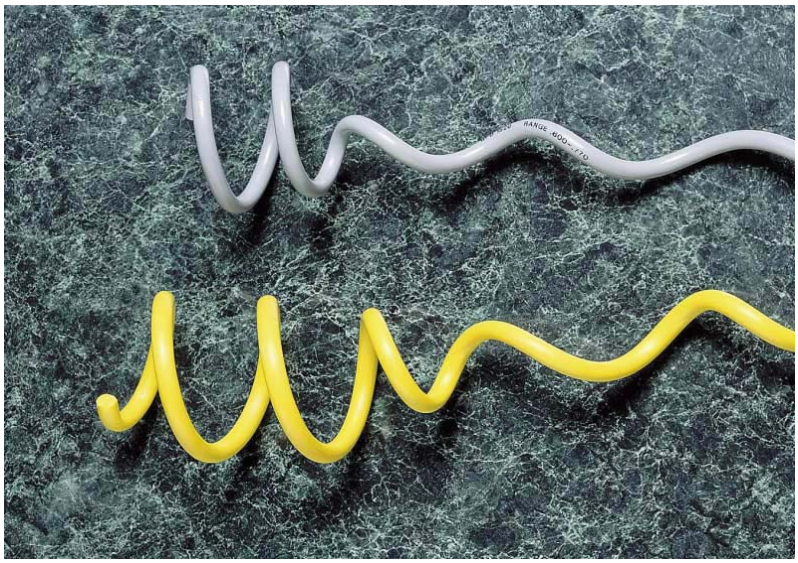

Figure 5.2.1 Bird Flight Diverters manufactured by Tyco Electronics

5.3 Record Keeping

Beginning in year one of the new license, Douglas PUD will do the following:

- Douglas PUD will maintain records of all avian mortalities detected on the Wells 230 kV transmission line right of way.

- Douglas PUD will report all avian mortalities caused by the Wells 230 kV transmission lines to USFWS through the online USFWS Bird Fatality/Injury Reporting Program (https://birdreport.fws.gov).

6.0 NEST MANAGEMENT AND TRANSMISSION LINE CORRIDOR MAINTENANCE

6.1 Nest Management

Power line structures in open habitat provide perch, roost and nest substrate for some avian species. This is especially true of raptors and ravens in open habitat where natural substrates are limited. Nests built on transmission line structures can cause outages and possibly fire when long sticks fall and cause phase to ground faults. A raptor incubating or brooding young will defecate over the side of the nest, potentially causing a streamer outage if the nest is above an energized phase.

The Wells 230 kV transmission lines travel the first 6.8 miles (10.9 km) through habitat rich with natural perching and nesting substrate including ponderosa pine (*Pinus ponderosa*) trees, cliffs and large basalt boulders. On the Waterville Plateau the transmission lines travel through 22.8 miles (36.6 km) of wheat fields with few nesting or perching opportunities. The final 11.4 miles (18.3 km) of the transmission line right of way again passes through habitat rich with ponderosa pine that provides ample perching and nesting opportunities.

Bird nests have not been a major problem on the Wells 230 kV transmission line towers. Parametrix (2009) found two common raven (*Corvus corax*) nests, a red-tailed hawk nest and a nest built by an unidentified occupant. Annual transmission line inspections have recorded an average of 4.75 nests per year, or 0.06 nest per mile per year on transmission line towers from 2004 to 2007.

Beginning in year one of the new license, Douglas PUD will implement a nest management protocol that includes:

- All nest management will be performed in compliance with federal and state laws.

- Douglas PUD's Wildlife Biologist will be consulted before any nest is removed and will secure permits from USFWS and WDFW, if necessary, before nest removal proceeds.

- Active nests will not be removed from the Wells 230 kV transmission line between February 1 and August 31 without prior approval from USFWS and WDFW.

Nests will only be removed if they are located above a line phase and have caused or threaten to cause an outage; present a fire hazard or other safety hazard; or because the size and weight of the nest threaten tower stability.

6.2 Transmission Line Corridor Maintenance

6.2.1 Tree Removal

The transmission line corridor passes through 64 acres of Douglas fir (*Pseudotsuga menziesii*) and ponderosa pine (Parametrix, 2009). The conifer canopy closure varies from sparse open canopy to closed canopy. When vegetation grows in close proximity to transmission line conductors, the vegetation can provide a path for electricity to travel to ground. An electrical flash over to ground can disrupt the delivery of energy to both customers in Douglas County and to other utilities purchasing power. Douglas PUD must maintain North America Electric Reliability Corporation (NERC) standards of 25 feet separation between conductors and vegetation to insure the transmission lines' reliability.

Removal of trees during the nesting season can have a negative impact on migratory bird species.

Beginning in year one of the new license, Douglas PUD will do the following:

- To protect nesting birds, Douglas PUD will only perform tree clearing on the transmission line corridor between August 31 and January 31. Clearing of the conifer trees on the transmission line corridor is anticipated to happen once every ten years beginning in 2018.

7.0 TRAINING

All appropriate utility personnel will be trained annually to understand avian issues on the Wells 230 kV transmission line. This training will include background information, protocols and procedures by which employees are required to report an avian mortality, implement a nest removal action, disposal of carcasses, perform vegetation management and comply with applicable regulations and the consequences of non-compliance.

Beginning in year one of the new license, Douglas PUD will do the following:

- Douglas PUD will train (as described above) all appropriate utility personnel to understand avian issues on the Wells 230 kV transmission lines.

8.0 CONSULTATION

Douglas PUD will meet with resource agencies or tribes, when requested, to discuss management of wildlife and botanical species on the transmission line corridor. All changes to

the APP must be agreed to by the WDFW, USFWS and Douglas PUD. Any agreed-upon changes to the APP will be reported to FERC for review and approval.

Table 8.1-1 Summary of implementation measures and schedule

Douglas PUD Action	Frequency	Schedule
Install bird flight diverters at the transmission line river crossing. (Section 5.2.1)	Once	Only in the event that the transmission line is reconductored or if static wires or aviation markers are replaced.
Maintain records of avian mortalities detected on the 230kV right-of-way. (Section 5.3)	As needed.	Beginning in year one of the new license.
Report all avian mortalities caused by the 230kV transmission lines to USFWS. (Section 5.3)	As needed.	Beginning in year one of the new license.
Implement a nest management protocol. (Section 6.1)	As needed.	Beginning year one of the new license.
Tree clearing on the transmission line corridor will only be performed between August 31 and January 31. (Section 6.2.1)	Approximately every ten years.	Beginning year one of the new license.
Train appropriate utility personnel to understand avian issues related to the 230kV transmission lines. (Section 7.0)	Annually.	Beginning year one of the new license.
Consult with agencies as needed (Section 8.0)	As needed.	As needed.

9.0 REFERENCES

Avian Power Line Interaction Committee (APLIC). 1994. Mitigating bird collisions with power lines: the state of the art in 1994. Edison Electric Institute. Washington.

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