RADAR RIDGE PANEL ASSESSMENT PREPARED FOR COMMISSIONER OF PUBLIC LANDS
PETER GOLDMARK

Independent Science Panel Review of Potential Impacts to Marbled Murrelets Relating to the Radar Ridge Wind Resource Area

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Introduction/Background

On April 1, 2007, the Washington State Department of Natural Resources (DNR) entered into a provisional lease agreement with Energy Northwest (Proponent) to develop a wind energy generation project in Pacific County at the Radar Ridge site. The Proponent has leased 3,359 acres of forested state trust lands for the purpose of erecting and operating up to 45 wind turbines to generate electricity. The three phases of the project are: 1) erection and operation of temporary meteorological towers to monitor wind direction and speed and acquisition of required permits; 2) construction of a wind power plant (wind driven turbines with substation) and associated infrastructure; and 3) operation of the power plant. The estimated operational life of the power plant is 30 years.

The proposed lease area would include up to 240 acres of forested state trust lands that would be cleared and remain in a non-forested condition and possibly additional acreage for transmission lines and a substation. The wind turbines would be aligned in a linear fashion along the ridge stretching for approximately 4 miles (Map 1). An overhead transmission line of approximately 5 miles in length would connect the turbine string to a new substation. Approximately 6 miles of new road construction and 5 miles of road reconstruction or improvements would occur, in addition to rock pit development.

The first phase of the lease agreement was contingent upon an evaluation of the potential for adverse impacts to the Marbled Murrelet (*Brachyramphus marmoratus*), a federally threatened species listed under the Endangered Species Act. DNR operates under an approved Habitat Conservation Plan (HCP) that addresses forest management across 2.1 million acres of forested state trust lands. However, wind power is not currently an activity covered by the HCP.

In September 2008, the Marbled Murrelet Science Team submitted conservation recommendations for southwestern Washington and the Olympic Peninsula (Raphael et al. 2008). The Nemah Block rated the highest for murrelet conservation in southwestern Washington. The lease site is centrally located within the recommended Marbled Murrelet Management Area for the Nemah Block (Raphael et al. 2008).

This report has been prepared at the request of the Commissioner of Public Lands Peter Goldmark. We address four questions for the purpose of evaluating affects of the wind resource area on the Marbled Murrelet, a threatened seabird listed under the Endangered Species Act. Members of the Working Group include:

- Kim Nelson, Research Wildlife Biologist/Senior Faculty Research Assistant, Oregon Cooperative Fish and Wildlife Research Unit, Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR.
- Dr. Martin G. Raphael, Chief Research Wildlife Biologist/Team Leader, U.S. Forest Service's Pacific Northwest Research Station, Olympia, WA.
- Peter Harrison, Scientist/Biological Services Program Lead, Ecosystem Services Section, Land Management Division, Department of Natural Resources, Olympia, WA.

Panel Assessment

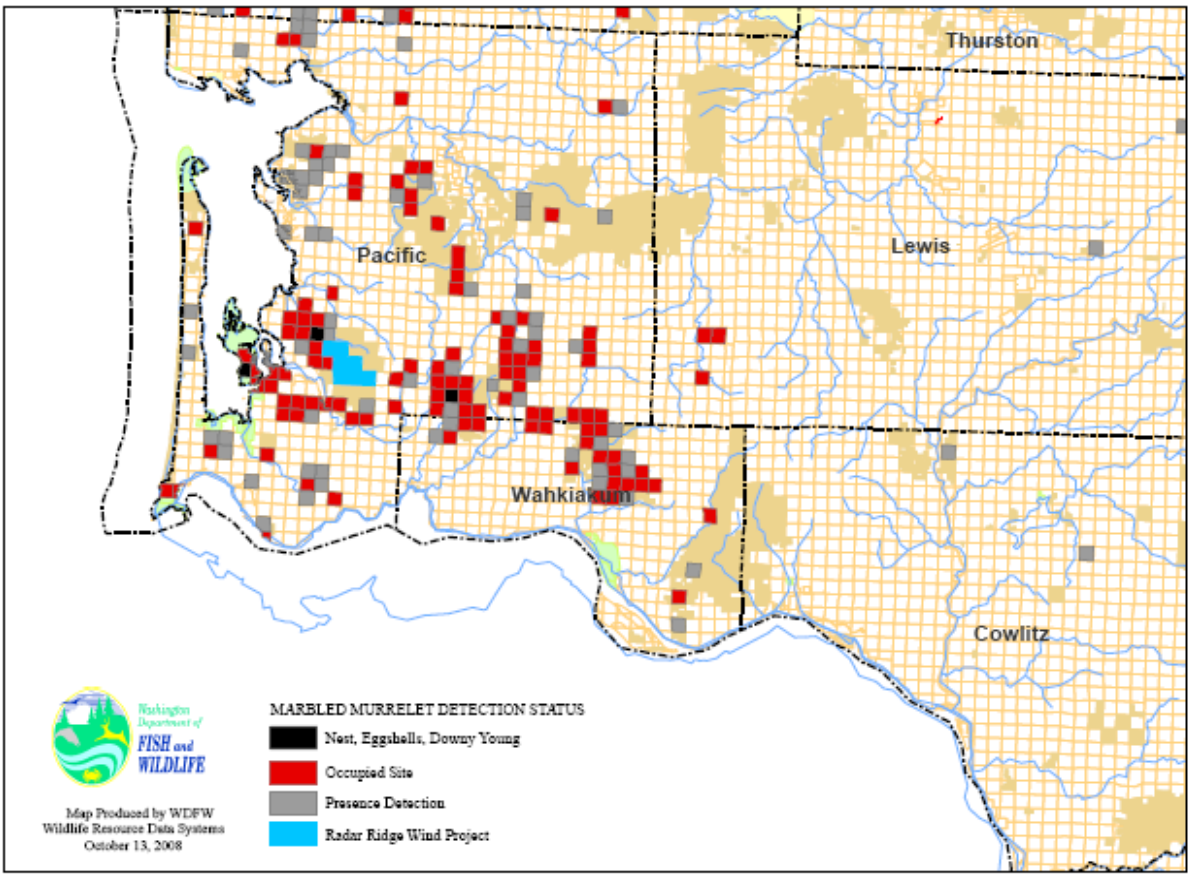
1. *Do Marbled Murrelets use the proposed lease area?*

Yes, Marbled Murrelets use the proposed lease area. Marbled Murrelet occupied behaviors and nest sites are located in the immediate area of the proposed project and have been documented flying over Radar Ridge. The northwest end of the proposed turbine string would be within approximately 1,800 feet of the area of highest known nesting use in Washington (South Nemah Natural Resources Conservation Area) (Map 1). Eighty-nine occupied sites (8,000 acres) exist on DNR managed lands within a 30-mile range of the proposed wind resource area (Map 2). Private and industrial forestlands also have a number of occupied sites within this 30-mile zone, but those data are proprietary and unavailable.

The current forest condition of the proposed lease area is not mature enough to provide suitable nesting platforms, but Marbled Murrelets fly over the proposed lease area as they socialize, search for nest sites, and commute to and from adjacent nesting areas (Hamer 2008a, Hamer 2009). To date, data collected by the Proponent through the implementation of marine radar has resulted in observations of 64 Marbled Murrelet targets within the proposed lease area at a rate of 1.59 murrelet observations per morning survey (Table 1) (Hamer 2009). Height data were recorded for 20 of the 64 murrelet target observations. The average height observed was 355 m, with a range of heights from 11.7 m to 900.9 m, with a standard deviation of 226.2 m, and a standard error of 50.6 m (Table 2). Marbled Murrelet detections with an elevation at or below 125 m are within the strike zone of the turbines. Two (10%) of these 20 detections have the potential to intersect with the wind turbine towers or blades.

sensitive species data
exempt RCW 42.56.430

Map 1. Radar Ridge Wind Resource Lease Area. Map shows the adjacent South Nemah Natural Resource Conservation Area with occupied sites and Marbled Murrelet detections, and the lease area with turbine location.



Map 2. This map shows Marbled Murrelet activity by detection status in the proposed project area landscape. The proposed project area is shown in blue. Marbled Murrelet detection status is mapped at a one square mile (section) scale.

Table 1. Marbled Murrelet radar sampling effort per morning and passage rates by season (Hamer 2009).

Period	Sampling Effort (morning radar survey)	Total Targets (# murrelets)	Passage Rate
Breeding Season 07	8.00	10	1.25
Winter 08	6.57	6	0.91
Breeding Season 08	8.86	23	2.60
Winter 09	6.84	3	0.44
Breeding Season 09	10.00	22	2.20
Breeding Season Total	26.86	55	2.05
Winter Total	13.41	9	0.67
ALL SEASONS TOTAL	**40.27**	**64**	**1.59**

Table 2. Height data from Marbled Murrelet morning radar sampling (N=20). Yellow highlighted numbers are observed Marbled Murrelet targets within the strike zone (125m; Hamer 2009).

Site		Date	Height (m)
Southeast (Communication tower)		6/4/2008	**11.7**
Southeast (Communication tower)		6/4/2008	**372.2**
Southeast (Communication tower)		7/16/2008	**390.7**
Middle (Rock quarry)		7/17/2008	**537.4**
Southeast (Communication tower)		2/13/2009	**106.2**
Southeast (Communication tower)		3/13/2009	**172.6**
Northwest (met tower)		4/15/2009	**175.5**
Northwest (met tower)		4/15/2009	**407**
Northwest (met tower)		4/15/2009	**512.4**
Northwest (met tower)		4/16/2009	**142.1**
Northwest (met tower)		4/16/2009	**319.2**
Northwest (met tower)		5/4/2009	**143.9**
Northwest (met tower)		5/4/2009	**523.8**
Northwest (met tower)		5/15/2009	**247.1**
Northwest (met tower)		5/15/2009	**801.4**
Northwest (met tower)		5/15/2009	**900.9**
Southeast (Communication tower)		5/26/2009	**230.2**
Southeast (Communication tower)		5/26/2009	**308.7**
Northwest (met tower)		5/28/2009	**318.8**
Northwest (met tower)		5/29/2009	**486.6**
AVG 355m	**Range 11.7-900.9**	**SD 226.2**	**SE 50.6**

2. *What are the likely impacts to Marbled Murrelets?*

Installation and operation of a wind energy facility will put Marbled Murrelets at risk of collision with turbines. Collision is expected to result in injury or mortality. To date there is no known Marbled Murrelet mortality associated with a wind facility, although we know of no wind plant that has been constructed within the range of the Marbled Murrelet. While the detection rate over the proposed wind resource area is relatively low, a rate of 1.59 murrelet observations per morning survey, 10% of the observed detections occur within the strike zone of the proposed turbines. We used existing data from the Proponent to determine the number of Marbled Murrelets that would pass through the strike zone. We used the Proponents seasonal periods and number of days at risk for this calculation. We believe the seasonal periods and number of days at risk is a low estimate. However, using these values demonstrates a high potential for adverse impacts to Marbled Murrelets (Table 3).

Table 3. Number of Marbled Murrelets at risk of strike (number of Marbled Murrelets that would fly through the strike zone), seasonally, annually and for the life of the project (Attachment A).

Period	Number of Marbled Murrelets at Risk of Strike
Breeding Season	**62**
Non-Breeding Season	**25**
Annually	**87**
Life of the Project, 30 years	**2,625**

Our analysis shows the project would put 2,625 Marbled Murrelet targets crossing the ridge at risk for the life of the project, 30 years. The Marbled Murrelet breeding season population estimates for Washington is 4,699 birds (Lance et al. 2008). Because the potential for adverse impacts cannot be reduced to discountable or insignificant levels (i.e., a scale where mortality would not occur), the appropriate determination for the proposed project is, adverse affects to Marbled Murrelets. If the wind energy facility is constructed, we expect direct mortality to Marbled Murrelets.

We investigated the issue of avoidance behavior by Marbled Murrelets but were unable to find any research on this issue. Currently, there is no way to evaluate the avoidance behavior issue. It is pertinent to acknowledge that poor weather conditions, heavy rain, and low cloud ceilings cause Marbled Murrelets to fly at low elevations (Mack et al. 2003). Radar Ridge is located along the southern coast of Washington State where these types of weather conditions are common in winter, spring, and fall, further increasing the risk of strike to murrelets that fly over the ridge.

Nesting Marbled Murrelets are at an increased risk to strikes as they are required to make additional flights through the project area to provision their young. Each adult of a breeding pair of Marbled Murrelets makes a minimum of two visits to the nest per day to provision the chick, but up to 5 visits per day are likely as the chick gets older. At least one visit occurs at sunrise and one visit at dusk. The death of an adult murrelet provisioning a nest would likely cause the nestling to die of starvation. There are no dusk radar surveys at the site, further complicating our ability to address impacts. Assessing likely impacts are difficult without a complete dataset of murrelet activity at the site. However, as stated in the Proponent's biological assessment, we understand that even with the existing survey information, the likelihood for mortality of Marbled Murrelets at Radar Ridge from collisions with wind turbines is high (Hamer 2008b).

3. *What is the adequacy of the data?*

Spatial coverage of the radar survey locations appear to be in the appropriate locations. The radar methods used to detect murrelet activity at the site also appear to be appropriate. The adequacy of the survey effort is complex and difficult to analyze. Survey scheduling and survey intensity are important considerations to adequately determine activity at the project site. Considerable effort would need to be invested into this issue to evaluate appropriately. However, as stated in the Proponent's biological opinion, we determined through an examination of existing survey information, the likelihood for mortality of Marbled Murrelets at Radar Ridge from collisions with wind turbines is high (Hamer 2008b).

4. *How would additional information affect our conclusion?*

A detailed analysis of the daily detection data would allow us to evaluate the adequacy of the survey effort. However, we determined through the examination of existing data that there would be adverse impacts to Marbled Murrelets. An opportunity to review the strike model methodology and components would provide us with an understanding of how the Proponent determines the mortality rates of Marbled Murrelets by the wind facility. However, this additional information would not change our conclusion that the proposed project will have adverse effects on Marbled Murrelets.

Literature Cited

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Attachment A

Marbled Murrelets at risk of strike by season, annually and for the life of the project (30 years)

Assumptions

1. Proponents data is filtered for Marbled Murrelet detections that cross the proposed turbine string
2. Uniform distribution of Marbled Murrelets crossing the ridge top
3. Area covered by radar has a 2km diameter
4. Turbine string is 6.4km in length
5. 27% of morning radar surveys are breeders (mean from; Cooper 2003, 2004; Cooper and Blaha 2004)

Variables	Breeding Season	Non-Breeding Season	Data Source/Equations
Detections per morning by radar unit	2.05	0.67	Hamer 2009
Ratio of evening to morning counts	0.27	0.27	(Cooper 2003, 2004)(Cooper and Blaha 2004) mean value of % detections, morning:evening (31%, 18%, 25%)
Daily number of Murrelet detections per radar unit	2.60	0.85	Detections per morning by radar unit + (% Detections that are breeders X Detections per morning by radar unit)
Area covered by each radar unit (km)	2	2	Hamer 2009
Project Area (km)	6.4	6.4	Hamer 2009
Expansion Factor	3.2	3.2	Project Area / 2
Number of Murrelets across turbine string per day	8.33	2.72	Area Covered by each radar unit X Daily Number of Murrelets crossing the turbine string
Days at risk	75	90	Hamer 2009
Total Number of Murrelets crossing ridge per season	624.84	245.06	Days at risk X Number of Murrelets across turbine string per day
# Detections through strike zone	0.1	0.1	Hamer 2009
# Murrelets at risk of strike	**62.48**	**25.00**	# Detections through strike zone (0-125M) X Total Number of Murrelets crossing the ridge per season
Annual Number of Murrelets at Risk of Strike		**87.48**	Breeding Season + Non-Breeding Season
Project Life, 30 years, Number of Murrelets at Risk of Strike		**2624.52**	Annual Number of Murrelets at Risk of Strike X 30 years