CH2MHILL

TECHNICAL MEMORANDUM

Revised Kittitas Valley Wind Power Project– Noise Analysis Summary

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DATE: November 23, 2005

1. Purpose and Scope of the Analysis

As described in the Rezone Application submitted to Kittitas County on September 30, 2005, Sagebrush Power Partners, LLC seeks to develop a wind farm with a capacity of up to 246 megawatts (MW) on an approximately 6,000 acre site located on lands extending approximately one mile on either side of Highway 97 in the area approximately 9 miles north of Ellensburg. The project will entail the installation of anywhere from 64 to 80 turbines - the precise number will depend upon the specifications of the wind generation equipment that is finally selected. The current project design represents a scaling back of the project that had originally been proposed and submitted to the Washington Energy Facility Site Evaluation Council (EFSEC) for licensing in January, 2003. The project as originally proposed would have entailed the installation of up to 121 turbines.

This technical memo provides a focused analysis of the noise impacts of the revised project. It builds on and revises the analyses of the project's noise impacts included in the noise analysis in the Draft EIS issued by EFSEC in December, 2003. The focus of this analysis is on the project's effects on noise for nearby receptors (especially Class A receptors as defined by the Washington Administrative Code (WAC) 173-6--030.

The locations of the proposed turbines and the locations of nearby receptors are shown in the Noise Study Contour Map attached to this memorandum.

2. Modeling Methodology

A noise model of the proposed project was developed using source input noise levels from wind turbine manufacturers' data. The noise levels at residential receptors in the general area due to noise emissions from the project have been calculated. The noise levels presented represent the anticipated steady-state level from the project with all of the wind turbines operating at their expected maximum noise output.

Standard acoustical engineering methods were used in the noise analysis. The computer software noise model used for the analysis, CADNA/A by DataKustik GmbH of Munich, Germany, is very sophisticated and enables one to fully model very complex noise sources. The sound propagation factors used in the model have been adopted from ISO 9613-2

Acoustics - Sound Attenuation During Propagation Outdoors (International Organization for Standardization, 1996) and VDI 2714 *Outdoor Sound Propagation*. The model divides the proposed facility into a list of individual point noise sources representing each piece of equipment that produces a significant amount of noise. The sound power levels representing the acoustical performance of each of these noise sources are assigned based either on field measurements of similar equipment made at other existing plants, data supplied by manufacturers, or information found in the technical literature. Using these standard power levels as a basis, the model calculates the sound pressure level that would occur at each receptor from each source after losses from distance, air absorption, blockages, ground effects, and noise reduction methods are considered. The sum of all these individual levels is the total project noise level at the modeling receptor location.

The sound power level used as input to the noise model for each wind turbine was based on the G90 – 2 MW turbine by Gamesa Eolica. Information was provided by Gamesa Eolica on sound power level vs wind speed for wind speeds from 3 meters per second (6.7 miles per hour) to 21 m/s (47 mph). The maximum sound power level listed was 105.3 dBA. This sound power level was used in the modeling. A wind turbine hub height of 67 meters was used for all turbines.

3. Modeling Results

The results of the noise modeling effort are provided below. A figure showing noise level contours, the locations of the wind turbines, and the locations of modeled noise receptors is attached.

A list of all of the noise receptors and their estimated noise levels from the project wind turbines is in Table 1.

TABLE 1: NOISE LEVELS

Receptor Name	ID No.	Estimated Project Noise Level (dBA)
U S TIMBERLANDS YAKIMA LLC	1	25
HARRIGAN, TIMOTHY ETUX	2	28
BORSVOLD, MICHAEL D. &	3	26
RANCH ON SWAUK CREEK LLC, THE	4	29
RANCH ON SWAUK CREEK LLC, THE	5	29
RANCH ON SWAUK CREEK LLC, THE	6	30
FOTHERGILL, REED	7	29
BERGMAN, VINCE L	8	29
HAMPTON, MARK ETUX	9	28
NIELSEN, WAYNE L	10	31
NIELSEN, WAYNE L	11	32
SAUNDERS, GEOFFREY M	12	30

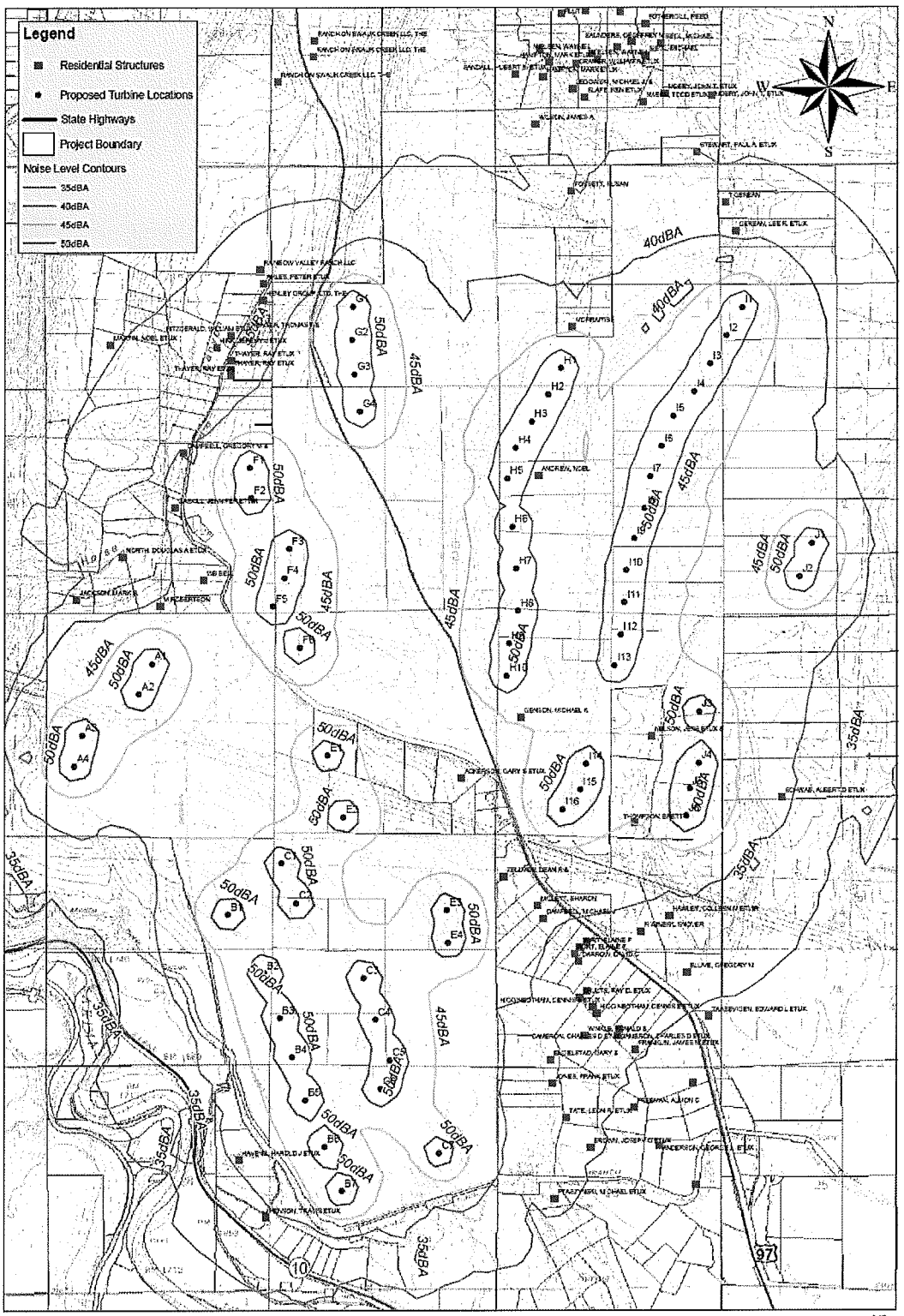
TABLE 1: NOISE LEVELS		
Receptor Name	**ID No.**	**Estimated Project Noise Level (dBA)**
SAUNDERS, GEOFFREY M	13	30
SIEGL, MICHAEL	14	31
SIEGL, MICHAEL	15	30
CRAMER, WILLIAM A ETUX	16	32
JARNAGIN, JERRY ETUX	17	31
SANDALL, HUBERT S. ETUX	18	32
HAMPTON, MARK ETUX	19	31
HAMPTON, MARK ETUX	20	32
SLAPE, KEN ETUX	21	33
LEGOWSKI, MICHAEL J. &	22	33
SWEEN, TODD ETUX	23	33
MOERY, JOHN T. ETUX	24	33
MOERY, JOHN T. ETUX	25	32
WILSON, JAMES A	26	34
STEWART, PAUL A. ETUX	27	35
STATE OF WASH (DNR)	28	38
LEE, THOMAS &	29	21
DONNELLY, DOUGLAS & JERI	30	21
FOSSETT, SUSAN	31	36
COE, VIRGINIA	32	24
HALL, WILLIAM L ETUX	33	21
RAINBOW VALLEY RANCH LLC	34	37
GEREAN, LEE R. ETUX	35	39
CARRERA, RUBEN &	36	21
KIMBALL, JERRY R ETUX	37	23
AHLES, PETER ETUX	38	38
HENLEY GROUP, LTD. THE	39	37
BRINKMAN, MYRON T ETUX	40	34
KOVALERCHUK, BORIS ETUX	41	27
FITZGERALD, WILLIAM ETUX	42	37
YEAGER, THOMAS F &	43	36

TABLE 1: NOISE LEVELS		
Receptor Name	**ID No.**	**Estimated Project Noise Level (dBA)**
MARTIN, NOEL ETUX	44	35
HINK, JEREMY J ETUX	45	37
THAYER, RAY ETUX	46	36
DORMAN, GARY D.	47	28
THAYER, RAY ETUX	48	37
THAYER, RAY ETUX	49	37
BEST, ROBERT H. ETUX	50	35
CAMPBELL, GREGORY M &	51	40
ANDREW, NOEL	52	49
GASKILL, JENNIFER ETVIR	53	41
HENRY, GREG	54	36
NORTH, DOUGLAS A ETUX	55	38
TAYLOR, SEAN	56	43
JACKSON, MARK S.	57	37
GENSON, MICHAEL K	58	45
NELSON, JESS ETUX &	59	46
ACKERSON, GARY S ETUX	60	42
THOMPSON, BRETT S	61	45
SCHWAB, ALBERT D ETUX	62	41
ZELLMER, DEAN R &	63	43
R WINES/L SNOVER	64	39
HAWLEY, COLLEEN M ETVIR	65	39
MILLETT, SHARON	66	41
CAMPBELL, MICHAEL J	67	41
BURT, ELAINE F	68	39
BURT, ELAINE F	69	39
BURT, ELAINE F	70	39
DARROW, DAVID C	71	38
SHULTS, RAY D. ETUX	72	38
SHULTS, RAY D. ETUX	73	38
BLUME, GREGORY M	74	36

TABLE 1: NOISE LEVELS

Receptor Name	ID No.	Estimated Project Noise Level (dBA)
HIGGINBOTHAM, DENNIS E ETUX	75	37
HIGGINBOTHAM, DENNIS E ETUX	76	37
CAMERON, CHARLES D ETUX	77	36
CAMERON, CHARLES D ETUX	78	36
FRANKLIN, JAMES M ETUX	79	36
WINKLE, RONALD &	80	37
TAASEVIGEN, EDWARD L ETUX	81	35
ENGELSTAD, GARY &	82	38
TATE, LEON R. ETUX	83	37
Not listed	84	34
FREEMAN, ALMON C	85	35
JONES, FRANK ETUX	86	38
BROWN, JOSEPH G ETUX	87	36
HAVENS, HAROLD J ETUX	88	41
Not listed	89	32
ANDERSON, GEORGE L. ETUX	90	33
PTASZYNSKI, MICHAEL ETUX	91	36
HENSON, TRAVIS ETUX	92	39
ROBERTSON	93	42
MORRIATIS	94	48

Based on the modeling effort, the maximum predicted project noise level at any of the receptors is 49 dBA. The Washington Department of Ecology has established limits for environmental noise in Washington Administrative Code (WAC) 173-60-040. The limit at residential receptors (environmental designation for noise abatement, or EDNA, Class A) for noise generated by from an industrial facility (EDNA C) is 60 dBA during the daytime and 50 dBA during the nighttime. The estimated maximum project noise level at a Class A receptor of 49 dBA complies with the WAC limits.



Kittitas Valley Wind Power Project
Noise Study Contours
Map Revised November 23, 2005

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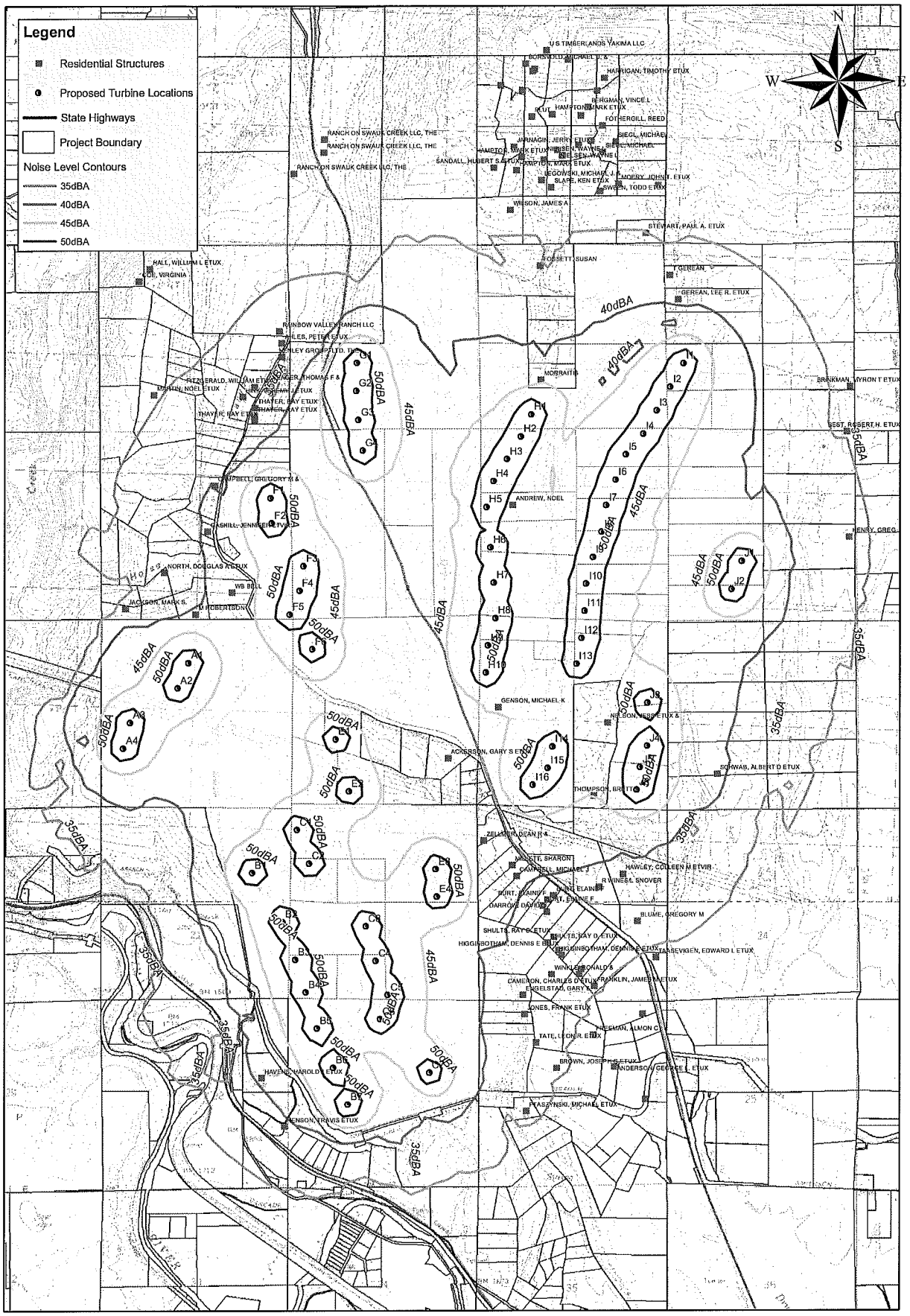

Kittitas Valley Wind Power Project
Noise Study Contours
Map Revised November 23, 2005

Table 3.12-5: Predicted Noise Levels in KVWPP Area, revised 11/23/05

Landowner	Approx. Distance from Structure to Turbine (feet)	Nearest Turbine to Structure	Est. Noise Level at Structure (dBA)	T/R/S of closest property line	Approx. Distance from Property Line to Turbine (feet)	Est. Noise Level at Property Line (dBA)	Nearest Turbine to Property Line
ACKERSON	2489	I16	42	19-17-15	1959	40-45	I16
AHLES	2178	G1	38	19-17-04	2157	35-40	G1
ANDREW	723	H5	49	PARTICIPATING LANDOWNER			
ARONICA				19-17-01	546	45-50	I1
ARRIOLA				19-17-09	1273	40-45	A1
ASSESSOR #19-17-26000-0016				19-17-26	2891	35-40	C7
BARKL				19-17-23	1254	40-45	E4
BASTERRECHEA				19-17-27	2179	35-40	B7
BELL	1740	F5	43	19-17-09	1079	40-45	F5
BEST				19-17-12	2469	35-40	J1
BISNETT				19-17-09	3864	35-40	F1
BLM				19-17-20	750	35-40	A4
BLUME	3673	J6	36	19-17-23	3230	35-40	J6
BNSF RAILWAY				19-17-28	2675	35-40	B5
BRINKMAN				19-17-01	2184	35-40	I1
BROWN	3549	C7	36	19-17-26	2712	35-40	C7
BURDYSHAW				19-17-02	1437	40-45	H1
BURT	3146	I16	39	19-17-23	2350	35-40	E4
	3112	E4	39				
	2979	E4	39				
CAMERON	4485	E4	36	19-17-23	3903	35-40	J6
	4567	E4	36				
CAMPBELL, G	1595	F1	40	19-17-09	1476	40-45	F1
CAMPBELL, J				19-17-23	1114	40-45	E4
CAMPBELL, M	2244	E3	41	19-17-23	1114	40-45	E4
CHAR				19-17-26	2717	35-40	C7
CORNWALL				19-17-01	2331	35-40	I1
DARROW	3138	E4	38	19-17-23	2762	35-40	E4
DE FACCIO				19-17-28	2753	35-40	B5
DER YUEN				19-17-34	2323	35-40	B7
DNR				PARTICIPATING LANDOWNER			
DOT				19-17-09	1275	40-45	F2
ENGELSTAD	3391	C7	38	19-17-26	2180	40-45	C7
FITZGERALD	2858	G2	37	19-17-04	2442	35-40	G2
FOSSETT	4172	H1	36	19-17-02	3331	35-40	H1
FRANKLIN	5080	E4	36	19-17-23	4299	35-40	J6

*Gray shading: No structure on property with a noise level at greater than 35dBA

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FREEMAN				19-17-26	3727	35-40	C7
GABRIELSON				19-17-12	631	45-50	J1
GALLAGHER				19-17-13	1260	40-45	J2
GARRETT				19-17-13	538	45-50	J3
GASKILL	1816	F2	41	19-17-09	1678	40-45	F2
GENSON	1026	H10	45	PARTICIPATING LANDOWNER			
GEORGE				19-17-28	2239	35-40	B7
GEREAN, L	1800	I1	39	19-17-01	1426	40-45	I1
GEREAN, T	2503	I1	38	19-17-01	2094	40-45	I1
GORDON				19-17-23	3539	35-40	E4
GORSKI				19-17-12	1114	40-45	J1
HAVENS	1994	B6	41	19-17-27	985	40-45	B7
HAWLEY	2386	J6	39	19-17-23	1824	40-45	J6
HENLEY GROUP	2121	G1	37	19-17-04	1905	35-40	G1
HENRY	3060	J1	36	19-17-12	594	45-50	J1
HENSON	1884	B7	39	19-17-27	1480	35-40	B7
HIGGINBOTHAM	3724	E4	37	19-17-23	3582	35-40	E4
	3845	E4	37				
HINK	2935	F1	37	19-17-04	2270	35-40	F1
HOLLISTER				19-17-23	557	45-50	J6
HOLMQUIST				19-17-21	984	40-45	B1
HOLTZ				19-17-09	1497	35-40	F1
JACKSON, MARK S.	2326	A1	37	19-17-09	1823	35-40	A1
JONES	3102	C7	38	19-17-26	1917	40-45	C7
JORGENSON				19-17-09	2203	35-40	F1
KELLY				19-17-28	2837	35-40	B7
KIRCHMAN				19-17-13	775	45-50	J3
KITTITAS CO TAX DEED				19-17-28	3256	35-40	B4
KITTITAS RECLAMATION DISTRICT				19-17-26	713	40-45	B7
KUHN				19-17-13	910	40-45	J2
LOS ABUELOS				PARTICIPATING LANDOWNER			
MARTIN				19-17-04	2757	35-40	F1
MCFARLAND				19-17-28	1462	40-45	B4
MCLEOD				19-17-28	3150	35-40	B5
MILLETT	2098	E3	41	19-17-23	1155	40-45	E4
MEYER				19-17-01	2740	40-45	I1

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MILLER				19-17-15	1284	40-45	I16
MORRAITIS	1000	H1	48	19-17-02	758	45-50	H1
MORSE				19-18-07	3560	35-40	J1
MURPHY				19-17-23	3271	35-40	J6
NELSON CREEK VISIONS				19-17-09	3514	35-40	F2
NELSON	1253	J3	46	19-17-14	538	45-50	I13
NEUMAN				19-17-27	2158	35-40	B7
NORTH	2622	A1	38	19-17-09	1955	35-40	A1
OBERHANSLEY				19-17-02	2662	45-50	H1
PARKER				19-17-01	2277	35-40	I1
PEARSON				19-17-27	1232	35-40	B7
PENTZ				19-18-07	3196	35-40	J1
POLLOCK				19-17-34	2320	35-40	B7
POULIN				19-17-26	1642	35-40	C7
PTASZYNSKI	2904	C7	36	19-17-26	2159	35-40	C7
RAINBOW VALLEY RANCH LLC	2352	G1	37	19-17-04	2039	35-40	G1
RANCH ON SWAUK CREEK LLC, THE				19-17-03	580	45-50	G1
RAND				19-17-09	1412	40-45	F4
REILLEY				19-17-26	1716	40-45	C7
ROBERTSON	1373	A1	42	19-17-09	1239	40-45	A1
ROMERO				19-17-15	1195	40-45	I16
SAFFORD				19-17-09	4325	35-40	F2
SCHALLER				19-17-09	2306	35-40	F1
SCHOBER				PARTICIPATING LANDOWNER			
SCHWAB	2098	J4	41	19-17-13	575	45-50	J4
SHERMAN				19-17-13	854	45-50	J6
SHORETT				19-17-09	2118	35-40	A1
SHULTS	3359	E4	38	19-17-23	1262	40-45	E4
	3448	E4	38				
SIX TEN INVESTMENTS				19-17-26	1355	40-45	C7
SMITH				19-17-15	1492	40-45	I16
SPRINGWOOD RANCH				19-17-28	3281	35-40	B4
STEWART				20-17-35	3321	35-40	I1
STORWICK				19-17-15	1509	40-45	E2

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SWAUK VALLEY RANCH				19-17-17	612	45-50	A4
SZUBA				19-18-07	3215	35-40	J1
TATE	3081	C7	37	19-17-26	2958	35-40	C7
THAYER	2555	F1	36	19-17-04	1880	35-40	G2
	2339	F1	37				
	2227	F1	37				
THOMAS				PARTICIPATING LANDOWNER			
THOMPSON, B	1226	J6	45	19-17-14	575	45-50	I14
THOMPSON, C				19-18-07	3156	35-40	J1
TONSETH				19-17-28	2195	35-40	B5
WEILER				20-17-35	4607	35-40	I1
WHITELEY				19-17-15	1185	40-45	I16
WILKENS				19-17-13	580	45-50	J4
WILSON				20-17-35	4769	35-40	H1
WINES				19-17-23	704	45-50	I16
WINES/SNOVER	2921	J6	39	19-17-23	996	40-45	I16
WINKLE	3869	E4	37	19-17-23	3300	35-40	E4
YEAGER	2442	G2	36	19-17-04	1894	35-40	G2
ZELLMER	1547	E3	43	19-17-23	1220	40-45	I16

*Gray shading: No structure on property with a noise level at greater than 35dBA