APPENDIX O: ACOUSTIC ~~MODELING RESULTS BY NOISE SENSITIVE RECEPTOR~~REPORTS (REVISED)

Table O-1. Acoustic Modeling Results Summary

NSR ID	UTM Coordinates (meters)		Participant Status	Received Sound Levels, Project Operation (dBA)			
	Easting	Northing		Option 1, GE 2.82 MW[1]	Option 1, GE 3.03 MW[2]	Option 2, GE 5.5 MW	Option 2, SG 6.0 MW
1	322527	5112498	Outside Project	36	32	31	29
2	315941	5121131	Outside Project	35	32	32	30
3	316266	5107887	Outside Project	41	38	35	33
4	311189	5122573	Outside Project	37	34	34	32
5	343399	5110839	Outside Project	33	30	26	31
6	341511	5111069	Outside Project	35	32	28	26
7	311211	5122463	Outside Project	37	34	34	32
8	311198	5122395	Outside Project	37	34	34	32
9	316832	5117843	Outside Project	41	38	37	35
10	315988	5120729	Outside Project	34	31	31	34
11	316117	5120672	Outside Project	34	31	31	29
12	315628	5121270	Outside Project	35	32	32	30
13	315475	5121324	Outside Project	35	32	32	30
14	314438	5121311	Outside Project	36	34	35	32
15	314426	5121457	Outside Project	36	34	34	32
16	314618	5121534	Outside Project	36	33	35	33
17	314304	5121488	Outside Project	36	34	34	32
18	314081	5121412	Outside Project	37	34	34	32
19	314327	5121318	Outside Project	36	34	34	32
20	314289	5121388	Outside Project	36	34	34	32
21	314246	5121579	Outside Project	37	33	35	33
22	314165	5121746	Outside Project	37	34	35	33
23	314334	5121739	Outside Project	36	34	35	33
24	314057	5121960	Outside Project	37	34	34	33
25	314353	5121794	Outside Project	36	34	35	33
26	314363	5121942	Outside Project	36	34	34	32
27	314143	5122044	Outside Project	36	34	34	32
28	314370	5122040	Outside Project	36	34	34	32
29	314702	5121491	Outside Project	36	34	35	32
30	314417	5121876	Outside Project	36	34	34	32
31	314496	5122131	Outside Project	36	33	34	32

Table O-1. Acoustic Modeling Results Summary

NSR ID	UTM Coordinates (meters)		Participant Status	Received Sound Levels, Project Operation (dBA)			
	Easting	Northing		Option 1, GE 2.82 MW[1]	Option 1, GE 3.03 MW[2]	Option 2, GE 5.5 MW	Option 2, SG 6.0 MW
32	314662	5121788	Outside Project	36	33	34	32
33	315157	5121460	Outside Project	35	32	34	32
34	305706	5120908	Outside Project	48	46	46	45
35	343912	5109936	Outside Project	33	30	25	45
36	344091	5110176	Outside Project	33	30	25	23
37	343901	5110065	Outside Project	33	30	25	23
38	343989	5110045	Outside Project	33	30	25	23
39	344112	5110060	Outside Project	32	29	25	23
40	344203	5110049	Outside Project	32	30	25	22
41	344300	5110066	Outside Project	32	29	24	22
42	344434	5110034	Outside Project	33	29	24	22
43	343870	5110375	Outside Project	33	30	25	23
44	343931	5110360	Outside Project	32	30	25	23
45	343871	5110489	Outside Project	32	29	25	23
46	344206	5110180	Outside Project	32	30	25	22
47	344298	5110225	Outside Project	32	29	25	22
48	344284	5110235	Outside Project	32	29	25	22
49	343893	5110285	Outside Project	33	30	25	23
50	343911	5110169	Outside Project	33	30	25	23
51	343772	5110237	Outside Project	33	30	26	23
52	343686	5110377	Outside Project	33	30	25	23
53	343696	5110481	Outside Project	33	30	26	23
54	343724	5110564	Outside Project	32	30	26	23
55	343963	5110266	Outside Project	32	30	25	23
56	344001	5110401	Outside Project	32	29	25	23
57	344134	5110354	Outside Project	32	29	25	22
58	344346	5110338	Outside Project	32	29	24	22
59	344321	5110369	Outside Project	32	29	24	22
60	344422	5110514	Outside Project	32	29	24	22
61	343040	5110522	Outside Project	34	31	27	25
62	342987	5110545	Outside Project	34	32	27	25

Table O-1. Acoustic Modeling Results Summary

NSR ID	UTM Coordinates (meters)		Participant Status	Received Sound Levels, Project Operation (dBA)			
	Easting	Northing		Option 1, GE 2.82 MW[1]	Option 1, GE 3.03 MW[2]	Option 2, GE 5.5 MW	Option 2, SG 6.0 MW
63	342885	5110527	Outside Project	35	32	28	25
64	342888	5110573	Outside Project	35	32	28	25
65	343184	5110161	Outside Project	35	32	27	25
66	342904	5110640	Outside Project	34	32	28	25
67	342926	5110746	Outside Project	34	31	28	25
68	343020	5110863	Outside Project	34	31	27	25
69	342907	5110985	Outside Project	34	31	27	25
70	343043	5111066	Outside Project	33	30	27	25
71	342980	5111146	Outside Project	33	30	27	24
72	343267	5110849	Outside Project	33	30	27	24
73	344342	5110868	Outside Project	31	28	25	24
74	323245	5110995	Outside Project	42	39	35	33
75	322924	5111422	Outside Project	40	37	34	33
76	322770	5111247	Outside Project	40	38	34	32
77	342682	5110672	Outside Project	35	32	28	32
78	342633	5110657	Outside Project	35	32	28	26
79	342619	5110615	Outside Project	35	33	28	26
80	342581	5110589	Outside Project	35	33	29	26
81	342490	5110551	Outside Project	36	33	29	27
82	342495	5110524	Outside Project	36	33	29	27
83	342459	5110574	Outside Project	36	33	29	27
84	342480	5110650	Outside Project	35	33	29	26
85	342368	5110689	Outside Project	36	33	29	26
86	342055	5109945	Outside Project	39	37	32	29
87	342155	5109936	Outside Project	39	37	32	29
88	342271	5110235	Outside Project	38	35	30	29
89	342775	5109919	Outside Project	37	34	29	28
90	342753	5109918	Outside Project	37	34	29	27
91	342731	5109920	Outside Project	37	34	29	27
92	342708	5109921	Outside Project	37	34	29	27
93	342782	5109938	Outside Project	37	34	29	27

Table O-1. Acoustic Modeling Results Summary

NSR ID	UTM Coordinates (meters)		Participant Status	Received Sound Levels, Project Operation (dBA)			
	Easting	Northing		Option 1, GE 2.82 MW[1]	Option 1, GE 3.03 MW[2]	Option 2, GE 5.5 MW	Option 2, SG 6.0 MW
94	342760	5109938	Outside Project	37	34	29	27
95	342739	5109938	Outside Project	37	34	29	27
96	342717	5109941	Outside Project	37	34	29	27
97	342812	5110266	Outside Project	36	33	28	26
98	342152	5110120	Outside Project	38	36	31	29
99	342322	5110406	Outside Project	37	34	30	28
100	342404	5110497	Outside Project	36	34	29	27
101	341239	5110322	Outside Project	38	35	30	28
102	341592	5111107	Outside Project	35	32	28	28
103	341675	5110987	Outside Project	35	32	29	26
104	341417	5111355	Outside Project	34	31	28	26
105	341448	5111299	Outside Project	34	31	28	25
106	341401	5111227	Outside Project	35	32	28	25
107	341721	5110818	Outside Project	36	33	29	27
108	341262	5111094	Outside Project	35	32	28	26
109	341281	5111215	Outside Project	35	32	28	26
110	341294	5111557	Outside Project	34	31	27	26
111	342208	5110980	Outside Project	35	32	28	26
112	342085	5110772	Outside Project	36	33	29	26
113	342134	5110763	Outside Project	36	33	29	26
114	342212	5110768	Outside Project	36	33	29	26
115	342158	5110866	Outside Project	35	32	28	26
116	342196	5111104	Outside Project	34	31	28	26
117	342210	5111184	Outside Project	34	31	28	25
118	342243	5111288	Outside Project	34	31	27	25
119	342237	5111349	Outside Project	34	31	27	25
120	342159	5111479	Outside Project	33	30	27	25
121	342359	5111212	Outside Project	34	31	27	25
122	342324	5111255	Outside Project	34	31	27	25
123	342368	5111340	Outside Project	33	30	27	25
124	342517	5110751	Outside Project	35	32	28	26

Table O-1. Acoustic Modeling Results Summary

NSR ID	UTM Coordinates (meters)		Participant Status	Received Sound Levels, Project Operation (dBA)			
	Easting	Northing		Option 1, GE 2.82 MW[1]	Option 1, GE 3.03 MW[2]	Option 2, GE 5.5 MW	Option 2, SG 6.0 MW
125	342611	5110750	Outside Project	35	32	28	26
126	342663	5110739	Outside Project	35	32	28	26
127	342709	5110775	Outside Project	35	32	28	25
128	342320	5110787	Outside Project	35	32	29	26
129	342821	5110744	Outside Project	34	31	28	26
130	342829	5110767	Outside Project	34	31	28	25
131	312236	5121923	Outside Project	37	34	35	33
132	321816	5111474	Outside Project	41	38	35	33
133	340319	5110447	Outside Project	37	34	30	33
134	340326	5110959	Outside Project	35	32	28	28
135	340862	5111315	Outside Project	34	31	28	26
136	340792	5110626	Outside Project	36	34	29	27
137	320184	5111045	Returned Signed	44	42	38	36
138	310364	5112015	Returned Signed	45	42	41	39
139	310380	5112063	Returned Signed	45	43	41	39
140	310203	5112130	Returned Signed	45	43	41	39
141	310041	5112852	Returned Signed	48	46	43	41
142	308878	5123772	Outside Project	38	36	35	41
143	309032	5123782	Outside Project	38	36	35	33
144	309092	5123741	Outside Project	38	36	35	33
145	308714	5123714	Outside Project	39	36	35	33
146	308772	5123926	Outside Project	38	35	34	33
147	309134	5124017	Outside Project	37	34	34	32
148	310428	5122868	Outside Project	38	35	34	32
149	310578	5122868	Outside Project	37	35	34	32
150	310750	5122769	Outside Project	37	34	34	32
151	310650	5122831	Outside Project	37	35	34	32
152	310633	5122714	Outside Project	36	33	33	32
153	310694	5122725	Outside Project	36	34	33	31
154	310731	5122708	Outside Project	36	34	33	31
155	310774	5122650	Outside Project	35	32	32	30

Table O-1. Acoustic Modeling Results Summary

NSR ID	UTM Coordinates (meters)		Participant Status	Received Sound Levels, Project Operation (dBA)			
	Easting	Northing		Option 1, GE 2.82 MW[1]	Option 1, GE 3.03 MW[2]	Option 2, GE 5.5 MW	Option 2, SG 6.0 MW
156	310582	5123116	Outside Project	37	34	34	32
157	310544	5123113	Outside Project	37	35	34	32
158	310491	5123114	Outside Project	37	35	34	32
159	310461	5122815	Outside Project	38	34	34	32
160	310569	5122750	Outside Project	36	34	33	31
161	310551	5122837	Outside Project	37	35	34	32
162	310660	5123029	Outside Project	37	34	34	32
163	310738	5123016	Outside Project	37	34	34	31
164	310781	5123070	Outside Project	37	34	33	31
165	310658	5123066	Outside Project	37	34	34	31
166	310782	5122934	Outside Project	37	34	34	32
167	310594	5122979	Outside Project	37	35	34	32
168	309847	5123167	Outside Project	39	36	36	33
169	309516	5123445	Outside Project	39	36	35	33
170	309344	5123549	Outside Project	39	36	35	33
171	309280	5123670	Outside Project	38	36	35	33
172	309335	5123828	Outside Project	38	35	34	33
173	309385	5123754	Outside Project	38	35	34	32
174	309924	5123233	Outside Project	39	36	35	33
175	310056	5123141	Outside Project	39	36	35	33
176	310274	5113506	Returned Signed GNA	51	48	45	43
177	310436	5114156	Returned Signed GNA	53	50	45	43
178	339281	5103516	Outside Project	48	46	42	43
179	311561	5122108	Outside Project	37	34	34	40
180	311308	5122856	Outside Project	36	34	33	32
181	310852	5122966	Outside Project	37	34	34	31
182	340657	5111632	Outside Project	33	30	27	31
183	314001	5122286	Outside Project	36	33	34	31
184	314079	5122236	Outside Project	36	33	34	31
185	307216	5114584	Outside Project	46	43	42	40
186	305836	5114745	Returned Signed	41	39	39	40

Table O-1. Acoustic Modeling Results Summary

NSR ID	UTM Coordinates (meters)		Participant Status	Received Sound Levels, Project Operation (dBA)			
	Easting	Northing		Option 1, GE 2.82 MW[1]	Option 1, GE 3.03 MW[2]	Option 2, GE 5.5 MW	Option 2, SG 6.0 MW
187	334088	5104853	Outside Project	44	41	40	38
188	312195	5115958	Returned Signed	51	49	47	45
189	309427	5124111	Outside Project	36	34	33	45
190	309301	5124131	Outside Project	36	34	33	31
191	319207	5115533	Outside Project	37	35	33	31
192	328441	5104524	Returned Signed	51	47	47	45
193	309122	5124082	Outside Project	37	34	34	45
194	308981	5124357	Outside Project	36	33	33	31
195	318228	5107921	Returned Signed	46	44	40	38
196	337781	5106178	Outside Project	41	38	36	38
197	345136	5107928	Outside Project	35	32	26	34
198	344909	5108127	Outside Project	35	32	26	24
199	344856	5108168	Outside Project	35	33	26	24
200	345199	5107904	Outside Project	35	32	26	24
201	345342	5107828	Outside Project	35	32	26	23
202	345562	5108010	Outside Project	33	31	25	23
203	345501	5108019	Outside Project	34	31	25	23
204	345249	5108025	Outside Project	34	31	26	23
205	345324	5108022	Outside Project	34	31	25	23
206	345428	5108019	Outside Project	34	31	25	23
207	345121	5108028	Outside Project	34	32	26	24
208	345124	5108143	Outside Project	35	32	26	23
209	345395	5107809	Outside Project	34	32	25	23
210	345485	5107793	Outside Project	34	31	25	23
211	304543	5117998	In pursuit	49	49	49	49
212	343320	5108172	Returned Signed	49	46	36	48
213	311188	5117741	Returned Signed	49	46	44	43
214	317663	5111107	Returned Signed	54	50	48	46
215	328497	5110444	Outside Project	40	37	32	45
216	321513	5109870	Returned Signed	47	45	43	41
217	342153	5109898	Outside Project	40	37	32	41

Table O-1. Acoustic Modeling Results Summary

NSR ID	UTM Coordinates (meters)		Participant Status	Received Sound Levels, Project Operation (dBA)			
	Easting	Northing		Option 1, GE 2.82 MW[1]	Option 1, GE 3.03 MW[2]	Option 2, GE 5.5 MW	Option 2, SG 6.0 MW
218	342084	5109844	Outside Project	40	37	32	30
219	342799	5109811	Outside Project	37	34	29	30
220	342778	5109810	Outside Project	37	34	29	26
221	315340	5119635	Outside Project	42	39	39	37
222	315231	5110885	Returned Signed	52	48	44	42
223	315253	5110907	Returned Signed	52	49	44	42
224	344376	5109177	Outside Project	34	31	26	42
225	343971	5109136	Outside Project	33	30	26	24
226	344335	5109830	Outside Project	33	30	25	24
227	316529	5119245	Outside Project	37	34	34	31
228	316013	5120417	Outside Project	34	32	31	31
229	316055	5120339	Outside Project	34	32	31	29
230	316156	5120339	Outside Project	34	32	31	29
231	316178	5120254	Outside Project	35	32	31	29
232	316222	5120145	Outside Project	34	31	31	29
233	316298	5120067	Outside Project	35	32	32	29
234	316261	5120012	Outside Project	36	33	32	30
235	316237	5120012	Outside Project	36	33	33	30
236	345369	5108240	Outside Project	34	32	25	29
237	345215	5108307	Outside Project	35	32	27	24
238	344454	5108902	Outside Project	35	32	26	24
239	345144	5108318	Outside Project	34	32	27	25
240	345062	5108247	Outside Project	35	32	26	23
241	345025	5108259	Outside Project	35	32	26	24
242	344477	5109770	Outside Project	33	30	25	23
243	342777	5109789	Outside Project	37	34	29	26
244	342803	5109791	Outside Project	37	34	29	26
245	343715	5109962	Outside Project	33	31	26	26
246	343843	5110076	Outside Project	33	30	26	23
247	344068	5109969	Outside Project	33	30	25	23
248	344259	5109949	Outside Project	33	30	25	23

Table O-1. Acoustic Modeling Results Summary

NSR ID	UTM Coordinates (meters)		Participant Status	Received Sound Levels, Project Operation (dBA)			
	Easting	Northing		Option 1, GE 2.82 MW[1]	Option 1, GE 3.03 MW[2]	Option 2, GE 5.5 MW	Option 2, SG 6.0 MW
249	342778	5109769	Outside Project	37	35	29	26
250	342800	5109769	Outside Project	37	34	29	26
251	342776	5109750	Outside Project	37	35	29	27
252	342798	5109748	Outside Project	37	35	29	26
253	342624	5109776	Outside Project	38	35	29	27
254	342645	5109776	Outside Project	38	35	29	27
255	342624	5109755	Outside Project	38	35	29	27
256	342646	5109755	Outside Project	38	35	29	27
257	342666	5109775	Outside Project	38	35	29	27
258	342666	5109754	Outside Project	38	35	29	27
259	342684	5109774	Outside Project	37	35	29	27
260	342682	5109753	Outside Project	37	35	29	27
261	345618	5108005	Outside Project	33	31	25	27
262	345705	5107997	Outside Project	34	30	24	22
263	345803	5107990	Outside Project	33	30	25	22
264	345928	5107968	Outside Project	34	30	25	22
265	345429	5107760	Outside Project	34	32	25	23
266	345511	5107713	Outside Project	34	31	25	23
267	345546	5107676	Outside Project	34	31	25	23
268	345568	5107655	Outside Project	34	31	25	23
269	345606	5107690	Outside Project	33	30	25	23
270	345634	5107796	Outside Project	33	31	25	22
271	345705	5107792	Outside Project	33	30	25	22
272	345735	5107778	Outside Project	33	30	25	22
273	345759	5107774	Outside Project	33	30	25	22
274	345799	5107778	Outside Project	34	30	25	22
275	345903	5107785	Outside Project	33	31	25	22
276	345764	5107501	Outside Project	33	30	25	22
277	345887	5107464	Outside Project	33	30	24	22
278	345935	5107395	Outside Project	32	29	24	22
279	346006	5107725	Outside Project	33	29	25	22

Table O-1. Acoustic Modeling Results Summary

NSR ID	UTM Coordinates (meters)		Participant Status	Received Sound Levels, Project Operation (dBA)			
	Easting	Northing		Option 1, GE 2.82 MW[1]	Option 1, GE 3.03 MW[2]	Option 2, GE 5.5 MW	Option 2, SG 6.0 MW
280	346166	5107740	Outside Project	33	29	25	22
281	346336	5107752	Outside Project	32	29	24	22
282	346443	5107784	Outside Project	33	28	25	22
283	346530	5107768	Outside Project	32	29	25	21
284	346691	5107704	Outside Project	32	29	24	21
285	346740	5107700	Outside Project	32	29	24	22
286	346749	5107818	Outside Project	32	29	25	22
287	346244	5107876	Outside Project	33	30	25	22
288	346024	5107806	Outside Project	33	30	25	22
289	346015	5107864	Outside Project	34	30	25	22
290	346116	5107924	Outside Project	33	30	25	23
291	346132	5107959	Outside Project	33	31	25	23
292	346031	5108029	Outside Project	34	31	25	22
293	346079	5108102	Outside Project	33	31	26	23
294	346275	5108061	Outside Project	33	30	25	23
295	346045	5108185	Outside Project	33	31	26	23
296	345965	5108189	Outside Project	34	31	26	23
297	346216	5108170	Outside Project	33	30	26	23
298	346421	5108174	Outside Project	33	30	26	23
299	346605	5108171	Outside Project	33	29	25	23
300	346638	5108164	Outside Project	33	29	25	22
301	346824	5108189	Outside Project	32	29	25	22
302	346502	5108232	Outside Project	33	29	26	23
303	346608	5108380	Outside Project	32	29	25	23
304	346559	5108299	Outside Project	33	29	25	23
305	346514	5108311	Outside Project	33	29	25	23
306	346430	5108275	Outside Project	33	30	26	23
307	346368	5108281	Outside Project	33	30	26	23
308	346356	5108319	Outside Project	33	30	26	23
309	346170	5108281	Outside Project	33	30	26	23
310	346137	5108272	Outside Project	33	30	26	23

Table O-1. Acoustic Modeling Results Summary

NSR ID	UTM Coordinates (meters)		Participant Status	Received Sound Levels, Project Operation (dBA)			
	Easting	Northing		Option 1, GE 2.82 MW[1]	Option 1, GE 3.03 MW[2]	Option 2, GE 5.5 MW	Option 2, SG 6.0 MW
311	346113	5108302	Outside Project	34	30	26	23
312	346070	5108276	Outside Project	34	30	26	23
313	346038	5108283	Outside Project	34	31	26	23
314	346038	5108421	Outside Project	33	31	26	23
315	346065	5108378	Outside Project	33	31	26	23
316	346111	5108402	Outside Project	33	30	26	23
317	346171	5108370	Outside Project	33	30	26	24
318	346208	5108425	Outside Project	33	30	26	23
319	346177	5108486	Outside Project	33	30	26	23
320	346124	5108525	Outside Project	34	30	26	23
321	346076	5108484	Outside Project	33	30	26	23
322	346038	5108476	Outside Project	33	30	26	23
323	346044	5108536	Outside Project	34	30	26	23
324	346073	5108531	Outside Project	34	30	26	23
325	346440	5108501	Outside Project	33	30	26	23
326	346380	5108578	Outside Project	33	30	26	23
327	346235	5108592	Outside Project	33	30	26	23
328	346148	5108639	Outside Project	33	30	26	23
329	346068	5108602	Outside Project	33	31	26	24
330	346325	5108655	Outside Project	33	30	26	23
331	346830	5108438	Outside Project	32	29	25	23
332	346603	5108731	Outside Project	32	29	25	23
333	346148	5108781	Outside Project	33	30	26	23
334	346099	5108798	Outside Project	33	30	26	23
335	343998	5111019	Outside Project	31	28	25	23
336	344498	5111165	Outside Project	31	27	25	23
337	344490	5111129	Outside Project	31	27	24	22
338	344268	5111161	Outside Project	31	27	25	22
339	344156	5111234	Outside Project	31	28	25	22
340	344068	5111436	Outside Project	31	27	25	22
341	344140	5111358	Outside Project	31	27	25	22

Table O-1. Acoustic Modeling Results Summary

NSR ID	UTM Coordinates (meters)		Participant Status	Received Sound Levels, Project Operation (dBA)			
	Easting	Northing		Option 1, GE 2.82 MW[1]	Option 1, GE 3.03 MW[2]	Option 2, GE 5.5 MW	Option 2, SG 6.0 MW
342	344280	5111430	Outside Project	31	27	24	22
343	344360	5111422	Outside Project	31	27	24	22
344	344419	5111391	Outside Project	31	27	24	22
345	344017	5111439	Outside Project	31	28	25	22
346	344103	5111526	Outside Project	31	27	25	22
347	343954	5111501	Outside Project	31	28	25	22
348	343782	5111972	Outside Project	31	27	25	22
349	343810	5111919	Outside Project	31	27	25	22
350	343764	5111847	Outside Project	31	27	25	22
351	343850	5111740	Outside Project	31	27	25	22
352	343759	5111669	Outside Project	31	27	25	22
353	343859	5111521	Outside Project	31	28	25	22
354	343759	5111564	Outside Project	31	28	25	22
355	343906	5111446	Outside Project	31	28	25	22
356	343680	5111548	Outside Project	31	28	25	23
357	343693	5111649	Outside Project	31	28	25	23
358	343682	5111757	Outside Project	31	28	25	22
359	343682	5111817	Outside Project	31	27	25	22
360	343589	5111459	Outside Project	31	28	26	23
361	343167	5111340	Outside Project	33	29	26	24
362	343222	5111331	Outside Project	32	29	26	24
363	343041	5111341	Outside Project	33	30	26	24
364	342973	5111352	Outside Project	33	30	26	24
365	342968	5111549	Outside Project	33	29	26	24
366	343272	5111718	Outside Project	32	28	26	24
367	342964	5111933	Outside Project	32	28	26	23
368	343271	5111925	Outside Project	31	28	25	23
369	343347	5112025	Outside Project	31	27	25	23
370	343402	5112015	Outside Project	31	27	25	22
371	343453	5112013	Outside Project	31	27	25	22
372	343500	5111945	Outside Project	31	28	25	22

Table O-1. Acoustic Modeling Results Summary

NSR ID	UTM Coordinates (meters)		Participant Status	Received Sound Levels, Project Operation (dBA)			
	Easting	Northing		Option 1, GE 2.82 MW[1]	Option 1, GE 3.03 MW[2]	Option 2, GE 5.5 MW	Option 2, SG 6.0 MW
373	343696	5112004	Outside Project	31	27	25	22
374	343556	5112090	Outside Project	30	27	25	22
375	343497	5112108	Outside Project	31	27	25	22
376	343369	5112084	Outside Project	31	27	25	22
377	343293	5112120	Outside Project	31	27	25	22
378	343245	5112089	Outside Project	31	28	25	23
379	343086	5112289	Outside Project	31	27	25	23
380	342962	5112313	Outside Project	31	28	25	22
381	342969	5112333	Outside Project	31	28	25	22
382	342969	5112377	Outside Project	31	27	25	22
383	342884	5112395	Outside Project	31	27	25	22
384	342770	5112317	Outside Project	31	28	25	23
385	342452	5112381	Outside Project	31	28	25	23
386	342388	5112526	Outside Project	31	27	25	23
387	342208	5112509	Outside Project	31	28	25	23
388	342266	5112668	Outside Project	31	27	25	22
389	342024	5112509	Outside Project	31	28	25	23
390	341832	5112522	Outside Project	31	28	25	23
391	341731	5112415	Outside Project	32	28	26	23
392	341225	5112438	Outside Project	32	28	26	23
393	341161	5112652	Outside Project	31	28	25	23
394	341155	5112729	Outside Project	31	27	25	23
395	341073	5112735	Outside Project	31	27	25	23
396	341111	5112585	Outside Project	31	28	25	23
397	340933	5112571	Outside Project	31	28	25	23
398	340951	5112467	Outside Project	32	28	26	23
399	341098	5112474	Outside Project	32	28	26	23
400	341204	5112346	Outside Project	32	28	26	23
401	341201	5112274	Outside Project	32	29	26	23
402	341045	5112356	Outside Project	32	28	26	23
403	340934	5112352	Outside Project	32	28	26	23

Table O-1. Acoustic Modeling Results Summary

NSR ID	UTM Coordinates (meters)		Participant Status	Received Sound Levels, Project Operation (dBA)			
	Easting	Northing		Option 1, GE 2.82 MW[1]	Option 1, GE 3.03 MW[2]	Option 2, GE 5.5 MW	Option 2, SG 6.0 MW
404	341041	5112276	Outside Project	32	29	26	23
405	341016	5112145	Outside Project	32	29	26	24
406	341031	5112042	Outside Project	33	29	26	24
407	340967	5112066	Outside Project	32	29	26	24
408	340919	5112192	Outside Project	32	29	26	24
409	340841	5112298	Outside Project	32	29	26	23
410	340726	5112261	Outside Project	32	29	26	23
411	340652	5112298	Outside Project	32	28	26	23
412	340824	5112593	Outside Project	31	28	25	23
413	340645	5112647	Outside Project	31	28	25	23
414	340551	5112651	Outside Project	31	28	25	23
415	340640	5112458	Outside Project	31	28	26	23
416	340576	5112478	Outside Project	31	28	26	23
417	340497	5112483	Outside Project	31	28	26	23
418	340333	5112535	Outside Project	31	28	25	23
419	340508	5112330	Outside Project	32	28	26	23
420	340195	5112229	Outside Project	32	28	26	23
421	340156	5112272	Outside Project	32	28	26	23
422	340111	5112112	Outside Project	32	29	26	24
423	340073	5112355	Outside Project	31	28	26	24
424	339800	5112401	Outside Project	31	28	25	23
425	339901	5112207	Outside Project	32	28	26	23
426	339936	5112104	Outside Project	32	29	26	23
427	340073	5112016	Outside Project	32	29	26	24
428	339885	5111903	Outside Project	32	29	26	24
429	339838	5112088	Outside Project	32	29	26	24
430	339740	5112292	Outside Project	31	28	26	23
431	339577	5112200	Outside Project	31	28	26	23
432	339572	5112131	Outside Project	32	28	26	23
433	339492	5112095	Outside Project	32	28	26	23
434	339413	5112023	Outside Project	32	28	26	23

Table O-1. Acoustic Modeling Results Summary

NSR ID	UTM Coordinates (meters)		Participant Status	Received Sound Levels, Project Operation (dBA)			
	Easting	Northing		Option 1, GE 2.82 MW[1]	Option 1, GE 3.03 MW[2]	Option 2, GE 5.5 MW	Option 2, SG 6.0 MW
435	339314	5112016	Outside Project	31	28	26	23
436	339273	5112012	Outside Project	31	28	26	23
437	339513	5112047	Outside Project	32	28	26	23
438	339811	5111976	Outside Project	32	29	26	24
439	339812	5111885	Outside Project	32	29	26	24
440	339621	5111879	Outside Project	32	29	26	24
441	339411	5111939	Outside Project	32	28	26	24
442	339322	5111915	Outside Project	32	28	26	23
443	339266	5111901	Outside Project	32	28	26	23
444	339172	5111935	Outside Project	31	28	26	23
445	339095	5111818	Outside Project	31	28	26	23
446	339636	5111789	Outside Project	32	29	26	24
447	339796	5111791	Outside Project	32	29	26	24
448	339968	5111819	Outside Project	33	29	26	24
449	339896	5111737	Outside Project	33	29	27	24
450	339620	5111690	Outside Project	32	29	27	24
451	339367	5111705	Outside Project	32	28	26	24
452	339306	5111649	Outside Project	32	28	26	23
453	339359	5111579	Outside Project	32	28	26	23
454	339474	5111604	Outside Project	32	29	26	24
455	339508	5111507	Outside Project	32	29	27	24
456	339604	5111566	Outside Project	33	29	27	24
457	339593	5111459	Outside Project	33	30	27	24
458	338955	5111720	Outside Project	31	28	26	24
459	329141	5111993	Outside Project	36	32	29	27
460	320487	5112609	Outside Project	36	33	31	29
461	320676	5115361	Outside Project	35	32	31	29
462	320537	5115399	Outside Project	35	32	31	28
463	320333	5115110	Outside Project	36	33	31	29
464	319894	5115127	Outside Project	37	34	32	30
465	319602	5115120	Outside Project	38	35	33	31

Table O-1. Acoustic Modeling Results Summary

NSR ID	UTM Coordinates (meters)		Participant Status	Received Sound Levels, Project Operation (dBA)			
	Easting	Northing		Option 1, GE 2.82 MW[1]	Option 1, GE 3.03 MW[2]	Option 2, GE 5.5 MW	Option 2, SG 6.0 MW
466	319571	5115342	Outside Project	36	34	32	31
467	319769	5115354	Outside Project	37	34	32	30
468	319867	5115379	Outside Project	36	33	32	30
469	320046	5115311	Outside Project	36	33	31	29
470	319975	5115477	Outside Project	36	33	32	29
471	320281	5115340	Outside Project	36	32	31	29
472	320316	5115423	Outside Project	35	32	31	29
473	320185	5115452	Outside Project	36	33	31	29
474	320270	5115545	Outside Project	35	32	31	28
475	320285	5115603	Outside Project	35	32	31	28
476	320303	5115664	Outside Project	35	32	31	28
477	320314	5115717	Outside Project	35	32	31	28
478	320402	5115805	Outside Project	35	32	31	28
479	320386	5115913	Outside Project	35	32	31	28
480	320255	5116004	Outside Project	35	32	31	28
481	320266	5115852	Outside Project	35	32	31	28
482	320217	5115775	Outside Project	35	32	31	28
483	320204	5115674	Outside Project	36	32	31	28
484	320179	5115571	Outside Project	35	32	31	29
485	320057	5115599	Outside Project	36	33	31	29
486	320070	5115705	Outside Project	36	33	31	29
487	320119	5115795	Outside Project	36	32	31	29
488	320154	5115876	Outside Project	35	32	31	28
489	320188	5116008	Outside Project	35	32	31	28
490	320205	5116114	Outside Project	35	32	31	28
491	320114	5116141	Outside Project	35	32	31	28
492	320057	5116061	Outside Project	35	32	31	28
493	320048	5115983	Outside Project	35	32	31	28
494	320049	5115906	Outside Project	35	32	31	29
495	320036	5115827	Outside Project	36	33	31	29
496	320008	5115719	Outside Project	36	33	31	29

Table O-1. Acoustic Modeling Results Summary

NSR ID	UTM Coordinates (meters)		Participant Status	Received Sound Levels, Project Operation (dBA)			
	Easting	Northing		Option 1, GE 2.82 MW[1]	Option 1, GE 3.03 MW[2]	Option 2, GE 5.5 MW	Option 2, SG 6.0 MW
497	319979	5115660	Outside Project	36	33	31	29
498	319950	5115592	Outside Project	36	33	31	29
499	319673	5115476	Outside Project	37	34	32	30
500	319597	5115501	Outside Project	37	34	32	30
501	319423	5115520	Outside Project	37	34	33	30
502	319333	5115514	Outside Project	37	35	33	30
503	319275	5115587	Outside Project	37	34	33	30
504	319333	5115623	Outside Project	37	34	33	30
505	319436	5115664	Outside Project	37	34	32	30
506	319549	5115683	Outside Project	37	34	32	30
507	319545	5115591	Outside Project	37	34	32	30
508	319608	5115672	Outside Project	37	34	32	30
509	319664	5115621	Outside Project	37	34	32	30
510	319854	5115652	Outside Project	36	33	31	30
511	319892	5115770	Outside Project	36	33	31	29
512	319921	5115871	Outside Project	36	33	31	29
513	319939	5115962	Outside Project	36	32	31	29
514	319961	5116057	Outside Project	35	32	31	28
515	319971	5116132	Outside Project	35	32	31	28
516	319895	5116151	Outside Project	35	32	31	29
517	319855	5116053	Outside Project	36	33	31	29
518	319747	5115952	Outside Project	36	33	31	29
519	319819	5115736	Outside Project	36	33	31	29
520	319756	5115853	Outside Project	36	33	31	29
521	319657	5115895	Outside Project	36	33	32	29
522	319628	5115935	Outside Project	36	33	32	29
523	319681	5115994	Outside Project	36	33	31	29
524	319769	5116095	Outside Project	36	33	31	29
525	319725	5116184	Outside Project	36	33	31	29
526	319804	5116166	Outside Project	36	32	31	29
527	319672	5116113	Outside Project	36	33	31	29

Table O-1. Acoustic Modeling Results Summary

NSR ID	UTM Coordinates (meters)		Participant Status	Received Sound Levels, Project Operation (dBA)			
	Easting	Northing		Option 1, GE 2.82 MW[1]	Option 1, GE 3.03 MW[2]	Option 2, GE 5.5 MW	Option 2, SG 6.0 MW
528	319605	5116054	Outside Project	36	33	31	29
529	319666	5116207	Outside Project	36	33	31	29
530	319541	5115980	Outside Project	36	33	32	29
531	319465	5115938	Outside Project	37	34	32	30
532	319410	5115900	Outside Project	37	34	32	30
533	319350	5115871	Outside Project	37	34	32	30
534	319285	5115845	Outside Project	37	34	32	30
535	319213	5115873	Outside Project	37	34	33	30
536	319162	5115915	Outside Project	37	34	32	30
537	319264	5115963	Outside Project	37	34	32	30
538	319370	5115982	Outside Project	37	34	32	30
539	319434	5116031	Outside Project	36	33	32	30
540	319495	5116078	Outside Project	36	33	32	29
541	319549	5116130	Outside Project	36	33	31	29
542	319590	5116227	Outside Project	36	33	31	29
543	319526	5116247	Outside Project	36	33	31	29
544	319469	5116193	Outside Project	36	33	32	29
545	319376	5116157	Outside Project	36	33	32	29
546	319300	5116110	Outside Project	36	34	32	29
547	319208	5115989	Outside Project	37	34	32	30
548	319120	5115957	Outside Project	37	34	32	30
549	318898	5116021	Outside Project	37	34	33	30
550	319077	5116041	Outside Project	37	34	32	30
551	319122	5116099	Outside Project	37	34	32	30
552	319180	5116143	Outside Project	37	34	32	30
553	319261	5116200	Outside Project	36	34	32	30
554	319330	5116229	Outside Project	36	33	32	29
555	319375	5116262	Outside Project	36	33	32	29
556	319444	5116314	Outside Project	36	33	31	29
557	318028	5117215	Outside Project	37	34	32	30
558	317801	5117630	Outside Project	36	33	32	30

Table O-1. Acoustic Modeling Results Summary

NSR ID	UTM Coordinates (meters)		Participant Status	Received Sound Levels, Project Operation (dBA)			
	Easting	Northing		Option 1, GE 2.82 MW[1]	Option 1, GE 3.03 MW[2]	Option 2, GE 5.5 MW	Option 2, SG 6.0 MW
559	317715	5117614	Outside Project	36	33	32	29
560	317729	5117664	Outside Project	36	33	32	29
561	317599	5117720	Outside Project	36	33	32	29
562	317708	5117770	Outside Project	36	33	32	29
563	317499	5117791	Outside Project	36	33	32	29
564	317642	5117920	Outside Project	36	33	31	29
565	317500	5117890	Outside Project	37	33	32	30
566	317629	5117968	Outside Project	36	33	32	29
567	317492	5117990	Outside Project	36	33	32	30
568	317634	5118019	Outside Project	36	33	32	30
569	317403	5118115	Outside Project	36	33	32	29
570	317651	5118132	Outside Project	36	33	31	29
571	317622	5118239	Outside Project	36	33	31	29
572	317606	5118282	Outside Project	36	33	31	29
573	317369	5118334	Outside Project	36	33	31	29
574	317501	5118338	Outside Project	35	32	31	29
575	317435	5118425	Outside Project	35	32	31	29
576	317484	5118517	Outside Project	35	32	31	29
577	317477	5118583	Outside Project	35	32	31	29
578	317237	5118501	Outside Project	36	33	32	29
579	317526	5118878	Outside Project	35	32	32	30
580	317258	5118944	Outside Project	35	32	32	29
581	317897	5119271	Outside Project	36	32	32	29
582	317128	5119285	Outside Project	36	33	33	30
583	317101	5119242	Outside Project	36	33	33	30
584	316970	5119215	Outside Project	36	33	33	30
585	316825	5119187	Outside Project	36	33	33	30
586	316749	5119214	Outside Project	36	33	33	31
587	316635	5119177	Outside Project	37	34	34	32
588	316646	5119219	Outside Project	37	34	34	31
589	316661	5119271	Outside Project	37	34	34	31

Table O-1. Acoustic Modeling Results Summary

NSR ID	UTM Coordinates (meters)		Participant Status	Received Sound Levels, Project Operation (dBA)			
	Easting	Northing		Option 1, GE 2.82 MW[1]	Option 1, GE 3.03 MW[2]	Option 2, GE 5.5 MW	Option 2, SG 6.0 MW
590	316635	5119296	Outside Project	37	34	34	31
591	316763	5119358	Outside Project	37	34	33	31
592	316889	5119436	Outside Project	36	33	33	30
593	316939	5119382	Outside Project	36	33	33	30
594	317130	5119481	Outside Project	36	33	33	30
595	317013	5119569	Outside Project	36	33	33	30
596	317081	5119673	Outside Project	36	33	32	30
597	317282	5119630	Outside Project	36	33	32	30
598	317300	5119728	Outside Project	36	33	32	30
599	316996	5119954	Outside Project	36	33	32	30
600	317190	5120029	Outside Project	36	33	32	30
601	317183	5120070	Outside Project	36	33	32	30
602	317055	5120082	Outside Project	36	32	32	30
603	316825	5120057	Outside Project	36	32	32	30
604	316766	5120177	Outside Project	36	33	32	30
605	316876	5120186	Outside Project	36	32	32	30
606	317109	5120194	Outside Project	36	32	32	30
607	317108	5120275	Outside Project	35	32	32	30
608	317069	5120246	Outside Project	35	32	32	30
609	316940	5120366	Outside Project	35	32	32	30
610	316838	5120424	Outside Project	35	32	32	30
611	316842	5120325	Outside Project	36	32	32	30
612	316777	5120344	Outside Project	36	32	32	30
613	316767	5120485	Outside Project	35	32	32	30
614	316655	5120484	Outside Project	35	32	32	30
615	316440	5120054	Outside Project	36	33	32	30
616	316304	5120372	Outside Project	34	32	31	30
617	316491	5120473	Outside Project	35	32	32	29
618	316518	5120348	Outside Project	35	32	32	29
619	316429	5120659	Outside Project	35	31	32	29
620	317255	5120522	Outside Project	35	32	32	29

Table O-1. Acoustic Modeling Results Summary

NSR ID	UTM Coordinates (meters)		Participant Status	Received Sound Levels, Project Operation (dBA)			
	Easting	Northing		Option 1, GE 2.82 MW[1]	Option 1, GE 3.03 MW[2]	Option 2, GE 5.5 MW	Option 2, SG 6.0 MW
621	317268	5120574	Outside Project	35	32	32	29
622	317158	5120702	Outside Project	35	32	32	29
623	317039	5120776	Outside Project	35	32	32	29
624	316959	5120867	Outside Project	35	32	32	29
625	316789	5120630	Outside Project	35	32	32	29
626	316690	5120701	Outside Project	35	32	32	29
627	316581	5120751	Outside Project	35	32	32	29
628	316307	5120638	Outside Project	34	31	32	29
629	316243	5120470	Outside Project	34	31	31	29
630	316211	5120593	Outside Project	34	31	31	29
631	316300	5120732	Outside Project	34	31	31	28
632	316189	5120726	Outside Project	34	31	31	29
633	316092	5120724	Outside Project	34	31	31	29
634	316040	5120860	Outside Project	34	31	31	29
635	316203	5120829	Outside Project	34	31	31	29
636	316207	5120950	Outside Project	34	31	32	29
637	316058	5121058	Outside Project	34	31	32	30
638	316142	5121041	Outside Project	34	31	32	30
639	315829	5122119	Outside Project	35	32	32	30
640	315723	5122078	Outside Project	35	32	32	30
641	311455	5122754	Outside Project	36	33	33	31
642	311503	5123126	Outside Project	35	33	33	31
643	309717	5124035	Outside Project	36	34	33	31
644	309676	5124025	Outside Project	36	34	33	31
645	309493	5124229	Outside Project	36	33	33	31
646	309378	5124183	Outside Project	36	34	33	31
647	309231	5124289	Outside Project	36	33	33	31
648	309232	5124363	Outside Project	36	33	32	31
649	309286	5124454	Outside Project	35	33	32	30
650	309301	5124519	Outside Project	35	33	32	30
651	309330	5124552	Outside Project	35	32	32	30

Table O-1. Acoustic Modeling Results Summary

NSR ID	UTM Coordinates (meters)		Participant Status	Received Sound Levels, Project Operation (dBA)			
	Easting	Northing		Option 1, GE 2.82 MW[1]	Option 1, GE 3.03 MW[2]	Option 2, GE 5.5 MW	Option 2, SG 6.0 MW
652	309244	5124538	Outside Project	35	33	32	30
653	309183	5124548	Outside Project	35	33	32	30
654	309132	5124550	Outside Project	35	32	32	30
655	308955	5124464	Outside Project	36	33	32	30
656	308886	5124498	Outside Project	36	33	32	30
657	308830	5124487	Outside Project	36	33	32	30
658	308898	5124553	Outside Project	35	33	32	30
659	308949	5124653	Outside Project	35	32	32	30
660	308899	5124646	Outside Project	35	32	32	30
661	309086	5124694	Outside Project	35	32	31	30
662	309037	5124690	Outside Project	35	32	32	30
663	309015	5124694	Outside Project	35	32	32	30
664	309010	5124724	Outside Project	35	32	32	30
665	309018	5124750	Outside Project	35	32	31	29
666	308967	5124694	Outside Project	35	32	32	30
667	308973	5124765	Outside Project	35	32	31	30
668	308966	5124745	Outside Project	35	32	32	29
669	308945	5124783	Outside Project	35	32	31	29
670	308885	5124816	Outside Project	35	32	31	29
671	308890	5124711	Outside Project	35	32	32	30
672	308922	5124697	Outside Project	35	32	32	30
673	308844	5124614	Outside Project	35	32	32	30
674	308836	5124708	Outside Project	35	32	32	30
675	308848	5124766	Outside Project	35	32	32	30
676	308777	5124561	Outside Project	35	33	32	30
677	308613	5124773	Outside Project	35	32	32	30
678	308522	5124507	Outside Project	35	33	32	30
679	308510	5124729	Outside Project	35	32	32	30
680	308273	5124639	Outside Project	35	32	32	30
681	308707	5124865	Outside Project	35	32	31	30
682	308790	5124857	Outside Project	35	32	31	29

Table O-1. Acoustic Modeling Results Summary

NSR ID	UTM Coordinates (meters)		Participant Status	Received Sound Levels, Project Operation (dBA)			
	Easting	Northing		Option 1, GE 2.82 MW[1]	Option 1, GE 3.03 MW[2]	Option 2, GE 5.5 MW	Option 2, SG 6.0 MW
683	309128	5125195	Outside Project	34	31	30	29
684	308954	5125294	Outside Project	33	31	30	28
685	308827	5125420	Outside Project	33	30	30	28
686	309068	5125267	Outside Project	33	31	30	28
687	306223	5125739	Outside Project	32	29	28	28
688	306137	5125744	Outside Project	32	29	28	27
689	306051	5125733	Outside Project	32	29	28	27
690	306021	5125840	Outside Project	31	29	28	27
691	305960	5125694	Outside Project	32	29	28	27
692	305968	5125561	Outside Project	32	29	29	27
693	305998	5125358	Outside Project	30	28	27	27
694	305751	5125403	Outside Project	29	26	27	25
695	305681	5125428	Outside Project	30	27	27	25
696	305592	5125453	Outside Project	29	26	26	24
697	305555	5125518	Outside Project	30	27	27	26
698	305609	5125531	Outside Project	30	27	27	26
699	305690	5125544	Outside Project	31	28	28	26
700	305750	5125563	Outside Project	31	29	28	26
701	305828	5125535	Outside Project	32	29	28	26
702	305898	5125621	Outside Project	32	29	28	27
703	305894	5125784	Outside Project	31	29	28	27
704	305894	5125918	Outside Project	31	29	28	27
705	305802	5125868	Outside Project	31	29	28	26
706	305685	5125850	Outside Project	31	29	28	26
707	305764	5125715	Outside Project	31	29	28	27
708	305654	5125736	Outside Project	31	29	28	27
709	305695	5125627	Outside Project	31	29	28	26
710	305628	5125633	Outside Project	31	28	28	26
711	305559	5125626	Outside Project	31	28	28	26
712	305399	5125753	Outside Project	30	27	27	26
713	305489	5125785	Outside Project	31	28	28	26

Table O-1. Acoustic Modeling Results Summary

NSR ID	UTM Coordinates (meters)		Participant Status	Received Sound Levels, Project Operation (dBA)			
	Easting	Northing		Option 1, GE 2.82 MW[1]	Option 1, GE 3.03 MW[2]	Option 2, GE 5.5 MW	Option 2, SG 6.0 MW
714	305555	5125891	Outside Project	31	28	28	26
715	304324	5122576	Returned Signed	40	38	37	36
716	304305	5122514	Returned Signed	40	38	37	36
717	341441	5112080	Outside Project	32	29	26	36
718	316430	5120862	Outside Project	34	31	32	29
719	310357	5111955	Returned Signed	45	42	41	39
720	305603	5117058	Returned Signed	44	42	41	40
721	305226	5125970	Outside Project	30	28	27	40
722	305125	5126029	Outside Project	30	28	27	26
723	305076	5125918	Outside Project	30	27	27	26
724	304901	5126024	Outside Project	30	27	27	25
725	305244	5125896	Outside Project	30	27	27	25
726	305392	5125919	Outside Project	31	28	27	26
727	304838	5126014	Outside Project	30	27	27	26
728	304685	5126095	Outside Project	29	27	26	25
729	304589	5126133	Outside Project	29	27	26	25
730	304457	5126179	Outside Project	29	26	26	25
731	301056	5125955	Outside Project	27	25	25	24
732	300821	5125642	Outside Project	27	25	25	24
733	301021	5122446	Outside Project	34	33	33	32
734	301277	5118011	Outside Project	39	39	39	38
735	301313	5117993	Outside Project	39	39	39	38
736	301207	5117957	Outside Project	39	38	38	38
737	301264	5112414	Outside Project	36	35	35	38
738	298913	5110891	Outside Project	28	27	27	35
739	300696	5111311	Outside Project	33	32	33	32
740	303840	5109281	Outside Project	38	37	37	37
741	307726	5108345	Outside Project	36	34	34	37
742	315160	5109549	Outside Project	44	41	39	37

[1] Wind turbine IDs 6,7, and 8 equipped with NRO 106 mode.
[2] Wind turbine IDs 6,7, and 8 equipped with LNTE blade technology.
dBA – A-weighted decibels; GE – General Electric; LNTE – low noise trailing edge; MW – megawatt; NRO – noise reduced operation; NSR – noise sensitive receptor; SG – Siemens Gamesa; UTM – Universal Transverse Mercator

Table O-2. Construction Noise Levels at NSRs within the Project Boundary

Equipment	L_{max} Equipment Sound Level at 50 feet (dBA)	Usage Factor (%)[1/]	Equipment Sound Level at 50 feet, L_{eq} (dBA)	NSR IDs within the Project Boundary																	
				43	20	21	65	69	116	44	41	62	118	117	720	119	718	120	71	715	716	46
				Distance to Closest Turbine (feet)																	
				1258	1313	1410	1537	1850	2092	2121	2508	2911	3494	3513	3578	3652	3831	4010	6032	6093	6194	6550
Crane	85	16	77	40	39	38	37	35	34	34	32	30	28	28	28	27	27	26	22	22	21	21
Forklift	80	40	76	39	38	37	36	34	33	33	31	29	27	27	27	26	26	25	21	21	20	20
Backhoe	80	40	76	39	38	37	36	34	33	33	31	29	27	27	27	26	26	25	21	21	20	20
Grader	85	40	81	44	43	42	41	39	38	38	36	34	32	32	32	31	31	30	26	26	25	25
Man basket	85	20	78	41	40	39	38	36	35	35	33	31	29	29	29	28	28	27	23	23	22	22
Dozer	88	40	84	47	46	45	44	42	41	41	39	37	35	35	35	34	34	33	29	29	28	28
Loader	88	40	84	47	46	45	44	42	41	41	39	37	35	35	35	34	34	33	29	29	28	28
Scissor Lift	85	20	78	41	40	39	38	36	35	35	33	31	29	29	29	28	28	27	23	23	22	22
Truck	85	40	81	44	43	42	41	39	38	38	36	34	32	32	32	31	31	30	26	26	25	25
Welder	73	40	69	32	31	30	29	27	26	26	24	22	20	20	20	19	19	18	14	14	13	13
Compressor	80	40	76	39	38	37	36	34	33	33	31	29	27	27	27	26	26	25	21	21	20	20
Concrete	77	50	74	37	36	35	34	32	31	31	29	27	25	25	25	24	24	23	19	19	18	18
Composite Equipment Sound Level at 2,000 feet, L_{eq} (dBA)				**53**	**53**	**52**	**51**	**49**	**47**	**47**	**45**	**43**	**41**	**41**	**41**	**41**	**40**	**40**	**35**	**35**	**35**	**34**

Table O-3. Construction Noise Levels at NSRs within 1 mile of the Project Boundary

Equipment	L_{max} Equipment Sound Level at 50 feet (dBA)	Usage Factor (%)[1/]	Equipment Sound Level at 50 feet, L_{eq}(dBA)	NSR IDs within 1 mile of the Project Boundary															
				45	227	72	79	80	742	81	258	18	549	737	33	39	34	36	38
				Distance to Project Boundary (feet)															
				75	82	136	138	157	178	276	464	495	526	560	651	662	685	696	697
Crane	85	16	77	72	71	65	65	64	62	57	51	51	50	49	47	47	47	47	47
Forklift	80	40	76	71	70	64	64	63	61	56	50	50	49	48	46	46	46	46	46
Backhoe	80	40	76	71	70	64	64	63	61	56	50	50	49	48	46	46	46	46	46
Grader	85	40	81	76	75	69	69	68	66	61	55	55	54	53	51	51	51	51	51
Man basket	85	20	78	73	72	66	66	65	63	58	52	52	51	50	48	48	48	48	48
Dozer	88	40	84	79	78	72	72	71	69	64	58	58	57	56	54	54	54	54	54
Loader	88	40	84	79	78	72	72	71	69	64	58	58	57	56	54	54	54	54	54
Scissor Lift	85	20	78	73	72	66	66	65	63	58	52	52	51	50	48	48	48	48	48
Truck	85	40	81	76	75	69	69	68	66	61	55	55	54	53	51	51	51	51	51
Welder	73	40	69	64	63	57	57	56	54	49	43	43	42	41	39	39	39	39	39
Compressor	80	40	76	71	70	64	64	63	61	56	50	50	49	48	46	46	46	46	46
Concrete Pump	77	50	74	69	68	62	62	61	59	54	48	47	47	46	44	44	44	44	44
Composite Equipment Sound Level at 2,000 feet, L_{eq} (dBA)				**86**	**85**	**79**	**79**	**77**	**76**	**71**	**65**	**64**	**63**	**62**	**61**	**61**	**60**	**60**	**60**

Equipment	L_{max} Equipment Sound Level at 50 feet (dBA)	Usage Factor (%)[1/]	Equipment Sound Level at 50 feet, L_{eq}(dBA)	NSR IDs within 1 mile of the Project Boundary															
				465	547	535	502	464	159	552	463	58	466	537	503	501	739	534	70
				Distance to Project Boundary (feet)															
				1436	1468	1473	1487	1511	1517	1529	1535	1603	1613	1644	1646	1651	1691	1711	1717
Crane	85	16	77	38	38	38	38	38	38	38	37	37	37	37	37	37	36	36	36
Forklift	80	40	76	37	37	37	37	37	37	37	36	36	36	36	36	36	35	35	35
Backhoe	80	40	76	37	37	37	37	37	37	37	36	36	36	36	36	36	35	35	35
Grader	85	40	81	42	42	42	42	42	42	42	41	41	41	41	41	41	40	40	40
Man basket	85	20	78	39	39	39	39	39	39	38	38	38	38	38	38	38	37	37	37
Dozer	88	40	84	45	45	45	45	45	45	45	44	44	44	44	44	44	43	43	43
Loader	88	40	84	45	45	45	45	45	45	45	44	44	44	44	44	44	43	43	43
Scissor Lift	85	20	78	39	39	39	39	39	39	38	38	38	38	38	38	38	37	37	37
Truck	85	40	81	42	42	42	42	42	42	42	41	41	41	41	41	41	40	40	40
Welder	73	40	69	30	30	30	30	30	30	30	29	29	29	29	29	29	28	28	28
Compressor	80	40	76	37	37	37	37	37	37	37	36	36	36	36	36	36	35	35	35
Concrete Pump	77	50	74	35	35	35	35	35	35	34	34	34	34	34	34	34	33	33	33
Composite Equipment Sound Level at 2,000 feet, L_{eq} (dBA)				**52**	**51**	**51**	**51**	**51**	**51**	**51**	**51**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**

Table O-3. Construction Noise Levels at NSRs within 1 mile of the Project Boundary (continued)

Equipment	L_{max} Equipment Sound Level at 50 feet (dBA)	Usage Factor (%)[1/]	Equipment Sound Level at 50 feet, L_{eq}(dBA)	NSR IDs within 1 mile of the Project Boundary															
				22	59	504	553	546	169	533	500	538	507	505	554	532	499	2	545
				Distance to Project Boundary (feet)															
				1736	1797	1818	1848	1850	1902	1923	1983	1994	2077	2077	2095	2119	2130	2131	2136
Crane	85	16	77	36	36	36	35	35	35	35	35	34	34	34	34	34	34	34	34
Forklift	80	40	76	35	35	35	34	34	34	34	34	33	33	33	33	33	33	33	33
Backhoe	80	40	76	35	35	35	34	34	34	34	34	33	33	33	33	33	33	33	33
Grader	85	40	81	40	40	40	39	39	39	39	39	38	38	38	38	38	38	38	38
Man basket	85	20	78	37	37	36	36	36	36	36	35	35	35	35	35	35	35	35	35
Dozer	88	40	84	43	43	43	42	42	42	42	42	41	41	41	41	41	41	41	41
Loader	88	40	84	43	43	43	42	42	42	42	42	41	41	41	41	41	41	41	41
Scissor Lift	85	20	78	37	37	36	36	36	36	36	35	35	35	35	35	35	35	35	35
Truck	85	40	81	40	40	40	39	39	39	39	39	38	38	38	38	38	38	38	38
Welder	73	40	69	28	28	28	27	27	27	27	27	26	26	26	26	26	26	26	26
Compressor	80	40	76	35	35	35	34	34	34	34	34	33	33	33	33	33	33	33	33
Concrete Pump	77	50	74	33	33	32	32	32	32	32	31	31	31	31	31	31	31	31	31
Composite Equipment Sound Level at 2,000 feet, L_{eq} (dBA)				**49**	**49**	**49**	**49**	**49**	**48**	**48**	**48**	**48**	**47**	**47**	**47**	**47**	**47**	**47**	**47**

Equipment	L_{max} Equipment Sound Level at 50 feet (dBA)	Usage Factor (%)[1/]	Equipment Sound Level at 50 feet, L_{eq}(dBA)	NSR IDs within 1 mile of the Project Boundary															
				469	467	539	3	555	471	531	506	468	192	223	508	509	160	540	247
				Distance to Project Boundary (feet)															
				2141	2215	2221	2254	2276	2279	2300	2323	2334	2337	2391	2411	2412	2428	2445	2457
Crane	85	16	77	34	33	33	33	33	33	33	33	33	33	32	32	32	32	32	32
Forklift	80	40	76	33	32	32	32	32	32	32	32	32	32	31	31	31	31	31	31
Backhoe	80	40	76	33	32	32	32	32	32	32	32	32	32	31	31	31	31	31	31
Grader	85	40	81	38	37	37	37	37	37	37	37	37	37	36	36	36	36	36	36
Man basket	85	20	78	35	34	34	34	34	34	34	34	34	34	33	33	33	33	33	33
Dozer	88	40	84	41	40	40	40	40	40	40	40	40	40	39	39	39	39	39	39
Loader	88	40	84	41	40	40	40	40	40	40	40	40	40	39	39	39	39	39	39
Scissor Lift	85	20	78	35	34	34	34	34	34	34	34	34	34	33	33	33	33	33	33
Truck	85	40	81	38	37	37	37	37	37	37	37	37	37	36	36	36	36	36	36
Welder	73	40	69	26	25	25	25	25	25	25	25	25	25	24	24	24	24	24	24
Compressor	80	40	76	33	32	32	32	32	32	32	32	32	32	31	31	31	31	31	31
Concrete Pump	77	50	74	31	30	30	30	30	30	30	30	30	30	29	29	29	29	29	29
Composite Equipment Sound Level at 2,000 feet, L_{eq} (dBA)				**47**	**47**	**47**	**46**	**46**	**46**	**46**	**46**	**46**	**46**	**46**	**46**	**46**	**46**	**45**	**45**

Table O-3. Construction Noise Levels at NSRs within 1 mile of the Project Boundary (continued)

Equipment	L_{max} Equipment Sound Level at 50 feet (dBA)	Usage Factor (%)[1/]	Equipment Sound Level at 50 feet, L_{eq}(dBA)	NSR IDs within 1 mile of the Project Boundary															
				544	242	158	49	182	4	530	50	556	472	181	462	225	473	461	541
				Distance to Project Boundary (feet)															
				2464	2465	2480	2486	2506	2512	2552	2554	2557	2559	2588	2590	2608	2630	2641	2655
Crane	85	16	77	32	32	32	32	32	32	32	32	32	32	31	31	31	31	31	31
Forklift	80	40	76	31	31	31	31	31	31	31	31	31	31	30	30	30	30	30	30
Backhoe	80	40	76	31	31	31	31	31	31	31	31	31	31	30	30	30	30	30	30
Grader	85	40	81	36	36	36	36	36	36	36	36	36	36	35	35	35	35	35	35
Man basket	85	20	78	33	33	33	33	33	33	33	33	33	33	32	32	32	32	32	32
Dozer	88	40	84	39	39	39	39	39	39	39	39	39	39	38	38	38	38	38	38
Loader	88	40	84	39	39	39	39	39	39	39	39	39	39	38	38	38	38	38	38
Scissor Lift	85	20	78	33	33	33	33	33	33	33	33	33	33	32	32	32	32	32	32
Truck	85	40	81	36	36	36	36	36	36	36	36	36	36	35	35	35	35	35	35
Welder	73	40	69	24	24	24	24	24	24	24	24	24	24	23	23	23	23	23	23
Compressor	80	40	76	31	31	31	31	31	31	31	31	31	31	30	30	30	30	30	30
Concrete Pump	77	50	74	29	29	29	29	29	29	29	29	29	29	28	28	28	28	28	28
Composite Equipment Sound Level at 2,000 feet, L_{eq} (dBA)				**45**	**45**	**45**	**45**	**45**	**45**	**45**	**45**	**45**	**45**	**45**	**45**	**45**	**45**	**45**	**44**

Equipment	L_{max} Equipment Sound Level at 50 feet (dBA)	Usage Factor (%)[1/]	Equipment Sound Level at 50 feet, L_{eq}(dBA)	NSR IDs within 1 mile of the Project Boundary															
				470	241	543	60	243	6	121	528	460	157	522	542	222	57	521	246
				Distance to Project Boundary (feet)															
				2674	2690	2703	2709	2743	2747	2756	2785	2801	2825	2834	2874	2921	2927	2930	2932
Crane	85	16	77	31	31	31	31	31	31	31	31	31	30	30	30	30	30	30	30
Forklift	80	40	76	30	30	30	30	30	30	30	30	30	29	29	29	29	29	29	29
Backhoe	80	40	76	30	30	30	30	30	30	30	30	30	29	29	29	29	29	29	29
Grader	85	40	81	35	35	35	35	35	35	35	35	35	34	34	34	34	34	34	34
Man basket	85	20	78	32	32	32	32	32	32	32	32	32	31	31	31	31	31	31	31
Dozer	88	40	84	38	38	38	38	38	38	38	38	38	37	37	37	37	37	37	37
Loader	88	40	84	38	38	38	38	38	38	38	38	38	37	37	37	37	37	37	37
Scissor Lift	85	20	78	32	32	32	32	32	32	32	32	32	31	31	31	31	31	31	31
Truck	85	40	81	35	35	35	35	35	35	35	35	35	34	34	34	34	34	34	34
Welder	73	40	69	23	23	23	23	23	23	23	23	23	22	22	22	22	22	22	22
Compressor	80	40	76	30	30	30	30	30	30	30	30	30	29	29	29	29	29	29	29
Concrete Pump	77	50	74	28	28	28	28	28	28	28	28	27	27	27	27	27	27	27	27
Composite Equipment Sound Level at 2,000 feet, L_{eq} (dBA)				**44**	**44**	**44**	**44**	**44**	**44**	**44**	**44**	**44**	**44**	**44**	**44**	**43**	**43**	**43**	**43**

Table O-3. Construction Noise Levels at NSRs within 1 mile of the Project Boundary (continued)

Equipment	L_{max} Equipment Sound Level at 50 feet (dBA)	Usage Factor (%)[1/]	Equipment Sound Level at 50 feet, L_{eq}(dBA)	NSR IDs within 1 mile of the Project Boundary															
				226	474	510	740	53	221	175	523	244	484	17	527	220	519	498	176
				Distance to Project Boundary (feet)															
				2945	2949	2950	2951	2961	2969	2991	3016	3019	3019	3036	3036	3040	3041	3046	3073
Crane	85	16	77	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	29
Forklift	80	40	76	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	28
Backhoe	80	40	76	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	28
Grader	85	40	81	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	33
Man basket	85	20	78	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	30
Dozer	88	40	84	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	36
Loader	88	40	84	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	36
Scissor Lift	85	20	78	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	30
Truck	85	40	81	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	33
Welder	73	40	69	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	21
Compressor	80	40	76	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	28
Concrete Pump	77	50	74	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	26
Composite Equipment Sound Level at 2,000 feet, L_{eq} (dBA)				**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**

Equipment	L_{max} Equipment Sound Level at 50 feet (dBA)	Usage Factor (%)[1/]	Equipment Sound Level at 50 feet, L_{eq}(dBA)	NSR IDs within 1 mile of the Project Boundary															
				485	16	529	174	475	1	520	232	52	218	518	525	245	7	497	219
				Distance to Project Boundary (feet)															
				3088	3092	3093	3116	3142	3154	3181	3193	3201	3226	3226	3257	3259	3262	3273	3275
Crane	85	16	77	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Forklift	80	40	76	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
Backhoe	80	40	76	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
Grader	85	40	81	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
Man basket	85	20	78	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Dozer	88	40	84	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
Loader	88	40	84	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
Scissor Lift	85	20	78	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Truck	85	40	81	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
Welder	73	40	69	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
Compressor	80	40	76	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
Concrete Pump	77	50	74	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Composite Equipment Sound Level at 2,000 feet, L_{eq} (dBA)				**43**	**43**	**43**	**43**	**43**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**

Table O-3. Construction Noise Levels at NSRs within 1 mile of the Project Boundary (continued)

Equipment	L_{max} Equipment Sound Level at 50 feet (dBA)	Usage Factor (%)[1/]	Equipment Sound Level at 50 feet, L_{eq} (dBA)	NSR IDs within 1 mile of the Project Boundary																
				177	206	207	511	240	194	524	476	483	173	89	124	748	178	217	733	587
				Distance to Project Boundary (feet)																
				3284	3290	3291	3294	3310	3316	3338	3345	3361	3373	3380	3397	3405	3406	3407	3408	3414
Crane	85	16	77	29	29	29	29	29	29	29	28	28	28	28	28	28	28	28	28	28
Forklift	80	40	76	28	28	28	28	28	28	27	27	27	27	27	27	27	27	27	27	27
Backhoe	80	40	76	28	28	28	28	28	28	27	27	27	27	27	27	27	27	27	27	27
Grader	85	40	81	33	33	33	33	33	33	32	32	32	32	32	32	32	32	32	32	32
Man basket	85	20	78	30	30	30	30	30	30	29	29	29	29	29	29	29	29	29	29	29
Dozer	88	40	84	36	36	36	36	36	36	35	35	35	35	35	35	35	35	35	35	35
Loader	88	40	84	36	36	36	36	36	36	35	35	35	35	35	35	35	35	35	35	35
Scissor Lift	85	20	78	30	30	30	30	30	30	29	29	29	29	29	29	29	29	29	29	29
Truck	85	40	81	33	33	33	33	33	33	32	32	32	32	32	32	32	32	32	32	32
Welder	73	40	69	21	21	21	21	21	21	20	20	20	20	20	20	20	20	20	20	20
Compressor	80	40	76	28	28	28	28	28	28	27	27	27	27	27	27	27	27	27	27	27
Concrete Pump	77	50	74	26	26	26	26	26	26	25	25	25	25	25	25	25	25	25	25	25
Composite Equipment Sound Level at 2,000 feet, L_{eq} (dBA)				**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**

Equipment	L_{max} Equipment Sound Level at 50 feet (dBA)	Usage Factor (%)[1/]	Equipment Sound Level at 50 feet, L_{eq}(dBA)	NSR IDs within 1 mile of the Project Boundary																
				172	196	486	56	195	590	588	193	496	150	526	477	589	51	179	224	
				Distance to Project Boundary (feet)																
				3421	3436	3437	3458	3461	3461	3462	3464	3473	3497	3497	3520	3534	3539	3551	3574	
Crane	85	16	77	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	
Forklift	80	40	76	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	
Backhoe	80	40	76	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	
Grader	85	40	81	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	
Man basket	85	20	78	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	
Dozer	88	40	84	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	
Loader	88	40	84	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	
Scissor Lift	85	20	78	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	
Truck	85	40	81	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	
Welder	73	40	69	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	
Compressor	80	40	76	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	
Concrete Pump	77	50	74	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	
Composite Equipment Sound Level at 2,000 feet, L_{eq} (dBA)				**42**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	

Table O-3. Construction Noise Levels at NSRs within 1 mile of the Project Boundary (continued)

Equipment	L_{max} Equipment Sound Level at 50 feet (dBA)	Usage Factor (%)[1/]	Equipment Sound Level at 50 feet, L_{eq}(dBA)	NSR IDs within 1 mile of the Project Boundary															
				205	512	208	517	61	144	216	88	180	143	48	8	202	145	191	9
				Distance to Project Boundary (feet)															
				3581	3587	3600	3602	3616	3623	3625	3629	3631	3634	3641	3647	3649	3667	3690	3693
Crane	85	16	77	28	28	28	28	28	28	28	28	28	28	28	27	27	27	27	27
Forklift	80	40	76	27	27	27	27	27	27	27	27	27	27	26	26	26	26	26	26
Backhoe	80	40	76	27	27	27	27	27	27	27	27	27	27	26	26	26	26	26	26
Grader	85	40	81	32	32	32	32	32	32	32	32	32	32	31	31	31	31	31	31
Man basket	85	20	78	29	29	29	29	29	29	29	29	29	28	28	28	28	28	28	28
Dozer	88	40	84	35	35	35	35	35	35	35	35	35	35	34	34	34	34	34	34
Loader	88	40	84	35	35	35	35	35	35	35	35	35	35	34	34	34	34	34	34
Scissor Lift	85	20	78	29	29	29	29	29	29	29	29	29	28	28	28	28	28	28	28
Truck	85	40	81	32	32	32	32	32	32	32	32	32	32	31	31	31	31	31	31
Welder	73	40	69	20	20	20	20	20	20	20	20	20	20	19	19	19	19	19	19
Compressor	80	40	76	27	27	27	27	27	27	27	27	27	27	26	26	26	26	26	26
Concrete Pump	77	50	74	25	25	25	25	25	25	25	24	24	24	24	24	24	24	24	24
Composite Equipment Sound Level at 2,000 feet, L_{eq} (dBA)				**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**

Equipment	L_{max} Equipment Sound Level at 50 feet (dBA)	Usage Factor (%)[1/]	Equipment Sound Level at 50 feet, L_{eq}(dBA)	NSR IDs within 1 mile of the Project Boundary															
				482	83	129	133	487	211	495	54	215	516	586	265	132	68	87	478
				Distance to Project Boundary (feet)															
				3693	3710	3717	3726	3740	3772	3772	3773	3774	3776	3796	3811	3814	3817	3825	3827
Crane	85	16	77	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
Forklift	80	40	76	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Backhoe	80	40	76	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Grader	85	40	81	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
Man basket	85	20	78	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
Dozer	88	40	84	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
Loader	88	40	84	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
Scissor Lift	85	20	78	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
Truck	85	40	81	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
Welder	73	40	69	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
Compressor	80	40	76	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Concrete Pump	77	50	74	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Composite Equipment Sound Level at 2,000 feet, L_{eq} (dBA)				**41**	**41**	**41**	**41**	**41**	**40**	**40**	**40**	**40**	**40**	**40**	**40**	**40**	**40**	**40**	**40**

Table O-3. Construction Noise Levels at NSRs within 1 mile of the Project Boundary (continued)

Equipment	L_{max} Equipment Sound Level at 50 feet (dBA)	Usage Factor (%)[1/]	Equipment Sound Level at 50 feet, L_{eq} (dBA)	NSR IDs within 1 mile of the Project Boundary															
				228	214	131	513	238	239	746	213	204	735	10	591	47	154	128	514	481
				Distance to Project Boundary (feet)															
				3830	3835	3838	3843	3847	3847	3847	3877	3894	3904	3909	3916	3937	3941	3946	3946	3953
Crane	85	16	77	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
Forklift	80	40	76	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Backhoe	80	40	76	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Grader	85	40	81	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
Man basket	85	20	78	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
Dozer	88	40	84	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
Loader	88	40	84	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
Scissor Lift	85	20	78	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
Truck	85	40	81	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
Welder	73	40	69	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
Compressor	80	40	76	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Concrete Pump	77	50	74	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Composite Equipment Sound Level at 2,000 feet, L_{eq} (dBA)				**40**	**40**	**40**	**40**	**40**	**40**	**40**	**40**	**40**	40	**40**	**40**	**40**	**40**	**40**	**40**	**40**

Equipment	L_{max} Equipment Sound Level at 50 feet (dBA)	Usage Factor (%)[1/]	Equipment Sound Level at 50 feet, L_{eq}(dBA)	NSR IDs within 1 mile of the Project Boundary															
				142	149	55	494	130	11	488	515	255	734	127	236	585	190	210	209
				Distance to Project Boundary (feet)															
				3958	3966	3973	3974	3976	3985	4011	4011	4015	4022	4023	4029	4037	4045	4060	4061
Crane	85	16	77	27	27	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Forklift	80	40	76	26	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Backhoe	80	40	76	26	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Grader	85	40	81	31	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Man basket	85	20	78	28	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
Dozer	88	40	84	34	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
Loader	88	40	84	34	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
Scissor Lift	85	20	78	28	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
Truck	85	40	81	31	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Welder	73	40	69	19	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Compressor	80	40	76	26	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Concrete Pump	77	50	74	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
Composite Equipment Sound Level at 2,000 feet, L_{eq} (dBA)				**40**	**40**	**40**	**40**	**40**	**40**	**40**	**40**	**40**	**40**	**40**	**40**	**40**	**40**	**40**	**40**

Table O-3. Construction Noise Levels at NSRs within 1 mile of the Project Boundary (continued)

Equipment	L_{max} Equipment Sound Level at 50 feet (dBA)	Usage Factor (%)[1/]	Equipment Sound Level at 50 feet, L_{eq}(dBA)	NSR IDs within 1 mile of the Project Boundary															
				201	229	266	493	261	200	615	479	212	203	252	557	86	155	12	126
				Distance to Project Boundary (feet)															
				4103	4103	4118	4142	4158	4159	4168	4175	4179	4181	4182	4192	4193	4211	4229	4235
Crane	85	16	77	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Forklift	80	40	76	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Backhoe	80	40	76	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Grader	85	40	81	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Man basket	85	20	78	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
Dozer	88	40	84	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
Loader	88	40	84	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
Scissor Lift	85	20	78	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
Truck	85	40	81	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Welder	73	40	69	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Compressor	80	40	76	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Concrete Pump	77	50	74	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
Composite Equipment Sound Level at 2,000 feet, L_{eq} (dBA)				**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**

Equipment	L_{max} Equipment Sound Level at 50 feet (dBA)	Usage Factor (%)[1/]	Equipment Sound Level at 50 feet, L_{eq} (dBA)	NSR IDs within 1 mile of the Project Boundary															
				736	492	112	267	248	231	14	146	125	148	268	592	749	270	113	109	269
				Distance to Project Boundary (feet)																
				4247	4262	4267	4274	4294	4305	4324	4330	4338	4366	4370	4376	4385	4388	4398	4431	4431
Crane	85	16	77	26	26	26	26	26	26	26	26	25	25	25	25	25	25	25	25	25
Forklift	80	40	76	25	25	25	25	25	25	24	24	24	24	24	24	24	24	24	24	24
Backhoe	80	40	76	25	25	25	25	25	25	24	24	24	24	24	24	24	24	24	24	24
Grader	85	40	81	30	30	30	30	30	30	29	29	29	29	29	29	29	29	29	29	29
Man basket	85	20	78	27	27	27	27	27	27	26	26	26	26	26	26	26	26	26	26	26
Dozer	88	40	84	33	33	33	33	33	33	32	32	32	32	32	32	32	32	32	32	32
Loader	88	40	84	33	33	33	33	33	33	32	32	32	32	32	32	32	32	32	32	32
Scissor Lift	85	20	78	27	27	27	27	27	27	26	26	26	26	26	26	26	26	26	26	26
Truck	85	40	81	30	30	30	30	30	30	29	29	29	29	29	29	29	29	29	29	29
Welder	73	40	69	18	18	18	18	18	18	17	17	17	17	17	17	17	17	17	17	17
Compressor	80	40	76	25	25	25	25	25	25	24	24	24	24	24	24	24	24	24	24	24
Concrete Pump	77	50	74	23	23	23	23	23	23	22	22	22	22	22	22	22	22	22	22	22
Composite Equipment Sound Level at 2,000 feet, L_{eq} (dBA)				**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**

Table O-3. Construction Noise Levels at NSRs within 1 mile of the Project Boundary (continued)

Equipment	L_{max} Equipment Sound Level at 50 feet (dBA)	Usage Factor (%)[1/]	Equipment Sound Level at 50 feet, L_{eq}(dBA)	NSR IDs within 1 mile of the Project Boundary															
				262	151	13	480	489	199	115	98	491	189	593	198	97	84	105	235
				Distance to Project Boundary (feet)															
				4443	4449	4450	4450	4450	4455	4477	4477	4480	4494	4497	4497	4510	4510	4512	4516
Crane	85	16	77	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Forklift	80	40	76	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Backhoe	80	40	76	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Grader	85	40	81	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Man basket	85	20	78	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Dozer	88	40	84	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
Loader	88	40	84	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
Scissor Lift	85	20	78	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Truck	85	40	81	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Welder	73	40	69	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Compressor	80	40	76	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Concrete Pump	77	50	74	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Composite Equipment Sound Level at 2,000 feet, L_{eq} (dBA)				**39**	**39**	**39**	**39**	**39**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**

Equipment	L_{max} Equipment Sound Level at 50 feet (dBA)	Usage Factor (%)[1/]	Equipment Sound Level at 50 feet, L_{eq}(dBA)	NSR IDs within 1 mile of the Project Boundary															
				123	584	15	114	732	237	102	185	271	249	104	256	103	152	272	85
				Distance to Project Boundary (feet)															
				4517	4519	4520	4527	4533	4536	4601	4606	4613	4621	4648	4661	4672	4707	4721	4728
Crane	85	16	77	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	24
Forklift	80	40	76	24	24	24	24	24	24	24	24	24	24	24	24	24	24	23	23
Backhoe	80	40	76	24	24	24	24	24	24	24	24	24	24	24	24	24	24	23	23
Grader	85	40	81	29	29	29	29	29	29	29	29	29	29	29	29	29	29	28	28
Man basket	85	20	78	26	26	26	26	26	26	26	26	26	26	26	26	26	26	25	25
Dozer	88	40	84	32	32	32	32	32	32	32	32	32	32	32	32	32	32	31	31
Loader	88	40	84	32	32	32	32	32	32	32	32	32	32	32	32	32	32	31	31
Scissor Lift	85	20	78	26	26	26	26	26	26	26	26	26	26	26	26	26	26	25	25
Truck	85	40	81	29	29	29	29	29	29	29	29	29	29	29	29	29	29	28	28
Welder	73	40	69	17	17	17	17	17	17	17	17	17	17	17	17	17	17	16	16
Compressor	80	40	76	24	24	24	24	24	24	24	24	24	24	24	24	24	24	23	23
Concrete Pump	77	50	74	22	22	22	22	22	22	22	22	22	22	22	22	22	21	21	21
Composite Equipment Sound Level at 2,000 feet, L_{eq} (dBA)				**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**

Table O-3. Construction Noise Levels at NSRs within 1 mile of the Project Boundary (continued)

Equipment	L_{max} Equipment Sound Level at 50 feet (dBA)	Usage Factor (%)[1/]	Equipment Sound Level at 50 feet, L_{eq} (dBA)	NSR IDs within 1 mile of the Project Boundary																
				141	96	42	747	263	490	616	188	273	122	234	233	693	108	106	153	107
				Distance to Project Boundary (feet)																
				4736	4737	4756	4756	4762	4764	4764	4781	4799	4805	4821	4839	4862	4866	4869	4871	4871
Crane	85	16	77	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Forklift	80	40	76	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
Backhoe	80	40	76	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
Grader	85	40	81	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
Man basket	85	20	78	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Dozer	88	40	84	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
Loader	88	40	84	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
Scissor Lift	85	20	78	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Truck	85	40	81	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
Welder	73	40	69	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Compressor	80	40	76	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
Concrete Pump	77	50	74	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
Composite Equipment Sound Level at 2,000 feet, L_{eq} (dBA)				**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**37**	**37**	**37**	**37**	**37**

Equipment	L_{max} Equipment Sound Level at 50 feet (dBA)	Usage Factor (%)[1/]	Equipment Sound Level at 50 feet, L_{eq}(dBA)	NSR IDs within 1 mile of the Project Boundary																
				595	274	583	99	629	111	140	253	582	90	197	618	694	603	100	136	
				Distance to Project Boundary (feet)																
				4889	4920	4952	4953	4957	4968	5000	5054	5058	5072	5076	5079	5080	5102	5105	5118		
Crane	85	16	77	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	
Forklift	80	40	76	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	
Backhoe	80	40	76	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	
Grader	85	40	81	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	
Man basket	85	20	78	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	
Dozer	88	40	84	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	
Loader	88	40	84	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	
Scissor Lift	85	20	78	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	
Truck	85	40	81	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	
Welder	73	40	69	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	
Compressor	80	40	76	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	
Concrete Pump	77	50	74	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	
Composite Equipment Sound Level at 2,000 feet, L_{eq} (dBA)				**37**	**37**	**37**	**37**	**37**	**37**	**37**	**37**	**37**	**37**	**37**	**37**	**37**	**37**	**37**	**37**	

Table O-3. Construction Noise Levels at NSRs within 1 mile of the Project Boundary (continued)

Equipment	L_{max} Equipment Sound Level at 50 feet (dBA)	Usage Factor (%)[1/]	Equipment Sound Level at 50 feet, L_{eq}(dBA)	NSR IDs within 1 mile of the Project Boundary														
				230	187	276	264	594	695	251	604	596	254	101	296	275	135	
				Distance to Project Boundary (feet)														
				5153	5155	5171	5178	5179	5204	5205	5209	5215	5216	5219	5224	5239	5247	
Crane	85	16	77	23	23	23	23	23	23	23	23	23	23	23	23	23	23	
Forklift	80	40	76	22	22	22	22	22	22	22	22	22	22	22	22	22	22	
Backhoe	80	40	76	22	22	22	22	22	22	22	22	22	22	22	22	22	22	
Grader	85	40	81	27	27	27	27	27	27	27	27	27	27	27	27	27	27	
Man basket	85	20	78	24	24	24	24	24	24	24	24	24	24	24	24	24	24	
Dozer	88	40	84	30	30	30	30	30	30	30	30	30	30	30	30	30	30	
Loader	88	40	84	30	30	30	30	30	30	30	30	30	30	30	30	30	30	
Scissor Lift	85	20	78	24	24	24	24	24	24	24	24	24	24	24	24	24	24	
Truck	85	40	81	27	27	27	27	27	27	27	27	27	27	27	27	27	27	
Welder	73	40	69	15	15	15	15	15	15	15	15	15	15	15	15	15	15	
Compressor	80	40	76	22	22	22	22	22	22	22	22	22	22	22	22	22	22	
Concrete Pump	77	50	74	20	20	20	20	20	20	20	20	20	20	20	20	20	20	
Composite Equipment Sound Level at 2,000 feet, L_{eq} (dBA)				**37**	**37**	**37**	**37**	**37**	**37**	**37**	**37**	**37**	**37**	**37**	**37**	**37**	**37**	

Baseline Sound Survey Report

Horse Heaven Wind Project

Benton County, Washington

Prepared for:
Horse Heaven Wind Farm, LLC

Prepared by:

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19803 North Creek Parkway
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February 2021

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ATTACHMENTS

Attachment A. Calibration Documentation

ACRONYMS AND ABBREVIATIONS

µPa	microPascal
Applicant	Horse Heaven Wind Farm, LLC
ANSI	American National Standards Institute
dB	decibel
dBA	A-weighted decibel
dBL	linear decibel
Hz	hertz
L_{eq}	equivalent sound level
L_P	sound pressure level
L_w	sound power level
Micrositing Corridor	Wind Energy Micrositing Corridor
NSR	noise sensitive receptor
Project	Horse Heaven Wind Farm
Turbine	wind turbine generator
UTM	Universal Transverse Mercator
WAC	Washington Administrative Code

1 INTRODUCTION

Horse Heaven Wind Farm, LLC (the Applicant), a subsidiary of Scout Clean Energy, proposes to construct and operate the Horse Heaven Wind Farm (the Project), a wind and solar energy project with a nominal generating capacity of up to approximately 1,150 megawatts located in Benton County, Washington. At its closest point, the Project is located approximately 4 miles south/southwest of the city of Kennewick and the larger Tri-Cities urban area, along the Columbia River.

To provide quantitative detail required under Washington Administrative Code (WAC) 463-60-352(1)(a) to describe the background noise environment, the Applicant has collected ambient sound data to document existing conditions within the Project Lease Boundary and vicinity. The purpose of conducting a baseline sound survey is to characterize the existing land uses, sound sources, and acoustic environment within the Project Lease Boundary and vicinity across a range of wind speeds and future wind turbine generator (Turbine) operational conditions.

1.1 Project Lease Boundary and Vicinity

The Project Lease Boundary (i.e., the extent of parcels in which the Applicant has executed a lease to construct Turbines, the solar array, and associated facilities) encompasses approximately 72,428 acres. The Project's Wind Energy Micrositing Corridor (Micrositing Corridor) encompasses 11,489 acres and consists of the area in which the Turbines and supporting facilities would be sited during the final design. The Solar Siting Areas (which consist of the three areas under consideration for siting of the proposed solar arrays during the final design) encompass 10,438 acres located within the Project Lease Boundary. The Micrositing Corridor and the Solar Siting Areas are larger than the Project's final footprint to allow minor rerouting to optimize the design and to avoid resources that may be discovered during the final design and pre-construction process.

The elevation within the Project Lease Boundary ranges from 604 to 2,051 feet above mean sea level. The Project Lease Boundary is dominated by rolling hills bisected by meandering canyons, some of which constitute ephemeral or intermittent drainages. The Horse Heaven Hills ridgeline lies along the northern border of the Project, particularly in the western portion of the Project Lease Boundary; on the southern side of this ridge, the landscape transitions to relatively rolling topography with shallow, meandering canyons that drain southwest into the Columbia River. While the majority of this western portion of the Project Lease Boundary drains to the southwest into the Columbia River, a small portion of the Project along the northeastern boundary ultimately drains northwest into the Yakima River and northeast into the Columbia River. The eastern portion of the Project Lease Boundary similarly drains primarily to the south into the Columbia River with a small portion of the Project draining northeast into the Columbia River.

To document actual ambient sound levels in the Project Lease Boundary and vicinity, five noise sensitive receptors (NSRs; i.e., residences) were selected as monitoring positions for the baseline sound survey. These residences were selected because they are distributed throughout the area and would act to represent the existing acoustic environment. Figure 1-1 shows the Project Lease Boundary and vicinity and the location of the five baseline sound monitoring stations.

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Horse Heaven Wind Farm

SCOUT CLEAN ENERGY

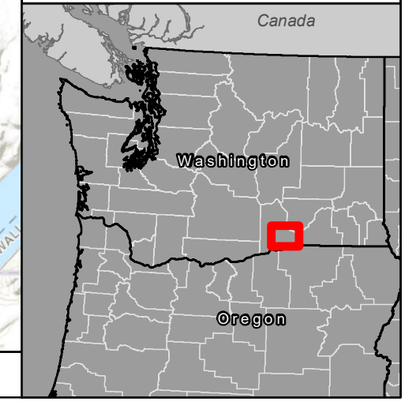
Figure 1-1
Project Lease Boundary and Vicinity

BENTON COUNTY, WA

- Noise Receptor - Participating
- Noise Receptor - Non-participating
- Option 1 Turbine Location
- Baseline Sound Monitoring Location
- Project Lease Boundary
- Proposed Project Substation
- Solar Siting Area
- Solar Array

TETRA TECH

Reference Map



ML-1
ML-2
ML-3
ML-4
ML-5

1:140,000 WGS 1984 UTM Zone 11N

0 0.5 1 2 3 4 Miles

NOT FOR CONSTRUCTION

R:\PROJECTS\HORSE_HEAVEN_6430\NOISEMAPS\NOISE_MONITORING_LOCATIONS_20210216.mxd

1.2 Acoustic Metrics and Terminology

All sounds originate with a source, whether it is a human voice, motor vehicles on a roadway, or a combustion turbine. Energy is required to produce sound and this sound energy is transmitted through the air in the form of sound waves – tiny, quick oscillations of pressure just above and just below atmospheric pressure. These oscillations, or sound pressures, impinge on the ear, creating the sound we hear. A sound source is defined by a sound power level (L_W), which is independent of any external factors. By definition, sound power is the rate at which acoustical energy is radiated outward and is expressed in units of watts.

A source sound power level cannot be measured directly. It is calculated from measurements of sound intensity or sound pressure at a given distance from the source outside the acoustic and geometric near-field. A sound pressure level (L_P) is a measure of the sound wave fluctuation at a given receiver location and can be obtained through the use of a microphone or calculated from information about the source sound power level and the surrounding environment. The sound pressure level in decibels (dB) is the logarithm of the ratio of the sound pressure of the source to the reference sound pressure of 20 microPascals (µPa), multiplied by 20.1. The range of sound pressures that can be detected by a person with normal hearing is very wide, ranging from about 20 µPa for very faint sounds at the threshold of hearing, to nearly 10 million µPa for extremely loud sounds such as a jet during take-off at a distance of 300 feet.

Broadband sound includes sound energy summed across the entire audible frequency spectrum. In addition to broadband sound pressure levels, analysis of the various frequency components of the sound spectrum can be completed to determine tonal characteristics. The unit of frequency is hertz (Hz), measuring the cycles per second of the sound pressure waves. Typically, the frequency analysis examines 11 octave bands ranging from 16 Hz (low) to 16,000 Hz (high). Since the human ear does not perceive every frequency with equal loudness, spectrally-varying sounds are often adjusted with a weighting filter. The A-weighted filter is applied to compensate for the frequency response of the human auditory system and is represented in A-weighted decibel (dBA).

Sound can be measured, modeled, and presented in various formats, with the most common metric being the equivalent sound level (L_{eq}). The L_{eq} has been shown to provide both an effective and uniform method for comparing time-varying sound levels and is widely used in acoustic assessments in the State of Washington. Estimates of noise sources and outdoor acoustic environments, and the comparison of relative loudness are presented in Table 1-1. Table 1-2 presents additional reference information on terminology used in the report.

Table 1-1. Sound Pressure Levels and Relative Loudness of Typical Noise Sources and Acoustic Environments

Noise Source or Activity	Sound Level (dBA)	Subjective Impression
Vacuum cleaner (10 feet)	70	Moderate
Passenger car at 65 miles per hour (25 feet)	65	
Large store air-conditioning unit (20 feet)	60	
Light auto traffic (100 feet)	50	Quiet
Quiet rural residential area with no activity	45	
Bedroom or quiet living room; Bird calls	40	Faint
Typical wilderness area	35	
Quiet library, soft whisper (15 feet)	30	Very quiet
Wilderness with no wind or animal activity	25	Extremely quiet
High-quality recording studio	20	
Acoustic test chamber	10	Just audible
	0	Threshold of hearing

Adapted from: Kurze and Beranek (1988) and EPA (1971)

Table 1-2. Acoustic Terms and Definitions

Term	Definition
Noise	Typically defined as unwanted sound. This word adds the subjective response of humans to the physical phenomenon of sound. It is commonly used when negative effects on people are known to occur.
Sound Pressure Level (L_P)	Pressure fluctuations in a medium. Sound pressure is measured in dB referenced to 20 µPa, the approximate threshold of human perception to sound at 1,000 Hz.
Sound Power Level (L_W)	The total acoustic power of a noise source measured in dB referenced to picowatts (one trillionth of a watt). Noise specifications are provided by equipment manufacturers as sound power as it is independent of the environment in which it is located. A sound level meter does not directly measure sound power.
Equivalent Sound Level (L_{eq})	The L_{eq} is the continuous equivalent sound level, defined as the single sound pressure level that, if constant over the stated measurement period, would contain the same sound energy as the actual monitored sound that is fluctuating in level over the measurement period.
A-Weighted Decibel (dBA)	Environmental sound is typically composed of acoustic energy across all frequencies. To compensate for the auditory frequency response of the human ear, an A-weighting filter is commonly used for describing environmental sound levels. Sound levels that are A-weighted are presented as dBA in this report.
Unweighted Decibels (dBL)	Unweighted sound levels are referred to as linear. Linear decibels are used to determine a sound's tonality and to engineer solutions to reduce or control noise as techniques are different for low and high frequency noise. Sound levels that are linear are presented as dBL in this report.
Propagation and Attenuation	Propagation is the decrease in amplitude of an acoustic signal due to geometric spreading losses with increased distance from the source. Additional sound attenuation factors include air absorption, terrain effects, sound interaction with the ground, diffraction of sound around objects and topographical features, foliage, and meteorological conditions including wind velocity, temperature, humidity, and atmospheric conditions.

2 EXISTING SOUND ENVIRONMENT

With the assistance of the Applicant, landowner permissions were secured at several pre-determined baseline monitoring locations prior to the survey. The sites were then screened on the day of deployment by experienced acoustic engineers to ensure the locations were in character with the overall area. The baseline sound survey commenced on December 22, 2020 and concluded on January 19, 2021. Data were collected at each monitoring location for a period of approximately 14 days occurring within that window. A long-term baseline survey is requisite to provide a statistically relevant data set, covering the full range of wind speeds and future operational scenarios. Extensive experience on several wind energy farms sited in the United States and Canada indicates that this data set can typically be obtained over a 10-day monitoring period, weather permitting.

2.1 Instrumentation

All measurements were taken with a Larson Davis 831 real-time sound level analyzer equipped with a PCB model 377B02 1/2" precision condenser microphone. This instrument has an operating range of 5 dB to 140 dB, and an overall frequency range of 16 to 20,000 Hz and meets or exceeds all requirements set forth in the American National Standards Institute (ANSI) standards for Type 1 sound level meters for quality and accuracy (precision). All instrumentation was laboratory calibrated within the previous 12-month period with calibration documentation provided in Attachment A.

The Larson Davis 831 sound level analyzer is designed for service as a long-term environmental sound level data logger measuring the A-weighted sound level. Each sound level analyzer used was enclosed in a weatherproof case and equipped with a self-contained microphone tripod. The microphone and windscreen were tripod-mounted at an approximate height of 1.5 to 1.7 meters (4.9 to 5.6 feet) above grade away from effects of ground level rustling vegetation and fallen leaves. When sound measurements are attempted in the presence of elevated wind speeds, extraneous noise can be self-generated across the microphone. Air blowing over a microphone diaphragm creates a pressure differential and turbulence. All sound level analyzer microphones were protected from wind-induced self-noise effects by a 3.5-inch-diameter open-cell foam windscreen. By using this microphone protection, the pressure gradient and turbulence is effectively moved farther away from the microphone, minimizing self-generated wind induced noise. Table 2-1 lists the measurement equipment employed during the survey. The sound level meters were programmed to sample and store A-weighted and octave band sound level data, including L_{eq} and the percentile sound levels.

Table 2-1. Measurement Equipment

Description	Manufacturer	Type
Signal Analyzer	Larson Davis	831
Preamplifier	Larson Davis	PRM902
Microphone	PCB	377B02
Windscreen	ACO Pacific	3.5-inch
Calibrator	Larson Davis	CAL200

The baseline monitoring stations were deployed within 7.5 to 30 meters (25 to 98 feet) of the principal residential structure with their position secured by fastening the monitoring station to a fencepost or other

stationary object. All monitoring stations were anchored in a manner that avoided interference from any large vertical reflective surfaces.

Prior to and immediately following the measurement session, the sound analyzers were calibrated (no level adjustment was required) with two ANSI Type 1 calibrators which have an accuracy traceable to the National Institute of Standards and Technology. The maximum observed calibration drift ranged from -0.1 dB to +0.2 dB, which is well within acceptable tolerances for long term baseline sound measurements.

2.2 Monitoring Locations

Monitoring locations were selected with the assistance of the Applicant to be representative of residences that would be in proximity to Project Turbines. Measurements were continuously logged at each location and those measurements were correlated with wind speed data collected by on-site meteorological towers as shown in Figure 1-1. Using the sound level measurement and wind speed data, a regression analysis was conducted for each monitoring location and the best fit correlation coefficient using a second order polynomial equation was evaluated. The measured L_{eq} sound levels were divided into daytime (7:00 a.m. to 10:00 p.m.) and nighttime (10:00 p.m. to 7:00 a.m.) periods to show diurnal variation at a monitoring position. Additional descriptions of the monitoring locations and field observations are provided in Section 3. Time history and regression analysis plots are also given for each monitoring location. Please note that measured sound pressure level data were evaluated and filtered to eliminate precipitation events and atypical extraneous sound contributions.

3 RESULTS

3.1 Monitoring Location 1

Monitoring location 1 was situated at a residence along Henson Road in Prosser, Washington (Universal Transverse Mercator [UTM] Zone 11T: 311134E, 5117731N). Larson Davis 831, Serial No. 3386, was used to collect data at this location. Observations during deployment were that the location was relatively quiet with agricultural activities and sporadic noise from animals onsite contributing to ambient sound levels. Figure 3-1 includes a photograph of the monitoring location. Figure 3-2 provides the time history and Figure 3-3 provides the regression analyses of ambient sound levels during daytime and nighttime monitoring periods.

Figure 3-1. Photograph of ML-1

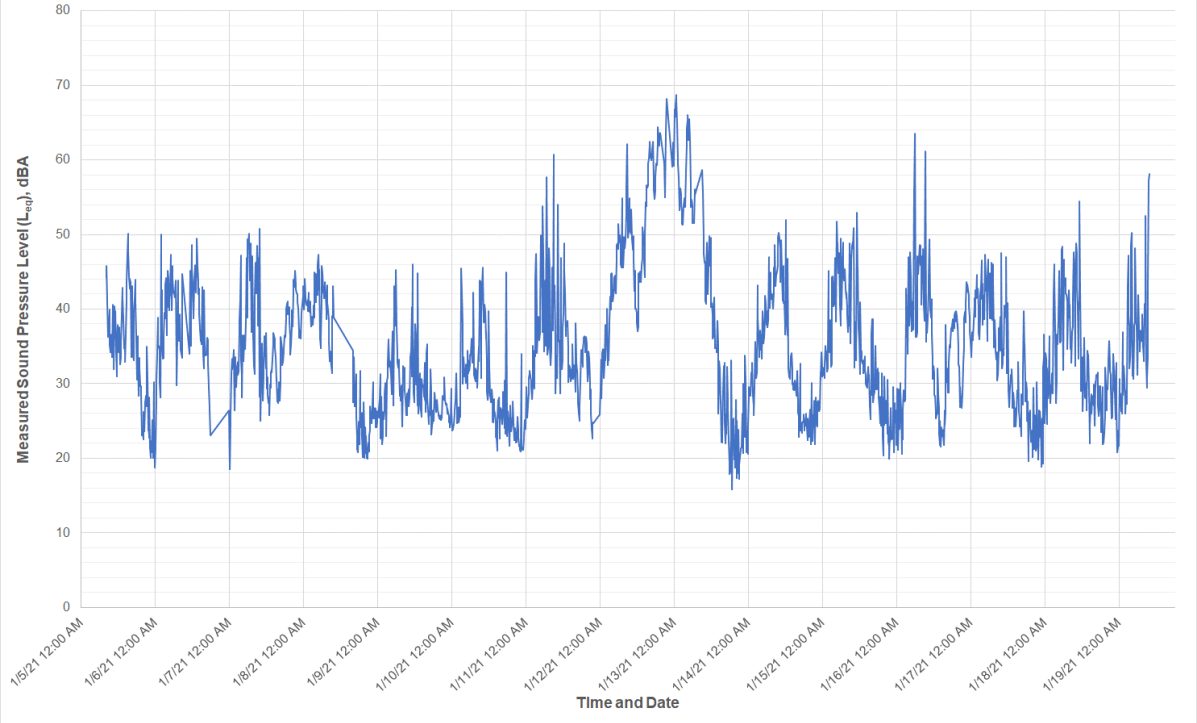


Figure 3-2. ML-1 Time History Plot

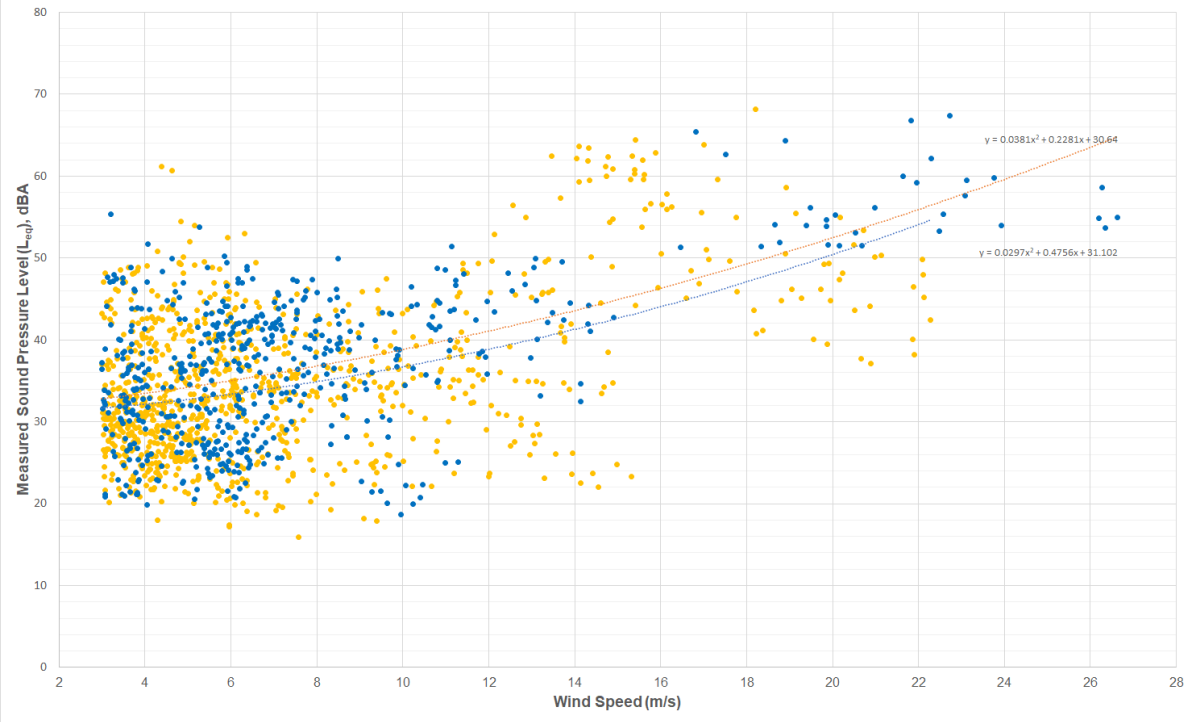


Figure 3-3. ML-1 Regression Analysis

3.2 Monitoring Location 2

Monitoring location 2 was situated at a residence along C Williams Road in Kennewick, Washington (UTM Zone 11T: 321518E, 5109850N). Larson Davis 831, Serial No. 2984, was used to collect data at this location. Observations during deployment were that the location was very quiet with no roadway noise heard during deployment and/or retrieval. Figure 3-4 includes a photograph of the monitoring location. Figure 3-5 provides the time history and Figure 3-6 provides the regression analyses of ambient sound levels during daytime and nighttime monitoring periods.

Figure 3-4. Photograph of ML-2

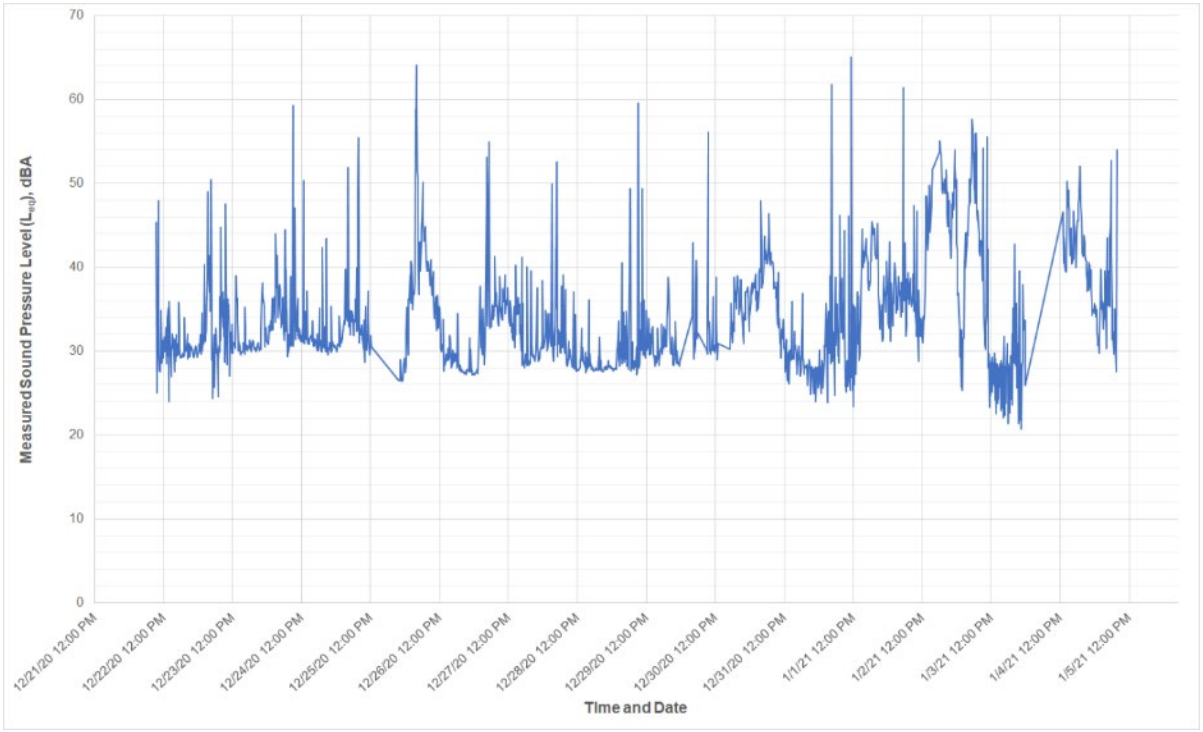


Figure 3-5. ML-2 Time History Plot

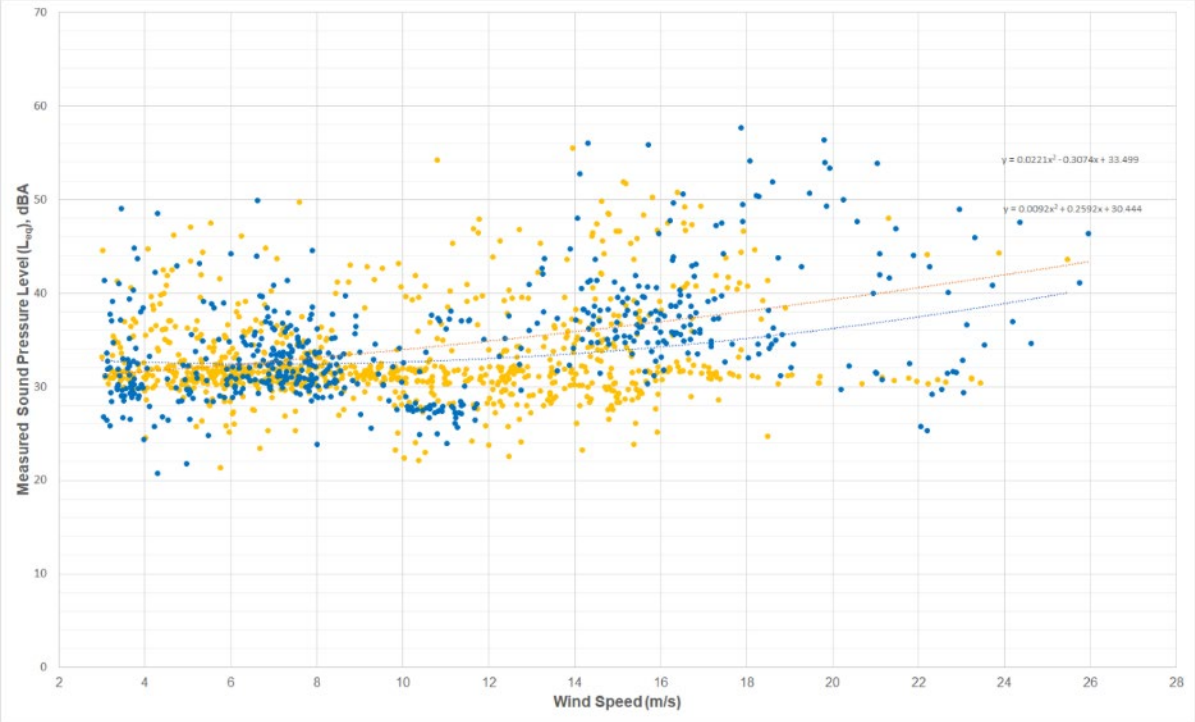


Figure 3-6. ML-2 Regression Analysis

3.3 Monitoring Location 3

Monitoring location 3 was situated at a residence along S. Bofer Canyon Road in Benton County, Washington (UTM Zone 11T: 328433E, 5104539N). Larson Davis 831, Serial No. 2985, was used to collect data at this location. Observations during deployment were that the location a low activity property. Some distance roadway noise from Interstate 82 could be heard. Figure 3-7 includes a photograph of the monitoring location. Figure 3-8 provides the time history and Figure 3-9 provides the regression analyses of ambient sound levels during daytime and nighttime monitoring periods.

Figure 3-7. Photograph of ML-3

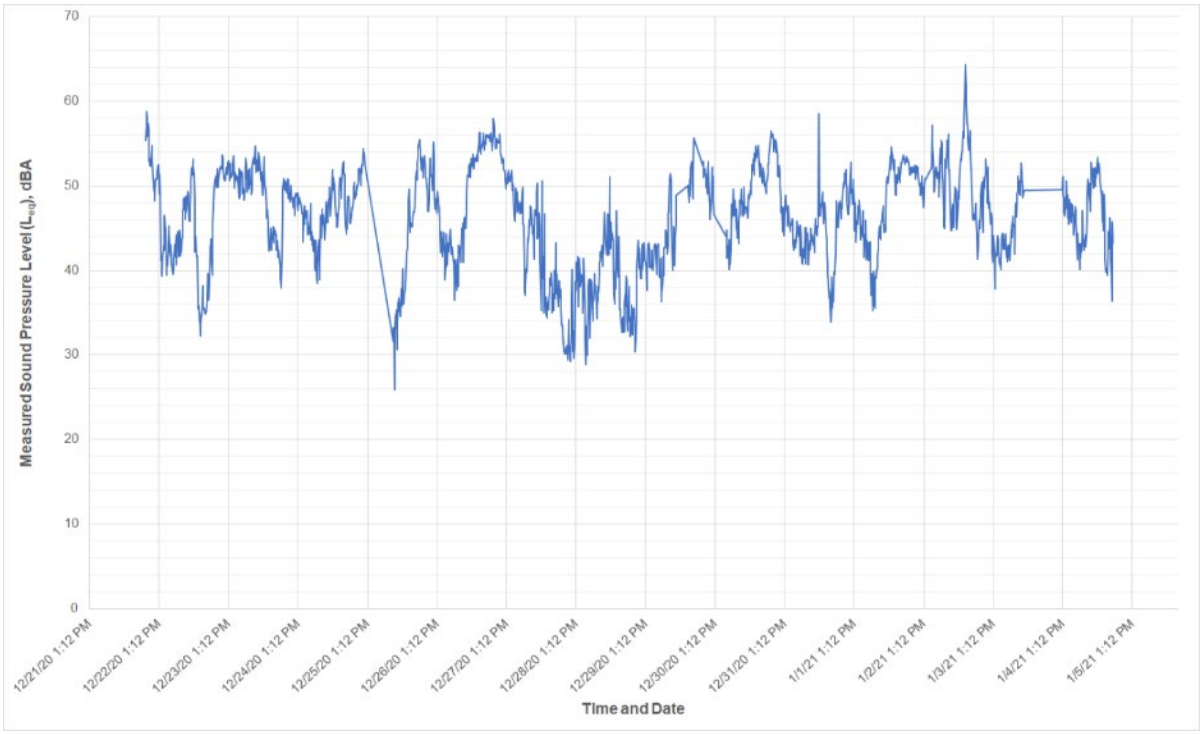


Figure 3-8. ML-3 Time History Plot

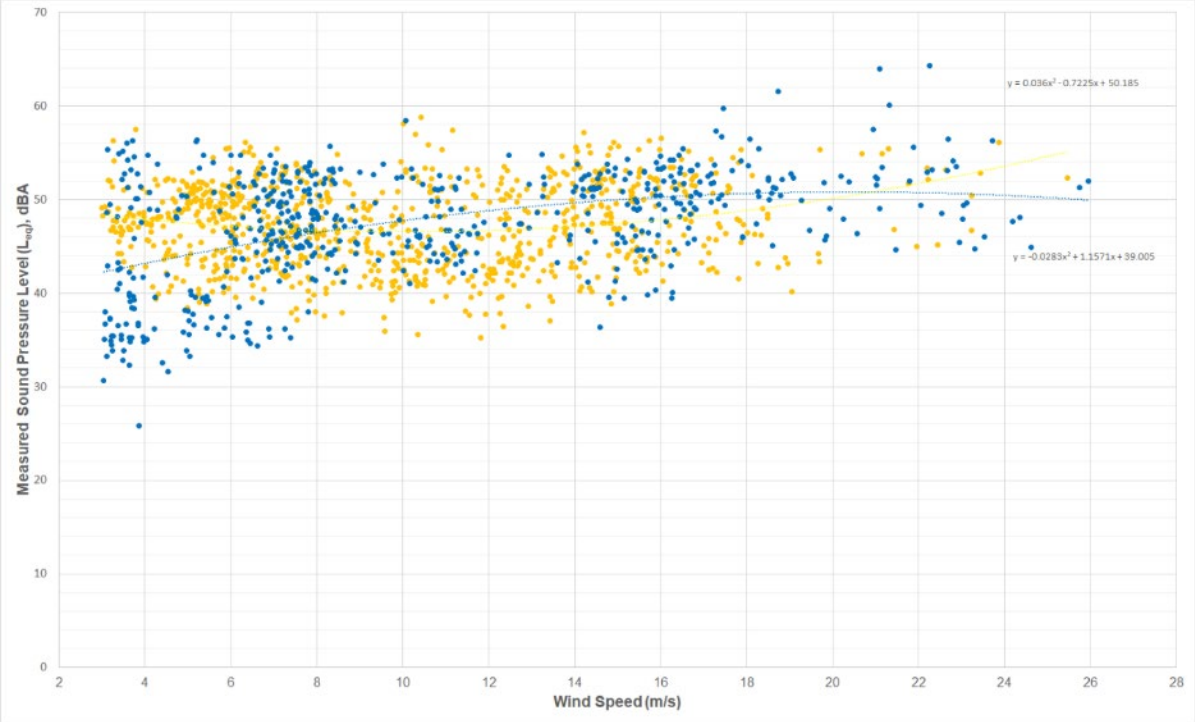


Figure 3-9. ML-2 Regression Analysis

3.4 Monitoring Location 4

Monitoring location 4 was situated at a residence along Finley Road in Kennewick, Washington (UTM Zone 11T: 343329E, 5108162N). Larson Davis 831, Serial No. 3548, was used to collect data at this location. Observations during deployment were that the location includes some farming activity; however, the monitor was located away from those activities. Noise from geese could also be heard. Figure 3-10 includes a photograph of the monitoring location. Figure 3-11 provides the time history and Figure 3-12 provides the regression analyses of ambient sound levels during daytime and nighttime monitoring periods.

Figure 3-10. Photograph of ML-4

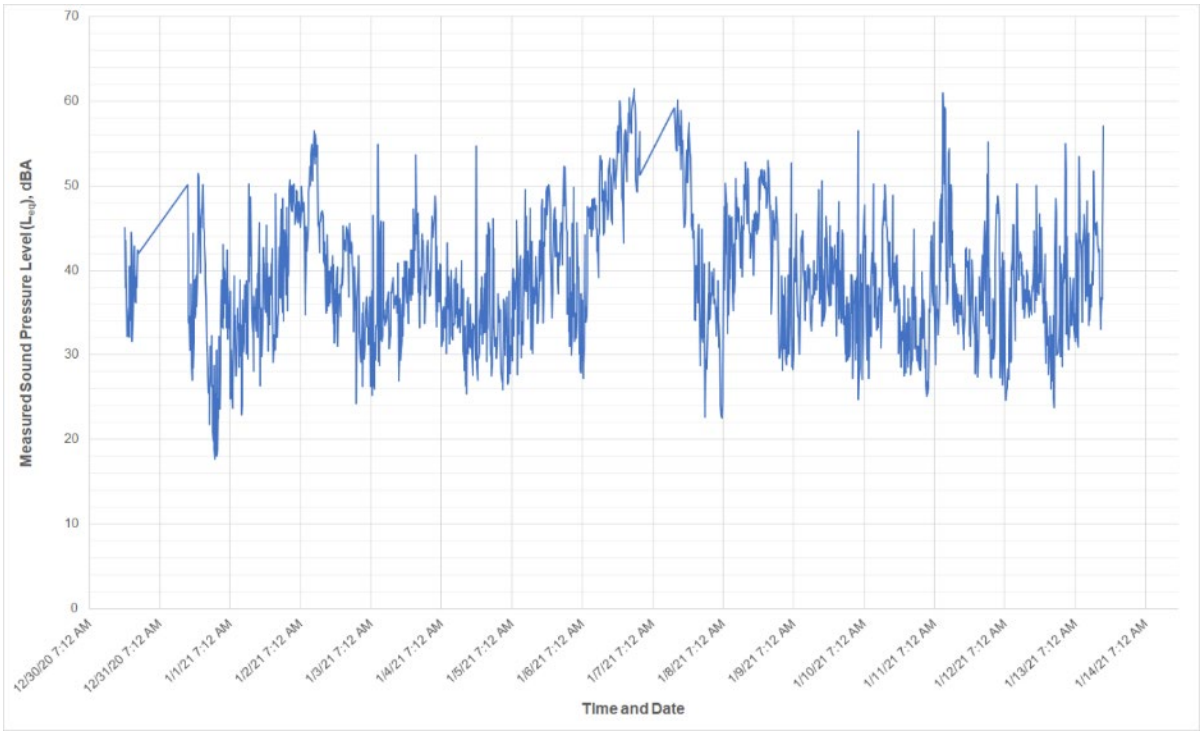


Figure 3-11. ML-4 Time History Plot

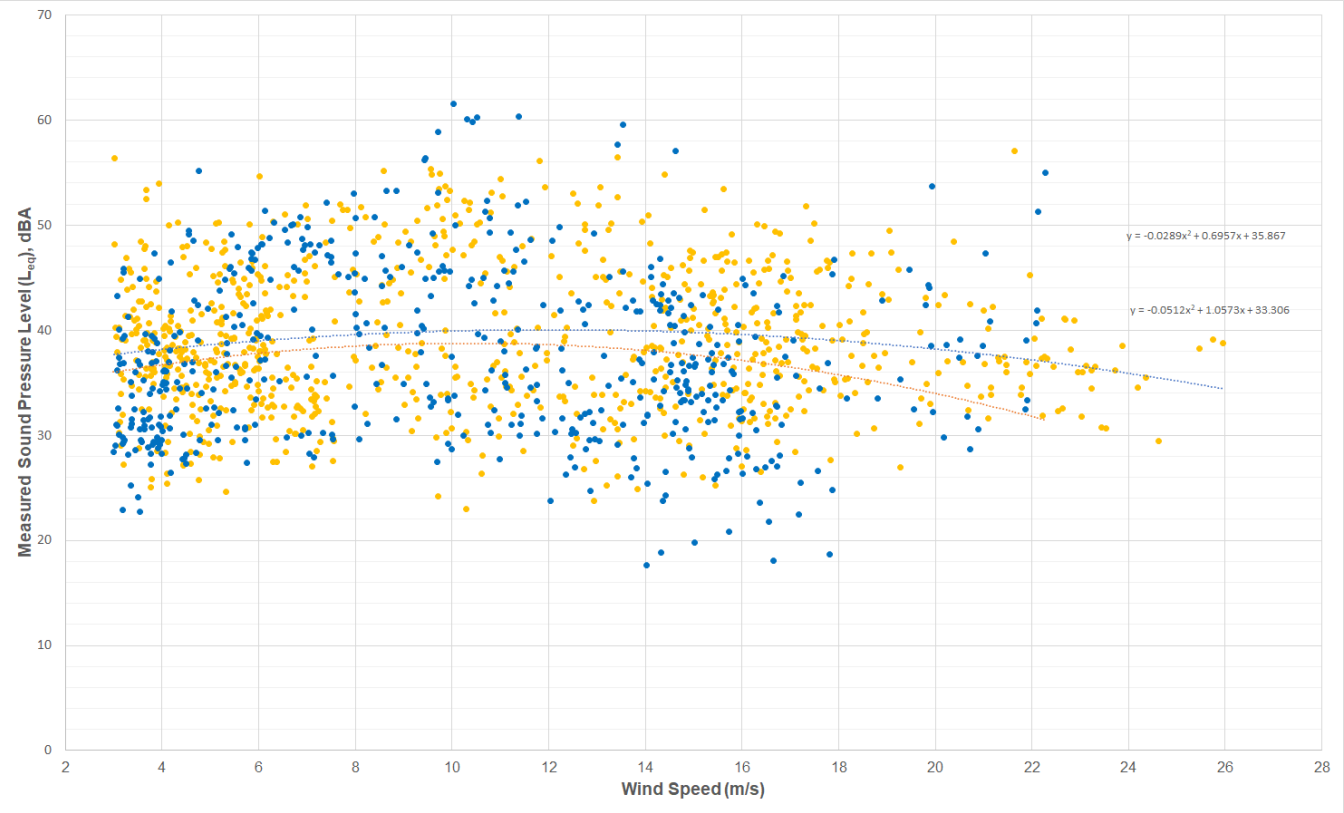


Figure 3-12. ML-4 Regression Analysis

3.5 Monitoring Location 5

Monitoring location 5 was situated at a residence along S. Travis Road in Prosser, Washington (UTM Zone 11T: 310369E, 5112039N). Larson Davis 831, Serial No. 3386, was used to collect data at this location. Observations during deployment were that the location has moderate agricultural activity. In addition, there was semi-frequent road traffic along S. Travis Road. Figure 3-13 includes a photograph of the monitoring location. Figure 3-14 provides the time history and Figure 3-15 provides the regression analyses of ambient sound levels during daytime and nighttime monitoring periods.

Figure 3-13. Photograph of ML-5

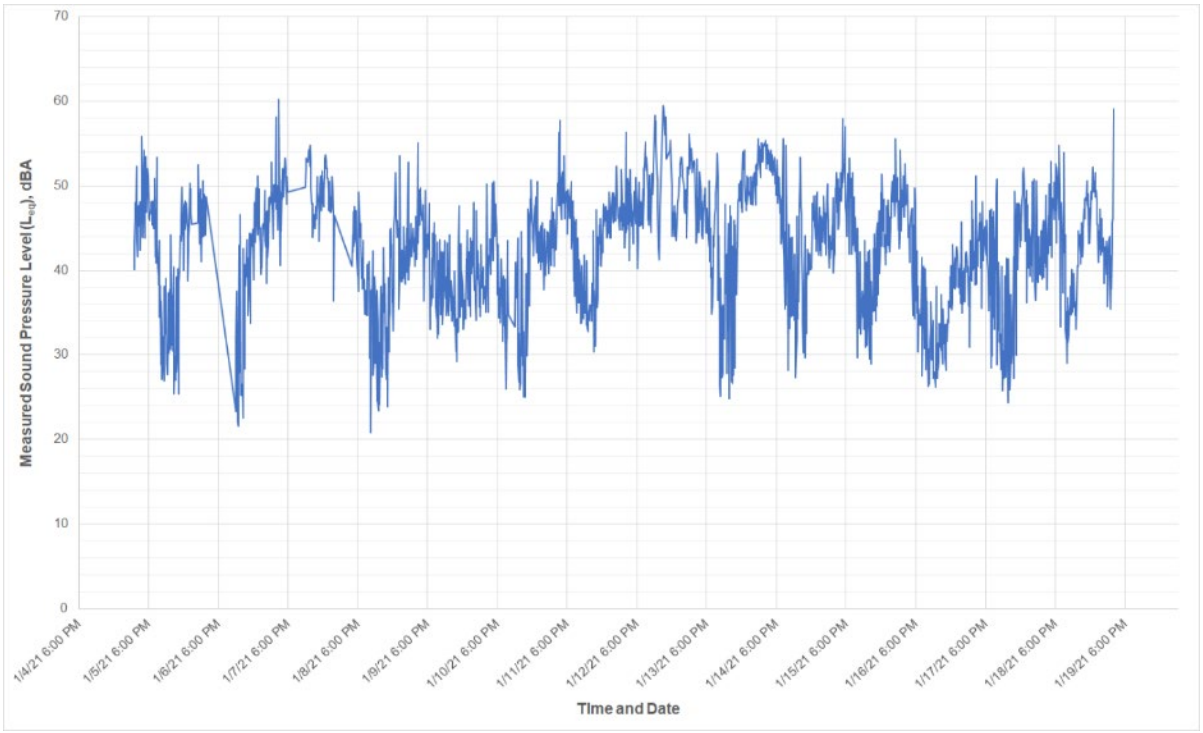


Figure 3-14. ML-5 Time History Plot

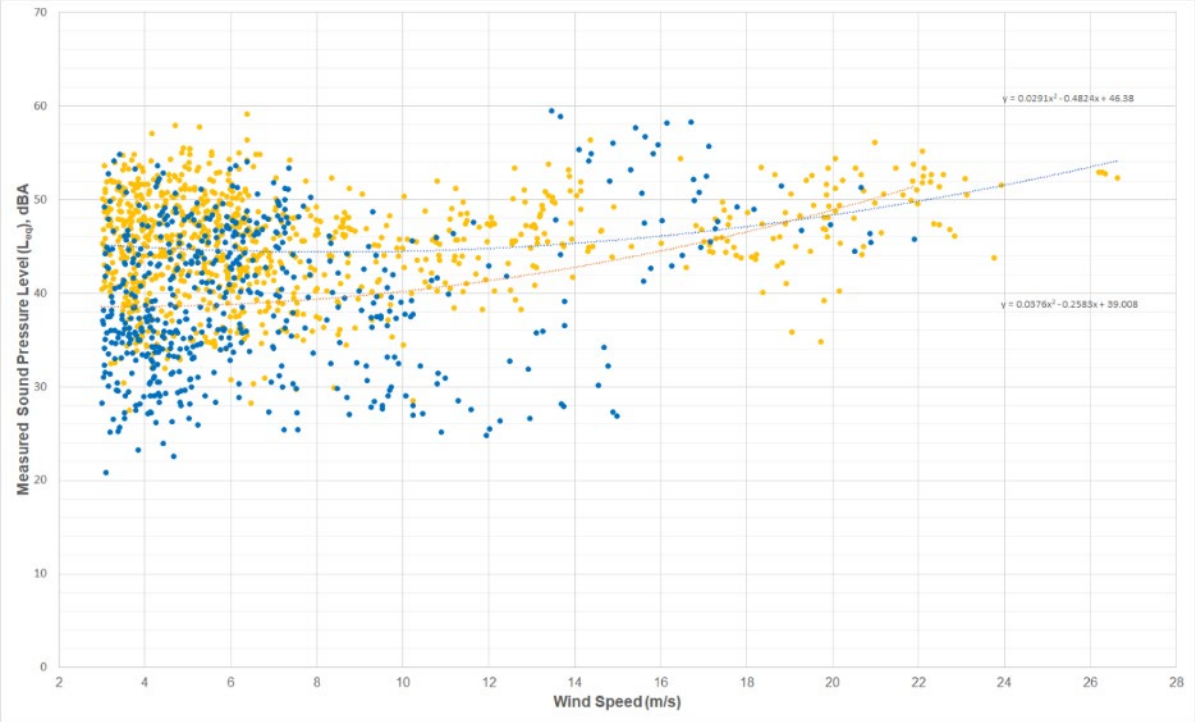


Figure 3-15. ML-5 Regression Analysis

4 CONCLUSIONS

Table 4-1 provides the results of the regression analyses for each monitoring location and cumulatively for all locations, representing the ambient sound levels across the Project Lease Boundary and vicinity. Table 4-1 displays daytime and nighttime ambient sound levels for each monitoring location and the Project Lease Boundary and vicinity for wind speed conditions ranging from calm to maximum rotational wind speed.

Table 4-1. Baseline Sound Survey Results, L_{eq} (dBA)

Monitoring Location	UTM Coordinates (UTM Zone 11T)		Time Period	Wind Speed (m/s)									
	Easting (m)	Northing (m)		3	4	5	6	7	8	9	10	11	12
ML-1	311134	5117731	Day	32	32	33	33	34	35	36	37	38	39
			Night	33	33	34	35	36	37	38	39	40	41
ML-2	321518	5109850	Day	33	33	33	32	32	32	33	33	33	33
			Night	31	32	32	32	33	33	34	34	34	34
ML-3	328433	5104539	Day	48	48	47	47	47	47	47	47	47	47
			Night	42	43	44	45	46	46	47	48	48	48
ML-4	343329	5108162	Day	38	38	39	39	39	40	40	40	40	40
			Night	36	37	37	38	38	38	39	39	39	39
ML-5	310369	5112039	Day	45	45	45	45	44	44	44	44	45	45
			Night	39	39	39	39	39	39	40	40	41	41
All Monitoring Locations			Day	38	39	39	39	39	39	40	40	40	40
			Night	37	37	37	38	38	38	39	39	40	40

As expected, ambient sound levels fluctuate constantly during both daytime and nighttime hours; however, generally typical diurnal variation (i.e., daytime levels being higher than nighttime levels) is observed with the exception of ML-1, which on average has a fairly homogeneous ambient acoustic environment. Increases in daytime ambient sound levels at ML-1 can be attributed to the agricultural activities occurring on-site. Ambient sound levels at ML-2 are consistently low, especially during nighttime hours when levels would be in and around 30 dBA. While some sporadic on-site activity and roadway noise contributed to daytime sound levels, the ambient acoustic environment at ML-2 is fairly quiet. Existing conditions at ML-3 are relatively higher due to its proximity to the I-82. Ambient sound levels at ML-4 range from 38 to 40 dBA during the day and 36 to 39 dBA during the night, which is of particular interest because that monitoring location is near the more densely populated community of Finley, to the northeast of the Project Lease Boundary. Ambient sound levels at ML-5 exhibited typical diurnal variation but were affected by both nearby agricultural activity as well as traffic-related noise occurring on S. Travis Road.

5 REFERENCES

Beranek, L. 1988. Noise and Vibration Control, Chapter 7 - Sound Propagation Outdoors. Institute of Noise Control Engineering, Washington, DC.

EPA (United States Environmental Protection Agency). 1971. Community Noise. NTID300.3 (N-96-01 IIA-231). Prepared by Wylie Laboratories.

ATTACHMENT A
CALIBRATION DOCUMENTATION

Certificate of Calibration and Conformance

This document certifies that the instrument referenced below meets published specifications per Procedure PRD-P263; ANSI S1.4-1983 (R 2006) Type 1; S1.4A-1985; S1.43-1997 Type 1; S1.11-2004 Octave Band Class 0; S1.25-1991; IEC 61672-2002 Class 1; 60651-2001 Type 1; 60804-2000 Type 1; 61260-2001 Class 0; 61252-2002.

Manufacturer:	Larson Davis	Temperature:	72.6	°F
Model Number:	831		22.56	°C
Serial Number:	2984	Rel. Humidity:	47.6	%
Customer:	TMS Rental	Pressure:	999.5	mbars
Description:	Sound Level Meter		999.5	hPa
Note:	As Found/As Left: In Tolerance			

Upon receipt for testing, this instrument was found to be:

Within the stated tolerance of the manufacturer's specification.

Calibration Date: 16-Mar-20 Calibration Due:

Calibration Standards Used:

Manufacturer	Model	Serial Number	Cal Due
Stanford Research Systems	DS360	123270	5/6/2020

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at The Modal Shop and/or Larson Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. Calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of The Modal Shop.

Technician: William Kellner Signature: William Kellner

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Certificate of Calibration and Conformance

This document certifies that the instrument referenced below meets published specifications per Procedure PRD-P263; ANSI S1.4-1983 (R 2006) Type 1; S1.4A-1985; S1.43-1997 Type 1; S1.11-2004 Octave Band Class 0; S1.25-1991; IEC 61672-2002 Class 1; 60651-2001 Type 1; 60804-2000 Type 1; 61260-2001 Class 0; 61252-2002.

Manufacturer:	Larson Davis	Temperature:	69.2	°F
Model Number:	831		20.67	°C
Serial Number:	2985	Rel. Humidity:	31.2	%
Customer:	TMS Rental	Pressure:	995.1	mbars
Description:	Sound Level Meter		995.1	hPa
Note:	As Found/As Left: In Tolerance			

Upon receipt for testing, this instrument was found to be:

Within the stated tolerance of the manufacturer's specification.

Calibration Date: 1-Feb-20 Calibration Due:

Calibration Standards Used:

Manufacturer	Model	Serial Number	Cal Due
Stanford Research Systems	DS360	123270	5/6/2020

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at The Modal Shop and/or Larson Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

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Manufacturer:	Larson Davis	Temperature:	72.6	°F
Model Number:	831		22.56	°C
Serial Number:	3386	Rel. Humidity:	47.6	%
Customer:	TMS Rental	Pressure:	999.5	mbars
Description:	Sound Level Meter		999.5	hPa
Note:	As Found / As Left: In Tolerance			

Upon receipt for testing, this instrument was found to be:

Within the stated tolerance of the manufacturer's specification.

Calibration Date: 15-Sep-20 Calibration Due:

Calibration Standards Used:

Manufacturer	Model	Serial Number	Cal Due
Stanford Research Systems	DS360	123270	5-May-21

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at The Modal Shop and/or Larson Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

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Technician: Ed Devlin Signature:

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This document certifies that the instrument referenced below meets published specifications per Procedure PRD-P263; ANSI S1.4-1983 (R 2006) Type 1; S1.4A-1985; S1.43-1997 Type 1; S1.11-2004 Octave Band Class 0; S1.25-1991; IEC 61672-2002 Class 1; 60651-2001 Type 1; 60804-2000 Type 1; 61260-2001 Class 0; 61252-2002.

Manufacturer:	Larson Davis	Temperature:	70.4	°F
Model Number:	831		21.33	°C
Serial Number:	3547	Rel. Humidity:	32.1	%
Customer:	TMS Rental	Pressure:	995.2	mbars
Description:	Sound Level Meter		995.2	hPa
Note:	As Found/As Left: In Tolerance			

Upon receipt for testing, this instrument was found to be:

Within the stated tolerance of the manufacturer's specification.

Calibration Date: 1-Feb-20 Calibration Due:

Calibration Standards Used:

Manufacturer	Model	Serial Number	Cal Due
Stanford Research Systems	DS360	123270	5/6/2020

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at The Modal Shop and/or Larson Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

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Manufacturer:	Larson Davis	Temperature:	69.2	°F
Model Number:	831		20.67	°C
Serial Number:	3556	Rel. Humidity:	16.2	%
Customer:	TMS Rental	Pressure:	990.5	mbars
Description:	Sound Level Meter		990.5	hPa
Note:	As Found/As Left: In Tolerance			

Upon receipt for testing, this instrument was found to be:

Within the stated tolerance of the manufacturer's specification.

Calibration Date: 5-Feb-20 Calibration Due:

Calibration Standards Used:

Manufacturer	Model	Serial Number	Cal Due
Stanford Research Systems	DS360	123270	5/6/2020

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at The Modal Shop and/or Larson Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

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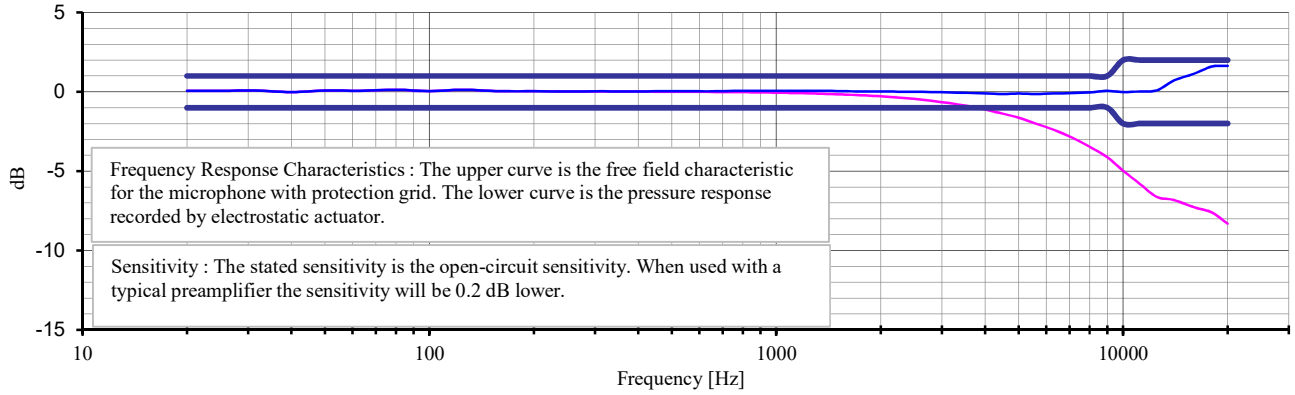
~Certificate of Calibration~

Manufacturer:	PCB	**Customer:**	TMS Rental
Model Number:	377B02	**Address:**	
Serial Number:	305688		
Asset ID:		**Cal Date / Cal ID:**	Oct 02, 2020 09:23:05
Description:	Free-Field Microphone	**Due Date:**	

Sensitivity:	**250 Hz**	**1 kHz**		**Temperature:**	72 (22)	°F (°C)
	-25.61	-25.67	dB re. 1V/Pa	**Humidity:**	40	%
	52.40	52.09	mV/Pa	**Ambient Pressure:**	1000.1	mbar

Reference Sens: In Tolerance
Freq. Response: In Tolerance

Polarization Voltage: 0 VDC



Traceability: The calibration is traceable through NIST Project A2007.

Notes:
Calibration results relate only to the items calibrated.
This certificate may not be reproduced, except in full, without written permission.
This calibration is performed in compliance with ISO 9001, ISO 17025 and ANSI Z540.
Measurement uncertainty (250 Hz sensitivity calibration) at 95% confidence level: 0.30 dB
Calibrated per procedure PRD-P204.

User Note: As Found / As Left: In Tolerance.

Frequency Response with reference to level at 250 Hz

Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)
20	0.07	**630**	0.03	**4500**	-0.13		
25	0.06	**800**	0.07	**5000**	-0.11		
31.5	0.09	**1000**	0.06	**5600**	-0.14		
40	-0.02	**1120**	0.06	**6300**	-0.10		
50	0.08	**1250**	0.06	**7100**	-0.09		
63	0.06	**1400**	0.06	**8000**	-0.03		
80	0.13	**1600**	0.04	**9000**	0.06		
100	0.05	**1800**	0.03	**10000**	-0.02		
125	0.13	**2000**	0.03	**11200**	0.03		
160	0.04	**2240**	0.01	**12500**	0.09		
200	0.03	**2500**	0.01	**14000**	0.71		
250	0.03	**2800**	-0.01	**16000**	1.14		
315	0.03	**3150**	-0.03	**18000**	1.59		
400	0.03	**3550**	-0.07	**20000**	1.64		
500	0.05	**4000**	-0.10				

Technician: Ed Devlin

Approval: Edward A. Devlin

Reference Equipment Used:

Manuf.	*Model*	*Serial*	*Cal. Date*	*Due Date*
GRAS	40AG	58094	2/19/2020	2/19/2021

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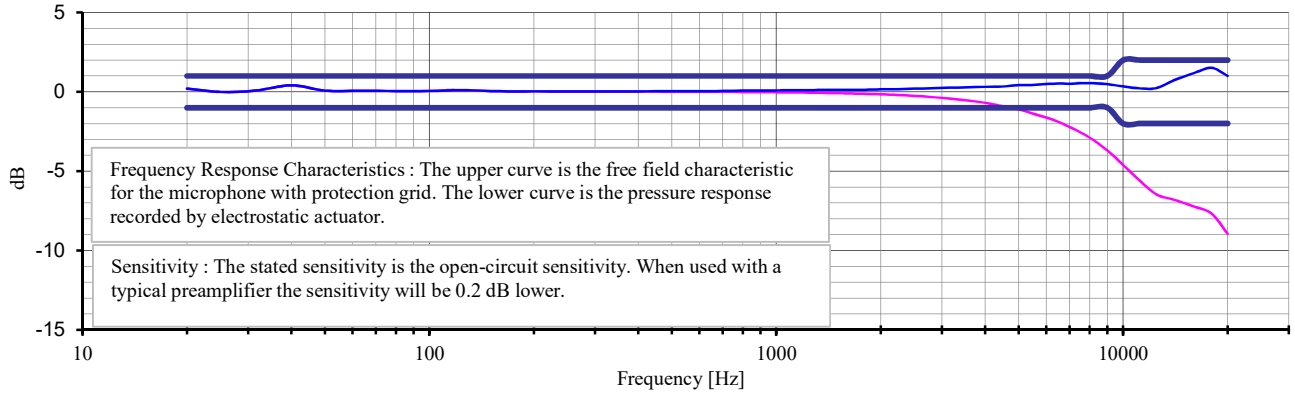
Manufacturer:	PCB		**Customer:**	TMS Rental	
Model Number:	377B02		**Address:**		
Serial Number:	307792				
Asset ID:			**Cal Date / Cal ID:**	Oct 02, 2020 09:59:59	
Description:	Free-Field Microphone		**Due Date:**		
Sensitivity:	**250 Hz**	**1 kHz**	**Temperature:**	72 (22)	°F (°C)
	-24.71	-24.74 dB re. 1V/Pa	**Humidity:**	39	%
	58.12	57.96 mV/Pa	**Ambient Pressure:**	1000.1	mbar
Reference Sens:	In Tolerance				
Freq. Response:	In Tolerance		**Polarization Voltage:**	0	VDC



Traceability: The calibration is traceable through NIST Project A2007.

Notes:
Calibration results relate only to the items calibrated.
This certificate may not be reproduced, except in full, without written permission.
This calibration is performed in compliance with ISO 9001, ISO 17025 and ANSI Z540.
Measurement uncertainty (250 Hz sensitivity calibration) at 95% confidence level: 0.30 dB
Calibrated per procedure PRD-P204.

User Note: As Found / As Left: In Tolerance.

Frequency Response with reference to level at 250 Hz

Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)
20	0.20	**630**	0.04	**4500**	0.34		
25	-0.01	**800**	0.08	**5000**	0.42		
31.5	0.07	**1000**	0.09	**5600**	0.44		
40	0.41	**1120**	0.10	**6300**	0.51		
50	0.07	**1250**	0.11	**7100**	0.52		
63	0.07	**1400**	0.12	**8000**	0.55		
80	0.05	**1600**	0.12	**9000**	0.48		
100	0.05	**1800**	0.13	**10000**	0.34		
125	0.10	**2000**	0.16	**11200**	0.21		
160	0.04	**2240**	0.17	**12500**	0.24		
200	0.03	**2500**	0.20	**14000**	0.73		
250	0.03	**2800**	0.22	**16000**	1.18		
315	0.03	**3150**	0.26	**18000**	1.51		
400	0.03	**3550**	0.28	**20000**	1.00		
500	0.05	**4000**	0.32				

Technician: Ed Devlin

Approval: Edward A. Devlin

Reference Equipment Used:

Manuf.	*Model*	*Serial*	*Cal. Date*	*Due Date*
GRAS	40AG	58094	2/19/2020	2/19/2021

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~Certificate of Calibration~

Manufacturer: PCB
Model Number: 377B02
Serial Number: 307396
Asset ID:
Description: Free-Field Microphone

Customer: TMS Rental
Address:

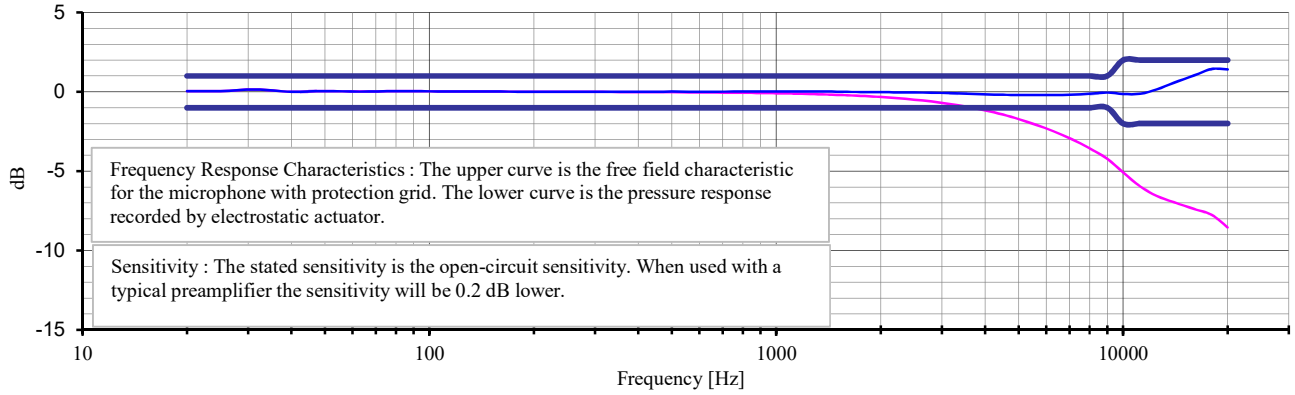
Cal Date / Cal ID: Mar 09, 2020 11:22:25
Due Date:

Sensitivity:	**250 Hz**	**1 kHz**	
	-25.96	-26.05	dB re. 1V/Pa
	50.34	49.82	mV/Pa

Temperature:	71 (22)	°F (°C)
Humidity:	26	%
Ambient Pressure:	1006.5	mbar

Reference Sens: In Tolerance
Freq. Response: In Tolerance

Polarization Voltage: 0 VDC



Traceability: The calibration is traceable through NIST Project A2007.
Notes: Calibration results relate only to the items calibrated.
This certificate may not be reproduced, except in full, without written permission.
This calibration is performed in compliance with ISO 9001, ISO 17025 and ANSI Z540.
Measurement uncertainty (250 Hz sensitivity calibration) at 95% confidence level: 0.30 dB
Calibrated per procedure PRD-P204.

User Note: As Found / As Left: In Tolerance.

Frequency Response with reference to level at 250 Hz

Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)
20	0.04	**630**	0.00	**4500**	-0.18		
25	0.05	**800**	0.03	**5000**	-0.20		
31.5	0.15	**1000**	0.03	**5600**	-0.20		
40	0.00	**1120**	0.03	**6300**	-0.20		
50	0.05	**1250**	0.02	**7100**	-0.19		
63	0.01	**1400**	0.02	**8000**	-0.12		
80	0.05	**1600**	0.00	**9000**	-0.05		
100	0.03	**1800**	-0.01	**10000**	-0.13		
125	0.02	**2000**	-0.02	**11200**	-0.12		
160	0.01	**2240**	-0.04	**12500**	0.16		
200	0.01	**2500**	-0.04	**14000**	0.57		
250	0.00	**2800**	-0.06	**16000**	1.03		
315	0.00	**3150**	-0.08	**18000**	1.44		
400	0.00	**3550**	-0.12	**20000**	1.41		
500	0.01	**4000**	-0.16				

Technician: Ed Devlin

Approval: Edward A. Devlin

Reference Equipment Used:

Manuf.	*Model*	*Serial*	*Cal. Date*	*Due Date*
GRAS	40AG	58094	2/19/2020	2/19/2021

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CALIBRATION CERT 2649.01

Calibration Certificate

Certificate Number 2020003029

Customer:
The Modal Shop
3149 East Kemper Road
Cincinnati, OH 45241, United States

Model Number	CAL200	***Procedure Number***	D0001.8386		
Serial Number	17758	***Technician***	Scott Montgomery		
Test Results	**Pass**	***Calibration Date***	5 Mar 2020		
Initial Condition	As Manufactured	***Calibration Due***			
		Temperature	24	°C	± 0.3 °C
Description	Larson Davis CAL200 Acoustic Calibrator	***Humidity***	30	%RH	± 3 %RH
		Static Pressure	101.3	kPa	± 1 kPa

Evaluation Method The data is aquired by the insert voltage calibration method using the reference microphone's open circuit sensitivity. Data reported in dB re 20 µPa.

Compliance Standards Compliant to Manufacturer Specifications per D0001.8190 and the following standards:
IEC 60942:2017 ANSI S1.40-2006

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2015.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Agilent 34401A DMM	08/15/2019	08/15/2020	001021
Larson Davis Model 2900 Real Time Analyzer	04/02/2019	04/02/2020	001051
Microphone Calibration System	03/03/2020	03/03/2021	005446
1/2" Preamplifier	09/17/2019	09/17/2020	006506
Larson Davis 1/2" Preamplifier 7-pin LEMO	08/06/2019	08/06/2020	006507
1/2 inch Microphone - RI - 200V	05/21/2019	05/21/2020	006510
Pressure Transducer	06/24/2019	06/24/2020	007310

Output Level

Nominal Level [dB]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
114	101.3	114.00	113.80	114.20	0.14	Pass
94	101.3	94.00	93.80	94.20	0.15	Pass

-- End of measurement results--

Frequency

Nominal Level [dB]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
114	101.3	1,000.14	990.00	1,010.00	0.20	Pass
94	101.3	1,000.15	990.00	1,010.00	0.20	Pass

-- End of measurement results--

Total Harmonic Distortion + Noise (THD+N)

Nominal Level [dB]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
114	101.3	0.43	0.00	2.00	0.25 ‡	Pass
94	101.3	0.45	0.00	2.00	0.25 ‡	Pass

-- End of measurement results--

Level Change Over Pressure

Tested at: 114 dB, 23 °C, 31 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
108.0	108.1	-0.02	-0.30	0.30	0.04 ‡	Pass
101.3	101.3	0.00	-0.30	0.30	0.04 ‡	Pass
92.0	91.9	0.03	-0.30	0.30	0.04 ‡	Pass
83.0	83.3	0.03	-0.30	0.30	0.04 ‡	Pass
74.0	73.8	0.02	-0.30	0.30	0.04 ‡	Pass
65.0	65.2	-0.03	-0.30	0.30	0.04 ‡	Pass

-- End of measurement results--

Frequency Change Over Pressure

Tested at: 114 dB, 23 °C, 31 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
108.0	108.1	0.00	-10.00	10.00	0.20 ‡	Pass
101.3	101.3	0.00	-10.00	10.00	0.20 ‡	Pass
92.0	91.9	0.00	-10.00	10.00	0.20 ‡	Pass
83.0	83.3	-0.01	-10.00	10.00	0.20 ‡	Pass
74.0	73.8	-0.01	-10.00	10.00	0.20 ‡	Pass
65.0	65.2	-0.01	-10.00	10.00	0.20 ‡	Pass

-- End of measurement results--

Certificate Number 2020003029

Total Harmonic Distortion + Noise (THD+N) Over Pressure

Tested at: 114 dB, 23 °C, 31 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
108.0	108.1	0.44	0.00	2.00	0.25 ‡	Pass
101.3	101.3	0.43	0.00	2.00	0.25 ‡	Pass
92.0	91.9	0.40	0.00	2.00	0.25 ‡	Pass
83.0	83.3	0.38	0.00	2.00	0.25 ‡	Pass
74.0	73.8	0.36	0.00	2.00	0.25 ‡	Pass
65.0	65.2	0.35	0.00	2.00	0.25 ‡	Pass

-- End of measurement results--

Signatory: Scott Montgomery

LARSON DAVIS - A PCB PIEZOTRONICS DIV.
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA ACCREDITED Cert. #3622.01

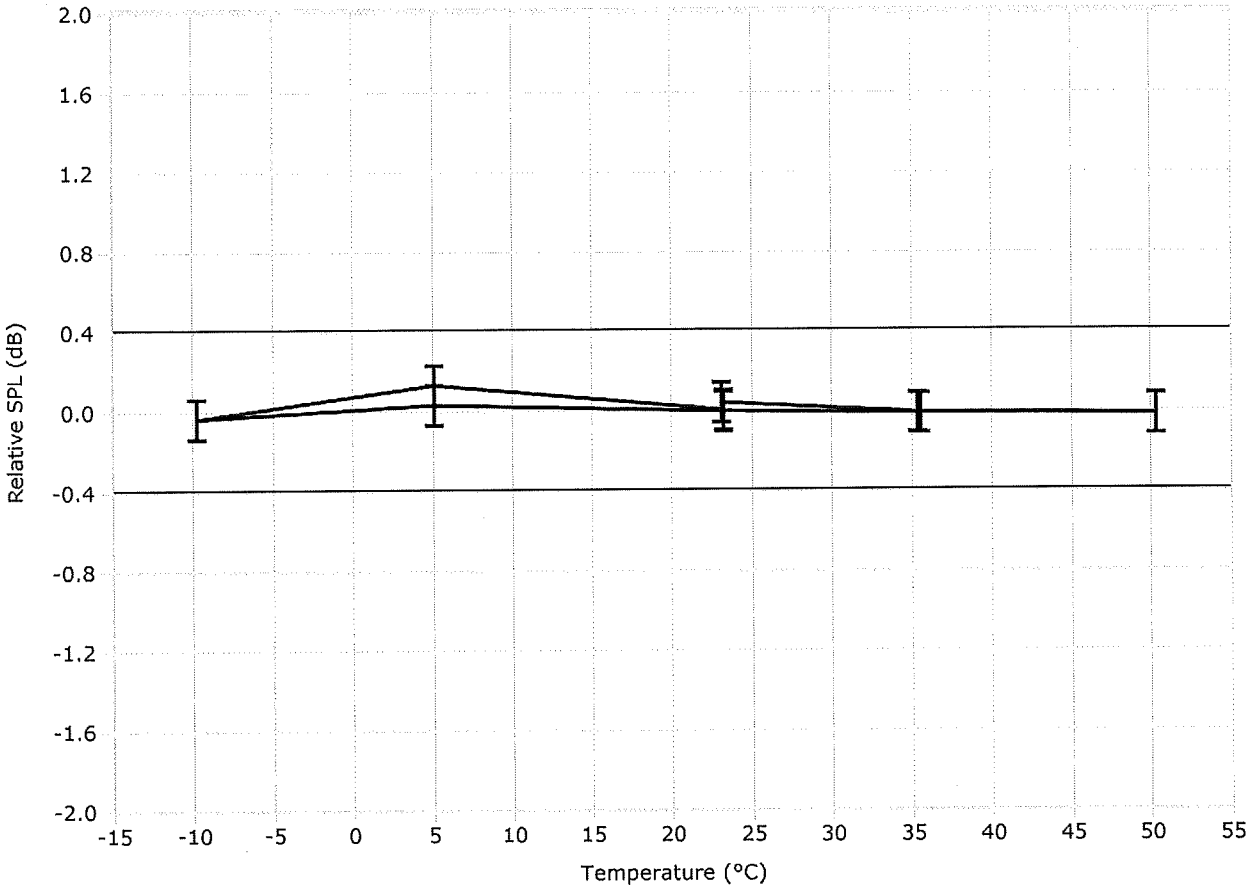
LARSON DAVIS A PCB PIEZOTRONICS DIV.

Model CAL200 Relative SPL vs. Temperature

Larson Davis Model CAL200 Serial Number: 17758

Model CAL200 Relative SPL vs. Temperature at 50% RH.
A 2559 Mic (SN: 3008) with a PRM902 Preamp (SN: 5789), station 23 was used to check the levels.

Test Date: 03 Feb 2020 7:56:54 AM



0.1dB expanded uncertainty at ~95% confidence level (k=2)

Sequence File: CAL200.SEQ

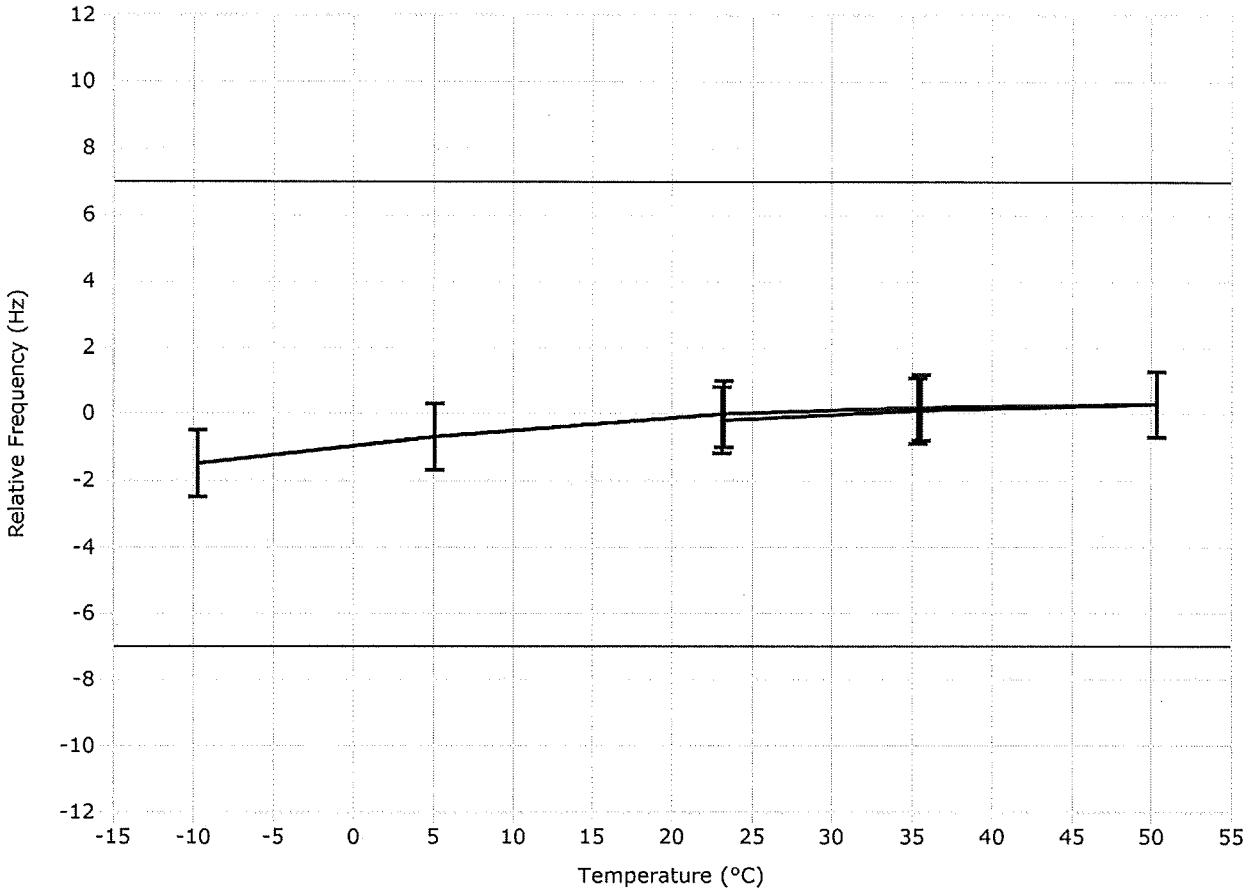
Test Location: Larson Davis, a division of PCB Piezotronics, Inc.
1681 West 820 North, Provo, Utah 84601
Tel: 716 684-0001 www.LarsonDavis.com

Model CAL200 Relative Frequency vs. Temperature

Larson Davis Model CAL200 Serial Number: 17758

Model CAL200 Relative Frequency vs. Temperature at 50% RH.
A 2559 Mic (SN: 3008) with a PRM902 Preamp (SN: 5789), station 23 was used to check the levels.

Test Date: 03 Feb 2020 7:56:54 AM



1.0 Hz expanded uncertainty at ~95% confidence level (k=2)

Sequence File: CAL200.SEQ

Test Location: Larson Davis, a division of PCB Piezotronics, Inc.
1681 West 820 North, Provo, Utah 84601
Tel: 716 684-0001 www.LarsonDavis.com

~ Certificate of Calibration and Compliance ~

Microphone Model: 377B02 Serial Number: 323599 Manufacturer: PCB

Calibration Environmental Conditions

Environmental test conditions as printed on microphone calibration chart.

Reference Equipment

Manufacturer	Model #	Serial #	PCB Control #	Cal Date	Due Date
National Instruments	PCIe-6351	1896F08	CA1918	10/18/19	10/16/20
Larson Davis	PRM915	134	CA2114	11/11/19	11/11/20
Larson Davis	PRM902	5352	CA1247	11/12/19	11/12/20
Larson Davis	PRM916	140	CA2129	11/25/19	11/25/20
Larson Davis	CAL250	4118	TA463	1/31/20	1/29/21
Larson Davis	2201	143	CA1206	2/13/20	2/12/21
Bruel & Kjaer	4192	2764626	CA1636	8/20/19	8/21/20
Larson Davis	GPRM902	5281	CA1595	11/20/19	11/20/20
Newport	iTHX-SD/N	1080002	CA1511	2/6/20	2/5/21
Larson Davis	PRA951-4	234	CA1154	11/8/19	11/6/20
Larson Davis	PRM915	123	CA866	11/20/19	11/20/20
PCB	68510-02	N/A	CA2672	2/13/20	2/12/21
0	0	0	0	not required	not required
0	0	0	0	not required	not required
0	0	0	0	not required	not required

Frequency sweep performed with B&K UA0033 electrostatic actuator.

Condition of Unit

As Found: n/a

As Left: New Unit, In Tolerance

Notes

1. Calibration of reference equipment is traceable to one or more of the following National Labs; NIST, PTB or DFM.
2. This certificate shall not be reproduced, except in full, without written approval from PCB Piezotronics, Inc.
3. Calibration is performed in compliance with ISO 10012-1, ANSI/NCSL Z540.3 and ISO 17025.
4. See Manufacturer's Specification Sheet for a detailed listing of performance specifications.
5. Open Circuit Sensitivity is measured using the insertion voltage method following procedure AT603-5.
6. Measurement uncertainty (95% confidence level with coverage factor of 2) for sensitivity is +/-0.20 dB.
7. Unit calibrated per ACS-20.

Technician: Leonard Lukasik Date: July 29, 2020

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CALIBRATION CERT #1862.01

PCB PIEZOTRONICS INC
VIBRATION DIVISION
3425 Walden Avenue, Depew, New York, 14043
TEL: 888-684-0013 FAX: 716-685-3886 www.pcb.com

ID:CAL112-3678882611.556+0

~ Calibration Report ~

Microphone Model: 377B02 Serial Number: 323599 Description: 1/2" Free-Field Microphone

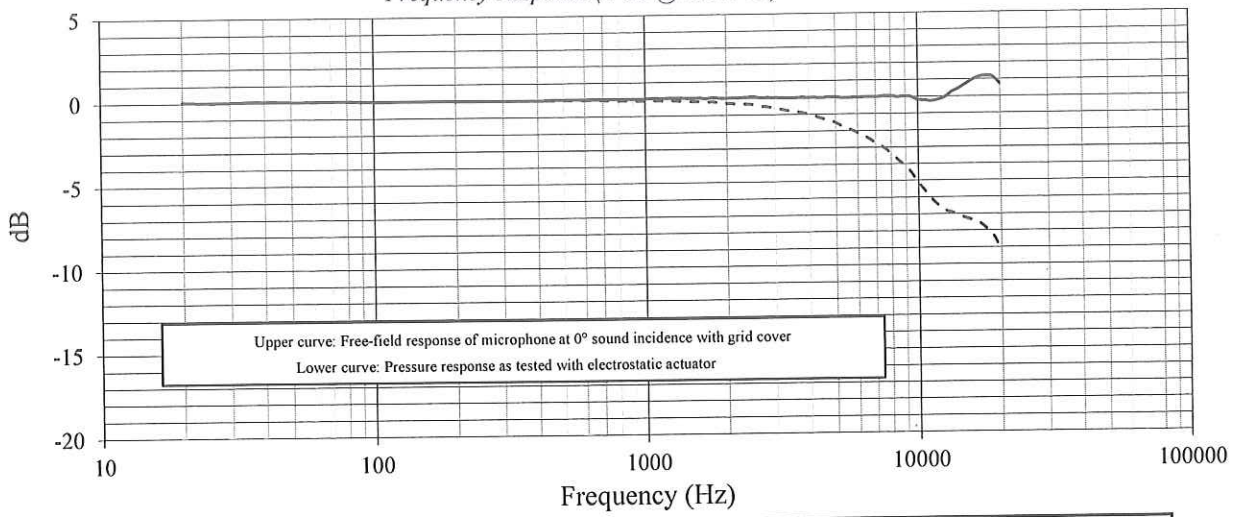
Calibration Data

Open Circuit Sensitivity @ 251.2 Hz: 57.00 mV/Pa
-24.88 dB re 1V/Pa

Polarization Voltage, External: 0 V
Capacitance: 13.7 pF

Temperature: 70 °F (21°C) Ambient Pressure: 987 mbar Relative Humidity: 48 %

Frequency Response (0 dB @ 251.2 Hz)



Freq (Hz)	Lower (dB)	Upper (dB)	Freq (Hz)	Lower (dB)	Upper (dB)	Freq (Hz)	Lower (dB)	Upper (dB)	Freq (Hz)	Lower (dB)	Upper (dB)
20.0	0.06	0.06	1679	-0.22	0.02	7499	-3.02	0.05	-	-	-
25.1	0.02	0.02	1778	-0.18	0.07	7943	-3.32	0.07	-	-	-
31.6	0.05	0.05	1884	-0.26	0.03	8414	-3.73	0.00	-	-	-
39.8	0.07	0.07	1995	-0.28	0.03	8913	-4.07	0.04	-	-	-
50.1	0.04	0.04	2114	-0.30	0.04	9441	-4.52	0.00	-	-	-
63.1	0.04	0.04	2239	-0.33	0.04	10000	-5.13	-0.18	-	-	-
79.4	0.04	0.04	2371	-0.34	0.07	10593	-5.62	-0.22	-	-	-
100.0	0.00	0.00	2512	-0.38	0.09	11220	-6.13	-0.27	-	-	-
125.9	0.01	0.01	2661	-0.49	0.02	11885	-6.51	-0.19	-	-	-
158.5	0.01	0.01	2818	-0.52	0.04	12589	-6.81	-0.04	-	-	-
199.5	0.00	0.00	2985	-0.60	0.02	13335	-6.93	0.26	-	-	-
251.2	0.00	0.00	3162	-0.68	0.01	14125	-7.13	0.46	-	-	-
316.2	-0.01	0.00	3350	-0.75	-0.01	14962	-7.26	0.71	-	-	-
398.1	-0.01	-0.01	3548	-0.82	0.00	15849	-7.38	0.97	-	-	-
501.2	0.00	0.04	3758	-0.88	0.02	16788	-7.58	1.14	-	-	-
631.0	-0.02	0.02	3981	-0.99	0.01	17783	-7.91	1.20	-	-	-
794.3	-0.05	0.04	4217	-1.10	0.01	18837	-8.38	1.13	-	-	-
1000.0	-0.08	0.04	4467	-1.24	-0.01	19953	-9.18	0.75	-	-	-
1059.3	-0.07	0.06	4732	-1.34	0.03	-	-	-	-	-	-
1122.0	-0.08	0.06	5012	-1.51	0.02	-	-	-	-	-	-
1188.5	-0.10	0.05	5309	-1.73	-0.03	-	-	-	-	-	-
1258.9	-0.09	0.07	5623	-1.91	-0.03	-	-	-	-	-	-
1333.5	-0.11	0.07	5957	-2.07	0.00	-	-	-	-	-	-
1412.5	-0.15	0.04	6310	-2.29	0.00	-	-	-	-	-	-
1496.2	-0.16	0.04	6683	-2.51	0.01	-	-	-	-	-	-
1584.9	-0.16	0.05	7080	-2.77	0.01	-	-	-	-	-	-

Technician: Leonard Lukasik Date: July 29, 2020

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ID.CAL112-3678882611.556+0

~ Certificate of Calibration and Compliance ~

Microphone Model: 377B02 Serial Number: 323918 Manufacturer: PCB

Calibration Environmental Conditions

Environmental test conditions as printed on microphone calibration chart.

Reference Equipment

Manufacturer	Model #	Serial #	PCB Control #	Cal Date	Due Date
National Instruments	PCIe-6351	1896F08	CA1918	10/18/19	10/16/20
Larson Davis	PRM915	134	CA2114	11/11/19	11/11/20
Larson Davis	PRM902	5352	CA1247	11/12/19	11/12/20
Larson Davis	PRM916	140	CA2129	11/25/19	11/25/20
Larson Davis	CAL250	4118	TA463	1/31/20	1/29/21
Larson Davis	2201	143	CA1206	2/13/20	2/12/21
Bruel & Kjaer	4192	2764626	CA1636	8/20/19	8/21/20
Larson Davis	GPRM902	5281	CA1595	11/20/19	11/20/20
Newport	iTHX-SD/N	1080002	CA1511	2/6/20	2/5/21
Larson Davis	PRA951-4	234	CA1154	11/8/19	11/6/20
Larson Davis	PRM915	123	CA866	11/20/19	11/20/20
PCB	68510-02	N/A	CA2672	2/13/20	2/12/21
0	0	0	0	not required	not required
0	0	0	0	not required	not required
0	0	0	0	not required	not required

Frequency sweep performed with B&K UA0033 electrostatic actuator.

Condition of Unit

As Found: n/a

As Left: New Unit, In Tolerance

Notes

1. Calibration of reference equipment is traceable to one or more of the following National Labs; NIST, PTB or DFM.
2. This certificate shall not be reproduced, except in full, without written approval from PCB Piezotronics, Inc.
3. Calibration is performed in compliance with ISO 10012-1, ANSI/NCSL Z540.3 and ISO 17025.
4. See Manufacturer's Specification Sheet for a detailed listing of performance specifications.
5. Open Circuit Sensitivity is measured using the insertion voltage method following procedure AT603-5.
6. Measurement uncertainty (95% confidence level with coverage factor of 2) for sensitivity is +/-0.20 dB.
7. Unit calibrated per ACS-20.

Technician: Leonard Lukasik Date: July 29, 2020

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ID:CAL112-3678878376.391+0

~ Calibration Report ~

Microphone Model: 377B02 Serial Number: 323918 Description: 1/2" Free-Field Microphone

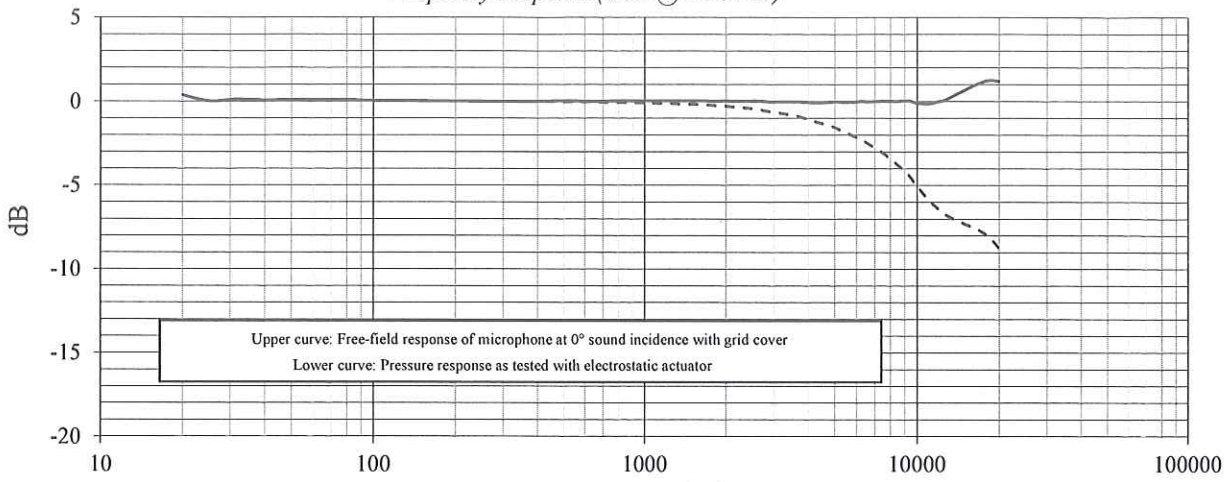
Calibration Data

Open Circuit Sensitivity @ 251.2 Hz: 47.64 mV/Pa
-26.44 dB re 1V/Pa

Polarization Voltage, External: 0 V
Capacitance: 13.7 pF

Temperature: 70 °F (21°C) Ambient Pressure: 986 mbar Relative Humidity: 49 %

Frequency Response (0 dB @ 251.2 Hz)



Freq (Hz)	Lower (dB)	Upper (dB)	Freq (Hz)	Lower (dB)	Upper (dB)	Freq (Hz)	Lower (dB)	Upper (dB)	Freq (Hz)	Lower (dB)	Upper (dB)
20.0	0.37	0.37	1679	-0.20	0.03	7499	-3.06	0.01	-	-	-
25.1	0.01	0.01	1778	-0.24	0.01	7943	-3.38	0.01	-	-	-
31.6	0.12	0.12	1884	-0.27	0.02	8414	-3.74	-0.01	-	-	-
39.8	0.07	0.07	1995	-0.28	0.03	8913	-4.07	0.04	-	-	-
50.1	0.09	0.09	2114	-0.34	0.00	9441	-4.51	0.02	-	-	-
63.1	0.09	0.09	2239	-0.36	0.01	10000	-5.05	-0.10	-	-	-
79.4	0.09	0.09	2371	-0.41	0.01	10593	-5.53	-0.13	-	-	-
100.0	0.04	0.04	2512	-0.44	0.02	11220	-5.99	-0.13	-	-	-
125.9	0.03	0.03	2661	-0.50	0.01	11885	-6.35	-0.03	-	-	-
158.5	0.02	0.02	2818	-0.58	-0.02	12589	-6.71	0.06	-	-	-
199.5	0.01	0.01	2985	-0.65	-0.03	13335	-6.93	0.26	-	-	-
251.2	0.00	0.00	3162	-0.70	-0.02	14125	-7.12	0.47	-	-	-
316.2	-0.01	0.00	3350	-0.77	-0.03	14962	-7.31	0.66	-	-	-
398.1	0.00	0.00	3548	-0.84	-0.02	15849	-7.47	0.89	-	-	-
501.2	-0.02	0.03	3758	-0.94	-0.04	16788	-7.66	1.06	-	-	-
631.0	-0.04	0.00	3981	-1.06	-0.06	17783	-7.91	1.20	-	-	-
794.3	-0.07	0.02	4217	-1.19	-0.08	18837	-8.27	1.24	-	-	-
1000.0	-0.09	0.03	4467	-1.31	-0.08	19953	-8.74	1.19	-	-	-
1059.3	-0.10	0.03	4732	-1.43	-0.06	-	-	-	-	-	-
1122.0	-0.12	0.02	5012	-1.56	-0.03	-	-	-	-	-	-
1188.5	-0.11	0.04	5309	-1.75	-0.05	-	-	-	-	-	-
1258.9	-0.12	0.04	5623	-1.94	-0.06	-	-	-	-	-	-
1333.5	-0.15	0.03	5957	-2.11	-0.04	-	-	-	-	-	-
1412.5	-0.15	0.04	6310	-2.30	-0.01	-	-	-	-	-	-
1496.2	-0.18	0.02	6683	-2.55	-0.03	-	-	-	-	-	-
1584.9	-0.19	0.03	7080	-2.79	-0.01	-	-	-	-	-	-

Technician: Leonard Lukasik Date: July 29, 2020

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ID:CAL112-3676876376.391+0

Baseline Sound Survey Report

Horse Heaven Wind Project

Benton County, Washington

Prepared for:
Horse Heaven Wind Farm, LLC

Prepared by:

Tetra Tech
19803 North Creek Parkway
Bothell, WA 98011

March 2022

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ATTACHMENTS

Attachment A. Calibration Documentation

ACRONYMS AND ABBREVIATIONS

µPa	microPascal
Applicant	Horse Heaven Wind Farm, LLC
ANSI	American National Standards Institute
dB	decibel
dBA	A-weighted decibel
dBL	linear decibel
Hz	hertz
L_{eq}	equivalent sound level
L_P	sound pressure level
L_w	sound power level
Micrositing Corridor	Wind Energy Micrositing Corridor
NSR	noise sensitive receptor
Project	Horse Heaven Wind Farm
Turbine	wind turbine generator
UTM	Universal Transverse Mercator
WAC	Washington Administrative Code

1 INTRODUCTION

Horse Heaven Wind Farm, LLC (the Applicant), a subsidiary of Scout Clean Energy, proposes to construct and operate the Horse Heaven Wind Farm (the Project), a wind and solar energy project with a nominal generating capacity of up to approximately 1,150 megawatts located in Benton County, Washington. At its closest point, the Project is located approximately 4 miles south/southwest of the city of Kennewick and the larger Tri-Cities urban area, along the Columbia River.

To provide quantitative detail required under Washington Administrative Code (WAC) 463-60-352(1)(a) to describe the background noise environment, the Applicant has collected ambient sound data to document existing conditions within and near the Project Lease Boundary and vicinity. The purpose of conducting a baseline sound survey is to characterize the existing land uses, sound sources, and acoustic environment within the Project Lease Boundary and vicinity across a range of wind speeds and future wind turbine generator (Turbine) operational conditions.

1.1 Project Lease Boundary and Vicinity

The Project Lease Boundary (i.e., the extent of parcels in which the Applicant has executed a lease to construct Turbines, the solar array, and associated facilities) encompasses approximately 72,428 acres. The Project's Wind Energy Micrositing Corridor (Micrositing Corridor) encompasses 11,489 acres and consists of the area in which the Turbines and supporting facilities would be sited during the final design. The Solar Siting Areas (which consist of the three areas under consideration for siting of the proposed solar arrays during the final design) encompass 10,438 acres located within the Project Lease Boundary. The Micrositing Corridor and the Solar Siting Areas are larger than the Project's final footprint to allow minor rerouting to optimize the design and to avoid resources that may be discovered during the final design and pre-construction process.

The elevation within the Project Lease Boundary ranges from 604 to 2,051 feet above mean sea level. The Project Lease Boundary is dominated by rolling hills bisected by meandering canyons, some of which constitute ephemeral or intermittent drainages. The Horse Heaven Hills ridgeline lies along the northern border of the Project, particularly in the western portion of the Project Lease Boundary; on the southern side of this ridge, the landscape transitions to relatively rolling topography with shallow, meandering canyons that drain southwest into the Columbia River. While the majority of this western portion of the Project Lease Boundary drains to the southwest into the Columbia River, a small portion of the Project along the northeastern boundary ultimately drains northwest into the Yakima River and northeast into the Columbia River. The eastern portion of the Project Lease Boundary similarly drains primarily to the south into the Columbia River with a small portion of the Project draining northeast into the Columbia River.

To document actual ambient sound levels in the Project Lease Boundary and vicinity, in January 2021 five baseline monitoring stations were deployed at noise sensitive receptors (NSRs; i.e., residences) distributed throughout the area. Results of the baseline sound survey were documented and submitted to EFSEC in February 2021. Following that, EFSEC requested that baseline sound data be collected at three additional monitoring areas. The additional three baseline monitoring stations were deployed in February 2022 and the results are presented in this report. Figure 1-1 shows the Project Lease Boundary and vicinity and the location of the five 2021 baseline sound monitoring stations (ML-1 through ML-5) and the three additional monitoring stations (ML-6 through ML-8).

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Horse Heaven Wind Farm

SCOUT CLEAN ENERGY

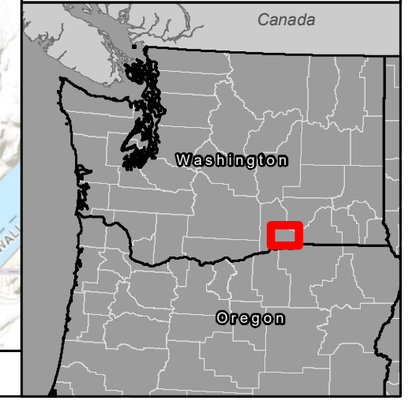
Figure 1-1
Project Area

BENTON COUNTY, WA

- Noise Receptor - Participating
- Noise Receptor - Non-participating
- Option 1 Turbine Location
- Baseline Sound Monitoring Location
- Project Lease Boundary
- Proposed Project Substation
- Solar Siting Area
- Solar Array

TETRA TECH

Reference Map



ML-6
ML-7
ML-8
ML-1
ML-5
ML-2
ML-3
ML-4

HH-West Intermediate Substation (Alternate)
HH-West Step-up Substation 500-kV (Alternate)
HH-West Intermediate Substation (Primary)
HH-West Step-up Substation 500-kV (Primary)
HH-East Substation

Benton City
West Richland
Richland
Pasco
Kennewick
Burbank
Tri-Cities Airport
Columbia Basin College
Chamna Preserve
South Columbia Point
Riverview Preserve
W. E. Johnson Park
Columbia Park
Hood Park
Sacajawea Historical State Park
Two Rivers Park
Canyon Lakes Golf Course

THE BADLANDS
GOOSE HILL
HORSE HEAVEN HILLS
BADGER MOUNTAIN
CARTER CANYON
BINGO CANYON
COYOTE CANYON
FOUR MILE CANYON
SWITZLER CANYON
RIDGE

Tom Foley Memorial Hwy
Lewis and Clark Trail Hwy
Columbia River
Yakima River
East Branch Glade Creek

1:140,000 WGS 1984 UTM Zone 11N

0 0.5 1 2 3 4 Miles

NOT FOR CONSTRUCTION

R:\PROJECTS\HORSE_HEAVEN_6430\NOISE\MAPS\NOISE_MONITORING_LOCATIONS_20210216.mxd

1.2 Acoustic Metrics and Terminology

All sounds originate with a source, whether it is a human voice, motor vehicles on a roadway, or a combustion turbine. Energy is required to produce sound and this sound energy is transmitted through the air in the form of sound waves – tiny, quick oscillations of pressure just above and just below atmospheric pressure. These oscillations, or sound pressures, impinge on the ear, creating the sound we hear. A sound source is defined by a sound power level (L_W), which is independent of any external factors. By definition, sound power is the rate at which acoustical energy is radiated outward and is expressed in units of watts.

A source sound power level cannot be measured directly. It is calculated from measurements of sound intensity or sound pressure at a given distance from the source outside the acoustic and geometric near-field. A sound pressure level (L_P) is a measure of the sound wave fluctuation at a given receiver location and can be obtained through the use of a microphone or calculated from information about the source sound power level and the surrounding environment. The sound pressure level in decibels (dB) is the logarithm of the ratio of the sound pressure of the source to the reference sound pressure of 20 microPascals (µPa), multiplied by 20.1. The range of sound pressures that can be detected by a person with normal hearing is very wide, ranging from about 20 µPa for very faint sounds at the threshold of hearing, to nearly 10 million µPa for extremely loud sounds such as a jet during take-off at a distance of 300 feet.

Broadband sound includes sound energy summed across the entire audible frequency spectrum. In addition to broadband sound pressure levels, analysis of the various frequency components of the sound spectrum can be completed to determine tonal characteristics. The unit of frequency is hertz (Hz), measuring the cycles per second of the sound pressure waves. Typically, the frequency analysis examines 11 octave bands ranging from 16 Hz (low) to 16,000 Hz (high). Since the human ear does not perceive every frequency with equal loudness, spectrally-varying sounds are often adjusted with a weighting filter. The A-weighted filter is applied to compensate for the frequency response of the human auditory system and is represented in A-weighted decibel (dBA).

Sound can be measured, modeled, and presented in various formats, with the most common metric being the equivalent sound level (L_{eq}). The L_{eq} has been shown to provide both an effective and uniform method for comparing time-varying sound levels and is widely used in acoustic assessments in the State of Washington. Estimates of noise sources and outdoor acoustic environments, and the comparison of relative loudness are presented in Table 1-1. Table 1-2 presents additional reference information on terminology used in the report.

Table 1-1. Sound Pressure Levels and Relative Loudness of Typical Noise Sources and Acoustic Environments

Noise Source or Activity	Sound Level (dBA)	Subjective Impression
Vacuum cleaner (10 feet)	70	Moderate
Passenger car at 65 miles per hour (25 feet)	65	
Large store air-conditioning unit (20 feet)	60	
Light auto traffic (100 feet)	50	Quiet
Quiet rural residential area with no activity	45	
Bedroom or quiet living room; Bird calls	40	Faint
Typical wilderness area	35	
Quiet library, soft whisper (15 feet)	30	Very quiet
Wilderness with no wind or animal activity	25	Extremely quiet
High-quality recording studio	20	
Acoustic test chamber	10	Just audible
	0	Threshold of hearing

Adapted from: Kurze and Beranek (1988) and EPA (1971)

Table 1-2. Acoustic Terms and Definitions

Term	Definition
Noise	Typically defined as unwanted sound. This word adds the subjective response of humans to the physical phenomenon of sound. It is commonly used when negative effects on people are known to occur.
Sound Pressure Level (L_P)	Pressure fluctuations in a medium. Sound pressure is measured in dB referenced to 20 µPa, the approximate threshold of human perception to sound at 1,000 Hz.
Sound Power Level (L_W)	The total acoustic power of a noise source measured in dB referenced to picowatts (one trillionth of a watt). Noise specifications are provided by equipment manufacturers as sound power as it is independent of the environment in which it is located. A sound level meter does not directly measure sound power.
Equivalent Sound Level (L_{eq})	The L_{eq} is the continuous equivalent sound level, defined as the single sound pressure level that, if constant over the stated measurement period, would contain the same sound energy as the actual monitored sound that is fluctuating in level over the measurement period.
A-Weighted Decibel (dBA)	Environmental sound is typically composed of acoustic energy across all frequencies. To compensate for the auditory frequency response of the human ear, an A-weighting filter is commonly used for describing environmental sound levels. Sound levels that are A-weighted are presented as dBA in this report.
Unweighted Decibels (dBL)	Unweighted sound levels are referred to as linear. Linear decibels are used to determine a sound's tonality and to engineer solutions to reduce or control noise as techniques are different for low and high frequency noise. Sound levels that are linear are presented as dBL in this report.
Propagation and Attenuation	Propagation is the decrease in amplitude of an acoustic signal due to geometric spreading losses with increased distance from the source. Additional sound attenuation factors include air absorption, terrain effects, sound interaction with the ground, diffraction of sound around objects and topographical features, foliage, and meteorological conditions including wind velocity, temperature, humidity, and atmospheric conditions.

2 EXISTING SOUND ENVIRONMENT

With the assistance of the Applicant, landowner permissions were secured at several pre-determined baseline monitoring locations prior to the survey. The sites were then screened on the day of deployment by experienced acoustic engineers to ensure the locations were in character with the overall area. The baseline sound survey commenced on February 14, 2022 and concluded on March 1, 2022. Data were collected at each monitoring location for a period of approximately 14 days occurring within that window. A long-term baseline survey is requisite to provide a statistically relevant data set, covering the full range of wind speeds and future operational scenarios. Extensive experience on several wind energy farms sited in the United States and Canada indicates that this data set can typically be obtained over a 10-day monitoring period, weather permitting.

2.1 Instrumentation

All measurements were taken with a Larson Davis 831 real-time sound level analyzer equipped with a PCB model 377B02 1/2" precision condenser microphone. This instrument has an operating range of 5 dB to 140 dB, and an overall frequency range of 16 to 20,000 Hz and meets or exceeds all requirements set forth in the American National Standards Institute (ANSI) standards for Type 1 sound level meters for quality and accuracy (precision). All instrumentation was laboratory calibrated within the previous 12-month period with calibration documentation provided in Attachment A.

The Larson Davis 831 sound level analyzer is designed for service as a long-term environmental sound level data logger measuring the A-weighted sound level. Each sound level analyzer used was enclosed in a weatherproof case and equipped with a self-contained microphone tripod. The microphone and windscreen were tripod-mounted at an approximate height of 1.5 to 1.7 meters (4.9 to 5.6 feet) above grade away from effects of ground level rustling vegetation and fallen leaves. When sound measurements are attempted in the presence of elevated wind speeds, extraneous noise can be self-generated across the microphone. Air blowing over a microphone diaphragm creates a pressure differential and turbulence. All sound level analyzer microphones were protected from wind-induced self-noise effects by a 3.5-inch-diameter open-cell foam windscreen. By using this microphone protection, the pressure gradient and turbulence is effectively moved farther away from the microphone, minimizing self-generated wind induced noise. Table 2-1 lists the measurement equipment employed during the survey. The sound level meters were programmed to sample and store A-weighted and octave band sound level data, including L_{eq} and the percentile sound levels.

Table 2-1. Measurement Equipment

Description	Manufacturer	Type
Signal Analyzer	Larson Davis	831
Preamplifier	Larson Davis	PRM902
Microphone	PCB	377B02
Windscreen	ACO Pacific	7-inch
Calibrator	Larson Davis	CAL200

Prior to and immediately following the measurement session, the sound analyzers were calibrated (no level adjustment was required) with two ANSI Type 1 calibrators which have an accuracy traceable to the National Institute of Standards and Technology. The maximum observed calibration drift ranged

from -0.1 dB to +0.2 dB, which is well within acceptable tolerances for long term baseline sound measurements.

2.2 Monitoring Locations

Monitoring locations were selected with the assistance of the Applicant to be representative of areas requested by EFSEC. Measurements were continuously logged at each location and those measurements were correlated with wind speed data collected by on-site meteorological towers as shown in Figure 1-1. Using the sound level measurement and wind speed data, a regression analysis was conducted for each monitoring location and the best fit correlation coefficient using a second order polynomial equation was evaluated. The measured L_{eq} sound levels were divided into daytime (7:00 a.m. to 10:00 p.m.) and nighttime (10:00 p.m. to 7:00 a.m.) periods to show diurnal variation at a monitoring position. Additional descriptions of the monitoring locations and field observations are provided in Section 3. Time history and regression analysis plots are also given for each monitoring location. Please note that measured sound pressure level data were evaluated and filtered to eliminate precipitation events and atypical extraneous sound contributions.

3 RESULTS

3.1 Monitoring Location 6

Monitoring location 6 was situated at an undeveloped property along N. McBee Road in Benton City, Washington (UTM Zone 11T: 308632E, 5123877N). Larson Davis 831, Serial No. 11597, was used to collect data at this location. Observations during deployment were that the location had infrequent road traffic along N. McBee Road and semi-frequent road traffic along Webber Canyon Road, approximately 0.25 miles away. Figure 3-1 includes a photograph of the monitoring location. Figure 3-2 provides the time history and Figure 3-3 provides the regression analyses of ambient sound levels during daytime and nighttime monitoring periods.

Figure 3-1. Photograph of ML-6

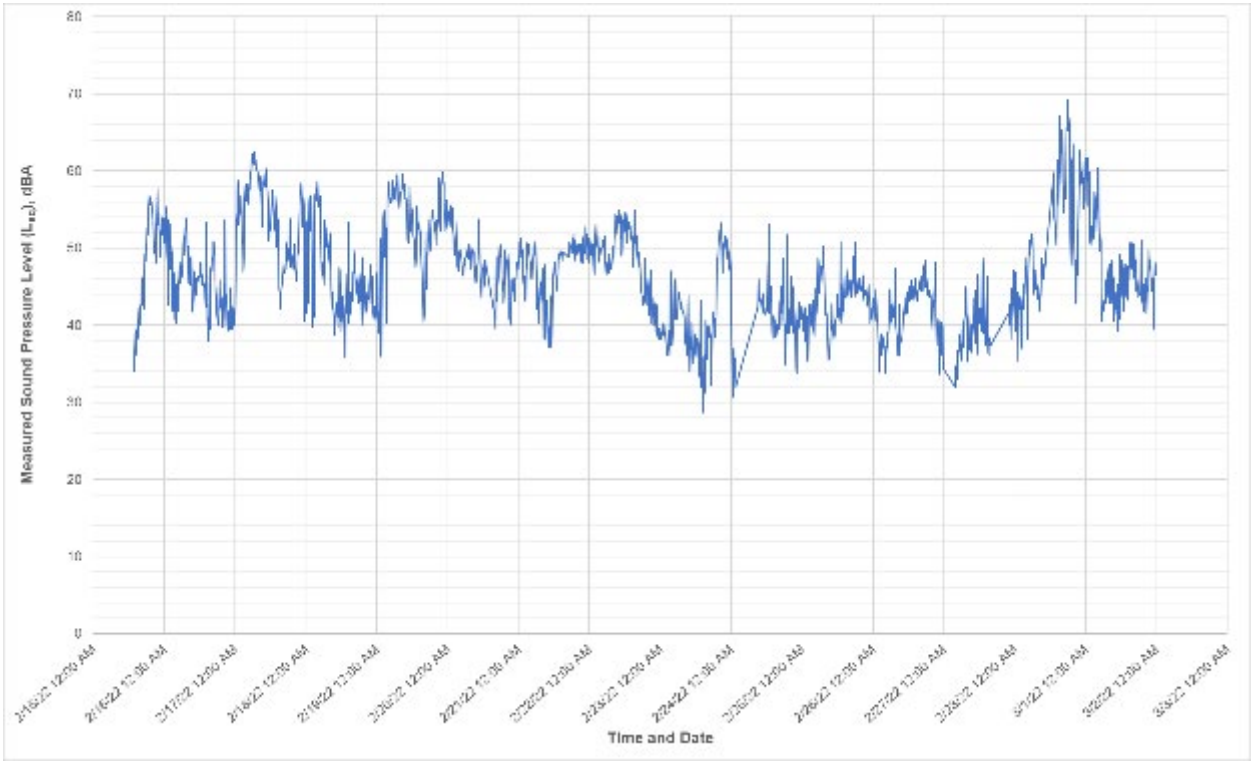


Figure 3-2. ML-6 Time History Plot

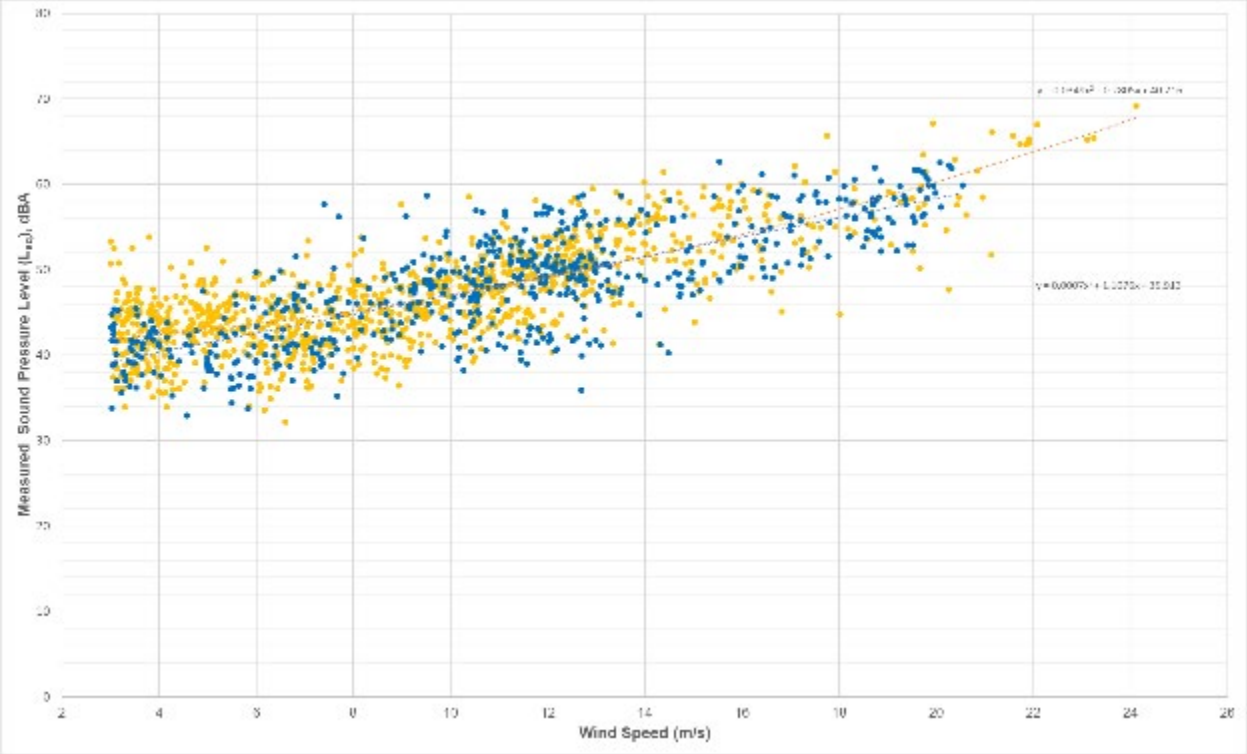


Figure 3-3. ML-6 Regression Analysis

3.2 Monitoring Location 7

Monitoring location 7 was situated at a residence along Canyon View PR NE in Benton City, Washington (UTM Zone 11T: 314483E, 5121403N). Larson Davis 831, Serial No. 11606, was used to collect data at this location. Observations during deployment were that the location has minor agricultural activity and some construction activity along the canal, approximately 500 feet to the south. Figure 3-4 includes a photograph of the monitoring location. Figure 3-5 provides the time history and Figure 3-6 provides the regression analyses of ambient sound levels during daytime and nighttime monitoring periods.

Figure 3-4. Photograph of ML-7

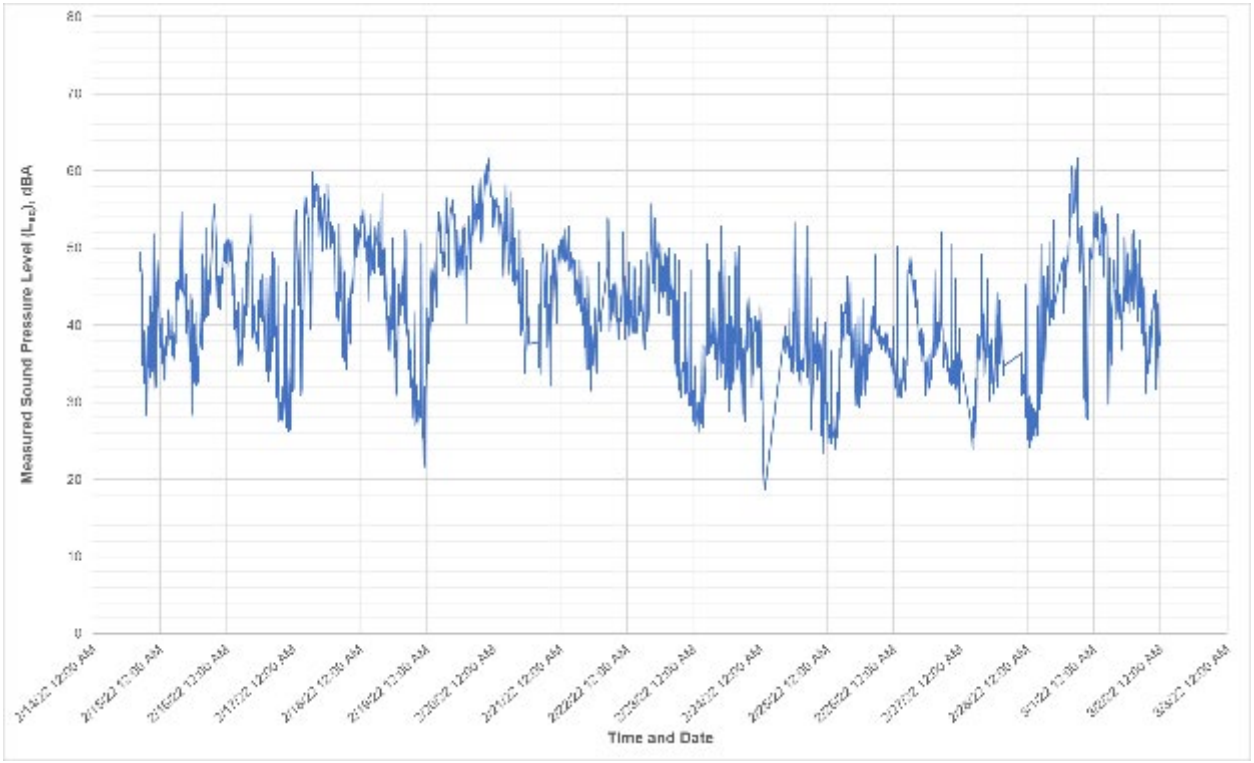


Figure 3-5. ML-7 Time History Plot

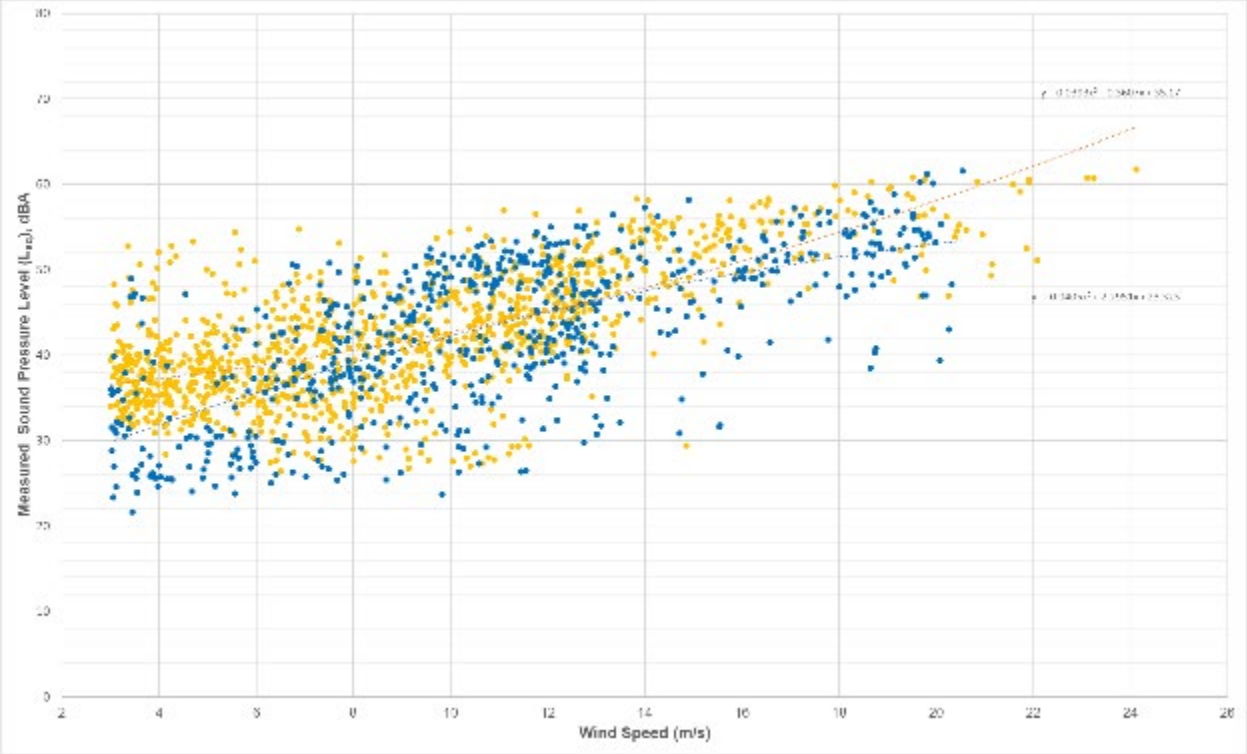


Figure 3-6. ML-7 Regression Analysis

3.3 Monitoring Location 8

Monitoring location 8 was situated at a property 1.5 miles east of Dennis Road in Benton City, Washington (UTM Zone 11T: 314766E, 5119102N). Larson Davis 831, Serial No. 11599, was used to collect data at this location. Observations during deployment were that the location had infrequent agricultural activity during the monitoring period. Figure 3-7 includes a photograph of the monitoring location. Figure 3-8 provides the time history and Figure 3-9 provides the regression analyses of ambient sound levels during daytime and nighttime monitoring periods.

Figure 3-7. Photograph of ML-8

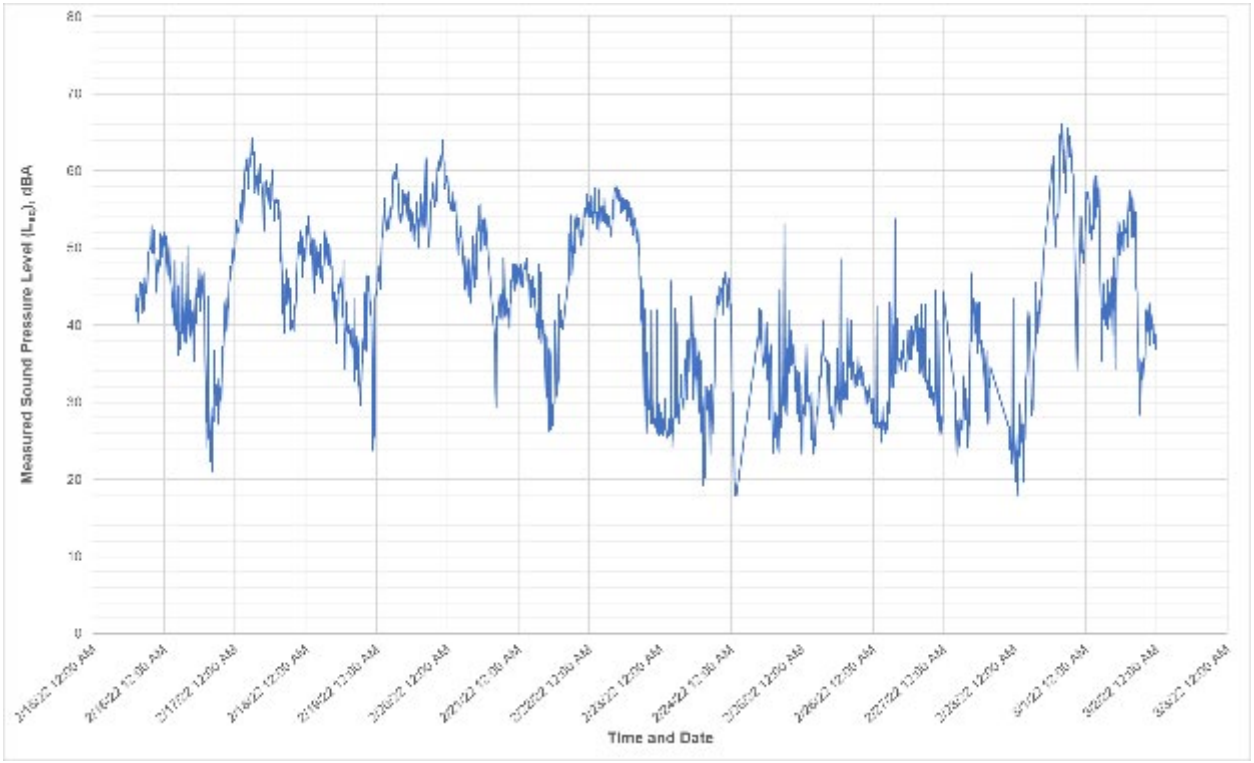


Figure 3-8. ML-8 Time History Plot

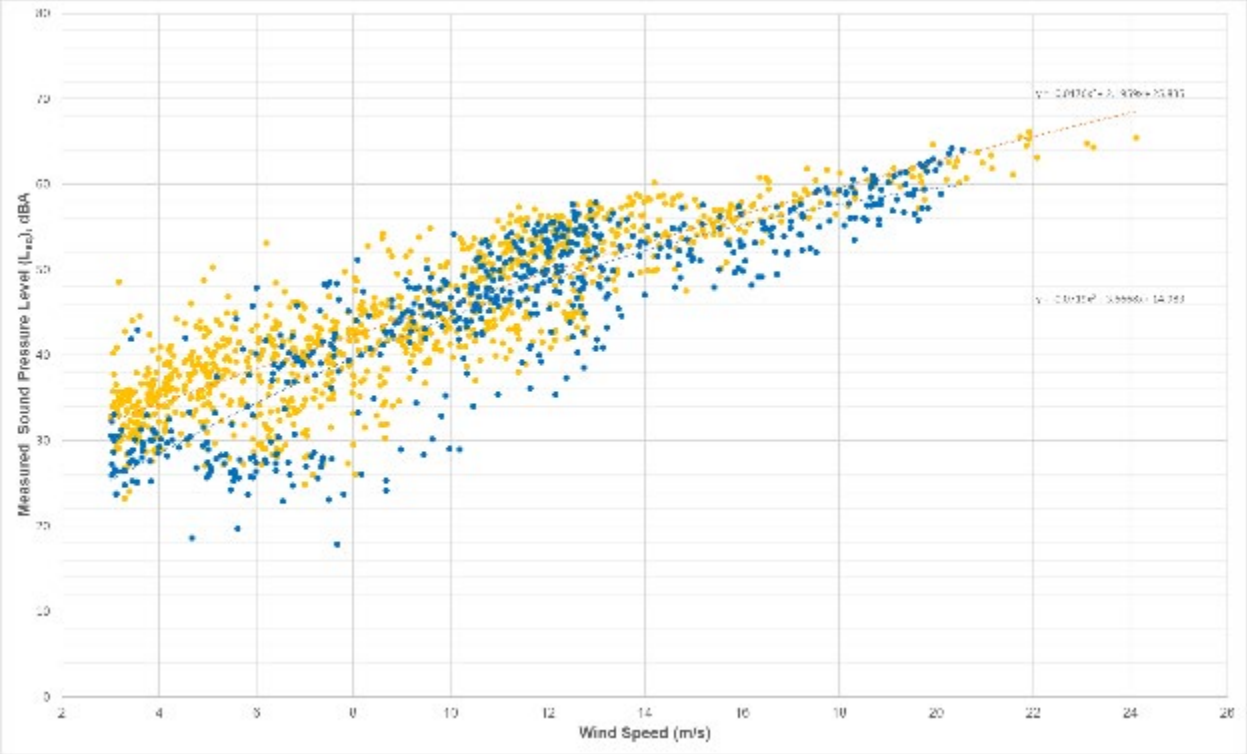


Figure 3-9. ML-8 Regression Analysis

4 CONCLUSIONS

Table 4-1 provides the results of the regression analyses for the first five ambient sound measurement locations monitored in January 2021, the additional three ambient sound measurement locations monitored in February 2022, and the cumulative results for all locations. Table 4-1 displays daytime and nighttime ambient sound levels for each monitoring location and the Project Lease Boundary and vicinity for wind speed conditions ranging from calm to maximum rotational wind speed.

Table 4-1. Baseline Sound Survey Results, L_{eq} (dBA)

Monitoring Location	UTM Coordinates (UTM Zone 11T)		Time Period	Wind Speed (m/s)									
	Easting (m)	Northing (m)		3	4	5	6	7	8	9	10	11	12
ML-1	311134	5117731	Day	32	32	33	33	34	35	36	37	38	39
			Night	33	33	34	35	36	37	38	39	40	41
ML-2	321518	5109850	Day	33	33	33	32	32	32	33	33	33	33
			Night	31	32	32	32	33	33	34	34	34	34
ML-3	328433	5104539	Day	48	48	47	47	47	47	47	47	47	47
			Night	42	43	44	45	46	46	47	48	48	48
ML-4	343329	5108162	Day	38	38	39	39	39	40	40	40	40	40
			Night	36	37	37	38	38	38	39	39	39	39
ML-5	310369	5112039	Day	45	45	45	45	44	44	44	44	45	45
			Night	39	39	39	39	39	39	40	40	41	41
Cumulative: Monitoring Locations 1-5			Day	38	39	39	39	39	39	40	40	40	40
			Night	37	37	37	38	38	38	39	39	40	40
ML-6	308632	5123877	Day	42	42	43	44	44	45	46	47	48	49
			Night	39	40	41	43	44	45	46	47	48	49
ML-7	314483	5121403	Day	37	37	38	39	40	41	42	43	44	45
			Night	30	32	34	36	37	39	41	42	44	45
ML-8	314766	5119102	Day	32	34	36	38	40	42	44	46	48	50
			Night	25	28	32	34	37	40	42	44	47	49
Cumulative: Monitoring Locations 6-8			Day	37	38	39	40	41	43	44	45	47	48
			Night	31	34	36	37	39	41	43	44	46	48
Cumulative: Monitoring Locations 1-8			Day	37	38	39	40	41	41	42	43	43	44
			Night	34	36	37	38	39	40	41	42	43	44

As expected, ambient sound levels fluctuate constantly during both daytime and nighttime hours; however, generally typical diurnal variation (i.e., daytime levels being higher than nighttime levels) is observed. Existing conditions at ML-6 are relatively higher due to its proximity to the I-82 and N McBee Road. Elevated sound levels at ML-6 during high winds can be attributed to the high density of vegetation surrounding the location. Ambient sound levels at ML-7 exhibited typical diurnal variation, but were affected by on-site activity as well as construction activity occurring at the nearby canal. Existing conditions at ML-8 are relatively lower due to its remoteness. Increases in daytime ambient sound levels at ML-8 can be attributed to agricultural activities occurring near the site, and elevated sound levels during high winds can be attributed to the high density of vegetation surrounding the site.

5 REFERENCES

Beranek, L. 1988. Noise and Vibration Control, Chapter 7 - Sound Propagation Outdoors. Institute of Noise Control Engineering, Washington, DC.

EPA (United States Environmental Protection Agency). 1971. Community Noise. NTID300.3 (N-96-01 IIA-231). Prepared by Wylie Laboratories.

ATTACHMENT A
CALIBRATION DOCUMENTATION

Calibration Certificate

Certificate Number 2021008683

Customer:

Tetra Tech EC Inc
6 Century Drive
3rd Floor
Parsippany,NJ 07054,United States

Model Number	831C	***Procedure Number***	D0001.8384		
Serial Number	11597	***Technician***	Ron Harris		
Test Results	**Pass**	***Calibration Date***	21 Jul 2021		
Initial Condition	As Manufactured	***Calibration Due***			
		Temperature	23.67	°C	± 0.25 °C
Description	Larson Davis Model 831C Class 1 Sound Level Meter Firmware Revision: 04.6.2R1	***Humidity***	50.8	%RH	± 2.0 %RH
		Static Pressure	86.34	kPa	± 0.13 kPa

Evaluation Method

Tested with:

Larson Davis PRM831, S/N 071167
Larson Davis CAL200, S/N 9079
PCB 377B02, S/N 330369
Larson Davis CAL291, S/N 0108

Data reported in dB re 20 µPa.

Compliance Standards

Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8378:

IEC 60651:2001 Type 1	ANSI S1.4-2014 Class 1
IEC 60804:2000 Type 1	ANSI S1.4 (R2006) Type 1
IEC 61260:2014 Class 1	ANSI S1.11-2014 Class 1
IEC 61672:2013 Class 1	ANSI S1.43 (R2007) Type 1

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2017.
Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2015.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Correction data from Larson Davis SoundAdvisor Model 831C Reference Manual, I831C.01 Rev B, 2017-03-31

For 1/4" microphones, the Larson Davis ADP024 1/4" to 1/2" adaptor is used with the calibrators and the Larson Davis ADP043 1/4" to 1/2" adaptor is used with the preamplifier.

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa; Reference Range: 0 dB gain

Periodic tests were performed in accordance with precedures from IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part3.

No Pattern approval for IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1 available.

The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part 3, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1 because (a) evidence was not publicly available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1 or correction data for acoustical test of frequency weighting were not provided in the Instruction Manual and (b) because the periodic tests of IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part 3 cover only a limited subset of the specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis CAL291 Residual Intensity Calibrator	2020-09-18	2021-09-18	001250
Hart Scientific 2626-H Temperature Probe	2021-02-04	2022-08-04	006767
Larson Davis CAL200 Acoustic Calibrator	2020-07-21	2021-07-21	007027
Larson Davis Model 831	2021-03-02	2022-03-02	007182
PCB 377A13 1/2 inch Prepolarized Pressure Microphone	2021-03-03	2022-03-03	007185
SRS DS360 Ultra Low Distortion Generator	2021-04-13	2022-04-13	007635
Larson Davis 1/2" Preamplifier for Model 831 Type 1	2020-10-06	2021-10-06	PCB0004783

Acoustic Calibration

Measured according to IEC 61672-3:2013 10 and ANSI S1.4-2014 Part 3: 10

Measurement	Test Result [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
1000 Hz	114.01	113.80	114.20	0.14	Pass

Loaded Circuit Sensitivity

Measurement	Test Result [dB re 1 V / Pa]	Lower Limit [dB re 1 V / Pa]	Upper Limit [dB re 1 V / Pa]	Expanded Uncertainty [dB]	Result
1000 Hz	-26.39	-27.84	-24.74	0.14	Pass

-- End of measurement results--

Acoustic Signal Tests, C-weighting

Measured according to IEC 61672-3:2013 12 and ANSI S1.4-2014 Part 3: 12 using a comparison coupler with Unit Under Test (UUT) and reference SLM using slow time-weighted sound level for compliance to IEC 61672-1:2013 5.5; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Expected [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
125	-0.05	-0.20	-1.20	0.80	0.23	Pass
1000	0.11	0.00	-0.70	0.70	0.23	Pass
8000	-2.63	-3.00	-5.50	-1.50	0.32	Pass

-- End of measurement results--

Self-generated Noise

Measured according to IEC 61672-3:2013 11.1 and ANSI S1.4-2014 Part 3: 11.1

Measurement	Test Result [dB]
A-weighted, 20 dB gain	40.29

-- End of measurement results--

-- End of Report--

Signatory: Ron Harris

LARSON DAVIS - A PCB PIEZOTRONICS DIV.
1681 West 820 North
Provo,UT 84601,United States
716-684-0001

ACCREDITED Cert. #3622.01

LARSON DAVIS A PCB PIEZOTRONICS DIV.

Calibration Certificate

Certificate Number 2021008692

Customer:

Tetra Tech EC Inc
6 Century Drive
3rd Floor
Parsippany, NJ 07054, United States

Model Number	831C	***Procedure Number***	D0001.8384		
Serial Number	11606	***Technician***	Ron Harris		
Test Results	**Pass**	***Calibration Date***	21 Jul 2021		
Initial Condition	As Manufactured	***Calibration Due***			
		Temperature	23.74	°C	± 0.25 °C
Description	Larson Davis Model 831C Class 1 Sound Level Meter Firmware Revision: 04.6.2R1	***Humidity***	53.1	%RH	± 2.0 %RH
		Static Pressure	86.32	kPa	± 0.13 kPa

Evaluation Method

Tested with:

Larson Davis CAL200, S/N 9079
Larson Davis CAL291, S/N 0108
Larson Davis PRM831, S/N 071171
PCB 377B02, S/N 330414

Data reported in dB re 20 µPa.

Compliance Standards

Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8378:

IEC 60651:2001 Type 1	ANSI S1.4-2014 Class 1
IEC 60804:2000 Type 1	ANSI S1.4 (R2006) Type 1
IEC 61260:2014 Class 1	ANSI S1.11-2014 Class 1
IEC 61672:2013 Class 1	ANSI S1.43 (R2007) Type 1

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2017.
Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2015.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Correction data from Larson Davis SoundAdvisor Model 831C Reference Manual, I831C.01 Rev B, 2017-03-31

For 1/4" microphones, the Larson Davis ADP024 1/4" to 1/2" adaptor is used with the calibrators and the Larson Davis ADP043 1/4" to 1/2" adaptor is used with the preamplifier.

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa; Reference Range: 0 dB gain

Periodic tests were performed in accordance with precedures from IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part3.

No Pattern approval for IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1 available.

The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part 3, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1 because (a) evidence was not publicly available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1 or correction data for acoustical test of frequency weighting were not provided in the Instruction Manual and (b) because the periodic tests of IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part 3 cover only a limited subset of the specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis CAL291 Residual Intensity Calibrator	2020-09-18	2021-09-18	001250
Hart Scientific 2626-H Temperature Probe	2021-02-04	2022-08-04	006767
Larson Davis CAL200 Acoustic Calibrator	2020-07-21	2021-07-21	007027
Larson Davis Model 831	2021-03-02	2022-03-02	007182
PCB 377A13 1/2 inch Prepolarized Pressure Microphone	2021-03-03	2022-03-03	007185
SRS DS360 Ultra Low Distortion Generator	2021-04-13	2022-04-13	007635
Larson Davis 1/2" Preamplifier for Model 831 Type 1	2020-10-06	2021-10-06	PCB0004783

Acoustic Calibration

Measured according to IEC 61672-3:2013 10 and ANSI S1.4-2014 Part 3: 10

Measurement	Test Result [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
1000 Hz	114.01	113.80	114.20	0.14	Pass

Loaded Circuit Sensitivity

Measurement	Test Result [dB re 1 V / Pa]	Lower Limit [dB re 1 V / Pa]	Upper Limit [dB re 1 V / Pa]	Expanded Uncertainty [dB]	Result
1000 Hz	-27.03	-27.84	-24.74	0.14	Pass

– End of measurement results–

Acoustic Signal Tests, C-weighting

Measured according to IEC 61672-3:2013 12 and ANSI S1.4-2014 Part 3: 12 using a comparison coupler with Unit Under Test (UUT) and reference SLM using slow time-weighted sound level for compliance to IEC 61672-1:2013 5.5; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Expected [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
125	-0.02	-0.20	-1.20	0.80	0.23	Pass
1000	0.18	0.00	-0.70	0.70	0.23	Pass
8000	-3.24	-3.00	-5.50	-1.50	0.32	Pass

– End of measurement results--

Self-generated Noise

Measured according to IEC 61672-3:2013 11.1 and ANSI S1.4-2014 Part 3: 11.1

Measurement	Test Result [dB]
A-weighted, 20 dB gain	40.25

– End of measurement results--

-- End of Report--

Signatory: Ron Harris

LARSON DAVIS - A PCB PIEZOTRONICS DIV.
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3622.01

LARSON DAVIS A PCB PIEZOTRONICS DIV.

Calibration Certificate

Certificate Number 2021008674

Customer:

Tetra Tech EC Inc
6 Century Drive
3rd Floor
Parsippany, NJ 07054, United States

Model Number	831C	***Procedure Number***	D0001.8378		
Serial Number	11597	***Technician***	Ron Harris		
Test Results	**Pass**	***Calibration Date***	21 Jul 2021		
Initial Condition	As Manufactured	***Calibration Due***			
		Temperature	23.56	°C	± 0.25 °C
Description	Larson Davis Model 831C Class 1 Sound Level Meter Firmware Revision: 04.6.2R1	***Humidity***	50.6	%RH	± 2.0 %RH
		Static Pressure	86.32	kPa	± 0.13 kPa

Evaluation Method Tested electrically using Larson Davis PRM831 S/N 071167 and a 12.0 pF capacitor to simulate microphone capacitance. Data reported in dB re 20 µPa assuming a microphone sensitivity of 50.0 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8384:

IEC 60651:2001 Type 1	ANSI S1.4-2014 Class 1
IEC 60804:2000 Type 1	ANSI S1.4 (R2006) Type 1
IEC 61672:2013 Class 1	ANSI S1.43 (R2007) Type 1
IEC 61260:2014 Class 1	ANSI S1.11-2014 Class 1

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2017. **Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2015.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

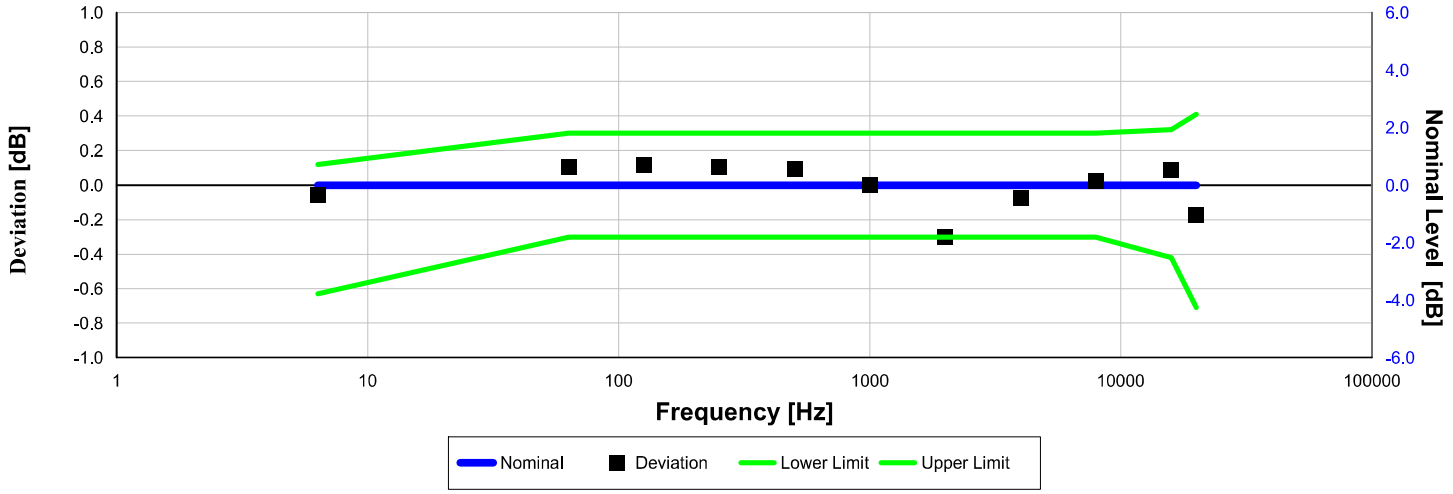
Correction data from Larson Davis SoundAdvisor Model 831C Reference Manual, I831C.01 Rev M, 2019-09-10

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa; Reference Range: 0 dB gain

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Hart Scientific 2626-H Temperature Probe	2021-02-04	2022-08-04	006767
SRS DS360 Ultra Low Distortion Generator	2020-08-19	2021-08-19	007167

Z-weight Filter Response

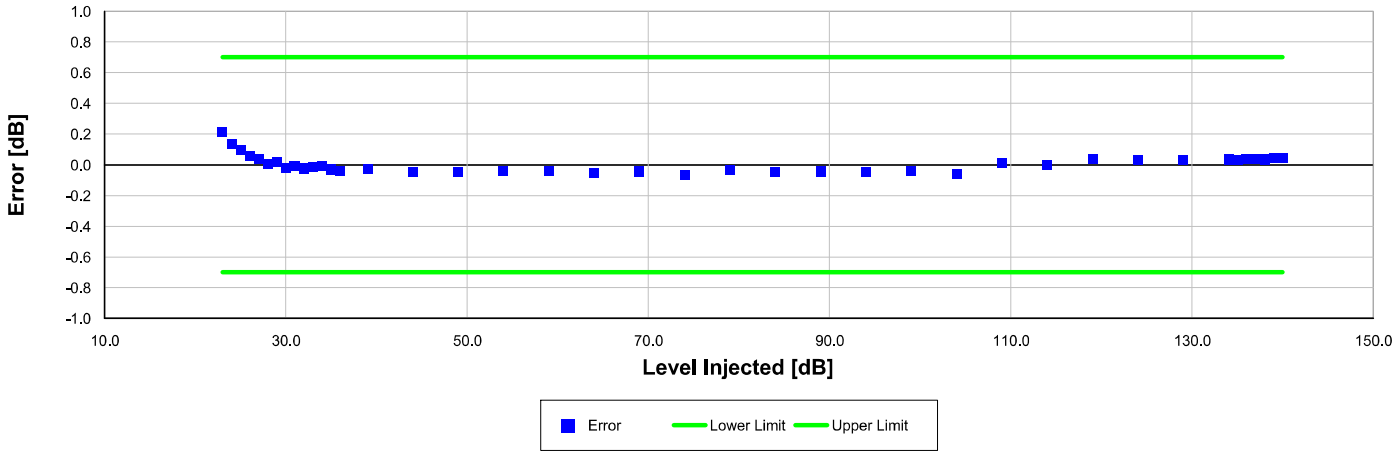


Electrical signal test of frequency weighting performed according to IEC 61672-3:2013 13 and ANSI S1.4-2014 Part 3: 13 for compliance to IEC 61672-1:2013 5.5; IEC 60651:2001 6.1 and 9.2.2; IEC 60804:2000 5; ANSI S1.4:1983 (R2006) 5.1 and 8.2.1; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Deviation [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
6.31	-0.06	-0.06	-0.63	0.12	0.15	Pass
63.10	0.10	0.10	-0.30	0.30	0.15	Pass
125.89	0.12	0.12	-0.30	0.30	0.15	Pass
251.19	0.10	0.10	-0.30	0.30	0.15	Pass
501.19	0.09	0.09	-0.30	0.30	0.15	Pass
1,000.00	0.00	0.00	-0.30	0.30	0.15	Pass
1,995.26	-0.30	-0.30	-0.30	0.30	0.15	Pass
3,981.07	-0.07	-0.07	-0.30	0.30	0.15	Pass
7,943.28	0.03	0.03	-0.30	0.30	0.15	Pass
15,848.93	0.09	0.09	-0.42	0.32	0.15	Pass
19,952.62	-0.17	-0.17	-0.71	0.41	0.15	Pass

-- End of measurement results--

A-weighted 0 dB Gain Broadband Log Linearity: 8,000.00 Hz



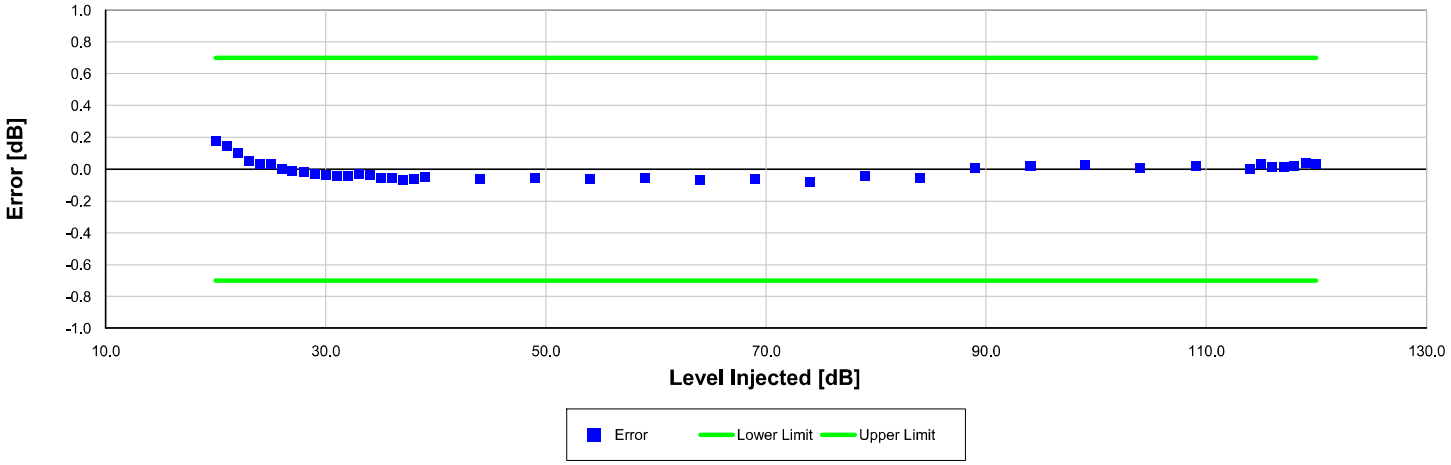
Broadband level linearity performed according to IEC 61672-3:2013 16 and ANSI S1.4-2014 Part 3: 16 for compliance to IEC 61672-1:2013 5.6, IEC 60804:2000 6.2, IEC 61252:2002 8, ANSI S1.4 (R2006) 6.9, ANSI S1.4-2014 Part 1: 5.6, ANSI S1.43 (R2007) 6.2

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
23.00	0.22	-0.70	0.70	0.16	Pass
24.00	0.14	-0.70	0.70	0.16	Pass
25.00	0.10	-0.70	0.70	0.16	Pass
26.00	0.06	-0.70	0.70	0.16	Pass
27.00	0.04	-0.70	0.70	0.16	Pass
28.00	0.01	-0.70	0.70	0.16	Pass
29.00	0.02	-0.70	0.70	0.18	Pass
30.00	-0.02	-0.70	0.70	0.17	Pass
31.00	-0.01	-0.70	0.70	0.17	Pass
32.00	-0.02	-0.70	0.70	0.17	Pass
33.00	-0.01	-0.70	0.70	0.16	Pass
34.00	-0.01	-0.70	0.70	0.16	Pass
35.00	-0.03	-0.70	0.70	0.16	Pass
36.00	-0.04	-0.70	0.70	0.16	Pass
39.00	-0.03	-0.70	0.70	0.16	Pass
44.00	-0.04	-0.70	0.70	0.16	Pass
49.00	-0.04	-0.70	0.70	0.16	Pass
54.00	-0.04	-0.70	0.70	0.16	Pass
59.00	-0.04	-0.70	0.70	0.16	Pass
64.00	-0.05	-0.70	0.70	0.16	Pass
69.00	-0.04	-0.70	0.70	0.16	Pass
74.00	-0.06	-0.70	0.70	0.16	Pass
79.00	-0.03	-0.70	0.70	0.16	Pass
84.00	-0.05	-0.70	0.70	0.16	Pass
89.00	-0.04	-0.70	0.70	0.16	Pass
94.00	-0.04	-0.70	0.70	0.16	Pass
99.00	-0.04	-0.70	0.70	0.16	Pass
104.00	-0.06	-0.70	0.70	0.15	Pass
109.00	0.01	-0.70	0.70	0.15	Pass
114.00	0.00	-0.70	0.70	0.15	Pass
119.00	0.04	-0.70	0.70	0.15	Pass
124.00	0.03	-0.70	0.70	0.15	Pass
129.00	0.03	-0.70	0.70	0.15	Pass
134.00	0.04	-0.70	0.70	0.15	Pass
135.00	0.03	-0.70	0.70	0.15	Pass
136.00	0.04	-0.70	0.70	0.15	Pass

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
137.00	0.04	-0.70	0.70	0.15	Pass
138.00	0.04	-0.70	0.70	0.15	Pass
139.00	0.04	-0.70	0.70	0.15	Pass
140.00	0.04	-0.70	0.70	0.15	Pass

-- End of measurement results--

A-weighted 20 dB Gain Broadband Log Linearity: 8,000.00 Hz



Broadband level linearity performed according to IEC 61672-3:2013 16 and ANSI S1.4-2014 Part 3: 16 for compliance to IEC 61672-1:2013 5.6, IEC 60804:2000 6.2, IEC 61252:2002 8, ANSI S1.4 (R2006) 6.9, ANSI S1.4-2014 Part 1: 5.6, ANSI S1.43 (R2007) 6.2

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
20.00	0.18	-0.70	0.70	0.17	Pass
21.00	0.15	-0.70	0.70	0.16	Pass
22.00	0.10	-0.70	0.70	0.16	Pass
23.00	0.05	-0.70	0.70	0.16	Pass
24.00	0.04	-0.70	0.70	0.16	Pass
25.00	0.04	-0.70	0.70	0.16	Pass
26.00	0.00	-0.70	0.70	0.19	Pass
27.00	-0.01	-0.70	0.70	0.18	Pass
28.00	-0.02	-0.70	0.70	0.19	Pass
29.00	-0.03	-0.70	0.70	0.18	Pass
30.00	-0.04	-0.70	0.70	0.17	Pass
31.00	-0.04	-0.70	0.70	0.17	Pass
32.00	-0.04	-0.70	0.70	0.17	Pass
33.00	-0.03	-0.70	0.70	0.16	Pass
34.00	-0.04	-0.70	0.70	0.16	Pass
35.00	-0.05	-0.70	0.70	0.16	Pass
36.00	-0.05	-0.70	0.70	0.16	Pass
37.00	-0.06	-0.70	0.70	0.16	Pass
38.00	-0.06	-0.70	0.70	0.16	Pass
39.00	-0.05	-0.70	0.70	0.16	Pass
44.00	-0.06	-0.70	0.70	0.16	Pass
49.00	-0.06	-0.70	0.70	0.16	Pass
54.00	-0.06	-0.70	0.70	0.16	Pass
59.00	-0.06	-0.70	0.70	0.16	Pass
64.00	-0.07	-0.70	0.70	0.16	Pass
69.00	-0.06	-0.70	0.70	0.16	Pass
74.00	-0.08	-0.70	0.70	0.16	Pass
79.00	-0.04	-0.70	0.70	0.16	Pass
84.00	-0.06	-0.70	0.70	0.16	Pass
89.00	0.01	-0.70	0.70	0.16	Pass
94.00	0.02	-0.70	0.70	0.16	Pass
99.00	0.03	-0.70	0.70	0.16	Pass
104.00	0.01	-0.70	0.70	0.15	Pass
109.00	0.02	-0.70	0.70	0.15	Pass
114.00	0.00	-0.70	0.70	0.15	Pass
115.00	0.03	-0.70	0.70	0.15	Pass

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
116.00	0.01	-0.70	0.70	0.15	Pass
117.00	0.02	-0.70	0.70	0.15	Pass
118.00	0.02	-0.70	0.70	0.15	Pass
119.00	0.04	-0.70	0.70	0.15	Pass
120.00	0.03	-0.70	0.70	0.15	Pass

-- End of measurement results--

Peak Rise Time

Peak rise time performed according to IEC 60651:2001 9.4.4 and ANSI S1.4:1983 (R2006) 8.4.4

Amplitude [dB]	Duration [µs]		Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
139.00	40	Negative Pulse	135.78	134.45	136.45	0.15	Pass
		Positive Pulse	135.78	134.46	136.46	0.15	Pass
	30	Negative Pulse	134.77	134.45	136.45	0.15	Pass
		Positive Pulse	134.79	134.46	136.46	0.15	Pass

-- End of measurement results--

Positive Pulse Crest Factor

200 µs pulse tests at 2.0, 12.0, 22.0, 32.0 dB below Overload Limit

Crest Factor measured according to IEC 60651:2001 9.4.2 and ANSI S1.4:1983 (R2006) 8.4.2

Amplitude [dB]	Crest Factor	Test Result [dB]	Limits [dB]	Expanded Uncertainty [dB]	Result
138.00	3	OVLD	± 0.50	0.15 ‡	Pass
	5	OVLD	± 1.00	0.15 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
128.00	3	0.07	± 0.50	0.15 ‡	Pass
	5	0.09	± 1.00	0.15 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
118.00	3	0.05	± 0.50	0.15 ‡	Pass
	5	0.07	± 1.00	0.15 ‡	Pass
	10	0.11	± 1.50	0.15 ‡	Pass
108.00	3	0.06	± 0.50	0.15 ‡	Pass
	5	0.08	± 1.00	0.15 ‡	Pass
	10	0.12	± 1.50	0.15 ‡	Pass

-- End of measurement results--

Negative Pulse Crest Factor

200 µs pulse tests at 2.0, 12.0, 22.0, 32.0 dB below Overload Limit

Crest Factor measured according to IEC 60651:2001 9.4.2 and ANSI S1.4:1983 (R2006) 8.4.2

Amplitude [dB]	Crest Factor	Test Result [dB]	Limits [dB]	Expanded Uncertainty [dB]	Result
138.00	3	OVLD	± 0.50	0.15 ‡	Pass
	5	OVLD	± 1.00	0.15 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
128.00	3	0.06	± 0.50	0.15 ‡	Pass
	5	0.08	± 1.00	0.15 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
118.00	3	0.05	± 0.50	0.15 ‡	Pass
	5	0.06	± 1.00	0.15 ‡	Pass
	10	-0.05	± 1.50	0.15 ‡	Pass
108.00	3	0.06	± 0.50	0.15 ‡	Pass
	5	0.08	± 1.00	0.15 ‡	Pass
	10	0.04	± 1.50	0.16 ‡	Pass

-- End of measurement results--

Gain

Gain measured according to IEC 61672-3:2013 17.3 and 17.4 and ANSI S1.4-2014 Part 3: 17.3 and 17.4

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
0 dB Gain	93.95	93.89	94.09	0.15	Pass
0 dB Gain, Linearity	28.03	27.29	28.69	0.16	Pass
20 dB Gain	94.01	93.89	94.09	0.15	Pass
20 dB Gain, Linearity	23.08	22.29	23.69	0.16	Pass
OBA High Range	93.99	93.20	94.80	0.15	Pass
OBA Normal Range	93.99	93.89	94.09	0.15	Pass

-- End of measurement results--

Broadband Noise Floor

Self-generated noise measured according to IEC 61672-3:2013 11.2 and ANSI S1.4-2014 Part 3: 11.2

Measurement	Test Result [dB]	Upper limit [dB]	Result
A-weight Noise Floor	5.83	9.00	Pass
C-weight Noise Floor	11.54	15.00	Pass
Z-weight Noise Floor	21.20	25.00	Pass

-- End of measurement results--

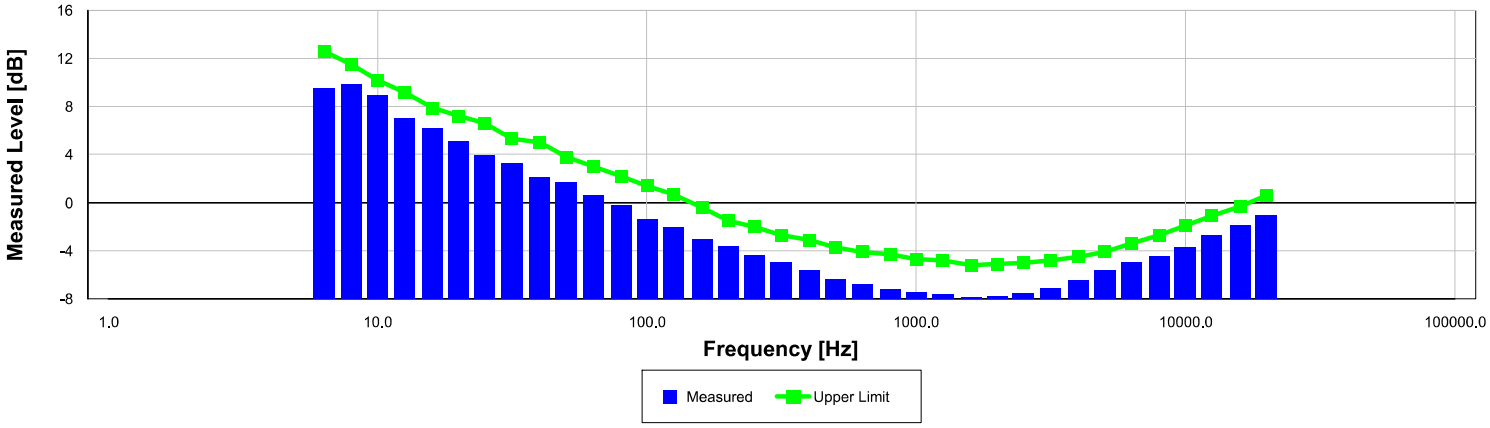
Total Harmonic Distortion

Measured using 1/3-Octave filters

Measurement	Test Result [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
10 Hz Signal	137.45	137.20	138.80	0.15	Pass
THD	-76.28		-60.00	1.30 ‡	Pass
THD+N	-75.28		-60.00	1.30 ‡	Pass

-- End of measurement results--

1/3-Octave Self-Generated Noise



The SLM is set to normal range and 20 dB gain.

Frequency [Hz]	Test Result [dB]	Upper limit [dB]	Result
6.30	9.51	12.60	Pass
8.00	9.83	11.50	Pass
10.00	8.97	10.20	Pass
12.50	6.99	9.20	Pass
16.00	6.23	7.90	Pass
20.00	5.10	7.20	Pass
25.00	3.97	6.60	Pass
31.50	3.30	5.30	Pass
40.00	2.16	5.00	Pass
50.00	1.69	3.80	Pass
63.00	0.57	3.00	Pass
80.00	-0.19	2.20	Pass
100.00	-1.34	1.40	Pass
125.00	-2.01	0.70	Pass
160.00	-3.06	-0.40	Pass
200.00	-3.59	-1.50	Pass
250.00	-4.41	-2.00	Pass
315.00	-4.95	-2.70	Pass
400.00	-5.65	-3.10	Pass
500.00	-6.38	-3.70	Pass
630.00	-6.77	-4.10	Pass
800.00	-7.17	-4.30	Pass
1,000.00	-7.46	-4.70	Pass
1,250.00	-7.65	-4.80	Pass
1,600.00	-7.82	-5.20	Pass
2,000.00	-7.75	-5.10	Pass
2,500.00	-7.56	-5.00	Pass
3,150.00	-7.13	-4.80	Pass
4,000.00	-6.44	-4.50	Pass
5,000.00	-5.65	-4.10	Pass
6,300.00	-4.96	-3.40	Pass
8,000.00	-4.42	-2.70	Pass
10,000.00	-3.73	-1.90	Pass
12,500.00	-2.69	-1.10	Pass
16,000.00	-1.84	-0.30	Pass
20,000.00	-1.08	0.60	Pass

-- End of measurement results--

-- End of Report--

Signatory: Ron Harris

LARSON DAVIS - A PCB PIEZOTRONICS DIV.
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3622.01

LARSON DAVIS A PCB PIEZOTRONICS DIV.

Calibration Certificate

Certificate Number 2021008682

Customer:

Tetra Tech EC Inc
6 Century Drive
3rd Floor
Parsippany, NJ 07054, United States

Model Number	831C	***Procedure Number***	D0001.8378		
Serial Number	11606	***Technician***	Ron Harris		
Test Results	**Pass**	***Calibration Date***	21 Jul 2021		
Initial Condition	As Manufactured	***Calibration Due***			
		Temperature	23.86	°C	± 0.25 °C
Description	Larson Davis Model 831C Class 1 Sound Level Meter Firmware Revision: 04.6.2R1	***Humidity***	52	%RH	± 2.0 %RH
		Static Pressure	86.33	kPa	± 0.13 kPa

Evaluation Method Tested electrically using Larson Davis PRM831 S/N 071171 and a 12.0 pF capacitor to simulate microphone capacitance. Data reported in dB re 20 µPa assuming a microphone sensitivity of 50.0 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8384:

IEC 60651:2001 Type 1	ANSI S1.4-2014 Class 1
IEC 60804:2000 Type 1	ANSI S1.4 (R2006) Type 1
IEC 61672:2013 Class 1	ANSI S1.43 (R2007) Type 1
IEC 61260:2014 Class 1	ANSI S1.11-2014 Class 1

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2017. **Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2015.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

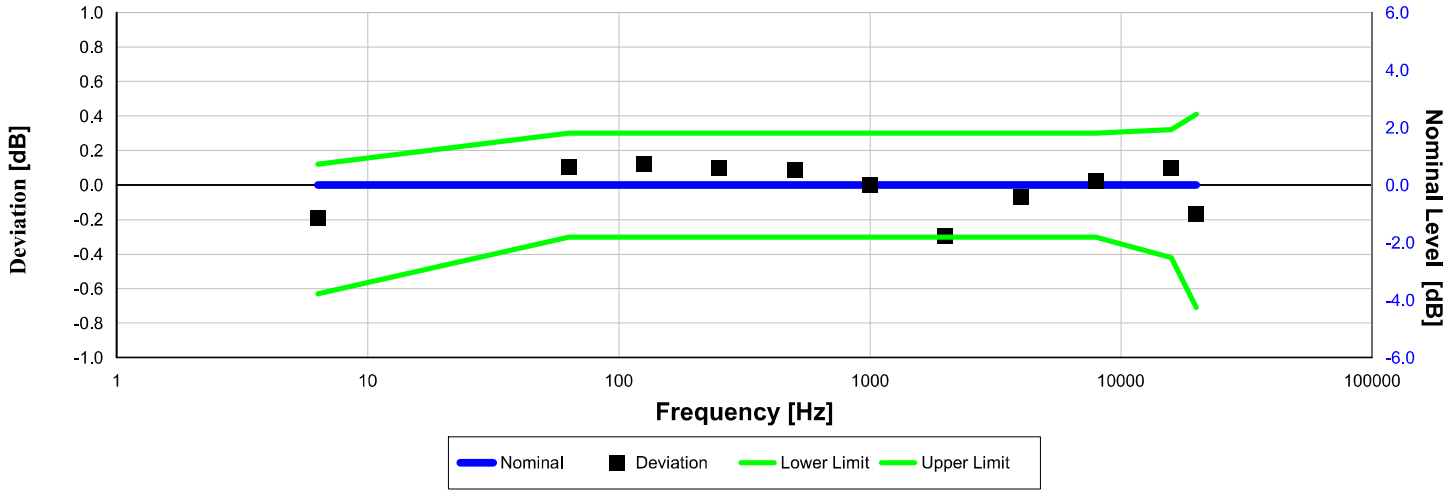
Correction data from Larson Davis SoundAdvisor Model 831C Reference Manual, I831C.01 Rev M, 2019-09-10

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa; Reference Range: 0 dB gain

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Hart Scientific 2626-H Temperature Probe	2021-02-04	2022-08-04	006767
SRS DS360 Ultra Low Distortion Generator	2021-01-05	2022-01-05	007118

Z-weight Filter Response

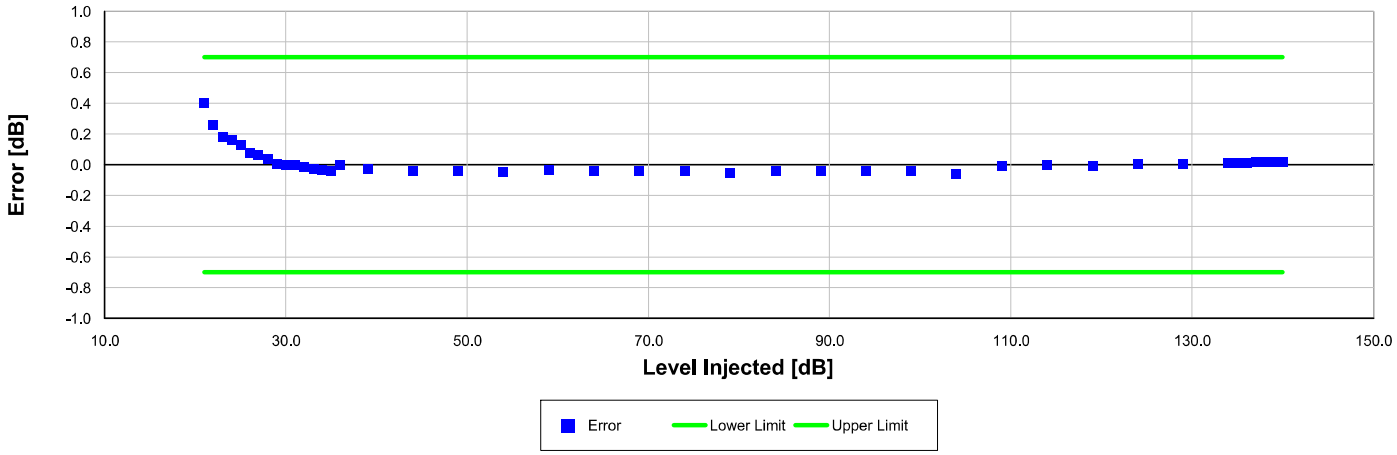


Electrical signal test of frequency weighting performed according to IEC 61672-3:2013 13 and ANSI S1.4-2014 Part 3: 13 for compliance to IEC 61672-1:2013 5.5; IEC 60651:2001 6.1 and 9.2.2; IEC 60804:2000 5; ANSI S1.4:1983 (R2006) 5.1 and 8.2.1; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Deviation [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
6.31	-0.19	-0.19	-0.63	0.12	0.15	Pass
63.10	0.11	0.11	-0.30	0.30	0.15	Pass
125.89	0.12	0.12	-0.30	0.30	0.15	Pass
251.19	0.10	0.10	-0.30	0.30	0.15	Pass
501.19	0.09	0.09	-0.30	0.30	0.15	Pass
1,000.00	0.00	0.00	-0.30	0.30	0.15	Pass
1,995.26	-0.29	-0.29	-0.30	0.30	0.15	Pass
3,981.07	-0.07	-0.07	-0.30	0.30	0.15	Pass
7,943.28	0.03	0.02	-0.30	0.30	0.15	Pass
15,848.93	0.10	0.10	-0.42	0.32	0.15	Pass
19,952.62	-0.17	-0.17	-0.71	0.41	0.15	Pass

-- End of measurement results--

A-weighted 0 dB Gain Broadband Log Linearity: 8,000.00 Hz



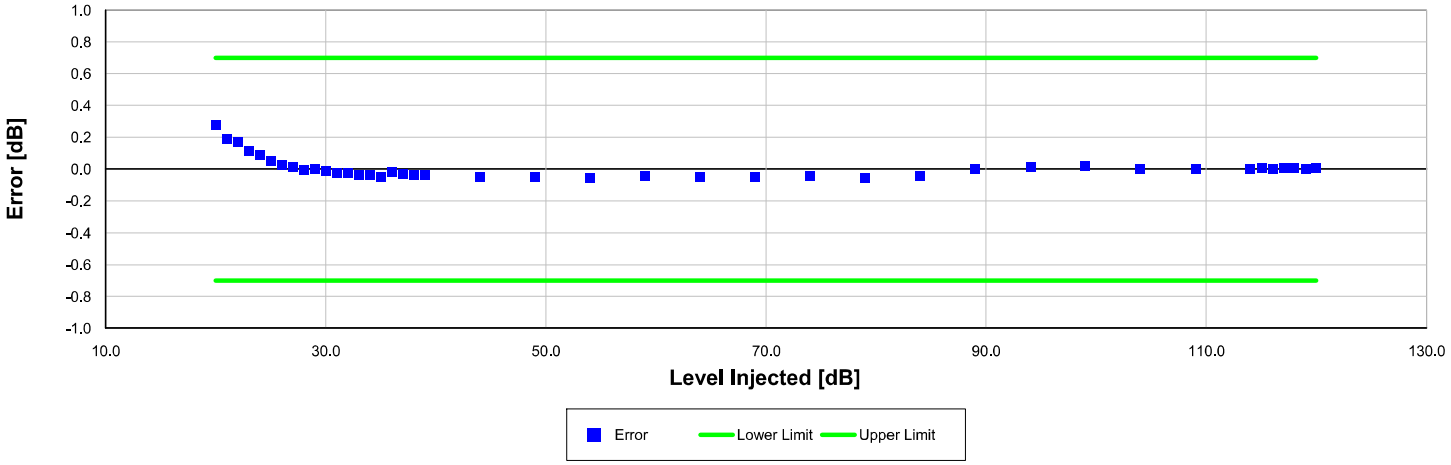
Broadband level linearity performed according to IEC 61672-3:2013 16 and ANSI S1.4-2014 Part 3: 16 for compliance to IEC 61672-1:2013 5.6, IEC 60804:2000 6.2, IEC 61252:2002 8, ANSI S1.4 (R2006) 6.9, ANSI S1.4-2014 Part 1: 5.6, ANSI S1.43 (R2007) 6.2

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
21.00	0.40	-0.70	0.70	0.16	Pass
22.00	0.26	-0.70	0.70	0.16	Pass
23.00	0.18	-0.70	0.70	0.16	Pass
24.00	0.17	-0.70	0.70	0.16	Pass
25.00	0.13	-0.70	0.70	0.16	Pass
26.00	0.08	-0.70	0.70	0.16	Pass
27.00	0.06	-0.70	0.70	0.16	Pass
28.00	0.04	-0.70	0.70	0.16	Pass
29.00	0.01	-0.70	0.70	0.18	Pass
30.00	0.00	-0.70	0.70	0.17	Pass
31.00	0.00	-0.70	0.70	0.17	Pass
32.00	-0.01	-0.70	0.70	0.17	Pass
33.00	-0.02	-0.70	0.70	0.16	Pass
34.00	-0.03	-0.70	0.70	0.16	Pass
35.00	-0.04	-0.70	0.70	0.16	Pass
36.00	0.00	-0.70	0.70	0.16	Pass
39.00	-0.03	-0.70	0.70	0.16	Pass
44.00	-0.04	-0.70	0.70	0.16	Pass
49.00	-0.04	-0.70	0.70	0.16	Pass
54.00	-0.05	-0.70	0.70	0.16	Pass
59.00	-0.04	-0.70	0.70	0.16	Pass
64.00	-0.04	-0.70	0.70	0.16	Pass
69.00	-0.04	-0.70	0.70	0.16	Pass
74.00	-0.04	-0.70	0.70	0.16	Pass
79.00	-0.05	-0.70	0.70	0.16	Pass
84.00	-0.04	-0.70	0.70	0.16	Pass
89.00	-0.04	-0.70	0.70	0.16	Pass
94.00	-0.04	-0.70	0.70	0.16	Pass
99.00	-0.04	-0.70	0.70	0.16	Pass
104.00	-0.06	-0.70	0.70	0.15	Pass
109.00	-0.01	-0.70	0.70	0.15	Pass
114.00	0.00	-0.70	0.70	0.15	Pass
119.00	-0.01	-0.70	0.70	0.15	Pass
124.00	0.00	-0.70	0.70	0.15	Pass
129.00	0.01	-0.70	0.70	0.15	Pass
134.00	0.01	-0.70	0.70	0.15	Pass

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
135.00	0.01	-0.70	0.70	0.15	Pass
136.00	0.01	-0.70	0.70	0.15	Pass
137.00	0.02	-0.70	0.70	0.15	Pass
138.00	0.02	-0.70	0.70	0.15	Pass
139.00	0.02	-0.70	0.70	0.15	Pass
140.00	0.02	-0.70	0.70	0.15	Pass

-- End of measurement results--

A-weighted 20 dB Gain Broadband Log Linearity: 8,000.00 Hz



Broadband level linearity performed according to IEC 61672-3:2013 16 and ANSI S1.4-2014 Part 3: 16 for compliance to IEC 61672-1:2013 5.6, IEC 60804:2000 6.2, IEC 61252:2002 8, ANSI S1.4 (R2006) 6.9, ANSI S1.4-2014 Part 1: 5.6, ANSI S1.43 (R2007) 6.2

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
20.00	0.28	-0.70	0.70	0.17	Pass
21.00	0.19	-0.70	0.70	0.16	Pass
22.00	0.17	-0.70	0.70	0.16	Pass
23.00	0.11	-0.70	0.70	0.16	Pass
24.00	0.09	-0.70	0.70	0.16	Pass
25.00	0.05	-0.70	0.70	0.16	Pass
26.00	0.03	-0.70	0.70	0.19	Pass
27.00	0.02	-0.70	0.70	0.18	Pass
28.00	0.00	-0.70	0.70	0.19	Pass
29.00	0.00	-0.70	0.70	0.18	Pass
30.00	-0.01	-0.70	0.70	0.17	Pass
31.00	-0.02	-0.70	0.70	0.17	Pass
32.00	-0.02	-0.70	0.70	0.17	Pass
33.00	-0.04	-0.70	0.70	0.16	Pass
34.00	-0.03	-0.70	0.70	0.16	Pass
35.00	-0.05	-0.70	0.70	0.16	Pass
36.00	-0.02	-0.70	0.70	0.16	Pass
37.00	-0.03	-0.70	0.70	0.16	Pass
38.00	-0.04	-0.70	0.70	0.16	Pass
39.00	-0.03	-0.70	0.70	0.16	Pass
44.00	-0.05	-0.70	0.70	0.16	Pass
49.00	-0.05	-0.70	0.70	0.16	Pass
54.00	-0.06	-0.70	0.70	0.16	Pass
59.00	-0.04	-0.70	0.70	0.16	Pass
64.00	-0.05	-0.70	0.70	0.16	Pass
69.00	-0.05	-0.70	0.70	0.16	Pass
74.00	-0.04	-0.70	0.70	0.16	Pass
79.00	-0.05	-0.70	0.70	0.16	Pass
84.00	-0.04	-0.70	0.70	0.16	Pass
89.00	0.00	-0.70	0.70	0.16	Pass
94.00	0.02	-0.70	0.70	0.16	Pass
99.00	0.02	-0.70	0.70	0.16	Pass
104.00	0.00	-0.70	0.70	0.15	Pass
109.00	0.00	-0.70	0.70	0.15	Pass
114.00	0.00	-0.70	0.70	0.15	Pass
115.00	0.01	-0.70	0.70	0.15	Pass

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
116.00	0.00	-0.70	0.70	0.15	Pass
117.00	0.01	-0.70	0.70	0.15	Pass
118.00	0.01	-0.70	0.70	0.15	Pass
119.00	0.00	-0.70	0.70	0.15	Pass
120.00	0.01	-0.70	0.70	0.15	Pass

-- End of measurement results--

Peak Rise Time

Peak rise time performed according to IEC 60651:2001 9.4.4 and ANSI S1.4:1983 (R2006) 8.4.4

Amplitude [dB]	Duration [µs]		Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
139.00	40	Negative Pulse	135.71	134.38	136.38	0.15	Pass
		Positive Pulse	135.76	134.42	136.42	0.15	Pass
	30	Negative Pulse	134.72	134.38	136.38	0.15	Pass
		Positive Pulse	134.73	134.42	136.42	0.15	Pass

-- End of measurement results--

Positive Pulse Crest Factor

200 µs pulse tests at 2.0, 12.0, 22.0, 32.0 dB below Overload Limit

Crest Factor measured according to IEC 60651:2001 9.4.2 and ANSI S1.4:1983 (R2006) 8.4.2

Amplitude [dB]	Crest Factor	Test Result [dB]	Limits [dB]	Expanded Uncertainty [dB]	Result
138.00	3	OVLD	± 0.50	0.15 ‡	Pass
	5	OVLD	± 1.00	0.15 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
128.00	3	0.06	± 0.50	0.15 ‡	Pass
	5	0.08	± 1.00	0.15 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
118.00	3	0.04	± 0.50	0.15 ‡	Pass
	5	0.06	± 1.00	0.15 ‡	Pass
	10	0.11	± 1.50	0.15 ‡	Pass
108.00	3	0.04	± 0.50	0.15 ‡	Pass
	5	0.08	± 1.00	0.15 ‡	Pass
	10	0.20	± 1.50	0.15 ‡	Pass

-- End of measurement results--

Negative Pulse Crest Factor

200 µs pulse tests at 2.0, 12.0, 22.0, 32.0 dB below Overload Limit

Crest Factor measured according to IEC 60651:2001 9.4.2 and ANSI S1.4:1983 (R2006) 8.4.2

Amplitude [dB]	Crest Factor	Test Result [dB]	Limits [dB]	Expanded Uncertainty [dB]	Result
138.00	3	OVLD	± 0.50	0.15 ‡	Pass
	5	OVLD	± 1.00	0.15 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
128.00	3	0.03	± 0.50	0.15 ‡	Pass
	5	0.05	± 1.00	0.15 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
118.00	3	0.01	± 0.50	0.15 ‡	Pass
	5	0.02	± 1.00	0.15 ‡	Pass
	10	-0.10	± 1.50	0.15 ‡	Pass
108.00	3	-0.02	± 0.50	0.15 ‡	Pass
	5	0.04	± 1.00	0.15 ‡	Pass
	10	-0.02	± 1.50	0.16 ‡	Pass

-- End of measurement results--

Gain

Gain measured according to IEC 61672-3:2013 17.3 and 17.4 and ANSI S1.4-2014 Part 3: 17.3 and 17.4

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
0 dB Gain	93.99	93.92	94.12	0.15	Pass
0 dB Gain, Linearity	28.05	27.32	28.72	0.16	Pass
20 dB Gain	94.03	93.92	94.12	0.15	Pass
20 dB Gain, Linearity	23.11	22.32	23.72	0.16	Pass
OBA High Range	94.02	93.20	94.80	0.15	Pass
OBA Normal Range	94.01	93.92	94.12	0.15	Pass

-- End of measurement results--

Broadband Noise Floor

Self-generated noise measured according to IEC 61672-3:2013 11.2 and ANSI S1.4-2014 Part 3: 11.2

Measurement	Test Result [dB]	Upper limit [dB]	Result
A-weight Noise Floor	7.02	9.00	Pass
C-weight Noise Floor	12.29	15.00	Pass
Z-weight Noise Floor	21.77	25.00	Pass

-- End of measurement results--

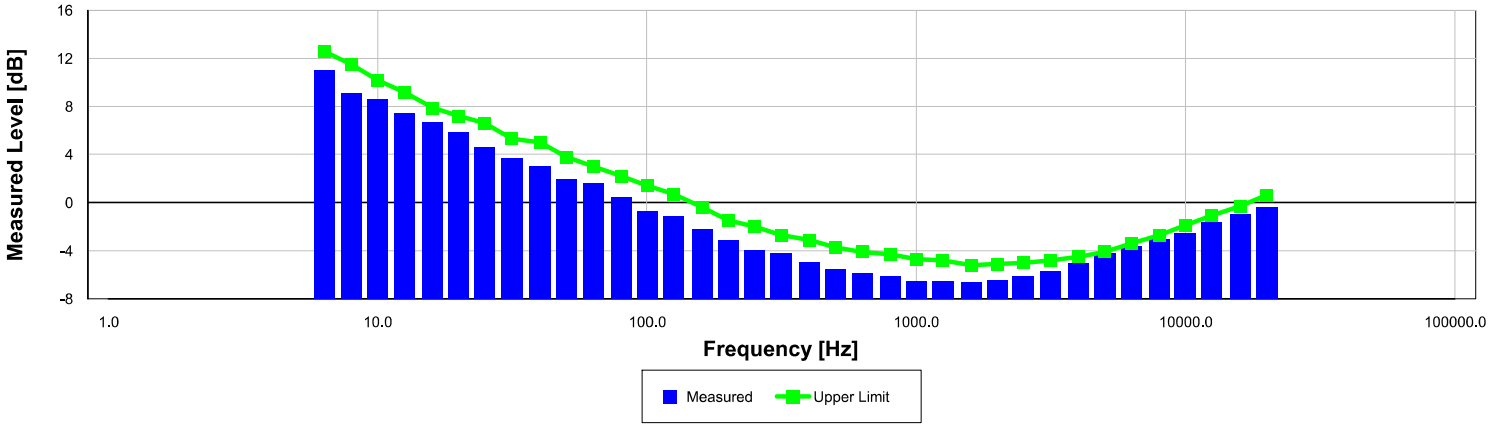
Total Harmonic Distortion

Measured using 1/3-Octave filters

Measurement	Test Result [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
10 Hz Signal	137.42	137.20	138.80	0.15	Pass
THD	-75.38		-60.00	1.30 ‡	Pass
THD+N	-74.48		-60.00	1.30 ‡	Pass

-- End of measurement results--

1/3-Octave Self-Generated Noise



The SLM is set to normal range and 20 dB gain.

Frequency [Hz]	Test Result [dB]	Upper limit [dB]	Result
6.30	11.01	12.60	Pass
8.00	9.10	11.50	Pass
10.00	8.59	10.20	Pass
12.50	7.45	9.20	Pass
16.00	6.73	7.90	Pass
20.00	5.84	7.20	Pass
25.00	4.64	6.60	Pass
31.50	3.71	5.30	Pass
40.00	2.99	5.00	Pass
50.00	1.98	3.80	Pass
63.00	1.60	3.00	Pass
80.00	0.43	2.20	Pass
100.00	-0.71	1.40	Pass
125.00	-1.12	0.70	Pass
160.00	-2.24	-0.40	Pass
200.00	-3.10	-1.50	Pass
250.00	-3.94	-2.00	Pass
315.00	-4.25	-2.70	Pass
400.00	-4.95	-3.10	Pass
500.00	-5.51	-3.70	Pass
630.00	-5.89	-4.10	Pass
800.00	-6.14	-4.30	Pass
1,000.00	-6.54	-4.70	Pass
1,250.00	-6.50	-4.80	Pass
1,600.00	-6.57	-5.20	Pass
2,000.00	-6.48	-5.10	Pass
2,500.00	-6.17	-5.00	Pass
3,150.00	-5.74	-4.80	Pass
4,000.00	-5.01	-4.50	Pass
5,000.00	-4.18	-4.10	Pass
6,300.00	-3.59	-3.40	Pass
8,000.00	-3.08	-2.70	Pass
10,000.00	-2.52	-1.90	Pass
12,500.00	-1.65	-1.10	Pass
16,000.00	-0.95	-0.30	Pass
20,000.00	-0.35	0.60	Pass

-- End of measurement results--

-- End of Report--

Signatory: Ron Harris

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ACCREDITED Cert. #3622.01

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