



# United States Department of the Interior

FISH AND WILDLIFE SERVICE  
San Francisco Bay National Wildlife Refuge Complex  
1 Marshlands Road  
Fremont, California 94555



Helen M. Goulde  
Acting Director, Office of Protected Resources  
National Marine Fisheries Service (NMFS)  
1315 East-West Highway  
Silver Spring, MD 20910-3226

August 5, 2013

Dear Ms. Goulde

Please find enclosed a summary report of pinniped takes from the Incidental Harassment Authorization (IHA) issued to the USFWS from November 7, 2012 through November 6, 2013. This IHA covers pinniped disturbances associated with a bird mitigation research trial conducted on the Farallon National Wildlife Refuge from November 29, 2012 to December 12, 2012. Additional details of pinniped related aspects of this study will be discussed in the Draft Environmental Impact Statement for the proposed house mouse eradication and a future report to the Oiled Wildlife Care Network, which helped to fund the project.

Marine mammals species that were impacted by these activities include the California stocks of northern elephant seal (*Mirounga angustirostris*), harbor seal (*Phoca vitulina richardii*), Steller sea lion (*Eumetopias jubatus*), Northern Fur Seal (*Callorhinus ursinus*) and California sea lion (*Zalophus californianus*).

We observed less than permitted take for all species, and no stampede takes, animal injuries, or death occurred. The Federal Register notice for this permit (RIN 0648-XC139) listed the allowable take for each species by number of individuals and clearly stated that "Pinnipeds may be disturbed as much as twice per day for the duration of the trial." However, raw data collection counted only the number of takes, as tracking individuals was not possible. In order to convert our data of total pinniped takes into number of individuals disturbed, we assumed that 50% of pinnipeds disturbed of each species were disturbed at least twice over the duration of the trial.. The same logic follows if 25% of individual pinnipeds were disturbed 4 times. This is a likely a very conservative estimate. For example, let us examine our results for California Sea Lion, the most numerous species in abundance. Over 14 days of operations, we recorded 128 take events in only 16 island areas (Appendix 3,4). Our permit allowed for each individual to be disturbed twice per day for the duration of the trial, in this case for California sea lions that equates to 28 times. Therefore, we feel that our assumption that 50% of the "raw takes" observed were animals which were disturbed twice, and the other 50% of takes were from unique animals is very robust, and that if our results are biased we may be overestimating take to individuals as opposed to underestimating it.

Table 1 summarizes total allowed and total actual take numbers of individuals by species for the



duration of the trial. Table 2 summarizes daily and total raw take numbers by species for the duration of the trial, adjusted take based on estimates described above, and total non-hazing related takes. Appendix 1 lists data on raw numbers of pinniped takes during active hazing. Appendix 2 lists data of raw numbers of pinniped takes not from active hazing, Appendix 3 details data documentation for the first 2 appendices, explaining codes used for island areas, Appendix 4 is a map, and Appendix 5 lists codes for various treatments and activities.

Thank you for all of your assistance. Please contact me at (510)792-0222, x222 or [gerry\\_mcchesney@fws.gov](mailto:gerry_mcchesney@fws.gov) if you have any questions.

Sincerely,

A handwritten signature in black ink, appearing to read "Gerry McChesney". The signature is fluid and cursive, with the first name "Gerry" and last name "McChesney" clearly distinguishable.

Gerry McChesney  
Manager, Farallon National Wildlife Refuge

cc: Monica DeAngelis  
Michael Payne  
Michelle MagglioCCA  
Russ Bradley, Point Blue Conservation Science  
Gabrielle Feldman, Island Conservation

**Table 1.** Total incidental take allowed by IHA permit and actual incidental take of five pinniped species during the Farallon Islands bird mitigation research trial, November 29 – December 12, 2012.

<b>Species</b>	<b>Permitted Take (individuals)</b>	<b>Actual Take (individuals)</b>
Northern Elephant Seal (Mir)	1,312	68
Harbor Seal (Pho)	324	70
Steller Sea Lion (Eum)	224	145
California Sea Lion (Zal)	14,152	10,768
Northern Fur Seal (Cal)	436	34

**Table 2.** Daily raw numbers, raw total, adjusted total, and total non-hazing related incidental take of all five pinniped species disturbed on the Farallon Islands November 29 – December 12, 2012. Non-hazing take is a subset to raw total and only includes total take for activities not caused by bird hazing methods, but from movement of personnel and equipment. Adjusted total was converted from the raw total into an estimate of number of individuals affected, assuming that 50% of pinnipeds were disturbed twice during the trial.

<b>Date</b>	<b># Mir</b>	<b># Pho</b>	<b># Eum</b>	<b># Zal</b>	<b>#Cal</b>
11/29	0	0	1	96	0
11/30	0	0	3	440	0
12/01	0	0	0	303	0
12/02	1	4	1	590	0
12/03	1	8	0	0	0
12/04	5	27	5	829	0
12/05	6	0	9	438	0
12/06	10	5	26	2401	0
12/07	0	6	13	1526	0
12/08	3	27	26	3043	35
12/09	4	5	92	3549	0
12/10	9	10	37	2146	33
12/11	52	0	12	630	0
12/12	15	0	1	391	0
<b>Raw Total</b>	<b>135</b>	<b>140</b>	<b>289</b>	<b>21,535</b>	<b>68</b>
<b>Adj. Total</b>	<b>68</b>	<b>70</b>	<b>145</b>	<b>10,768</b>	<b>34</b>
Raw Non-hazing	30	49	63	5155	0

**Appendix 1.** Raw take of five pinniped species, listed by treatment type, resulting from tests conducted during the bird mitigation research trial on the Farallon National Wildlife Refuge (November 29 – December 12, 2012). Mitigation tests had up to three treatment types (T1, T2, and T3). Area codes are shown in Appendices 3 and 4, and treatment codes are listed in Appendix 5. Pinnipeds are: Northern Elephant Seal (Mir), Harbor Seal (Pho), Steller Sea Lion (Eum), California Sea Lion (Zal), and Northern Fur Seal (Cal). Disturbances from the trial treatments are separated by animals that were alerted (Alert), moved greater than one meter (Move), or were flushed to the water (Flush).

Day	Time	Area	T1	T2	T3	Mir Alert	Mir_ Move	Mir Flush	Pho Alert	Pho Move	Pho Flush	Eum Alert	Eum Move	Eum Flush	Zal Alert	Zal Move	Zal Flush	Cal Alert	Cal Move	Cal Flush
1129	705	ap	kt	.	.	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0
1129	646	mf	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1129	709	mb	bg	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1129	720	ap	zon	.	.	0	0	0	0	0	0	0	0	1	35	18	35	0	0	0
1129	724	mf	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1129	726	mb	bg	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1129	741	mf	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1129	748	mb	bg	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1129	806	mb	bg	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1129	811	mb	bg	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1129	815	mf	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1129	833	mf	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1129	837	mb	hum	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1129	845	mb	wail	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1129	850	mf	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1129	908	mf	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1129	914	mb	wail	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1129	925	mf	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1129	927	mb	wail	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1129	943	mf	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1129	948	mb	zon	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1129	1001	mf	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1129	1620	mf	wail	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1129	1624	mf	wail	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix 1 (con't).

Day	Time	Area	T1	T2	T3	Mir Alert	Mir_ Move	Mir Flush	Pho Alert	Pho Move	Pho Flush	Eum Alert	Eum Move	Eum Flush	Zal Alert	Zal Move	Zal Flush	Cal Alert	Cal Move	Cal Flush
1129	1630	sl/isl/ap	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1129	1645	sl/isl/ap	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1129	1654	mb	zon	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1130	713	ap	bga	.	.	0	0	0	0	0	0	0	0	0	71	18	9	0	0	0
1130	713	isl	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1130	723	ap	bga	.	.	0	0	0	0	0	0	0	0	0	35	6	0	0	0	0
1130	723	isl	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1130	727	mb	lrاد	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1130	735	mb	lrاد	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1130	750	mf	wail	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1130	757	mf	wail	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1130	801	mb	lrاد	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1130	824	ap	lrاد	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1130	824	isl	lrاد	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1130	835	ap	lrاد	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1130	835	isl	lrاد	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1130	1548	mf	wail	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1130	1555	mb	bga	.	.	0	0	0	0	0	0	0	0	0	46	92	15	0	0	0
1130	1607	mf	wail	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1130	1626	ap	lrاد	.	.	0	0	0	0	0	0	1	2	0	33	67	50	0	0	0
1130	1626	isl	lrاد	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1130	1626	sl	lrاد	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1201	1052	mb	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1201	1349	ap	kt	.	.	0	0	0	0	0	0	0	0	0	63	63	0	0	0	0
1201	1349	isl	kt	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1201	1349	sl	kt	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1201	1406	wsp	lrاد	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1201	1406	mtf	lrاد	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix 1 (con't).

Day	Time	Area	T1	T2	T3	Mir Alert	Mir_ Move	Mir Flush	Pho Alert	Pho Move	Pho Flush	Eum Alert	Eum Move	Eum Flush	Zal Alert	Zal Move	Zal Flush	Cal Alert	Cal Move	Cal Flush
1201	1426	mf	kt	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1201	1522	ap	bg	.	.	0	0	0	0	0	0	0	0	0	26	0	26	0	0	0
1201	1522	isl	bg	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1201	1522	sl	bg	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1201	1531	ap	zon	.	.	0	0	0	0	0	0	0	0	0	50	25	50	0	0	0
1201	1531	isl	zon	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1201	1531	sl	zon	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1201	1617	ap	las	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1201	1623	isl	las	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1202	1127	ap	bgm	.	.	0	0	0	0	0	0	0	0	0	11	0	0	0	0	0
1202	1127	isl	bgm	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1202	1127	sl	bgm	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1202	1206	ap	pyro	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1202	1206	isl	pyro	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1202	1206	sl	pyro	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1202	1206	nl	pyro	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1202	1206	slc	pyro	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1202	1216	ap	pyro	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1202	1216	isl	pyro	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1202	1216	sl	pyro	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1202	1216	nl	pyro	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1202	1216	slc	pyro	.	.	0	0	0	0	0	0	0	0	0	0	213	0	0	0	0
1202	1237	ap	pyro	.	.	0	0	0	0	0	0	1	0	0	138	0	28	0	0	0
1202	1237	isl	pyro	.	.	0	0	0	0	0	0	0	0	0	4	1	0	0	0	0
1202	1237	sl	pyro	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1202	1237	nl	pyro	.	.	0	0	0	0	0	0	0	0	0	0	31	52	0	0	0
1202	1237	slc	pyro	.	.	0	0	0	0	0	0	0	0	0	90	0	0	0	0	0
1202	1511	mf	pyro	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix 1 (con't).

Day	Time	Area	T1	T2	T3	Mir Alert	Mir_ Move	Mir Flush	Pho Alert	Pho Move	Pho Flush	Eum Alert	Eum Move	Eum Flush	Zal Alert	Zal Move	Zal Flush	Cal Alert	Cal Move	Cal Flush
1202	1511	mb	pyro	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1202	1522	mf	pyro	.	.	1	0	0	4	0	0	0	0	0	0	0	12	0	0	0
1202	1522	mb	pyro	.	.	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0
1203	742	mf	wail	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1203	829	sl	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1203	829	isl	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1203	829	ap	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1203	1500	mf	my	.	.	0	1	0	8	0	0	0	0	0	0	0	0	0	0	0
1203	1553	isl	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1203	1553	ap	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1203	1606	wsp	lrاد	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1203	1626	sl	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1203	1626	ap	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1203	1626	isl	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1203	1656	isl	bga	las	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1203	1709	weh	las	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1203	1709	sb	las	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1204	716	rc	pyro	.	.	0	0	0	0	0	0	0	0	0	0	105	0	0	0	0
1204	745	pb	pyro	.	.	0	0	0	0	0	0	0	0	0	69	0	0	0	0	0
1204	751	mf	lrاد	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1204	813	stp	lrاد	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1204	813	wsp	lrاد	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1204	815	ap	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1204	815	isl	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1204	815	sl	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1204	815	wsp	lrاد	.	.	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
1204	815	stp	lrاد	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1204	825	pb	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix 1 (con't).

Day	Time	Area	T1	T2	T3	Mir Alert	Mir_ Move	Mir Flush	Pho Alert	Pho Move	Pho Flush	Eum Alert	Eum Move	Eum Flush	Zal Alert	Zal Move	Zal Flush	Cal Alert	Cal Move	Cal Flush
1204	838	rc	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1204	847	rc	pyro	.	.	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0
1204	852	mb	lrad	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1204	857	rc	bga	.	.	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0
1204	914	ap	bga	pyro	.	5	0	0	0	0	0	2	2	0	176	88	88	0	0	0
1204	914	isl	bga	pyro	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1204	914	sl	bga	pyro	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1204	914	nl	bga	pyro	.	0	0	0	4	0	0	0	0	0	6	24	3	0	0	0
1204	957	mf	wail	pyro	.	0	0	0	18	0	5	0	0	0	0	0	0	0	0	0
1204	1022	weh/sb	bga	.	.	0	0	0	0	0	0	0	0	0	0	120	0	0	0	0
1204	1653	ap/isl/sl	bga	pyro	.	0	0	0	0	0	0	0	0	0	20	80	20	0	0	0
1205	1052	sl	bga	.	.	0	0	0	0	0	0	0	0	1	44	0	30	0	0	0
1205	1115	mtf/wsp	lrad	.	.	0	0	0	0	0	0	0	0	0	3	13	0	0	0	0
1205	1158	mf	wail	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1205	1500	ap/isl/sl/ nl	pyro	.	.	6	0	0	0	0	0	4	4	0	194	78	78	0	0	0
1206	801	pb/sb/pc h	helo	.	.	0	0	0	0	0	0	11	0	0	660	220	0	0	0	0
1206	801	rc/ih	helo	.	.	0	0	0	0	0	0	2	0	0	288	24	24	0	0	0
1206	833	mf	wail	.	.	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
1206	850	pb/sb	helo	.	.	0	0	0	0	0	0	0	0	0	61	0	0	0	0	0
1206	916	mb	lrad	.	.	10	0	0	0	0	0	0	0	0	117	47	9	0	0	0
1206	941	mf	wail	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1206	1043	pb	bga	pyro	.	0	0	0	0	0	0	0	0	0	26	128	0	0	0	0
1206	1118	mb	bgm	.	.	0	0	0	0	0	0	0	0	0	0	140	5	0	0	0
1206	1119	mb	bgm	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1206	1137	mb	bgm	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1206	1152	mf	wail	.	.	0	0	0	5	0	0	0	0	0	3	1	0	0	0	0
1206	1246	wsp/rc	bga	pyro	.	0	0	0	0	0	0	0	0	0	0	300	75	0	0	0
1206	1345	slc/ap	lrad	.	.	0	0	0	0	0	0	0	0	0	44	22	0	0	0	0



Appendix 1 (con't).

Day	Time	Area	T1	T2	T3	Mir Alert	Mir_ Move	Mir Flush	Pho Alert	Pho Move	Pho Flush	Eum Alert	Eum Move	Eum Flush	Zal Alert	Zal Move	Zal Flush	Cal Alert	Cal Move	Cal Flush
1206	1354	pb	pyro	.	.	0	0	0	0	0	0	0	0	0	18	18	0	0	0	0
1206	1517	ap/isl/sl/ slc	pyro	.	.	0	0	0	0	0	0	13	0	0	163	8	0	0	0	0
1206	1548	slc	lrad	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1207	752	mb	lrad	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1207	839	sl/isl/ap	lrad	pyro	.	0	0	0	0	0	6	6	0	1	192	144	48	0	0	0
1207	908	wsp/rc	bga	pyro	.	0	0	0	0	0	0	0	0	0	0	228	0	0	0	0
1207	943	ap/isl/sl	bga	.	.	0	0	0	0	0	0	0	0	0	165	55	28	0	0	0
1207	1035	slc/ap/isl /sl	pyro	.	.	0	0	0	0	0	0	2	0	1	134	267	67	0	0	0
1207	1542	spp	lrad	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1207	1604	isl	pyro	.	.	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0
1207	1616	ap/isl/sl	pyro	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1207	1620	isl	pyro	.	.	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0
1207	1622	ap/isl/sl	helo	pyro	.	0	0	0	0	0	0	0	0	0	89	0	0	0	0	0
1207	1654	slc	lrad	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1207	1710	slc/ap/isl	bga	.	.	0	0	0	0	0	0	3	0	0	70	0	0	0	0	0
1208	729	isl/sl	pyro	.	.	0	0	0	4	0	0	0	0	0	16	0	0	0	0	0
1208	753	mb	pyro	.	.	0	0	0	0	0	0	0	0	0	39	0	0	0	0	0
1208	754	ih/rc	bga	pyro	.	0	0	0	0	0	0	0	0	0	79	237	40	0	0	0
1208	755	mb	pyro	.	.	0	0	0	0	0	0	0	0	0	39	39	0	0	0	0
1208	800	mb	lrad	pyro	.	0	0	0	0	0	0	0	0	0	39	39	39	0	0	0
1208	812	isl	pyro	.	.	0	0	0	0	0	0	0	0	0	11	11	0	0	0	0
1208	837	slc	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1208	844	slc	bga	pyro	.	0	0	0	0	0	0	0	0	0	32	0	0	0	0	0
1208	854	slc	pyro	.	.	0	0	0	0	0	0	2	0	0	252	189	63	0	0	0
1208	854	sb	pyro	.	.	0	0	0	0	0	0	0	0	0	90	270	45	0	0	0
1208	.	ih/rc	bga	.	.	0	0	0	0	0	0	0	0	0	320	80	1	19	0	0
1208	934	sr/mf	lrad	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1208	938	sr/mf	pyro	.	.	0	0	0	2	9	4	0	0	0	0	0	0	0	0	0

Appendix 1 (con't).

Day	Time	Area	T1	T2	T3	Mir Alert	Mir_ Move	Mir Flush	Pho Alert	Pho Move	Pho Flush	Eum Alert	Eum Move	Eum Flush	Zal Alert	Zal Move	Zal Flush	Cal Alert	Cal Move	Cal Flush
1208	1554	mf	lrad	hum	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1208	1608	nl/sl/isl	pyro	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1208	1621	sl	helira d	.	.	0	0	0	0	0	0	0	0	0	41	0	0	0	0	0
1208	1625	sl	pyro	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1208	1625	ih	helira d	.	.	0	0	0	0	0	0	0	0	0	186	62	0	13	3	0
1208	1628	sl	helira d	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1208	1634	pb/sb	helira d	.	.	0	0	0	0	0	0	0	0	0	65	0	0	0	0	0
1208	1644	isl/sl	pyro	.	.	3	0	0	8	0	0	23	2	0	533	82	41	0	0	0
1208	1715	pb/sb	pyro	.	.	0	0	0	0	0	0	0	0	0	65	0	0	0	0	0
1209	721	rc/ih	pyro	.	.	0	0	0	0	0	0	6	0	0	189	95	32	0	0	0
1209	731	stp	lrad	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1209	745	slc/ap/isl	bga	lrad	.	0	0	0	0	0	0	6	0	0	340	0	0	0	0	0
1209	756	slc/ap/isl	pyro	.	.	0	0	0	0	0	0	3	0	0	136	0	0	0	0	0
1209	759	sl/slc/ap/ isl	helira d	.	.	0	0	0	0	0	0	2	0	0	68	0	0	0	0	0
1209	806	sl/slc/ap/ isl	helira d	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1209	812	sl/slc/ap/ isl	helira d	.	.	0	0	0	0	0	0	2	0	0	34	0	0	0	0	0
1209	832	slc/isl	pyro	.	.	4	0	0	0	0	0	17	7	1	481	111	111	0	0	0
1209	908	sr/mf	pyro	.	.	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0
1209	918	sr/mf/mb	pyro	.	.	0	0	0	0	0	0	0	0	0	23	0	0	0	0	0
1209	953	slc	pyro	.	.	0	0	0	0	0	0	9	0	1	73	44	15	0	0	0
1209	953	ap/isl	pyro	.	.	0	0	0	0	0	0	0	0	0	174	15	15	0	0	0
1209	1025	bp/a/c	pyro	.	.	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0
1209	1341	sr/mf	pyro	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1209	1439	mb	pyro	.	.	0	0	0	0	0	0	0	0	0	371	0	20	0	0	0
1209	1423	isl/sl	bgm	pyro	.	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0
1209	1615	sl/slc/ap/ isl	bga	pyro	.	0	0	0	0	0	0	14	0	0	278	6	6	0	0	0

Appendix 1 (con't).

Day	Time	Area	T1	T2	T3	Mir Alert	Mir_ Move	Mir Flush	Pho Alert	Pho Move	Pho Flush	Eum Alert	Eum Move	Eum Flush	Zal Alert	Zal Move	Zal Flush	Cal Alert	Cal Move	Cal Flush
1209	1630	sl/slc/ap/ isl	pyro	helir ad	.	0	0	0	0	0	0	14	3	8	348	58	116	0	0	0
1209	1633	pb/sb	helira d	.	.	0	0	0	0	0	0	0	0	0	10	3	0	0	0	0
1209	1643	sb	helira d	las	.	0	0	0	0	0	0	0	0	0	210	70	0	0	0	0
1210	734	slc/ap	las	pyro	hel o	0	0	0	0	0	0	0	0	3	96	96	32	0	0	0
1210	751	ih	helira d	.	.	0	0	0	0	0	0	0	0	0	66	22	0	13	0	0
1210	753	sl/ap/nl	pyro	.	.	0	0	0	0	0	1	0	0	0	24	36	36	0	0	0
1210	802	ih	pyro	helir ad	.	0	0	0	0	0	0	5	0	0	109	186	16	20	0	0
1210	814	ap	bga	pyro	.	0	0	0	0	0	0	0	0	0	52	0	65	0	0	0
1210	822	ap/sl	bga	pyro	.	0	0	0	0	0	0	0	0	0	10	0	3	0	0	0
1210	825	ph	pyro	.	.	0	0	0	0	0	0	0	0	0	43	17	0	0	0	0
1210	845	ih	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1210	845	mb	lrad	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1210	907	ap/slc	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1210	923	sr/mf	pyro	.	.	0	0	2	0	0	3	0	0	0	10	2	21	0	0	0
1210	1003	ih	bga	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1210	1100	sl/ap/isl/ nl	pyro	.	.	0	0	0	0	0	5	2	2	2	225	50	75	0	0	0
1210	1118	sl/ap/isl/ nl	pyro	.	.	0	0	0	0	0	1	4	2	2	144	48	48	0	0	0
1210	1143	slc	pyro	.	.	0	0	0	0	0	0	4	1	1	60	8	8	0	0	0
1210	1147	slc	pyro	.	.	0	0	0	0	0	0	4	0	0	73	15	15	0	0	0
1210	1200	stp	pyro	.	.	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
1210	1304	pb	bgm	pyro	bga	0	0	0	0	0	0	0	0	0	69	99	10	0	0	0
1210	1436	ap/isl	hum	.	.	7	0	0	0	0	0	0	2	4	0	60	60	0	0	0
1210	1603	stp	pyro	.	.	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0
1210	1603	slc	pyro	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1210	1620	sb/weh	helira d	.	.	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0
1210	1627	pb	helira d	.	.	0	0	0	0	0	0	0	0	0	35	70	0	0	0	0

Appendix 1 (con't).

Day	Time	Area	T1	T2	T3	Mir Alert	Mir_ Move	Mir Flush	Pho Alert	Pho Move	Pho Flush	Eum Alert	Eum Move	Eum Flush	Zal Alert	Zal Move	Zal Flush	Cal Alert	Cal Move	Cal Flush
1211	747	stp	pyro	.	.	36	0	0	0	0	0	0	0	0	120	100	80	0	0	0
1211	823	ap/slc	pyro	.	.	16	0	0	0	0	0	4	4	4	95	114	76	0	0	0
1211	1016	stp	lrad	pyro	.	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
1211	1509	slc/stp	pyro	.	.	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
1211	1511	slc/stp	pyro	.	.	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0
1211	1637	stp	pyro	helir ad	pyr o	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
1211	1649	ih	helira d	.	.	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0
1212	751	stp/slc	pyro	.	.	0	0	0	0	0	0	0	0	0	30	45	0	0	0	0
1212	808	wsp/mb	lrad	pyro	.	15	0	0	0	0	0	1	0	0	105	140	70	0	0	0
1212	1527	stp	pyro	.	.	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
<b>Raw</b>	<b>Total</b>					<b>102</b>	<b>1</b>	<b>2</b>	<b>54</b>	<b>9</b>	<b>28</b>	<b>165</b>	<b>31</b>	<b>30</b>	<b>8961</b>	<b>5420</b>	<b>1999</b>	<b>46</b>	<b>22</b>	<b>0</b>

**Appendix 2.** Raw incidental take of five pinniped species during the Farallon Islands bird mitigation research trial that were not associated with hazing treatments. Take of each species is listed by area and source of disturbance. See Appendix 1 for species and disturbance codes and Appendices 3-5 for descriptions of area and source codes.

Day	Time	Area	Source	Mir Alert	Mir Move	Mir Flush	Pho Alert	Pho Move	Pho Flush	Eum Alert	Eum Move	Eum Flush	Zal Alert	Zal Move	Zal Flush	Cal Alert	Cal Move	Cal Flush
1202	1500	mf	hum	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0
1203	1140	mb	helo	0	0	0	0	0	0	0	0	0	32	0	0	0	0	0
1203	1140	wsp	helo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1203	1140	ih	helo	0	0	0	0	0	0	0	0	0	28	56	0	0	0	0
1203	1140	pb	helo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1203	1140	weh	helo	0	0	0	0	0	0	0	0	0	21	0	0	0	0	0
1203	1140	sb	helo	0	0	0	0	0	0	6	4	0	319	96	0	0	0	0
1203	1230	mb	helo	0	0	0	0	0	0	0	0	0	32	0	0	0	0	0
1203	1230	wsp	helo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1203	1230	ih	helo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1203	1230	pb	helo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1203	1230	weh	helo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1203	1230	sb	helo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1203	1439	mf	helo	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0
1206	723	ih	helo	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0
1206	1000	sb	helo	0	0	0	0	0	0	8	0	0	325	65	7	0	0	0
1206	1010	sb	helo	0	0	0	0	0	0	8	0	0	323	32	0	0	0	0
1206	1200	mf	hum	0	0	0	3	0	25	0	0	0	2	0	3	0	0	0
1207	815	slc	hum	0	0	0	0	0	0	0	3	0	0	90	0	0	0	0
1207	1325	mb/fr/ wsp	hum	19	0	0	0	0	0	0	0	0	35	142	35	0	0	0
1207	1433	mb/fr/ wsp	hum	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1207	1536	rc	hum	0	0	0	0	0	0	0	0	0	25	375	50	0	0	0
1208	1435	sb/ih	helo	0	0	0	0	0	0	0	0	0	450	200	50	0	0	0
1209	1530	sb/ih	helo	0	0	0	0	0	0	3	4	0	170	300	10	0	0	0
1210	718	slc	helira	0	0	0	0	0	0	0	0	0	0	0	30	0	0	0

Appendix 2 (con't).

Day	Time	Area	Source	Mir Alert	Mir Move	Mir Flush	Pho Alert	Pho Move	Pho Flush	Eum Alert	Eum Move	Eum Flush	Zal Alert	Zal Move	Zal Flush	Cal Alert	Cal Move	Cal Flush
			d															
1210	1148	sb	helo	0	0	0	0	0	0	0	10	5	0	420	70	0	0	0
1211	1020	rc	hum	0	0	0	0	0	0	0	0	0	44	154	11	0	0	0
1211	1112	mf	hum	2	0	0	0	0	0	0	0	0	5	10	10	0	0	0
1211	1210	sb	hum	0	0	0	0	0	0	1	2	0	210	280	70	0	0	0
1212	1600	stp	hum	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
1214	1000	ap	hum	0	2	0	0	0	0	0	9	0	0	35	110	0	0	0
1214	1020	ap	hum	1	0	0	0	0	0	0	0	0	86	86	0	0	0	0
1214	1100	mb/ wsp	hum	0	0	0	0	0	0	0	0	0	20	210	0	0	0	0
<b>Raw</b>	<b>Total</b>			<b>28</b>	<b>2</b>	<b>0</b>	<b>14</b>	<b>0</b>	<b>35</b>	<b>26</b>	<b>32</b>	<b>5</b>	<b>2147</b>	<b>2552</b>	<b>456</b>	<b>0</b>	<b>0</b>	<b>0</b>

**Appendix 3.** Descriptions of location (Area) codes used in the bird mitigation research on the Farallon National Wildlife Refuge. See Appendix 4 for map of areas.

<b>COD E</b>	<b>AREA</b>	<b>NOTES</b>
<b>a</b>	Gull Plot A	Includes everything from Queen's Bath to Murre Blind on South side of Shubrick
<b>ap</b>	Aulon Peninsula	Includes Dead Sea Lion Flat
<b>b</b>	Gull Plot B	Includes the catchment pad, slope behind catchment pad to old wooden beams and SE face of LHH
<b>bp</b>	Blowhole Peninsula	All of Blowhole Peninsula from the top (NW end) of Garbage Gulch to the end by East Landing
<b>c</b>	Gull Plot C	Includes Cistern and area SE of trail to Murre Blind out to the top (NW) end of Garbage Gulch
<b>cb</b>	Corm Blind	Includes the area below the Corm Blind as well as Cross Channel
<b>cg</b>	Coast Guard	Area between CG House and Power House
<b>cs</b>	Carp Shop	Area bounded by Cart Path, Carp Shop, Heligoland Hill and Garbage Gulch Annex
<b>domes</b>	Domes	Area between lower end of Helo Pad and the NW end of Mussel Flat including the Domes and intertidal area by Stinky Ponds
<b>el</b>	East Landing	Area between the East Landing and Garbage Gulch Annex on the NE side of the Cart Path
<b>e-ter</b>	East Marine Terrace	Eastern portion of the Marine Terrace between the Helo Pad and the top (NW) end of Sea Pigeon Gulch from the Cart Path to the upper extent of the intertidal
<b>ff</b>	Fertilizer Flat	Area includes Fertilizer Flat, the Eastern side of Lighthouse Hill and Tower Point
<b>fr</b>	Falcon's Roost	Small hill at the Eastern end of Weather Service Peninsula
<b>he</b>	Heligoland	Area between Heligoland Hill and the boardwalk that runs from the Power House to the Catchment Pad south to the Cart Path
<b>helo</b>	Helicopter Pad	Concrete Pad SW of Power House
<b>hs</b>	House	Area around PRBO and Coast Guard Houses from Cart Path to rock wall/catacombes behind houses
<b>ih</b>	Indian Head	On West End Island including Indian Head, Indian Head Beach and the area above Indian Head Beach
<b>isl</b>	Islets	All the smaller islets on the North side of SEFI including Chocolate Chip, Finger Rock, Arch Rock, Aulon Islet and Sea Lion Islet
<b>k</b>	Gull Plot K	Everything above the old lower pathway to NL between the Corm Blind and the Gap including West face of LLHH
<b>lhh</b>	Lighthouse Hill	For this study, LHH is just the SW face where the trail ascends from the houses to the top
<b>llhh</b>	Little Lighthouse Hill	The South and SW faces of Little Lighthouse Hill

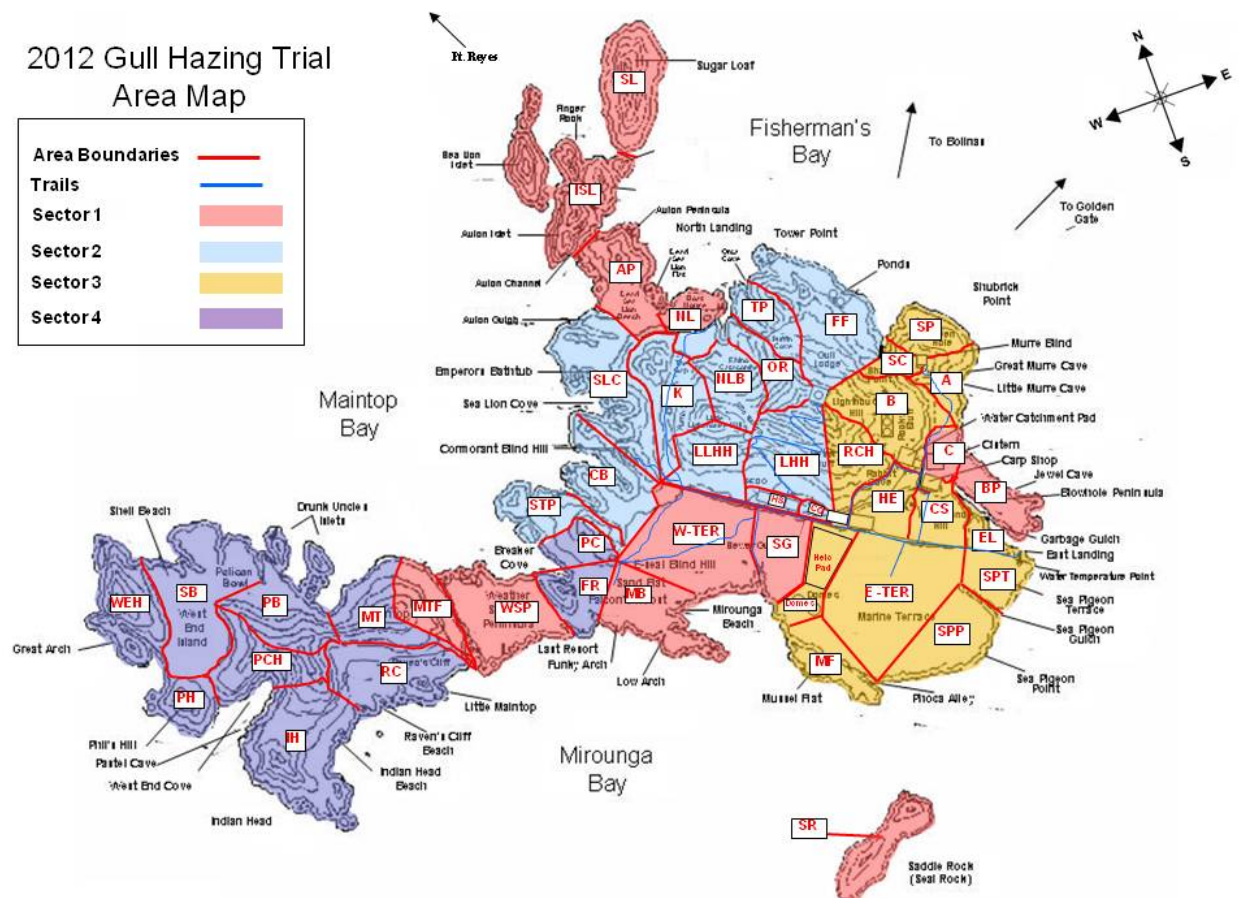
<b>COD E</b>	<b>AREA</b>	<b>NOTES</b>
<b>mb</b>	Mirounga Beach	The greater Mirounga Beach area where E-seals breed, including Sand Flat and Low Arch and Marint Terrace up to the E-seal Blind
<b>mf</b>	Mussel Flat	Mussel Flat and the intertidal area below the East Terrace
<b>mt</b>	Maintop	The Western side of Maintop on West End Island
<b>mtf</b>	Maintop Face	The Eastern Face of Maintop on West End Island including Jordan Channel (visible from the Lighthouse)
<b>nl</b>	North Landing	The area between the Gap and North Landing as far West as the Sea Lion Cove Blind and Habitat Sculpture and including the NW face of LLHH
<b>nlb</b>	North Landing Bowl	The area above NL between LLHH and Orca Ridge where the old trail is, includes Egger's House and NE face of LLHH
<b>or</b>	Orca Ridge	NW ridge of LHH opposite the North Landing
<b>pb</b>	Pelican Bowl	On West End Island, the area on the NE side between Maintop and Shell Beach
<b>pc</b>	Pointy Cliff	Pointy Cliff and the area SW of Pointy Cliff to Breaker Cove
<b>pch</b>	Pastel Cave Highlands	On West End Island, the area on the West side above Pastel Cave and West End Cove
<b>phil</b>	Phil's Hill	On West End Island, small Hill on the West side, North of West End Cove
<b>rch</b>	Rabbit Cave Highlands	Southeast Slope of LHH above Rabbit Cave
<b>rc</b>	Raven's Cliff	On West End Island, Southeast Slope of Maintop including Raven's Cliff Beach and Little Maintop
<b>sb</b>	Shell Beach	On West End Island, Expansive flat area on NW side between Pelican Bowl and West End Head
<b>sc</b>	Shubrick Cove	Area between Shubrick Point and Lighthouse Hill, including hill above Shubrick Cove
<b>sg</b>	Sewer Gulch	Area on Marine Terrace in Front of Houses between the SG trail and the Helo Pad
<b>slc</b>	Sea Lion Cove	Area on West side of SEFI between the Corm Blind and Dead Sea Lion Flat, below the old trail to NL
<b>sl</b>	Sugarloaf	Largest of the islets off the North side of SEFI
<b>sp</b>	Shubrick Point	All of Shubrick Point visible from inside the Murre Blind as well as the NE face below the old gun turret
<b>stp</b>	Study Point Peninsula	Peninsula on SEFI, West of Pointy Cliff between XXChannel (Boiler Cove) and Breaker Cove
<b>spp</b>	Sea Pigeon Point	Southeast portion of marine terrace between the end of Sea Pigeon Gulch and Phoca Alley including all intertidal
<b>spt</b>	Sea Pigeon Terrace	Portion of marine terrace between the end of Sea Pigeon Gulch and the Cart Path, east to the intertidal
<b>sr</b>	Saddle Rock	Islet off the SE side of SEFI



Appendix 3 (con't)

<b>COD E</b>	<b>AREA</b>	<b>NOTES</b>
<b>tp</b>	Tower Point	Hill directly across (east) from North Landing
<b>weh</b>	West End Head	On West End Island, farthest West hill side past Shell Beach
<b>wsp</b>	Weather Service Peninsula	Peninsula on SEFI between Falcon's Roost and Jordan Channel
<b>w-ter</b>	West Marine Terrace	Western portion of the Marine Terrace between Sewer Gulch trail and Corm Blind Hill from NL trail to E-seal Blind hill

**Appendix 4.** Map of the South Farallon Islands (Farallon National Wildlife Refuge) showing area delineations used in the bird mitigation research trial. See Appendix 3 for area descriptions.



**Appendix 5.** Treatment and source codes used in the Farallon Islands bird mitigation research trial.

**wail** = Wailer distress caller

**kt** = Kite (stationary)

**zon** = Zon propane cannon

**bg** = BirdGuard Biosonic distress caller

**bga** = BirdGuard Biosonic amplified

**helo** = helicopter

**helirad** = LRAD deployed from the helicopter

**hum** = human

**las** = handheld lasers

**pyro** = pyrotechnics (caps, bangers, screamers, crackers and capa rockets)