

Virginia Capes (VACAPES) Missile Exercise (MISSELEX) Training Event

Marine Species Monitoring

AERIAL MONITORING SURVEYS

TRIP REPORT



13-14 March 2013

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ACRONYMS AND ABBREVIATIONS

BSS	Beaufort sea state
ft	feet/foot
hr	hour(s)
ICMP	Integrated Comprehensive Monitoring Program
VACAPES	Virginia Capes Range Complex
km	kilometer(s)
km ²	square kilometers
MISSELEX	Missile Exercise
m	meter(s)
NM	nautical mile(s)
OPAREA	operating area
SPUE	Sightings Per Unit Effort
U.S.	United States

Section 1 Introduction

Aerial marine species monitoring occurred on 13 and 14 March 2013 off the eastern coast of Virginia for a Missile Exercise (MISSELEX) training event within the Virginia Capes (VACAPES) Range Complex. These types of events occur periodically throughout the year and allow the United States (U.S.) Navy to fulfill essential training requirements.

As part of the compliance requirements of the Marine Mammal Protection Act of 1972 and the Endangered Species Act of 1973, the U.S. Navy developed the Integrated Comprehensive Monitoring Program (ICMP). The ICMP applies by regulation to those activities on U.S. Navy training ranges and operating areas (OPAREAs) for which the U.S. Navy sought and received incidental take authorizations. In order to support the U.S. Navy in meeting regulatory requirements for monitoring established under the Final Rules and to provide a mechanism to assist with coordination of program objectives under the ICMP, monitoring of marine mammals and sea turtles during this exercise included visual surveys from a fixed-wing aircraft.

The results of marine mammal monitoring reported here are part of a long-term monitoring effort under the U.S. Navy's Marine Species Monitoring Program (Contract # N62470-10-D-3011) issued to HDR.

Section 2 Methods

Study Area and Event Details

The U.S. Navy's VACAPES OPAREA lies off the eastern coast off Virginia and North Carolina. Protected marine species monitoring conducted prior to the MISSELEX training event was planned for the W-72 1A1, 1A2, 1A3, and 1A4 boxes (see **Figure 1**). This area is approximately 33 to 77 kilometers (km) (18 to 42 nautical miles [NM]) offshore, covers an area approximately 1,643 square kilometers (km²) in size, and ranges in bottom depth from 10 to 40 meters (m)). Due to multiple exercises occurring in the primary range boxes of interest and safety concerns with multiple aircraft in the area on 13 March, aerial surveys were conducted south of the primary MISSELEX region in W-72 2A1, 2A2, 2A3, and 2A4 boxes (see **Figure 2**). On 14 March, aerial surveys resumed in the primary MISSELEX 1A1-1A4 boxes (see **Figure 2**). While the planned MISSELEX exercise did not occur on 15 March, an alternative exercise was conducted in the same range boxes during which three Griffin missiles were fired.

Aerial-Based Monitoring

Aerial-based monitoring was conducted prior to the scheduled MISSELEX within the VACAPES Range on 13 and 14 March (see **Figures 1 and 2, Table 1**). Survey methods were consistent with currently accepted Distance Sampling theory (Buckland et al. 2001) and followed a well-established protocol used for aerial surveys throughout all U.S. Navy Range Complexes (Smultea et al. 2009). A survey altitude of approximately 1,000 feet (ft) at 100 knots was maintained while on-effort, but might have varied slightly based on weather conditions in the area. Once a marine mammal sighting was made and basic sighting information was collected,

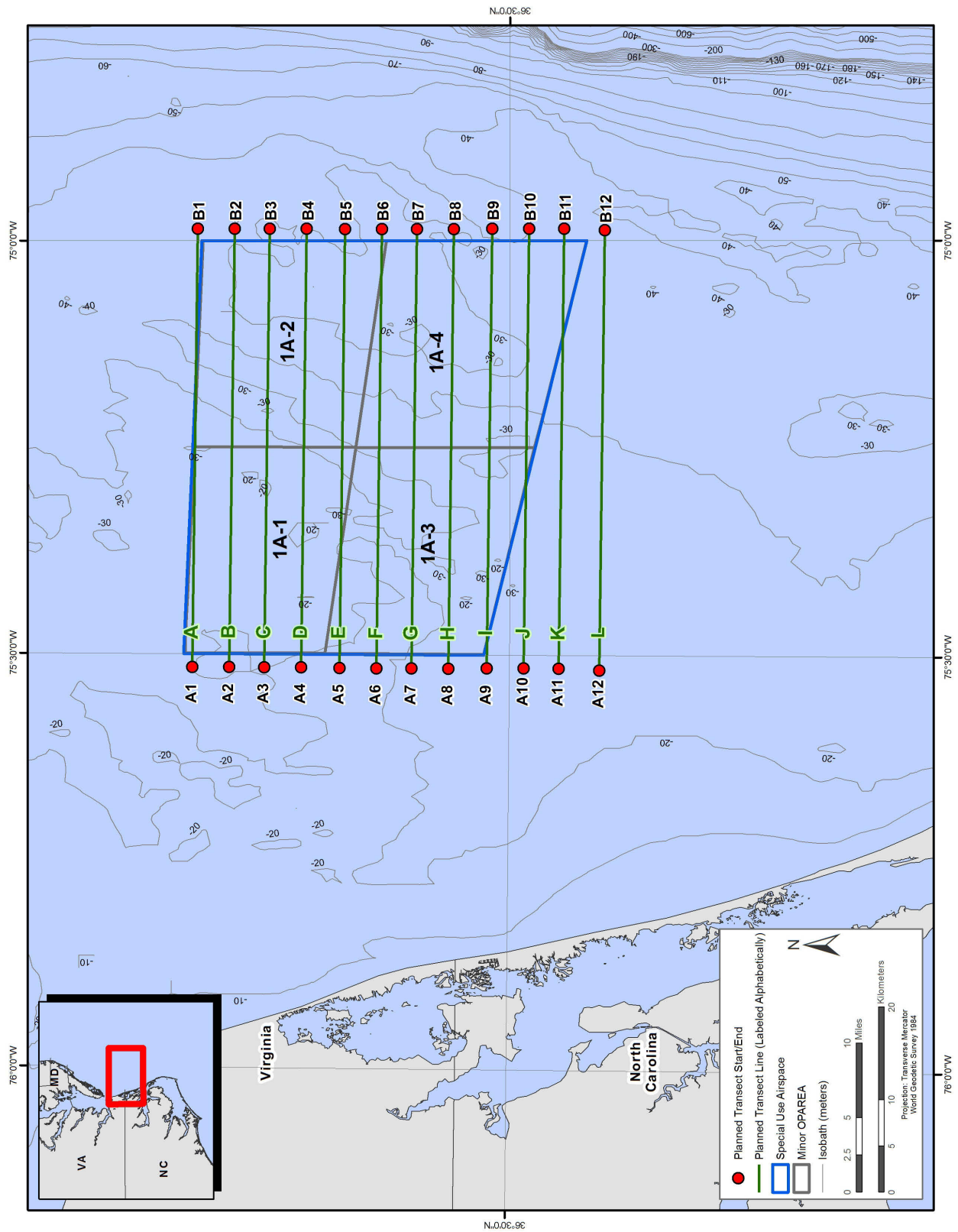


Figure 1. Primary Pre-planned Tracklines for the Survey Effort for VACAPES MISSELEX Monitoring

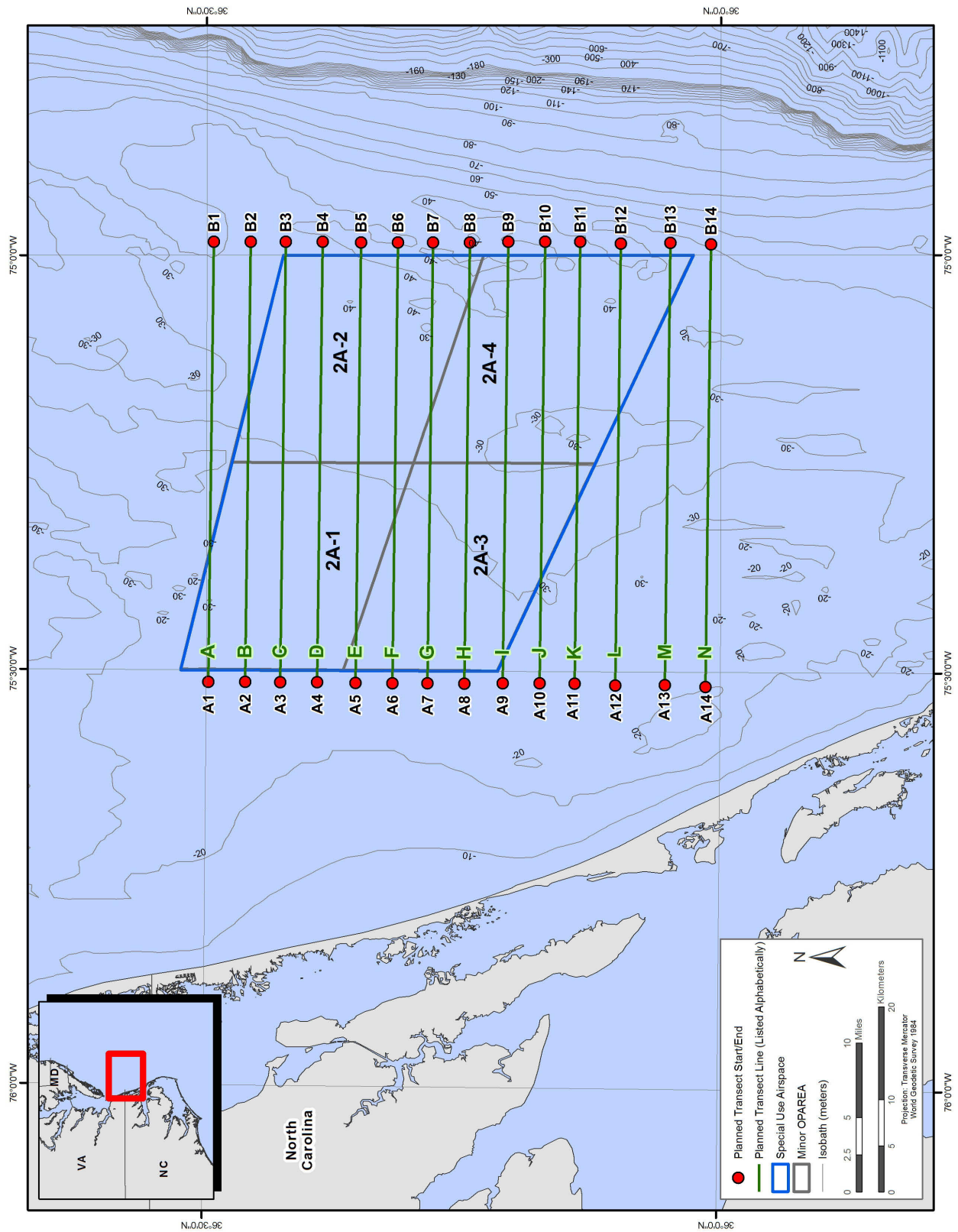


Figure 2. Secondary (Alternate) Pre-planned Tracklines for the Survey Effort for VACAPES MISSELEX Monitoring

Table 1. Summary of Monitoring Effort for VACAPES MISSELEX Training

Date	Description	Start Time	Stop Time	Total Survey (Minutes [*])	Total On-Effort (Minutes)	Trackline On-Effort Distance (km)
13 March	Transect Survey (Pre-Event)	12:36	18:32	264	194	658
14 March	Transect Survey (Pre-Event)	08:15	12:53	228	154	558
Total				492 (≈ 8.2 hr[†])	348 (≈ 5.8 hr)	1,216 km

Note:

* Total Survey Minutes reflect minutes occupied in the range/area of interest and include both on-effort (systematic) and off-effort (cross-legs between transects, and circling for focal follows or species ID) total minutes. Total Survey Minutes may not match the difference between Start Time and Stop Time in the table due to differences in rounding.

[†] hr is defined as hours.

a focal follow session was initiated at 1,000 ft or higher if conditions were appropriate (Smultea et al. 2009; refer to the survey methods on page 6 of this document). When possible, a lower altitude of approximately 700 to 800 ft was established before or after focal-follow sessions for photography purposes to provide sharper images required for species identification.

The observation platform was a Cessna T337H Turbo Skymaster aircraft operating out of Norfolk Airport in Norfolk, Virginia. Two surveys on 13 and 14 March were conducted following pre-planned transect lines and extending approximately 2 km beyond the boundaries of the designated range boxes of interest (see **Figure 1, Table 1**). Each survey was limited to a 5-hour (hr) maximum flight time window.

Both aerial observers (see **Table 2**) were experienced with line-transect survey methodology, had experience in identification of Atlantic marine mammal and sea turtle species, and were knowledgeable of marine mammal biology and behavior.

Table 2. Observers and Roles

Observer	Role(s)
Carter Esch	Chief Scientist/Observer
Lenisa Blair	Observer/Recorder

Survey effort attempted to cover the portion of the area within the VACAPES 1A-1 through 1A-4 range boxes relevant to the MISSELEX event (approximately 1,643 km²). Ten parallel tracklines running from east to west measuring approximately 48 km long and spaced approximately 4 km apart were flown during “systematic” efforts throughout the monitoring period. Based on an effective sampling width of approximately six km (three km distance on each side of the transect line to reliably sight a group of 25 or more dolphins in optimal conditions at an altitude of 305 m), our total survey coverage area was approximately 2,880 km² (see **Figure 1**). Planned lines were followed when possible, but exact transects flown for each survey day were subject to modifications as a result of range exclusion by U.S. Navy exercises in

the area, unfavorable weather conditions on the range, or hourly contact with naval flight operations requiring an increase in the plane's altitude (see **Figure 3, Table 1**). The following describes the general survey approach:

1. Pre-planned transect lines and waypoints were followed using methods described by Smultea et al. (2009) until a marine mammal/sea turtle group was sighted. Standard environmental and oceanographic parameters such as Beaufort sea state (BSS), glare, visibility, and cloud cover were recorded at the start of each transect line as well as when conditions changed during flight.
2. Upon sighting a marine mammal/sea turtle group, basic sighting information was recorded per established protocol (see Smultea et al. 2009). As outlined in the *VACAPES Range Complex Monitoring Plan*, information included: (1) species identification and group size; (2) standard environmental and oceanographic parameters; (3) the behavior of marine mammals and (if encountered) sea turtles; (4) date, time, and visual conditions associated with each observation; (5) direction of travel relative to true North; and (6) duration of the observation.
3. If the sighting appeared suitable for a focal follow, the aircraft increased altitude to approximately 365 to 455 m, and radial distance increased approximately 0.5 to 1.0 km. Then, the aircraft circled the sighting to obtain detailed behavior information as long as possible and logistically feasible. Focal follows occurred for a minimum of 5 minutes. When conditions allowed, high-definition video and digital photographs of the group were also collected.
4. If the sighting was not selected for a focal follow, and species and group size were unknown, the aircraft circled the sighting to obtain digital photographs for species identification confirmation and to estimate group size/composition.

Section 3 Results

Survey Effort

The MISSELEX was scheduled for 15 March, but was cancelled on 14 March due to poor weather conditions predicted for 15 March. Therefore, aerial surveys were confined to pre-event monitoring.

Observers visually surveyed 1,216 km of on-effort trackline and an additional 445 km off-effort (connector lines) during 2 survey days for approximately 5.8 hr of on-effort status (see **Table 1**). Due to restricted airspace limitations related to U.S. Navy activities in the VACAPES Range, the MISSELEX event area (boxes 1A1-1A4) was not able to be surveyed on 13 March 2013 and an alternate site to the south covering range boxes 2A1-2A4 was surveyed instead. No airspace restrictions were in place on 14 March 2013 precluding access to the intended MISSELEX event area, therefore aerial surveys were conducted in range boxes 1A1-1A4 as originally intended. BSS varied from 2 to 3 on 13 March and 4 to 5 on 14 March; sightings were made on 13 March only and in conditions ranging from 2 to 3 (see **Table 3**). **Appendix A** contains a detailed description of environmental, oceanographic, and sighting conditions.

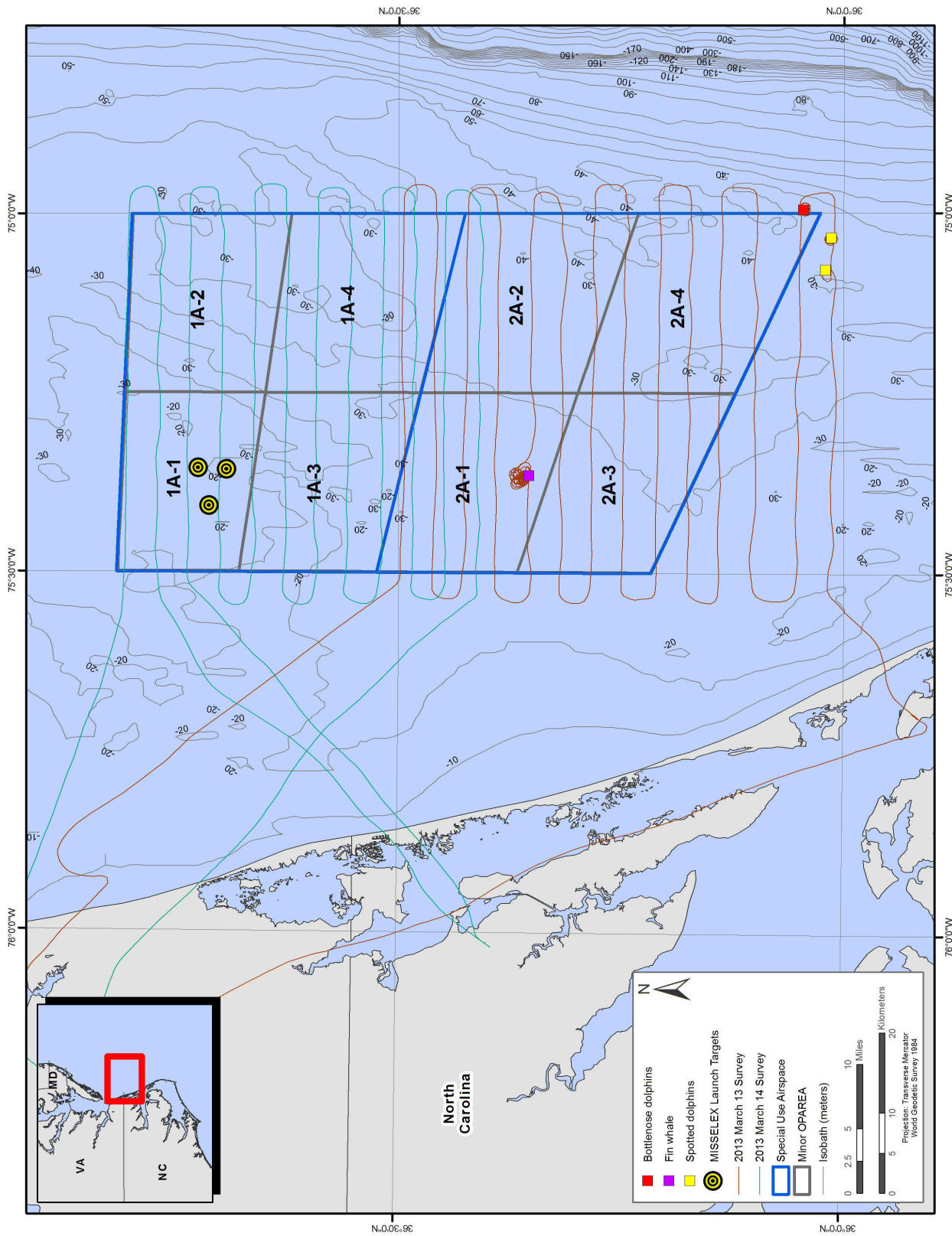


Figure 3. Locations of All Cetacean Sightings Seen Throughout the VACAPES MISSELEX Monitoring Period (13 and 14 March)

Table 3. Summary of Sightings

Sighting No.	Date	Species	Group Size Best/High/Low			Calves	Start Time	Stop Time	BSS	Latitude	Longitude	Vert. Angle	Bearing Angle	Distance Off Track (m)	Heading	Bottom Depth (m)	Photos/Video Taken	Focal Follow	Behavioral Summary
Pre-MISSELEX Sightings – 13 March 2013																			
1	3/13/13	Bp	1	1	1	0	14:04	14:34	2	36.354	-75.364	042	159	480	180	20-30	Yes/No	No	Fin whale repeatedly diving in discrete area (probable feeding). Cloudy water and repeated diving making it difficult to circle for a focal follow. No disturbance detected. Sighting made on-effort. Minimal video collected during circling. No photos collected.
2	3/13/13	Tt	5	7	5	1	16:48	16:53	3	36.045	-74.995	064	274	340	120	30-40	No/No	No	Bottlenose dolphin milling and diving repeatedly. Difficult to circle for a focal follow. No disturbance detected. Sighting made on-effort. No photos collected.
3	3/13/13	Sf	20	23	10	0	16:57	17:06	3	36.014	-75.034	041	332	480	90	30-40	No/No	No	Probable Atlantic spotted dolphins traveling in a consistent direction. Difficult to circle for a focal follow. No disturbance detected. Sighting made on-effort. No photos collected. ID based on body shape and markings viewed through binoculars by experienced observers.

Sighting No.	Date	Species	Group Size Best/High/Low			Calves	Start Time	Stop Time	BSS	Latitude	Longitude	Vert. Angle	Bearing Angle	Distance Off Track (m)	Heading	Bottom Depth (m)	Photos/Video Taken	Focal Follow	Behavioral Summary
4	3/13/13	Sf	15	15	2	3	17:08	17:10	2	36.021	-75.078	046	302	510	90	30-40	No/No	No	Probable Atlantic spotted dolphins traveling quickly in a consistent direction. Difficult to circle for a focal follow. No disturbance detected (i.e. speed of travel did not appear to change from beginning to end of sighting). Sighting made on-effort. No photos collected. ID based on body shape and markings viewed through binoculars by experienced observers.

Key: Bp = Fin whale (*Balaenoptera physalus*); Tt = Bottlenose dolphin (*Tursiops truncatus*); Sf = Atlantic spotted dolphin (*Stenella frontalis*)

Sightings

Four sightings of cetaceans were recorded during approximately 8.2 hr of total survey flight time (includes on-effort and off-effort intervals) within the survey area covering a 2-day period. All sightings were made on 13 March 2013 during the pre-event survey period (see **Figures 4 and 5, Table 3**). Sightings over the 2-day period included one sighting of a fin whale (*Balaenoptera physalus*), one sighting of bottlenose dolphins (*Tursiops truncatus*), and two sightings of probable Atlantic spotted dolphins (*Stenella frontalis*). Identity was based on body shape and markings, as viewed through binoculars by experienced observers. **Table 4** provides a summary of sightings information and bottom depth information. Bottom depths for each sighting were estimated in 10-m ranges from plots of latitude and longitude for each sighting within a Geographic Information System. Due to limitations arising from flight time, glare, altitude, and group dispersal, digital photographs to determine or confirm species identification were not collected for all marine species sighted in the area.

Table 4. Summary of Sightings and Depths Recorded During Monitoring for VACAPES MISSELEX Training

Species	Number of Sightings	Bottom Depths (m)
Fin whale	1	20-30
Bottlenose dolphin	1	30-40
(Probable) Atlantic spotted dolphin	2	30-40

Sightings Per Unit Effort (SPUE)

SPUE was calculated as the total number of sightings divided by total survey on-effort (hr/km/NM). For monitoring conducted on 13 March in BSS ranging from 2 to 3, the SPUE for marine mammals ($n=4$) was equal to 1.25 sightings per hr, 0.006 sightings per km, and 0.003 sightings per NM. For monitoring on 14 March in BSS ranging from 4 to 5, the SPUE for marine mammals ($n=0$) was equal to zero (0) sightings per hour, per km, and per NM. For this 2-day monitoring exercise across two separate locations, the overall SPUE for marine mammals ($n=4$) was equal to 0.689 sightings per hr, 0.003 per km, and 0.001 NM. The SPUE for sea turtles ($n=0$) was equal to zero (0) sightings per hr, per km, and per NM.

Behavior

No visible evidence of unusual behavior was observed during the pre-MISSELEX surveys. The survey team attempted to conduct a focal follow for the fin whale sighted on 13 March 2013, but was unsuccessful given the whale's extensive diving behavior (likely foraging dives) and cloudy water conditions making tracking difficult. The same problematic issues with regards to circling small groups of dolphins for focal follows occurred for both the bottlenose dolphins and two small groups of probable Atlantic spotted dolphins. While attempts to focal follow are always made, they are particularly challenging in a BSS of 2 or more.

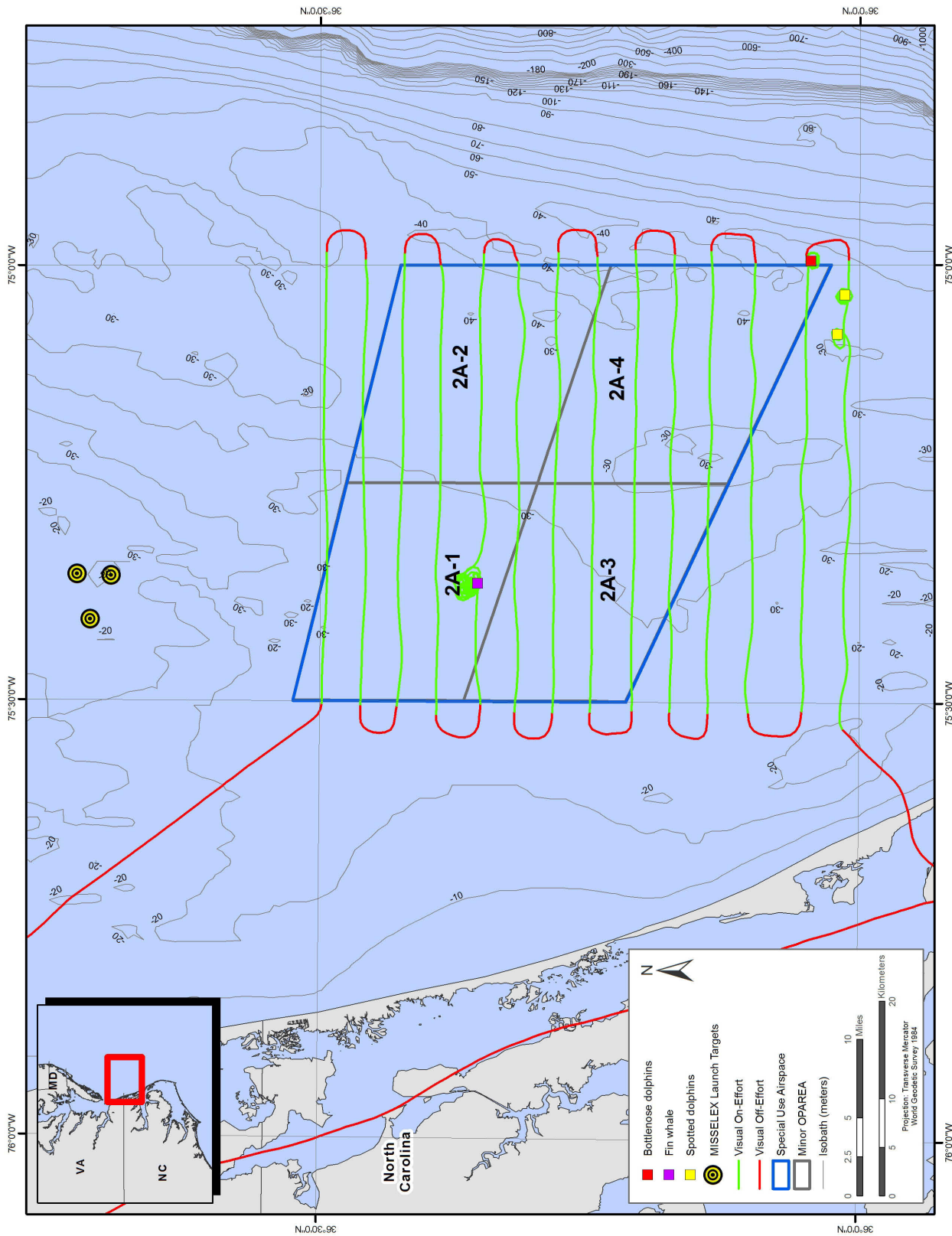


Figure 4. Locations of All Cetacean Sightings Seen Throughout the VACAPES MISSELEX Pre-exercise Monitoring Period (13 March)

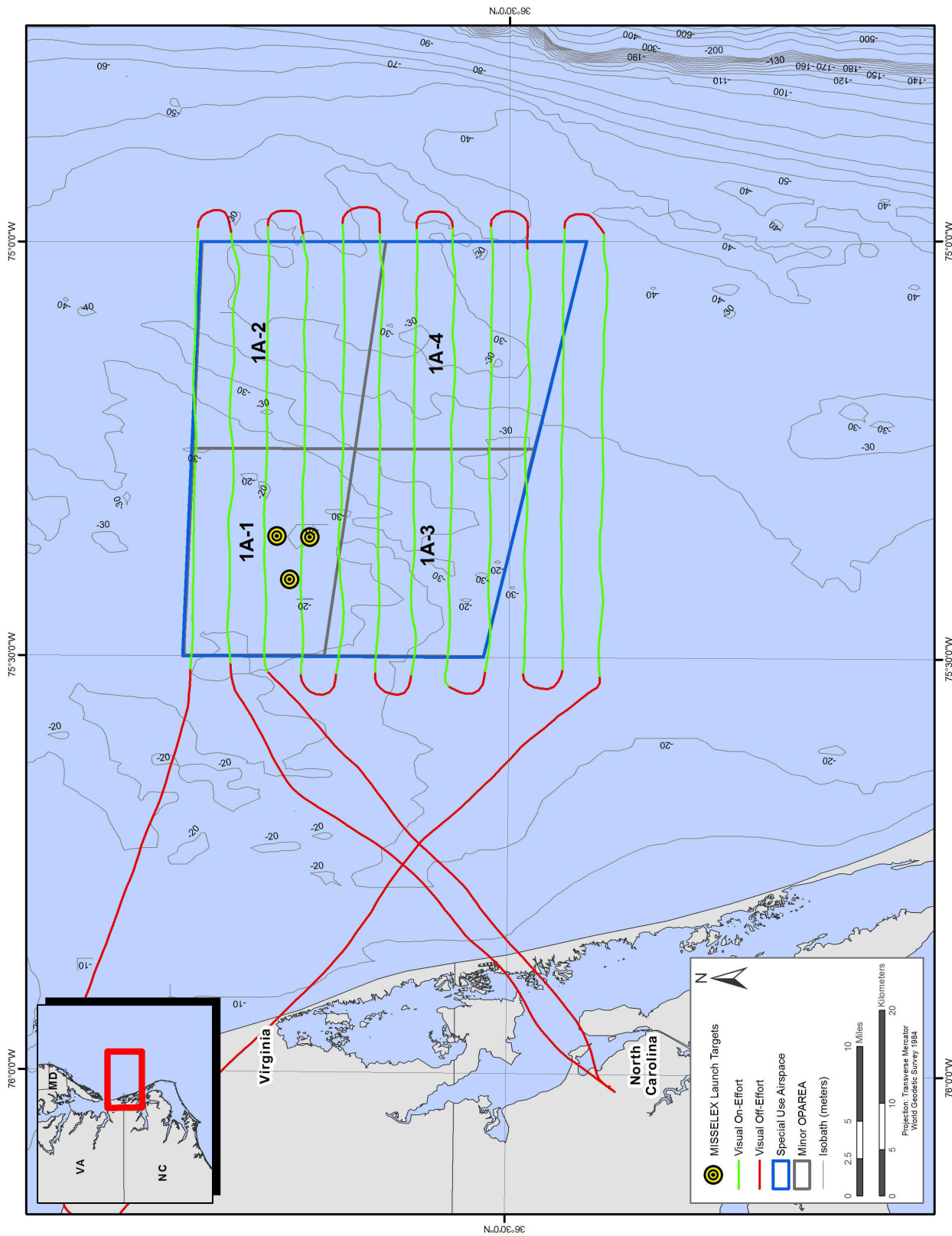


Figure 5. Locations of All Cetacean Sightings Seen Throughout the VACAPES MISSELEX Pre-exercise Monitoring period (14 March)

Section 4 Acknowledgements

We would like to thank Orion Aviation's Director Ed Coffman and pilots Robert Stickle and Sam Garrett. These data were obtained under National Marine Fisheries Service Permit No. 14451 issued to Joseph R. Mobley, Jr.

Section 5 References

- Buckland et al. 2001 Buckland, S.T., D.R. Anderson, K.P. Burnham, J.L. Laake, D.L. Borchers, and L. Thomas. 2001. *Introduction to Distance Sampling: Estimating Abundance of Biological Populations*. Oxford University Press, Oxford, U.K.
- Smultea et al. 2009 Smultea, M.A., J.R. Mobley, Jr., and K. Lomac-MacNair. 2009. *Aerial Survey Monitoring for Marine Mammals and Sea Turtles in Conjunction with US Navy Major Training Events off San Diego, California, 15-21 October and 15-18 November 2008, Final Report*. Prepared by Marine Mammal Research Consultants, Honolulu, HI, and Smultea Environmental Sciences, LLC., Issaquah, WA, under Contract No. N62742-08-P-1936 and N62742-08-P-1938 for NAVFAC Pacific, EV2 Environmental Planning, Pearl Harbor, HI.

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APPENDIX A

Environmental, Oceanographic, and Sighting Conditions

Table A-1 shows the environmental, oceanographic, and sighting conditions encountered throughout the pre-MISSELEX monitoring efforts.

Time	Beaufort Left MMO	Glare Left MMO (%)	Visibility Distance Left MMO (km)	Beaufort Right MMO	Glare Right MMO (%)	Visibility Distance Right MMO (km)	Cloud Cover (%)
Pre-MISSELEX Survey Effort – 13 March 2013							
12:55	2	diffuse	1	3	diffuse	1	50
13:11	3	<50	1	3	diffuse	1.5	40
13:27	2	<10	1	2	>75	1	20
13:43	3	>75	1	3	<50	1.5	20
13:59	2	diffuse	1.5	2	<75	0.75	10
14:32	2	diffuse	2	3	<75	1	10
14:43	3	>75	1.5	3	<10	1.5	10
14:59	2	diffuse	1.5	2	<50	1	10
15:15	2	>75	1.5	3	<10	1.5	10
15:31	2	<10	1.5	2	<50	1	10
15:48	2	>75	1.5	2	<50	1.5	10
16:04	2	diffuse	1.5	2	<50	1	10
16:19	2	>75	1.5	2	<50	1.5	10
16:35	2	diffuse	1	3	<10	1	10
16:50	2	diffuse	1	3	<10	1	10
16:54	2	>75	1.5	2	<50	1.5	10
17:05	2	>75	1.5	2	<50	1.5	10
17:10	2	>75	1.5	2	<50	1.5	10
Pre-MISSELEX Survey Effort – 14 March 2013							
08:41	4	none	1	4	<75	0.5	50
08:56	5	diffuse	1	5	<50	0.5	60
10:04	4	<10	1	4	<75	1	20
10:18	4	<10	1	4	<50	1	30
10:33	4	<10	1	4	<75	1	10
10:48	4	<10	1	5	<50	0.5	10
11:03	4	diffuse	1	4	<75	0.75	5
11:17	5	<10	0.5	4	<50	0.75	5

Time	Beaufort Left MMO	Glare Left MMO (%)	Visibility Distance Left MMO (km)	Beaufort Right MMO	Glare Right MMO (%)	Visibility Distance Right MMO (km)	Cloud Cover (%)
Pre-MISSELEX Survey Effort – 14 March 2013 (continued)							
11:33	4	diffuse	1	4	>75	0.5	5
11:48	5	<10	1	5	<10	0.5	5
12:02	4	<10	1	4	>75	0.5	10
12:16	5	<50	1	3	<50	0.5	10