FLIR Survey of Maternal Polar Bear (*Ursus maritimus*) Denning Habitat

Winter 2017/2018

FINAL

Prepared for:

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Survey Conducted by Fairweather Science, LLC. for ConocoPhillips Alaska, Inc.

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Introduction

Between December 10 and December 17, 2017 ConocoPhillips Alaska, Inc. (CPAI) sponsored Infrared (IR) surveys on the North Slope of Alaska around proposed CPAI activities planned for the winter of 2017/2018. The proposed activities included:

- Routine operations and ice road construction within the Kuparuk River Unit;
- Routine operations and ice road construction within and near the Alpine oil field in the Colville River Unit including the annual resupply ice road connecting Alpine to the Kuparuk oil field;
- GMT1 and GMT2 Development construction activities; and
- An exploration program in the National Petroleum Reserve – Alaska (NPRA).

The IR surveys were conducted to identify potential locations of maternal polar bear dens in accordance protocols developed by the United States Geological Survey (USGS) in 2004. The specific survey areas to be flown were identified by the United Stated Fish and Wildlife Service (USFWS) during a pre-flight meeting on November 16, 2017. This report summarizes the survey results.

Methods

The surveys were conducted using the Shared Services Twin Otter (DHC-6) equipped with a Star SAFIRE® HD 380 FLIR unit. Survey times, crews, and locations are shown in Table 1.

Surveys were flown between 400 and 1,500 feet above ground level depending on weather conditions. The crew used Global Positioning System coordinates, computer mapping software, and visual ground reference to navigate the drainages and bluffs. The survey coordinators interfaced with the pilots and the sensor operator to capture clear images of the target areas. Repeated transects were flown to ensure adequate coverage.

Weather conditions for the surveys are shown on Table 2.

Survey Activities

On December 10th potential denning habitat (drainages, bluffs, and channels conducive to adequate snow drifting) were surveyed in anticipation of winter activities In the Kuparuk and Colville River Delta Areas.

Project areas in the NPR-A and south near Ocean Point were surveyed on December 15 and 17. See Figures 1 and 2.

Results

Heat signatures indicative of polar bear dens were not detected during the CPAI surveys.

Video footage was reviewed as necessary and released to USFWS.

Summary

No polar bear dens were detected near any CPAI planned activity.

IR technology, while a prudent methodology for assessing potential polar bear den locations, may not locate 100% of the dens in the survey area. Work and travel should be done with caution in all areas following the guidelines outlined in *CPAI's Polar Bear Avoidance and Interaction Plan (July, 2017)*. USFWS will advise CPAI of any supplemental findings (e.g. locations of collared bear den locations) once they are obtained.

Discussion

The December 2017 polar bear den detection surveys were hindered by foul weather across the entirety of the slope. Considering all operators' survey areas, it took 18 days to complete 7 individual survey flights due to extreme winds, precipitation, and poor visibility. On December 10th, the weather conditions were not ideal, however they were the best we'd seen in several days so the decision was made to survey. In order to account for the high winds and pockets of precipitation, flights were conducted lower, slower, and images were analyzed with more than usual scrutiny. Judging by our quality of ground contact, and temperature contrast observed of other features (clarity of snow drifts, exposed tundra and ice, etc.) we determined that quality images of denning habitat were obtained and survey confidence was acceptable (See sample images 1 and 2).

It should also be noted that several times over the course of the slopewide surveys den locations of collared grizzly bears were overflown near the Sagavanirktok and Colville Rivers. At first look imagery was inconclusive but video was transferred to the Alaska Department of Fish and Game for further analysis. The ability to

incorporate IR overflights of grizzly dens during polar bear dens surveys should be recognized as an additional grizzly den data source.

TABLES

Table 1 Winter 2017-2018 CPAI Polar Bear Den Detection Survey Details

	December 10, 2017 Flight 1 of 1	December 15, 2017 Flight 1 of 1	December 17, 2017 Flight 1 of 1
Client	**CPAI**	**CPAI**	**CPAI**
Departed	10:45	15:15	8:30
Landed	3:15	17:10	10:55
Aircraft	DHC-6 Twin Otter (N842AR)	DHC-6 Twin Otter (N842AR)	DHC-6 Twin Otter (N842AR)
Sensor	FLIR SAFIRE HD380	FLIR SAFIRE HD380	FLIR SAFIRE HD380
Pilot	Larry Shue	Mike Watson	Mike Watson
Co-Pilot	Dave McElroy	Jon Gregorio	Jon Gregorio
FLIR Operator	Nathan Mitchell	Brian Nelson	Brian Nelson
Survey Coordinator	Justin Blank	Justin Blank	Justin Blank
Observer(s)	-	-	-
Areas Surveyed	Pipeline from PBU to KUP, KUP, ALP	NPRA GMT 1 and Willow Areas	Southern NPRA Area, Ocean Point, Rolligon Route, Jones Islands
Notes	Departed and landed at ALP. Surveyed for other operators during this flight. No dens detected.	Depart and land at ALP. Started W of CD5 and worked west staying north of NQT most of the time. No hotspots discovered.	Depart from ALP and landed at SCC. Started in NPRA just SW of NQT. Worked S and W. Rolligon route E of Colville. No hotspots discovered.

Table 2 Weather Conditions

	Flight 1/1 (10:45 depart)	Time of Observation (local)	Temp (Celsius)	Dew Point (Celsius)	Wind Direction	Wind Speed (knots)	Visibility (miles)	Altimeter	Cloud Cover	Notes
10-Dec-17	Alpine (PALP) Weather Conditions	10:55	-15	-17	ENE	18	2	76.56*	Broken clouds at 270m, Overcast at 370m	Light Snow, Mist
	Deadhorse (PASC) Weather Conditions	10:53	-14*	-18*	ENE	22	2	76.42*	N/A	Blowing Snow, Mist
	Kuparuk (PAKU) Weather Conditions	10:45	-15*	-19*	ENE	22	3	N/A	Broken clouds at 150m, Overcast at 340m	Blowing Snow
	Nuiqsut (PAQT) Weather Conditions	10:53	-15	-16	NE	17	2.5	76.48*	Overcast at 400m	Blowing Snow, Mist
	Flight 1/1 (15:15 depart)	**Time of Observation (local)**	**Temp (Celsius)**	**Dew Point (Celsius)**	**Wind Direction**	**Wind Speed (knots)**	**Visibility (miles)**	**Pressure (cmHg)**	**Cloud Cover**	**Notes**
15-Dec-17	Alpine (PALP) Weather Conditions	14:47	-17	-17	NE	20	7	75.69	Clear	N/A
	Deadhorse (PASC) Weather Conditions	14:53	-16	-17	NE	20	4	75.62	Overcast at 1400m	Light Snow, Blowing Snow
	Kuparuk (PAKU) Weather Conditions	15:45	-15*	-18*	ENE	17	7	N/A	Few clouds at 610m, Scattered clouds at 1500m	N/A
	Nuiqsut (PAQT) Weather Conditions	14:53	-18	-19	NE	14	10	79.72	Clear below 3700m	N/A

	Flight 1/1 (8:30 depart)	Time of Observation (local)	Temp (Celsius)	Dew Point (Celsius)	Wind Direction (magnetic)	Wind Speed (knots)	Visibility (miles)	Pressure (cmHg)	Cloud Cover	Notes
17-Dec-17	Alpine (PALP) Weather Conditions	8:11	-20	-23	NE	20	5	75.13	Broken clouds at 2100m, Overcast at 2700m	Mist
	Deadhorse (PASC) Weather Conditions	8:20	-19*	-22*	NE	23	1	74.88*	Overcast at 460m	Light Snow, Blowing Snow
	Kuparuk (PAKU) Weather Conditions	8:45	N/A	N/A	ENE	19	3	N/A	Broken clouds at 520m, Overcast at 910m	Blowing Snow
	Nuiqsut (PAQT) Weather Conditions	8:20	N/A	N/A	NE	17	3	N/A	Few clouds at 460m, Overcast at 1200m	Light Snow, Mist[1]

*Weather data that was not available at the specified observation time was inserted from other observations from that day.

FIGURES

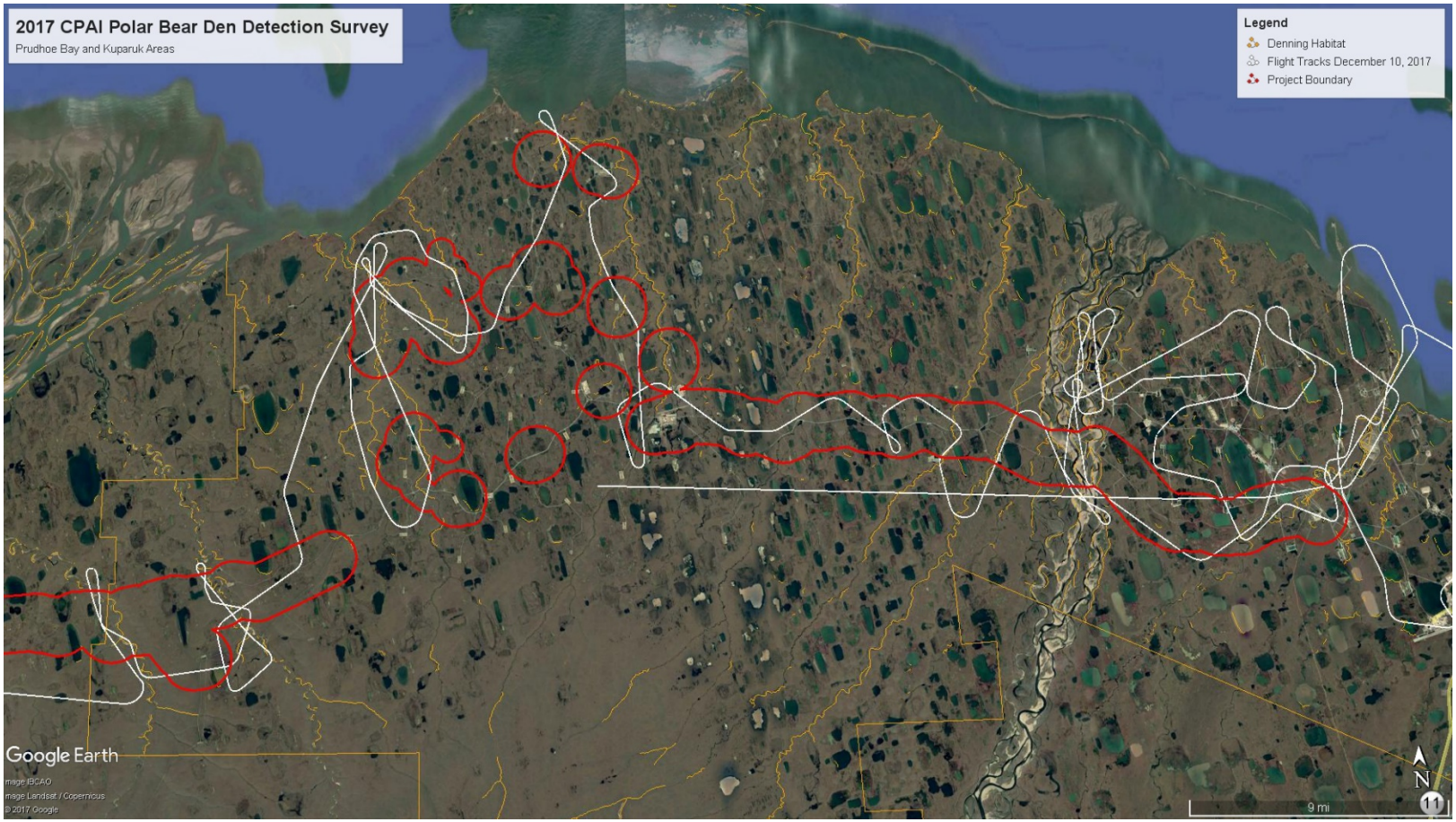
2017 CPAI Polar Bear Den Detection Survey
Prudhoe Bay and Kuparuk Areas
Legend
Denning Habitat
Flight Tracks December 10, 2017
Project Boundary
Google Earth
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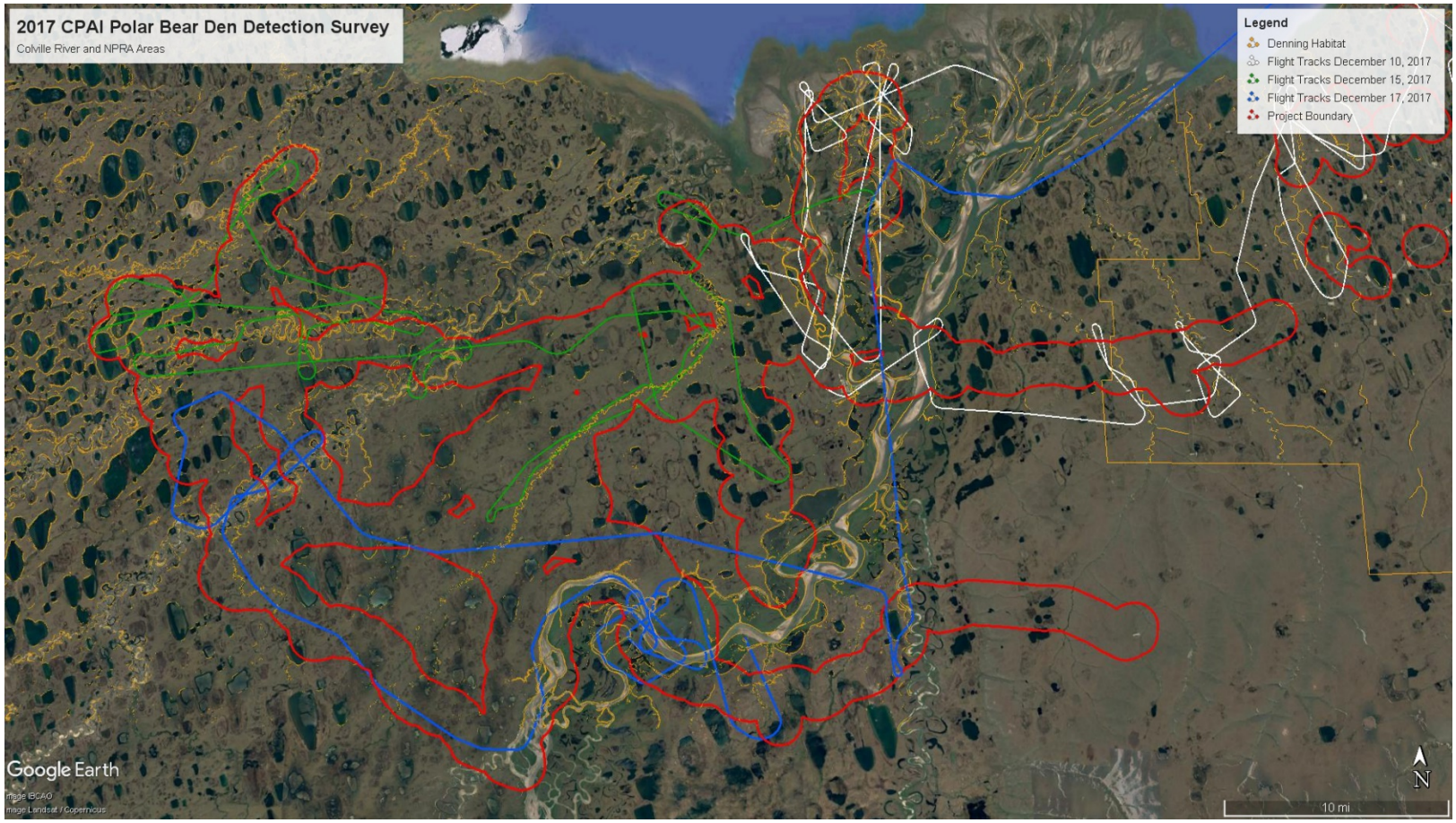
Figure 1


2017 CPAI Polar Bear Den Detection Survey
Colville River and NPRA Areas
Legend
Denning Habitat
Flight Tracks December 10, 2017
Flight Tracks December 15, 2017
Flight Tracks December 17, 2017
Project Boundary
Google Earth
Image IBCAO
Image Landsat / Copernicus
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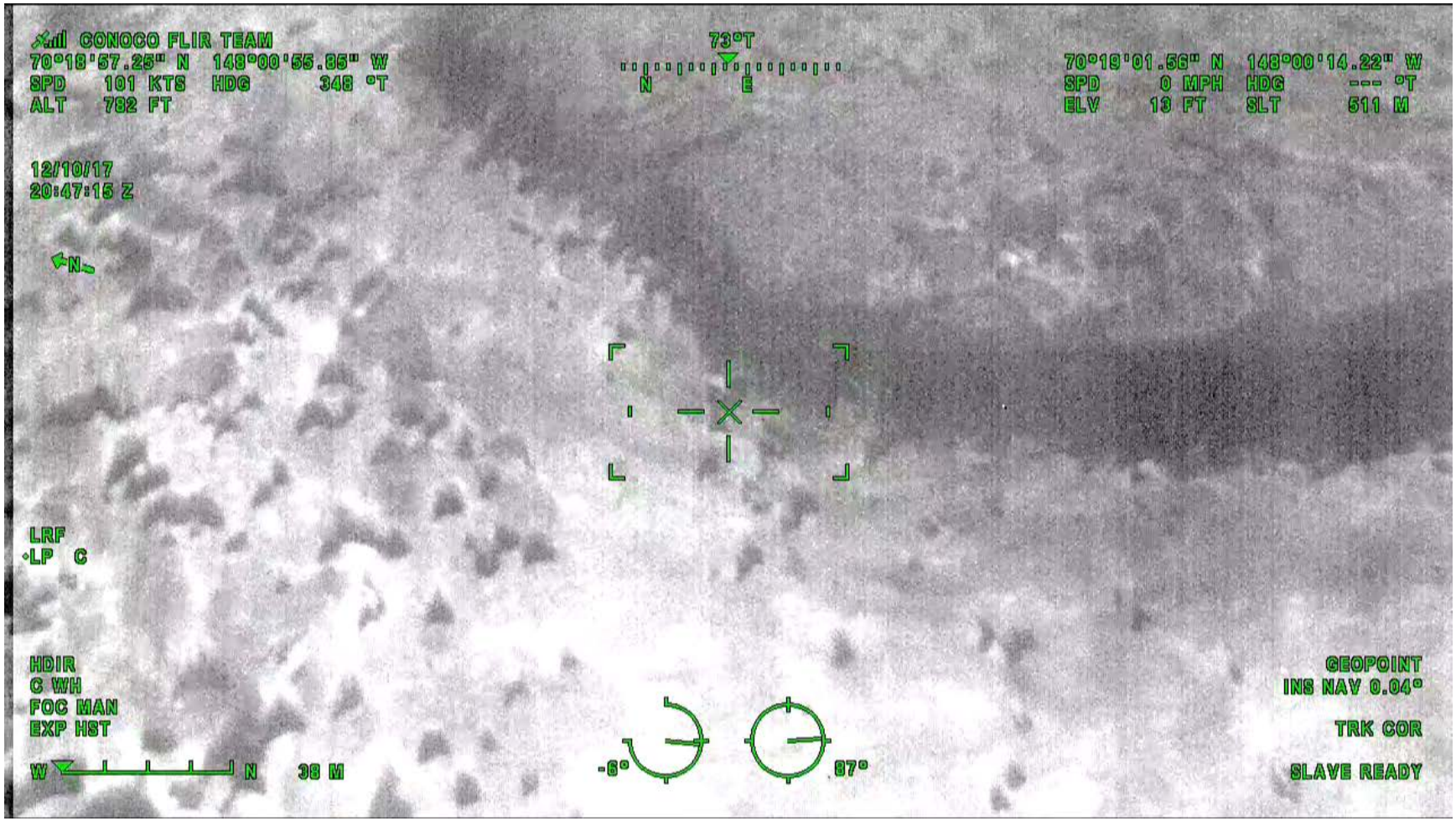
10 mi

Figure 2

SAMPLE IMAGES

Sample Image 1: An example of imagery showing clear distinction of cold bands of drifted snow, tundra surface, exposed ice, and subtle temerature variations.



Sample Image 2: Inclement weather degraded infrared imagery so surveys were flown closer than usual to enhance detectability.