



**Data Collection & Product Report for 2022 Seed Project:
Topographic Expression of Lava Tubes
in the Lava Beds National Monument**

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Data Collection Summary:

Collection Dates, Flights:	1 flight on September 28, 2023 (DOY 271)
Aircraft, Equipment:	Piper PA-31 Navajo (C-GJMT), Optech Titan (14SEN340)
Nominal Flight Parameters:	Flying Height: 500 m AGL, Speed: 120 kt, Overlap: 50%
Nominal Equipment Parameters:	Pulse Rate: 150 kHz, Scan Rate: 26 Hz, Scan Angle: $\pm 30^\circ$
Collected Area:	57.3 km ²

GNSS Reference Station Summary:

Station Name	Operating Agency	Coordinates (ITRF2014 Epoch 2023.74 / Ellipsoid)
KLMT	NCALM	42°09'56.53228" N, 121°44'49.20702" W, 1226.411 m
P380	UNAVCO	42°15'34.80973" N, 121°46'46.92223" W, 1390.829 m

Data Processing Summary:

Scan Angle Cutoff:	$\pm 1^\circ$
Intensity Normalization:	500 m
Data Adjustments:	Line-by-line roll/pitch/elevation matching, project elevation shift of 0.322 m
Ground Classification:	1 iteration of moderate ground determination, manual classification of misclassified ground
Elevation Model Generation:	Bare-earth calculated from Kriging, first-return calculated from TIN model

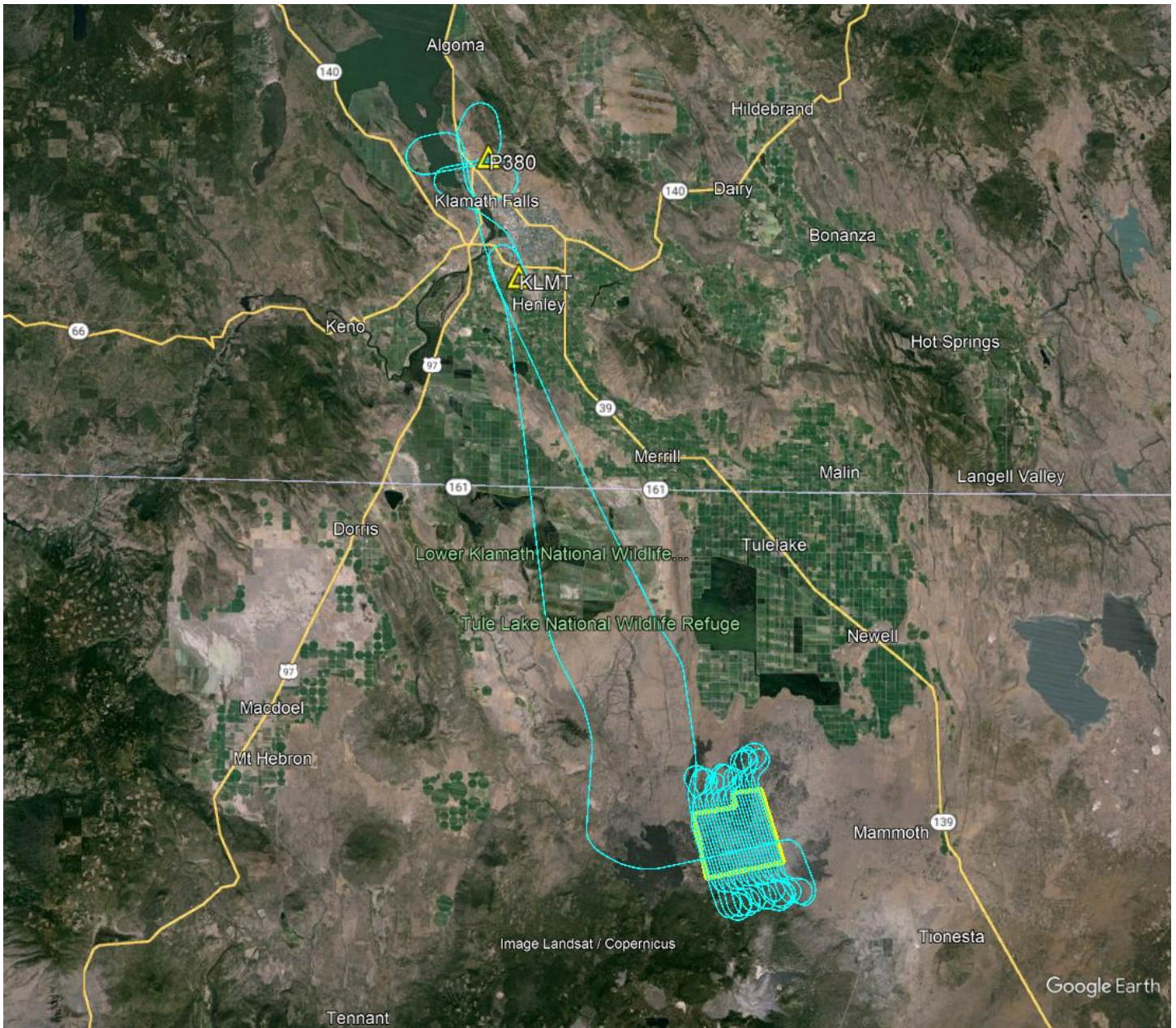
Data Accuracy Summary:

Strip-to-Strip Average:	0.027 m
GCP Residual RMS:	0.018 m (in calibration area)

Data Product Summary:

Horizontal / Vertical Datum:	WGS84 (ITRF2014) epoch 2023.74 / NAVD88 (GEOID18)
Projection / Units:	UTM Zone 10N / meters
Point Cloud Tiles:	1000-m \times 1000-m tiles in LAS format (Version 1.4) with non-ground (1), ground (2), low point (7), and high point (18) returns
Bare-Earth Elevation Model:	GeoTIFF @ 50-cm resolution from classified ground
First-Surface Elevation Model:	GeoTIFF @ 50-cm resolution with canopy and buildings included

Area of Interest:



Location of survey polygon, aircraft trajectory (including instrument calibration), and GNSS reference stations

The requested survey area consisted of one polygon located southeast of Klamath Falls, OR, over Lava Beds National Monument, CA. The polygon enclosed approximately 39.7 km² (15.3 mi²).