# **UC San Diego**

**Field Reports** 

#### Title

Chichen Itza, Mayapan, Coba, Xkukikan - December 7th - 14th, 2024 Yucatan, Mexico

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#### Authors

Mcavoy, Scott Patrick Rissolo, Dominique, Dr.

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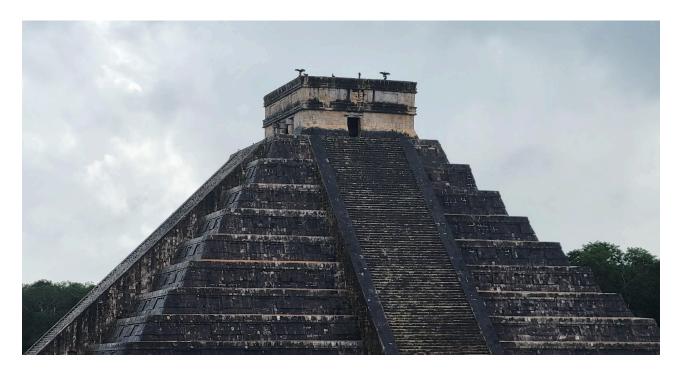






# Field Report: Chichen Itza, Mayapan, Coba, Xkukikan

December 7th - 14th, 2024 Yucatan, Mexico



vultures atop El Castillo drying their wings in the breeze

Field Report prepared December 20th 2024

Scott McAvoy\*, smcavoy@ucsd.edu Dominique Rissolo

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# **Expedition Overview:**

Our 5th team expedition to Yucatan, acquiring 103 new datasets through various means for integration into the archive and visualization atlas. This trip included data capture at Chichen Viejo, further capture in El Castillo sub-structures, an artifact scanning campaign within the new Chichen Itza Museum, along with trips to Mayapan, Coba, and Xkukikan.

A full listing of datasets and their contributors are provided in appendix 1. Please contact Scott McAvoy (<u>smcavoy@ucsd.edu</u>) for any questions regarding access to this data.

Thanks to the Strauss Family Fund for MesoAmerican Studies at UC San Diego.

## **Expedition Team**

Scott McAvoy\*(UC San Diego), smcavoy@ucsd.edu Dominique Rissolo (UC San Diego) Brian Strauss (UC San Diego) Travis Stanton (UC Riverside) Sam Meacham (Cindaq) Julien Fortin (Cindaq) Christophe — (Cindaq) Wetherbee Dorshow (Earth Analytics)

Manuel Eduardo Pérez Rivas (INAH) Francisco Pérez Ruiz (INAH) Jose Francisco Javier Osorio León (INAH) Claudia García-Solís (INAH) Julieta Ramos Pacheco (INAH) Cecilio Cortés Arreola (INAH) Jesus Manuel Gallegos Flores (INAH) Juan Enrique Be Herrera (INAH) José Arturo Cortés Gutiérrez (INAH) Claudia Alejandra Mei Chong Batidas (INAH) Max Edwin Ayala Lozano (INAH) Marco Antonio Rivas Saucedo (INAH)

# Field Diary

## 12/07/2024 - Travel and Customs Issues

Scott and Dominique arrived in Cancun airport late Saturday and were held up at customs for several hours. Though we had appropriate letters from INAH, they addressed the "civil and military airport authority", while the customs officer on duty was insistent that they needed to also specifically name the aduanas (customs office). We felt our paperwork was appropriate, but the customs officer was committed, and we had to contact archaeological authorities to speak with them. We ended up with a compromise, a form detailing all incoming equipment, to be presented upon exit to verify that we didn't leave anything behind. Drove to Playa Del Carmen and stayed the night.

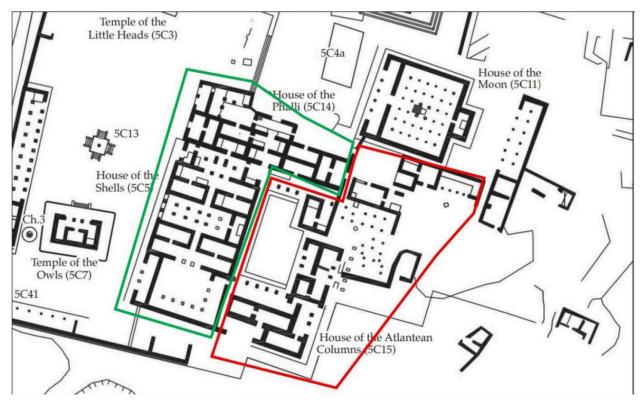
### 12/08/2024 - Travel

Rendezvous with Sam and Wetherbee in the morning, then returned to Cancun to pick up Brian from the airport. Drove to Piste together and met Travis at the airbnb. The airbnb was covered in mold, causing some concern.

## 12/09/2024 - Chichen Itza Initial Series, San Juan, Mil Columnas North

An early start at the Chichen Itza initial series, joined by Cindaq partners and Wetherbee. Sam performed an automated drone survey over the drone over the whole initial series area, along with manually flown close-ups for a number of other structures. Since our previous imaging campaign in 2018, there has been some new development at this location including the " temple of the darts" and other structures at the southeastern corner of the complex. We were told that this area was only open by reservation, we'd previously understood that it would become openly accessible to the public along with the rest of the site, but given its distance, the policy seemed appropriate.

- Scott performed terrestrial LiDAR scans of the temple of the monkeys (monos) and entrance to falos/templos caracoles (not to be confused with el caracol/observatorio).
- Julien captured structured light scans of many friezes and chacmools in the area, several for building facades friezes had been reassembled on the ground, facing upwards.
- Dominique conducted 2 Looq scans of the House of the Phalli and the House of the Atlantean Columns. Both scans started in the NE corner of the House of the Phalli,
  - *ISG House of Phalli 01*: Area indicated in Red (below). Focused on unroofed rooms associated with the House of the Atlantean Columns.
  - *ISG House of Phalli 02*: Area indicated in Green (below). Focused on interior rooms/spaces of the House of the Phalli



Initial Series Complex, Looq scan areas

Dominique, Travis, and Enrique left the main group to visit a site known as San Juan (east of Chichen; north of Xcalacoop). Possible satellite of Chichen. Mounds had been cleared. There is a single, partially intact temple building. We performed 2 Looq scan and I did a photogrammetry run with the Sony a7rIV.

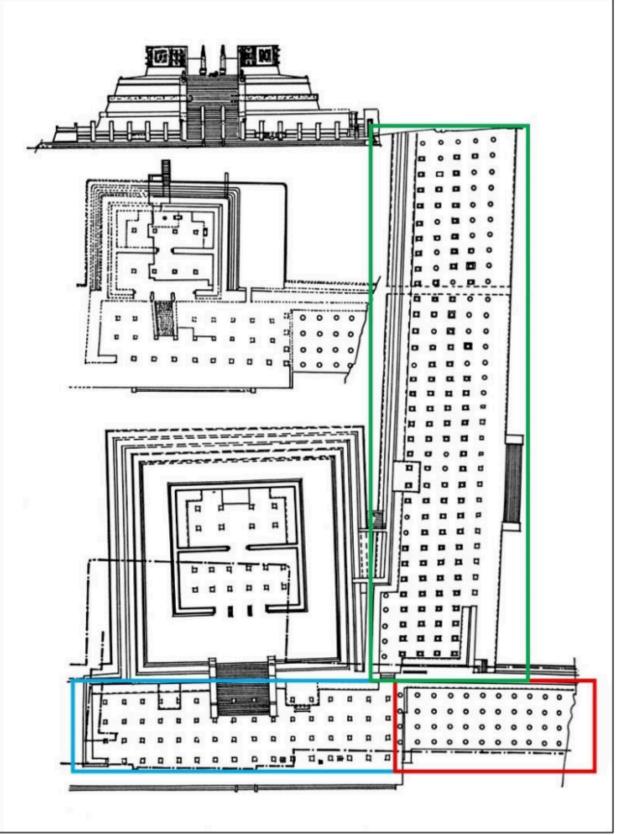
- San Juan 01: Dominique, comprehensive scan
- San Juan 02: Enrique, comprehensive scan
- Sony a7rIV with one LED light panel. Scale and color chart were used



Enrique using the Looq at San Juan

Back at Chichen Itza, Dominique performed 3 Looq scans at the Temple of the Warriors colonnades.

- *Warriors 01*: Focused on the square columns directly in front of the temple. See Blue box.
- Warriors 02: Focused on the cylindrical columns to the south (known as the West Colonnade). Note that this long scan encountered several problems. UI indicated that the IMU was not operable; the preview from the top cam was considerably darker than the other three cams; all four cam previews showed a "?" after 15 into the scan; and the UI indicated that the scan should be stopped. See Red box (which continues beyond illustration). (note from Scott, there are two scans entitled "warriors 02", they are as yet unresolved.)
- *Warriors 03*: Focused on the columns on the south side of the temple (known as the North Colonnade). See Green box.



Field Report - Cultural Heritage Engineering Initiative (CHEI)

Mil Columnas North ( including Temple of the Warriors) Looq scan areas

## 12/10/2024 - Chichen Itza Plaza, El Castillo Southern Substructure

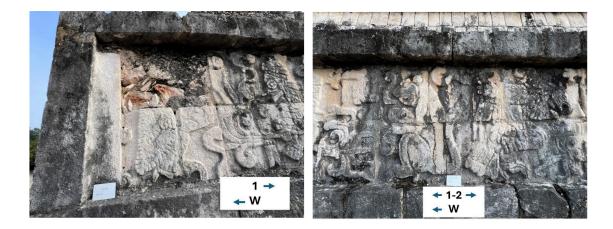
Scott, Brian, Max, and Wetherbee went to the top of El Castillo (accompanied by three happy dogs), for additional terrestrial LiDAR scans of the exterior, and drone photogrammetry. Wetherbee focused on capturing the roof of El Castillo, which was occluded in previous close range drone images.

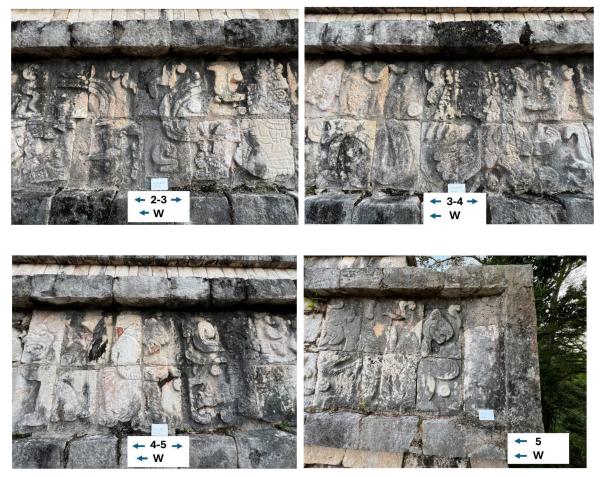
Dominique performed structured light scanning on of Tablero 3 (3rd from bottom) at the Temple of the Warriors, which depict a variety of animals. South side of the structure. Noting that the naming of the Artec Leo scans proved problematic. The Tablero involved 5 contiguous (and overlapping) scans. The intent was to save the 5 scans as 1 named project, but user error (Rissolo) resulted in a more than one project name. Nevertheless, the 5 scans were performed in sequence, from Left to Right. The reference photos below indicate the areas of the Tablero associated with the beginning and end of each of the 5 scans. This should aid in the alignment of the 5 scans.



Tablero 3, south side of Temple of the Warriors

The reference photos below indicate the areas of the Tablero associated with the beginning and end of each of the 5 scans. This should aid in the alignment of the 5 scans.





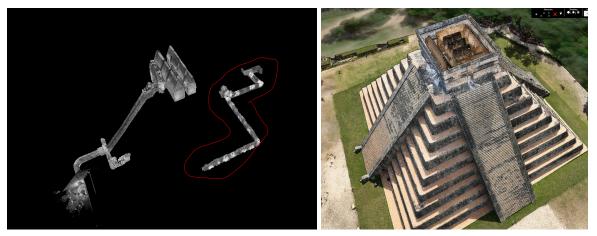
Reference images for SLS scan capture areas

At Grandes Mesas, Scott performed structured light and terrestrial LiDAR scans of the temple, anticipating a future iconographic study with one of Travis' collaborators.

At the Caracol (observatory) Dominique Performed a single Looq scan of the: building (*Caracol 01*) excluding the platform, with a focus on the interior spaces. He was not able to access the narrow passageway to the roof (or the roof itself).

At Xtoloc, Dominique performed a Looq scan from the Xtoloc temple (Xtoloc 01) down to the water surface and back. Could potentially be fused with the Hovermap scan to provide color (for a portion of the scan).

Scott and Dominique went into the plaza level excavation tunnels on the southside of El Castillo, which were dug to the base exterior of the sub pyramid. There were a couple of odd carved blocks, but it was otherwise undecorated. Dominique performed a Looq scan of the tunnels on the south and west sides of the Castillo (*Castillo Sub 01*).

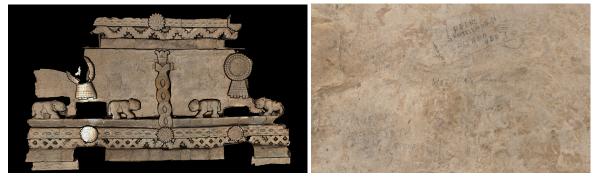


El Castillo southern tunnel outlined in red

Miscellaneous scans structured light scans included a panel at Tzompantli believed to show a skeletal figure, carvings and serpent heads at Pequenas Mesas, a filler piece from the lower temple of the jaguars, panels and the chacmool at the platform of the eagles and jaguars (the panels showing the jaguars eating human hearts).

# 12/11/2024 - El Castillo Substructure North, Artifacts in Chichen Itza Museum

Scott, Dominique, and Jesus began with a long awaited structured light scan of El Castillo's sub pyramid northern facade. INAH had erected scaffolding, with a ladder on top allowing access to high features. There were tight niches on left and right with reduced access, Dominique had to squeeze into the niche on the west side. We found graffiti from the 60s, strange that there had been access, but scholarship failed to capture in adequate detail. Dominique made the suggestions that we purchase a telescoping ladder for these kinds of projects. Something we can easily carry through tight spots.



sub pyramid northern facade, and graffiti

Dominique performed two looq scans

- *Castillo North Sub*: of the tunnel/temple complex on the south side of the Castillo.
- *Castillo Ext*: around the base of the Castillo.

We spent the afternoon in the new museum, scanning 41 sculptures and artifacts, including the offering box, jadite necklaces, and blades uncovered from the sub pyramid, and the oversized chacmool which once sat atop the El Castillo superstructure. We intend for these data to come together in a digital exploration of El Castillo.

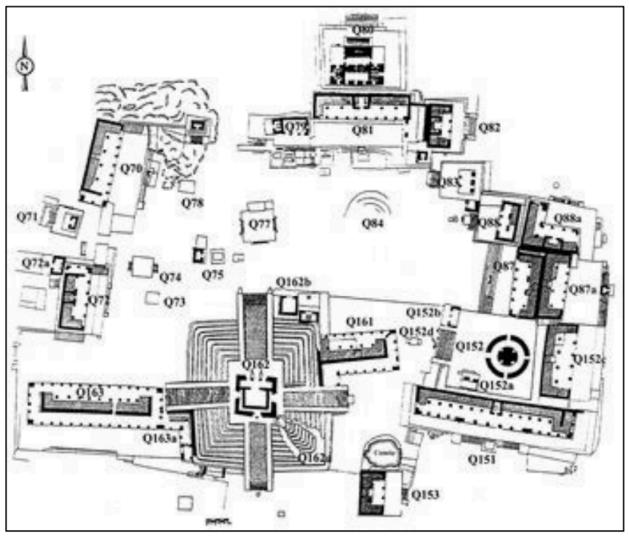


Dominique in the museum

#### 12/12/2024 - Mayapan

Visited Mayapan with Claudia. The site had been closed to the public as the local town had forced INAH out. We came to help assess the current state of pieces, and to document before further deterioration. The site was a bit overgrown, with grass coming up to our knees in many places, requiring snake chaps. Claudia was interested in some exposed plaster pieces and covered murals, which included:

- SE corner (Q162a) of Castillo/Temple of Kukulkan, and associated Sala de los Frescos (Q161) and Warrior Columns (Q163)
- Templo de los Nichos Pintados (Q80)
- Witz masks on South side of Observatory platform (Q151)
- Small shrine on the Easter side of the site center



Map of Mayapan and labeled archaeological features



Claudia had let us know that the sub-pyramid at Chichen Itza, along with several other substructures at key Maya sites had been overtaken by mold a couple of years before. We looked at models of the El Castillo substructure to see if the mold-killing treatments had any impact on the paint of the red jaguar

throne, she didn't think it had. Claudia commented that the tomato red color covering much of the throne was modern paint, while the more brownish cinnabar based color, visible only in patches, was original.



Jaguar throne at Chichen Itza

Dominique performed a single Looq scan (Mayapan 01) around and atop the Castillo. Conducted a series of BLK360 scans with Scott as he focused on SLS of select panels/friezes.

## 12/13/2024 - Coba and Xkukican

Drove to Coba, met Travis, Julieta and Manuel, who took us to scan a glyph panel recently restored to the southwest of the great platform. It's not clear if the panel had already been translated, or if there was an epigrapher attached to the project. We need to confirm any restrictions on the sharing of these data.



glyph panel at Coba, just south of great platform

Met Cecilio, who worked under Manuel, capturing aerial LiDAR under the Tren Maya project. He was kind enough to share several beautifully detailed drone LiDAR datasets with us, noted in the data appendix. We did a full walk around the great platform. Manuel showed us a potential cave

Afternoon at Xkukican(also spelled kukican), this site is included inTravis' 2017 NCALM LiDAR. Travis had worked here creating the initial site survey some years ago. We went with the head of the ahido, who let us know that there are hopes to prepare the site for tourism, funded by the town.



Xkukican, south of Coba

### 12/14/2024 - Travel and Customs

Returned through Cancun, stopping at the aduanas office on the exit side of the airport to have the equipment checked back in. It took some time for the private security to coordinate our entrance, as access usually requires having already gone through security and screening on the other side of the airport. The officer on duty was aware of our situation and the process went smoothly. We left and re-checked in through the other side.

# Data Acquisition:

Our imaging tools and methodologies are outlined below:

# Terrestrial LiDAR (TLS) - Leica RTC 360 G2



Highly compact tripod mounted laser scanning system, enabling rapid capture of architectural spaces and features.

HDR 360 images at 13 mp, point density (resolution) of 6mm at 10 meters accuracy of 4mm at 10 meters

Ideal for confined spaces, overheats easily in direct sunlight.

# Structured Light Scanning (SLS) - Artec Leo



This portable system projects patterns, whose deformation is read realtime and aligned with SLAM to create 3D scans.

Capable of capturing complex geometries at approximately 0.3mm resolution (under best conditions), reliably capturing at 0.6 - 0.7 mm resolution.

# Mobile Mapping System - Looq



The Looq is a multi camera GPS assisted photogrammetric 3d mapping system with 4x 5mp cameras. The speed of acquisition, pre-aligned views, and built in lighting systems make the Looq ideal for tight spaces, caves, tunnels, alleyways...

Intended for infrastructure inspection, and positioning of spherical images, resolution and accuracy of 3d products are generally expected to be within 3 cm.

# Data Quality and Availability

The data provided by this project is not certified by a licensed surveyor. Measurements provided are subject to error. If an application requires a particularly high level of accuracy or precision (for example, a hydrological analysis) please contact the authors of this report.

# Appendix - Data Inventory

Data Set	Date	Location	Data Type	Device	Contributor
inah_aerial_lidar_piste	2024	Chichen_Itza / Piste	drone_lidar	zenmuse L2	Cecilio Cortés Arreola
inah_aerial_lidar_coba	2024	Coba	drone_lidar	zenmuse L3	Cecilio Cortés Arreola
inah_aerial_lidar_naach_muul	2024	NAACH MUUL	drone_lidar	zenmuse L4	Cecilio Cortés Arreola
inah_aerial_lidar_panadero	2024	PANADERO	drone_lidar	zenmuse L5	Cecilio Cortés Arreola
stela_20	12/13/2024	Coba	structured_light	Artec Leo	Dominique Rissolo
Glyph_Panel_hd	12/13/2024	Coba	structured_light	Artec Leo	Scott McAvoy
Glyph_Panel_low_Res	12/13/2024	Coba	structured_light	Artec Leo	Scott McAvoy
Glyph_Panel	12/13/2024	Coba	terrestrial_lidar	BLK360 g2	Scott McAvoy
eastern_temple_vaults	12/13/2024	Xkukikan	terrestrial_lidar	BLK360 g2	Dominique Rissolo
eastern_temple_vaults	12/13/2024	Xkukikan	terrestrial_phot ogrammetry	Sony A7 r4	Dominique Rissolo
Templo Grandes Mesas	12/11/2024	Chichen Itza	terrestrial_lidar	BLK360 g2	Scott McAvoy
Templo Grandes Mesas	12/11/2024	Chichen Itza	structured_light	Artec Leo	Scott McAvoy
Chacmool_templo_aguiles_e_ja guares	12/10/24	Chichen Itza	structured_light	Artec Leo	Scott McAvoy
templo_aguiles_e_jaguares	12/10/24	Chichen Itza	structured_light	Artec Leo	Scott McAvoy
cenote_sagrado_toad4	12/10/24	Chichen Itza	structured_light	Artec Leo	Scott McAvoy
cenote_sagrado_boulder_potenti al_toad	12/11/24	Chichen Itza	structured_light		Scott McAvoy

		гіеій кероі	t - Cultural Heritage	Engineening i	
pequenes_mesas	12/10/24	Chichen Itza	structured_light	Artec Leo	Scott McAvoy
tzompantli_east_panel	12/10/24	Chichen Itza	structured_light	Artec Leo	Scott McAvoy
elcastillo_north_subpyramid_fac ade	12/11/2024	Chichen Itza	structured_light	Artec Leo	Scott McAvoy
elcastillo_south_subpyramid_tun nels	12/10/2024	Chichen Itza	terrestrial_lidar	BLK360 g2	Scott McAvoy
elcastillo_super_exterior	12/10/2024	Chichen Itza	terrestrial_lidar	BLK360 g2	Scott McAvoy
Templos-buhos	12/9/2024	Chichen Itza	terrestrial_lidar	BLK360 g3	Scott McAvoy
Templos-buhos-door-columnas	12/9/2024	Chichen Itza	terrestrial_lidar	Artec Leo	Julien Fortin
Templos-caracales-entrance	12/9/2024	Chichen Itza, Viejo	terrestrial_lidar	BLK360 g3	Scott McAvoy
Templos_guerreros_animals_pa nel_south_mid	12/11/2024	Chichen Itza	structured_light	Artec Leo	Dominique Rissolo
San_Juan	12/09/2024	San Juan	terrestrial_phot ogrammetry	Sony A7 r4	Dominique Rissolo
Chichen Viejo	12/09/2024	_	aerial_photogra mmetry		Sam Meacham (CINDAQ)
Chichen Itza main Plaza	12/10/2024	Chichen_Itza	aerial_photogra mmetry		Wetherbee Dorshow (Earth Analytics)
10-20412.leo	12/11/2024	Chichen Itza Museum	structured_light	Artec Leo	Scott McAvoy
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10-66873.leo	12/11/2024	Chichen Itza Museum	structured_light	Artec Leo	Scott McAvoy
10-66883.leo	12/11/2024	Chichen Itza Museum	structured_light	Artec Leo	Scott McAvoy
10-290153&10-290154.leo	12/11/2024	Chichen Itza Museum	structured_light	Artec Leo	Scott McAvoy
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CasaDeLosAtlantes-Columnalzu ierda.leo	12/09/2024	Chichen Itza, Viejo	structured_light	Artec Leo	Julien Fortin
CasaDeLosCaracoles-AtlanteNo rte1.leo	12/09/2024	Chichen Itza, Viejo	structured_light	Artec Leo	Julien Fortin
CasaDeLosCaracolesAtlanteNor te2.leo	12/09/2024	Chichen Itza, Viejo	structured_light	Artec Leo	Julien Fortin
CasaDeLosCaracoles-GroundSt ones.leo	12/09/2024	Chichen Itza, Viejo	structured_light	Artec Leo	Julien Fortin
LaCasaDeLosAtlantes-Columna Derecha.leo	12/09/2024	Chichen Itza, Viejo	structured_light	Artec Leo	Julien Fortin
LaTumba-Chaac.leo	12/09/2024	Chichen Itza, Viejo	structured_light	Artec Leo	Julien Fortin
Serpent and Jag failec.leo	12/09/2024	Chichen Itza, Viejo	structured_light	Artec Leo	Julien Fortin
TemploDeLosBuhos-Columnas.l eo	12/09/2024	Chichen Itza, Viejo	structured_light	Artec Leo	Julien Fortin

		Field Repor	t - Cultural Heritage	Engineering I	nitiative (CHEI)
TemploSerieInicial-AtlantesTech o.leo	12/09/2024	Chichen Itza, Viejo	structured_light	Artec Leo	Julien Fortin
TemploSerieInicial-Chaac.leo	12/09/2024	Chichen Itza, Viejo	structured_light	Artec Leo	Julien Fortin
CornerMask.leo	12/09/2024	Chichen Itza, Viejo	structured_light	Artec Leo	Julien Fortin
mayapan-castillosu -q162a	12/12/2024	Mayapan	structured_light	Artec Leo	Scott McAvoy
mayapan-castillosu -q162a	12/12/2024	Mayapan	terrestrial_lidar	BLK360 g2	Dominique Rissolo
Mayapan-q161	12/12/2024	Mayapan	structured_light	Artec Leo	Scott McAvoy
Mayapan-q161	12/12/2024	Mayapan	terrestrial_lidar	BLK360 g2	Dominique Rissolo
Mayapan-q163	12/12/2024	Mayapan	structured_light	Artec Leo	Scott McAvoy
Mayapan-q163	12/12/2024	Mayapan	terrestrial_lidar	BLK360 g2	Dominique Rissolo
q97	12/12/2024	Mayapan	structured_light	Artec Leo	Scott McAvoy
q97	12/12/2024	Mayapan	terrestrial_lidar	BLK360 g2	Dominique Rissolo
Redondo Witz	12/12/2024	Mayapan	structured_light	Artec Leo	Dominique Rissolo
templeofthepaintedniches	12/12/2024	Mayapan	structured_light	Artec Leo	Scott McAvoy
templeofthepaintedniches	12/12/2024	Mayapan	terrestrial_lidar	BLK360 g2	Dominique Rissolo
Warriors 01	12/10/2024	Chichen_Itza	terrestrial_phot ogrammetry	Looq	Dominique Rissolo
Warriors 02	12/10/2024	Chichen_Itza	terrestrial_phot ogrammetry	Looq	Dominique Rissolo
Warriors 03	12/10/2024	Chichen_Itza	terrestrial_phot ogrammetry	Looq	Dominique Rissolo
ISG House of Phalli 01	12/9/2024	Chichen Itza, Viejo	terrestrial_phot ogrammetry	Looq	Dominique Rissolo
ISG House of Phalli 02	12/9/2024	Chichen Itza, Viejo	terrestrial_phot ogrammetry	Looq	Dominique Rissolo
Mayapan 01	12/12/2024	Mayapan	terrestrial_phot ogrammetry	Looq	Dominique Rissolo
Caracol 01	12/10/2024	Chichen_Itza	terrestrial_phot ogrammetry	Looq	Dominique Rissolo

Castillo North Sub	12/11/2024	Chichen_Itza	terrestrial_phot ogrammetry	Looq	Dominique Rissolo	
San Juan 01	12/9/2024	San Juan	terrestrial_phot ogrammetry	Looq	Dominique Rissolo	
Xtoloc 01	12/10/2024	Chichen_Itza	terrestrial_phot ogrammetry	Looq	Dominique Rissolo	
Castillo Sub 01	12/10/2024	Chichen_Itza	terrestrial_phot ogrammetry	Looq	Dominique Rissolo	
Castillo Ext	12/10/2024	Chichen_Itza	terrestrial_phot ogrammetry	Looq	Dominique Rissolo	