



# GROUNDSTONE LANDSCAPE AT LUKE AIR FORCE BASE: A FOUR-DIMENSIONAL APPROACH

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# INTRODUCTION & LOCATION



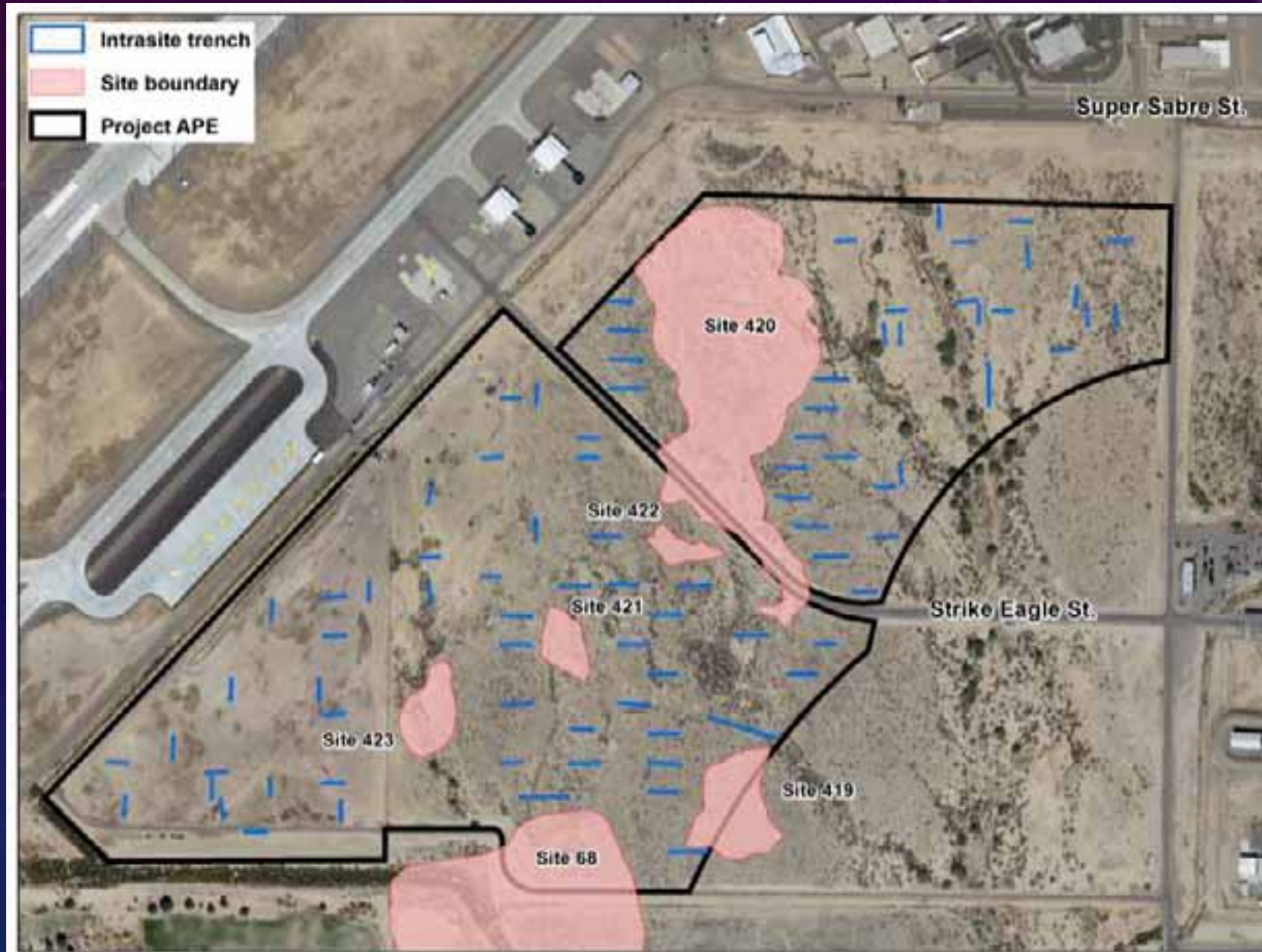
# PROJECT OVERVIEW

- Luke Air Force Base (LAFB), in partnership with Arizona Public Service Company, plans to construct a 17-megawatt solar-power array on an undeveloped portion of the base in order to comply Renewable Energy Standard. This standard requires 15% of all the state of AZ utilities come from renewable sources by 2025.
- The LAFB Solar-Power Array Archaeological Data Recovery Project (Luke Solar project) area of potential effects (APE) is a 107-acre parcel located south of Super Sabre Street and southeast of the LAFB flight line. The APE is divided by Strike Eagle Street; the 42-acre portion north of Strike Eagle Street is designated Area A, and the 65-acre portion south of Strike Eagle Street is designated Area B (see Figure 1.1).
- Statistical Research, Inc.(SRI), was contracted in November 2010 to conduct the archaeological mitigation for the Luke Solar project.

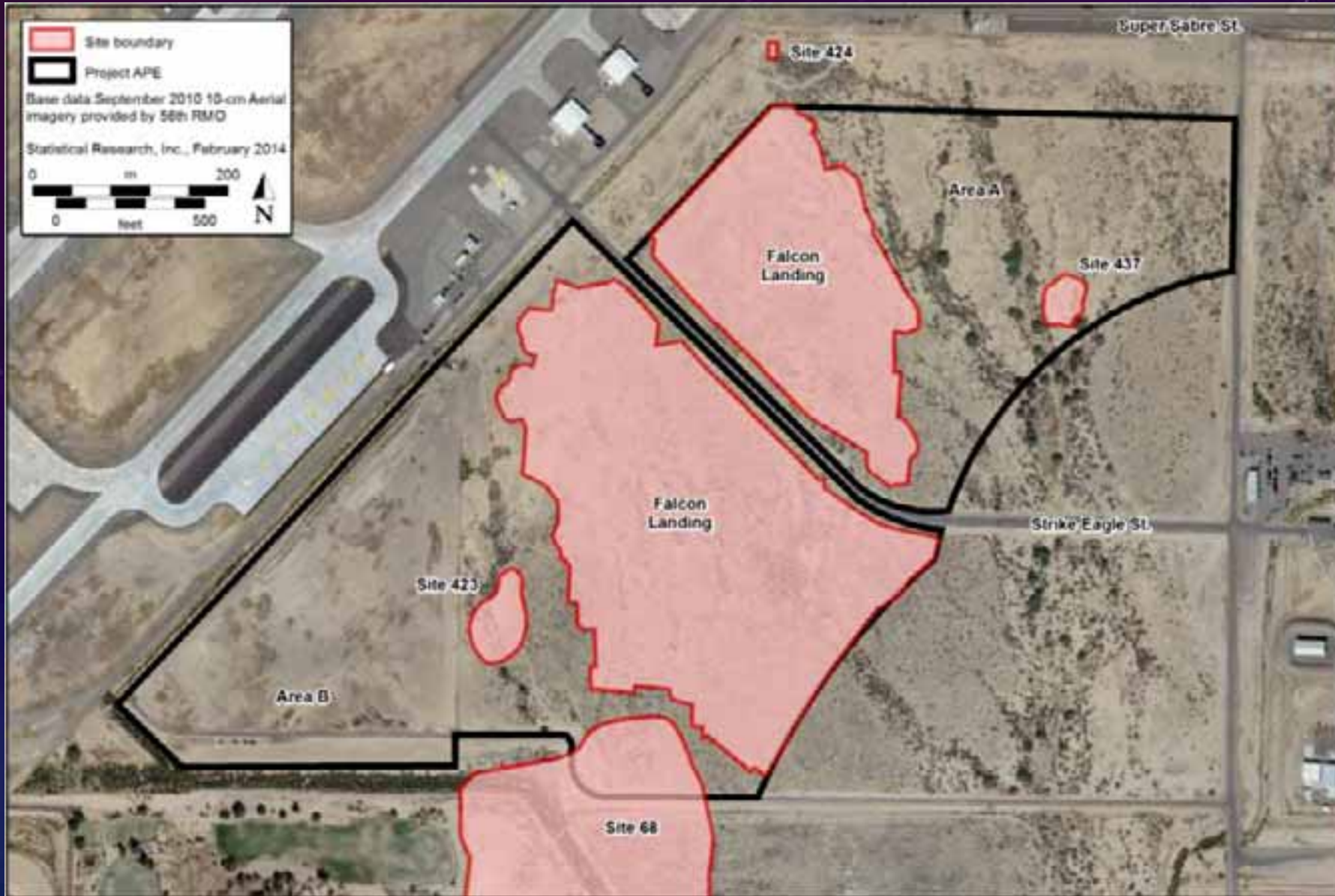
# PROJECT OVERVIEW

- **Phase 1:** Between November 3 and December 2, 2010, SRI conducted archaeological investigations in the Luke Solar project area.
- **Intersite Testing:** An additional intersite-testing program for the areas between previously defined archaeological site boundaries within the project APE was conducted between May 23 and June 9, 2011.
- **Phase 2.1:** On September 19, 2011, SRI began data recovery on the Luke Solar project. The data recovery phase consisted of mechanical stripping and intensive feature excavation.
- **Phase 2.2:** SRI resumed data recovery efforts on November 5, 2012, as a sub-consultant to Aerostar Environmental Services, Inc. (Aerostar), and that work concluded on April 25, 2013.

# PROJECT OVERVIEW



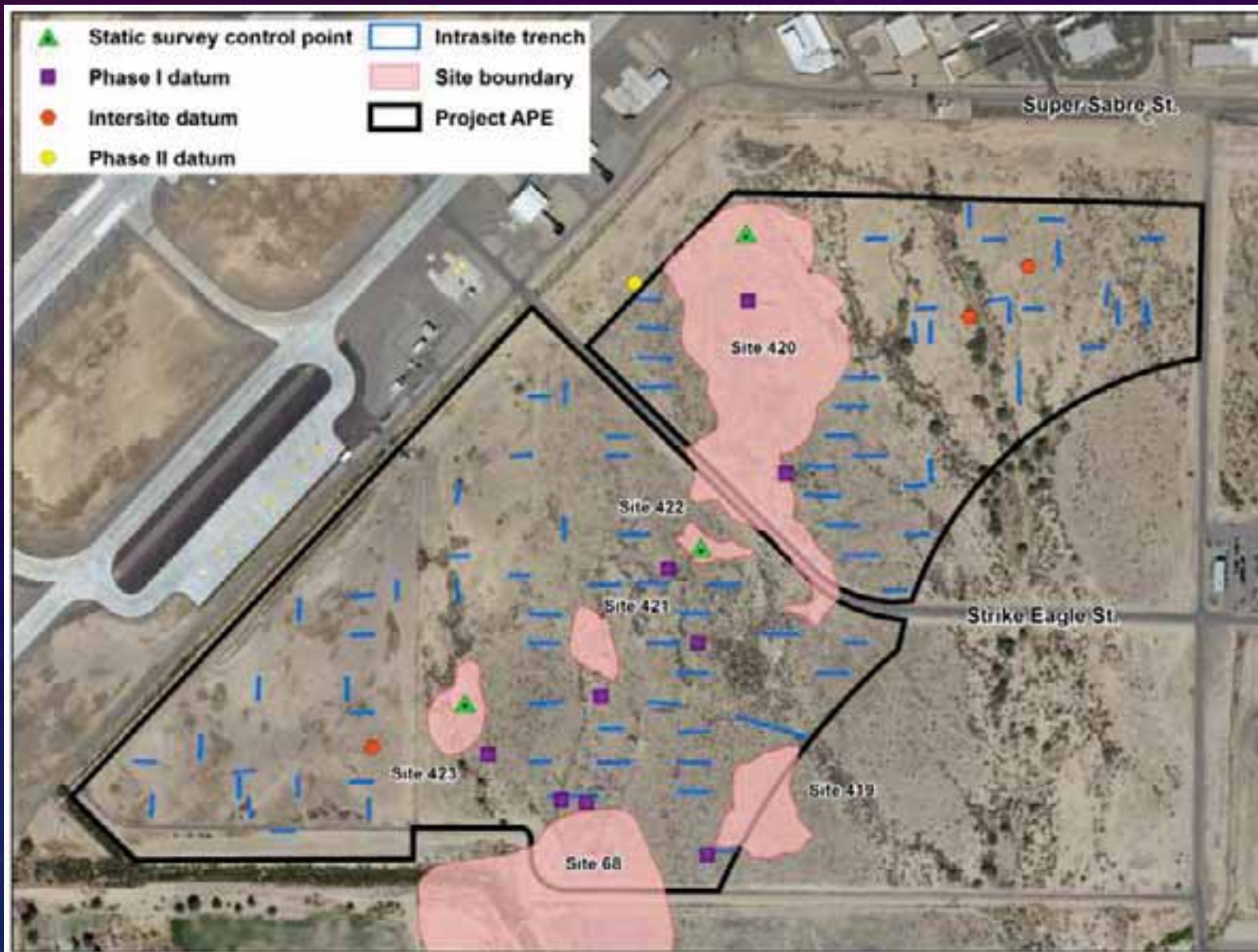
# PROJECT OVERVIEW



# FIELD MAPPING

- SRI's Department of Cartography and Geospatial Technologies (CAGST) was responsible for maintaining control and documentation of spatial locations for all archaeological fieldwork activities.
- At the beginning of the project, three control points were established by a static Global Positioning System (GPS) survey with an Ashtech ProMark2 L1 antenna.
- Throughout the project, these three control points were used to establish additional datums within the project area.
- Once control was established, all spatial data for each site were acquired with a Sokkia Set 5 total station, using a Panasonic Toughbook laptop computer and PenMap software.
- Over 44,000 points were shot throughout the project.
- 427 extramural ground stones were point located, and over 5000 features were mapped.

# FIELD MAPPING





# FIELD MAPPING



# MECHANICAL STRIPPING

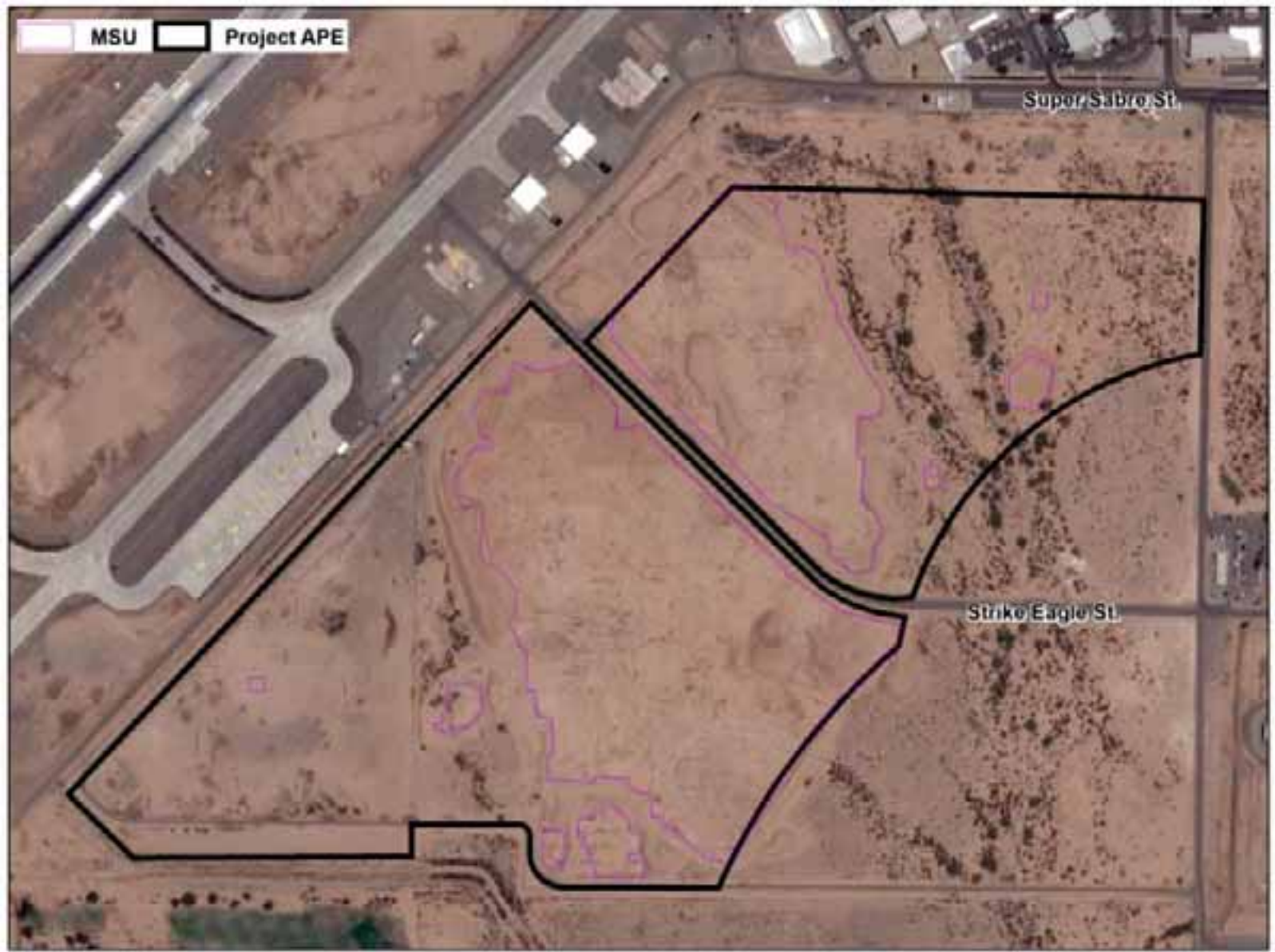
The site sediments were mechanically stripped with a trackhoe until cultural material or sterile sediments were encountered. This process took a total of 22 weeks to complete and involved two 325 Series trackhoes, two 550 Series front-end loaders, and three water trucks. Dust control and stormwater pollution prevention requirements were significant logistical challenges.



# MECHANICAL STRIPPING



# MECHANICAL STRIPPING



# MECHANICAL STRIPPING

During mechanical stripping of 42 acres, 427 complete ground stone tools, like this mortar, were found and recorded in extramural contexts.



# MECHANICAL STRIPPING

Some artifacts were pedestaled with the trackhoe, and the surrounding area was excavated to a lower depth to identify additional features and artifacts.



# RECOVERY CONTEXTS

Ground stone artifacts in place on the stripping surface. The Falcon Landing site contained a rarely preserved “landscape” of Middle and Late Archaic period ground stone tools.

Features and artifacts representing thousands of years of occupation were contained within only about half a meter of deposition.

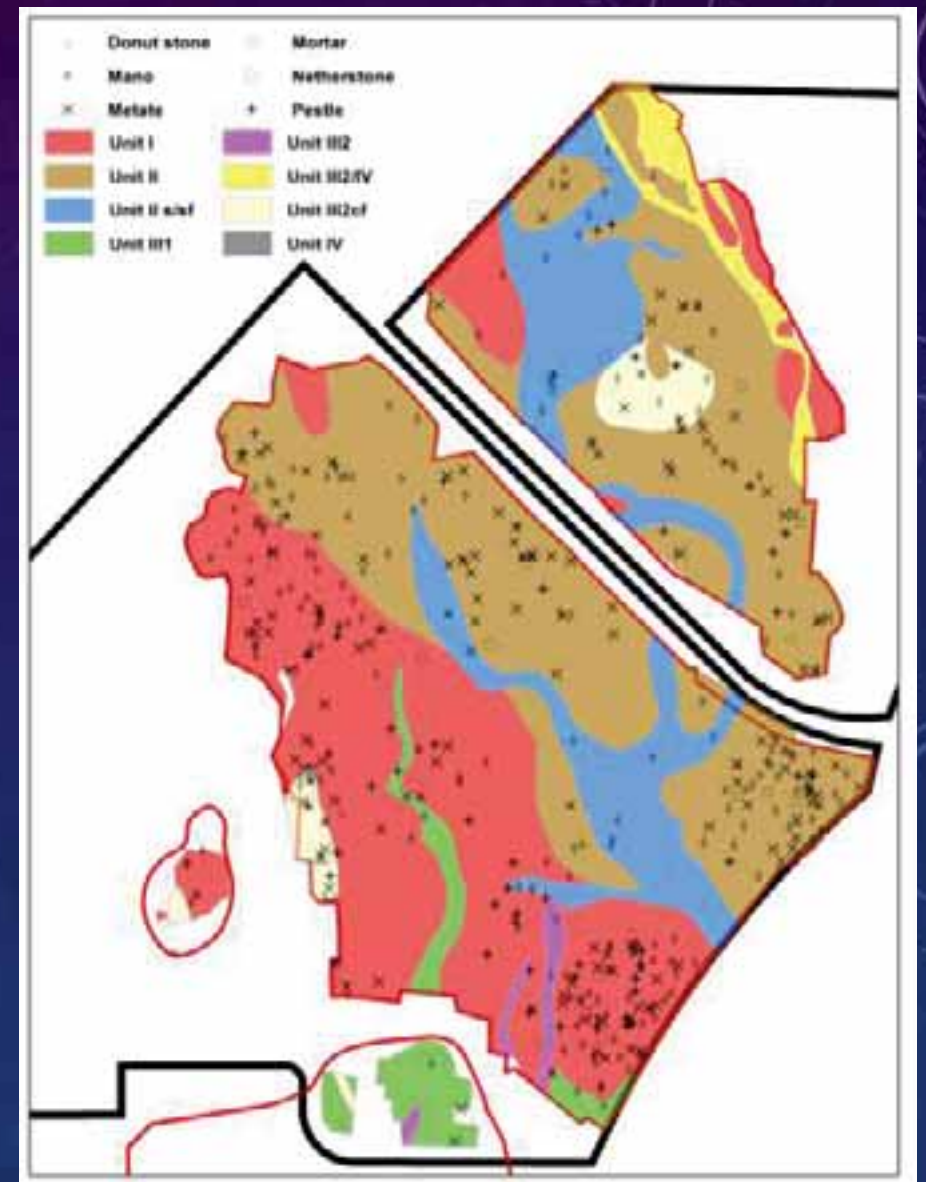
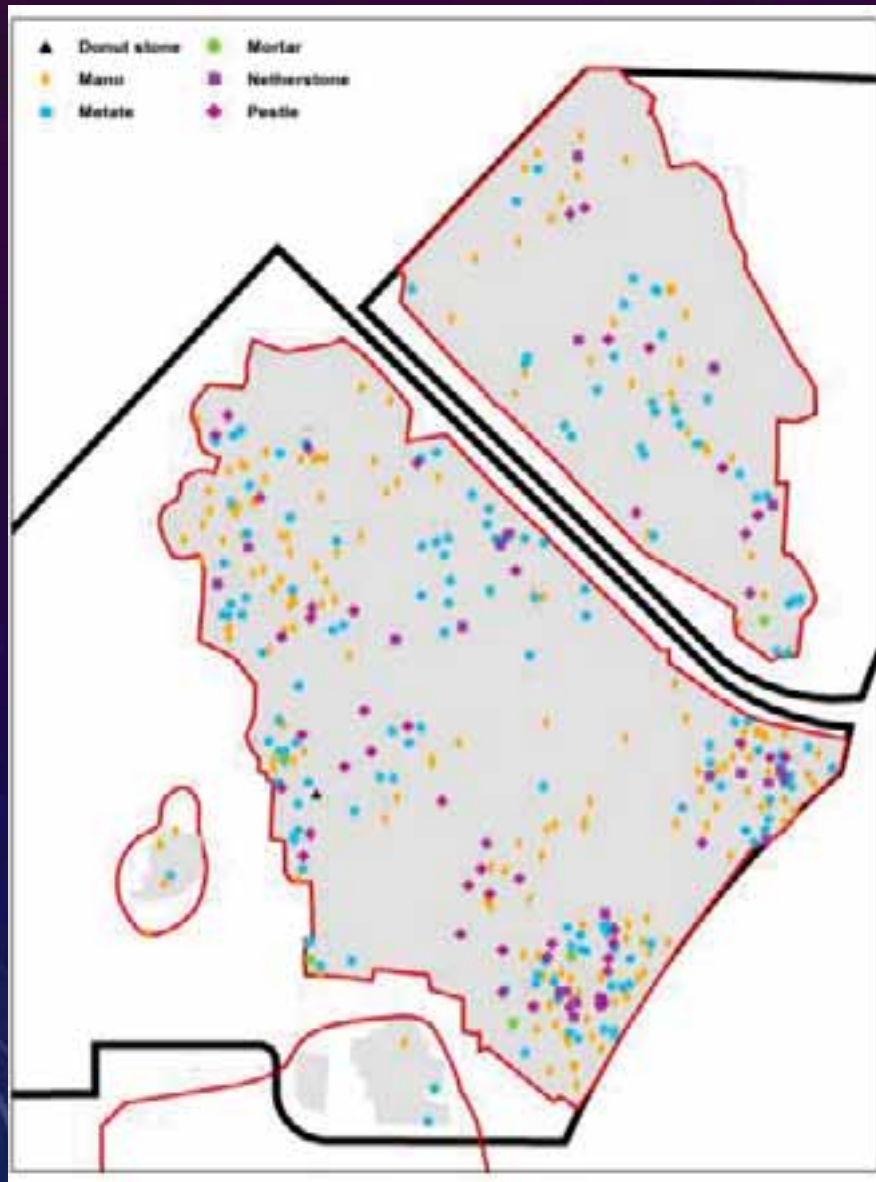


# STRATIGRAPHIC UNIT AGES

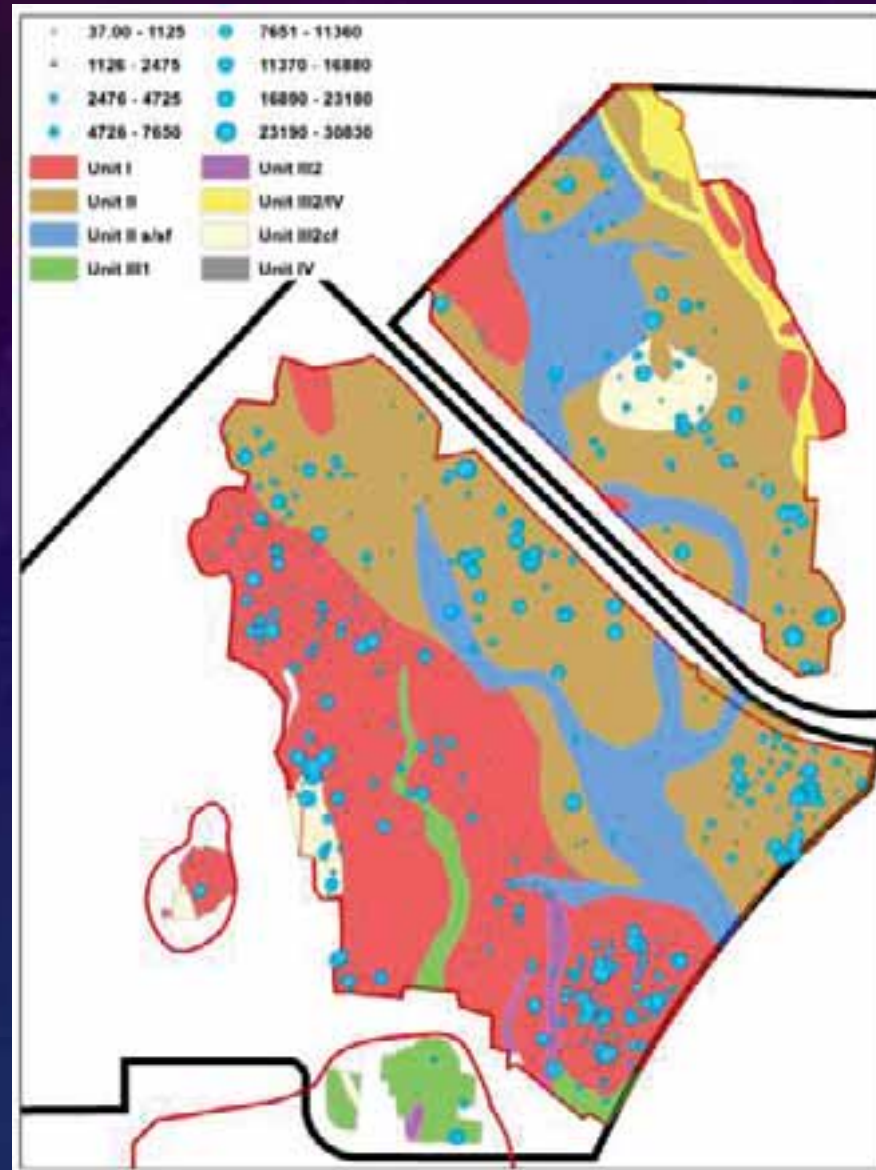
Stratigraphic Unit	Date Range	Temporal Component
I	7040–5320 cal B.C.	
II	2970–2730 cal B.C.	Chiricahua
IIA	2810–2420 cal B.C.	Chiricahua
IIA/II s/sf	2810–790 cal B.C.	Chiricahua
II s/sf	2570–790 cal B.C.	Chiricahua
II s/sf /III1	2570–920 cal B.C.	Chiricahua
III1	1380–920 cal B.C.	Chiricahua/ San Pedro transition , San Pedro
III1/III2	1380–200 cal B.C.	San Pedro, San Pedro/ Cienega Transition, Cienega
III2	720–200 cal B.C.	Cienega
III2/IV	720 cal B.C.–cal A.D. 1220	Cienega/Classic period
III2cf	160 cal B.C.–cal A.D. 340	Cienega/Red Mountain transition
III2cf/IV	160 cal B.C. –cal A.D. 1220	Cienega/Classic period
IV	cal A.D. 610–1220	pre-Classic Classic
V	cal A.D. 1520–1800	Protohistoric Historic



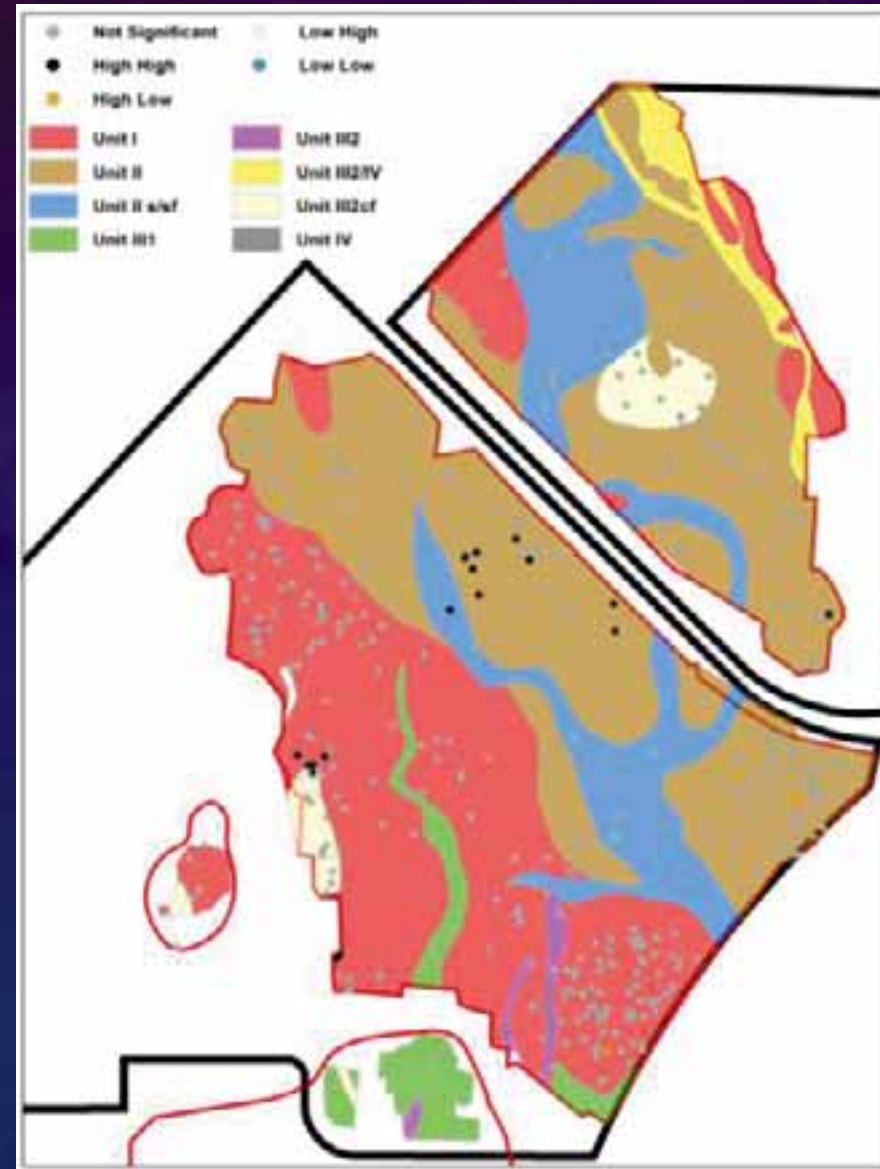
# GROUNDSTONE DISTRIBUTION



# EXPLORATORY DATA ANALYSIS



# HOT SPOT ANALYSIS



# RESULTS AND CONCLUSIONS

- The hot spot analysis works by looking at each ground stone artifact within the spatial context of neighboring ones.
- To be a statistically significant hot spot, a ground stone artifact should have high value in weight and also be surrounded by similarly weighted ground stone artifacts.
- Our analysis indicates that extramural ground stone found on the surfaces of stratigraphic Units I and II is significantly heavier and more concentrated compared to other stratigraphic unit surface (e.g., Unit IV).

# ACKNOWLEDGEMENTS

