DRAFT ENVIRONMENTAL IMPACT STATEMENT

SPACEX STARSHIP-SUPER HEAVY LAUNCH VEHICLE AT LAUNCH COMPLEX 39A

at the Kennedy Space Center, Merritt Island, Florida

Volume II, Appendix B.3, Part 3

August 2025

Federal Aviation Administration

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TABLE OF CONTENTS

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National Aeronautics and Space Administration

John F. Kennedy Space Center
Kennedy Space Center, FL 32899

December 20, 2024

Reply to Attn of: SI-E3

Mr. Marcellus Osceola, Chairman
Seminole Tribe of Florida
6300 Stirling Road
Hollywood, FL 33024

Subject: Section 106 Consultation SpaceX Starship Super Heavy Launch and Reentry Vehicles at Launch Complex-39A, Kennedy Space Center, Cape Canaveral, Florida

Dear Chairman Osceola,

The purpose of this letter is to initiate consultation under Section 106 of the National Historic Preservation Act of 1966 (NHPA) and to invite the Muscogee (Creek) Nation of Oklahoma to participate as a Consulting Party.

The National Aeronautics and Space Administration's Kennedy Space Center (NASA KSC) is initiating consultation with your office as part of the Federal Aviation Administration's (FAA) environmental review of the proposed action for the SpaceX Starship Super Heavy launch and reentry vehicles at Launch Complex-39A (LC-39A). While NASA is leading Section 106 consultation, the FAA is leading Government to Government consultation which will be covered in a separate letter sent from the FAA. Under the supervision of the FAA's Office of Commercial Space Transportation, SpaceX is preparing an Environmental Impact Statement (EIS) to evaluate the potential impacts of proposed infrastructure construction, and ground, launch, and reentry operations associated with the Starship Super Heavy launch and reentry vehicles at LC-39A. Because SpaceX plans to apply to the FAA's Office of Commercial Space Transportation for a vehicle operator license for Starship Super Heavy, the EIS will conform to the FAA's National Environmental Policy Act (NEPA) implementing policy, FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures,* regarding the potential infrastructure construction, ground operations, launch, and reentry-related impacts.

Description of the Undertaking

The undertaking involves issuance of a vehicle operator license by the FAA's Office of Commercial Space Transportation that will facilitate ground, launch, and reentry operations associated with the SpaceX Starship Super Heavy at LC-39A. Specifically, this would include up to 44 launches of Starship Super Heavy per year; return of the first stage booster to

LC-39A; return of Starship to LC-39A; and construction of an air separation unit for liquid oxygen and liquid nitrogen, on-site natural gas liquefaction production and cryogenic liquid storage capability, roadway improvements, other associated infrastructure, and a catch tower (see Enclosure 1). Additional information is available on FAA's project website at: https://www.faa.gov/space/stakeholder_engagement/spacex_starship_ksc/.

Area of Potential Effects

The area of potential effects (APE) considers any physical, visual, or auditory effects that the project may have on historic properties*. As such, the APE has been developed to consider both a construction APE and an operational APE. The construction APE is limited within the existing boundaries of LC-39A. Additionally, it is anticipated that proposed new construction associated with the operation of the Starship Super Heavy will be compatible with the characteristic of other launch complex infrastructure and will not pose view shed effects to historic properties. The operational APE considers the auditory effects of the Starship Super Heavy launch activity as well as the overpressure effects of the sonic boom generated during atmospheric reentry. FAA guidance stipulates consideration of a 130 decibel (dB) threshold for launch effects and a 2.0 pounds per square foot (psf) threshold for effects from the sonic boom. Based on this information, and previous research regarding rocket engine noise and vibration effects to structures, the APE was established as any area subjected to greater than or equal to 2.0 psf sonic booms (see Enclosure 2, Figure 2). This area also encompasses the 130 dB threshold for launch effects, as well as the construction APE.

**Historic property means any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria. 36 CFR 800.16(l)*

Initial Identification of Historic Properties and Proposed Identification Efforts

The proposed identification approach is designed to make a reasonable and good faith effort to identify historic properties within the APE that may be affected by the undertaking. Effects related to construction will be limited within the footprint of LC-39A. This area has already been subject to survey and evaluation and will not require additional studies. The fieldwork and analysis will therefore focus on historic properties subject to the potential effects of elevated noise and vibrations associated with the undertaking.

The undertaking has the potential to affect historic properties from increased vibratory impacts. According to data provided by SpaceX, launch and reentry events are estimated to result in Lmax levels of 130 dB and/or sonic boom impacts of 2 psf or higher within the APE. Archaeological resources consisting solely of either surface scatters or subsurface deposits are not likely to be affected by the vibratory effects of increased sonic boom exposure due to the protective qualities of the surrounding soil matrix. Similarly, underwater archaeological sites are unlikely to be affected. However, vibratory effects may be greater on historic age

resources within the built environment. Architectural elements most susceptible to damage from launch and reentry vehicle noise include windows and, infrequently, plastered walls and ceilings. Vibration effects may be greatest to non-structural elements such as fragile glass and loose plaster/stone ornamentation. The enclosed memorandum provides additional information on this summation of the potential for vibratory effects on cultural resources (see Enclosure 2).

Previously Recorded Resources Within the APE

Historic properties within the construction APE include the Launch Complex 39 Pad A Historic District (8BR1686) which is listed in the National Register of Historic Places (NRHP). The historic district is the first of two launch pads constructed by NASA in the 1960s to accommodate the Saturn V launch vehicle for Apollo missions and modified in the 1970s to accommodate the Space Shuttle Program. The historic district contains 23 extant contributing resources all used to support launch operations. One contributing resource, Launch Complex 39 Pad A (8BR1995), is also individually listed in the NRHP. No archaeological sites have been recorded or documented within LC-39A.

A preliminary assessment of the operational APE, using data contained in the Florida Master Site File (FMSF), identified 2,964 previously recorded resources, including 2,315 structures, 31 bridges, 465 archaeological sites, 31 cemeteries, and 122 resource groups. Of these, 35 properties are listed in the NRHP and 353 have been evaluated as eligible (see Enclosure 2).

Approach for the Identification of Historic Properties

In 2010, NASA KSC completed HAER documentation of the LC-39A historic district and its associated contributing resources. As such, LC-39A is well documented and no further identification or evaluation of LC-39A is proposed.

Identification efforts will focus on historic properties that may be subject to physical damage from elevated noise and vibrations as well as cultural resources whose setting and feeling may be affected by audible and acoustic effects during launch and reentry activities. This will include buildings and structures within the APE that were not specifically designed to withstand the concussive forces of launching and landing spacecraft. Additionally, there are specific types of cultural resources for which aspects of setting and feeling are more likely to represent important components of historic integrity. These types of cultural resources potentially include:

- Designed historic landscapes such as parks and gardens
- Rural historic landscapes with continuity in their traditional use (farming, hunting/ fishing, sports/recreation)
- Historic districts
- Historic sites that feature outdoor spaces such as yards and plazas
- Cemeteries

Since the universe of properties in the APE will include many thousands of buildings and structures, identification efforts will focus on properties greater than 45 years of age, in areas that have not been surveyed within the last 10 years, and limited to historic properties and potential historic properties that may reasonably be affected by the undertaking. Previously recorded resources that were determined ineligible for listing in the NRHP will be excluded from further identification and evaluation efforts.

Historic properties will be identified in two ways. First, NASA KSC, supported by SEARCH, will compile an inventory of previously recorded cultural resources within the APE that are listed, eligible for listing, potentially eligible for listing, and unevaluated for listing in the NRHP. NASA KSC will use the FMSF database as well as the Integrated Cultural Resource Management Plans from both KSC and the Cape Canaveral Space Force Station. Additionally, county property appraiser databases will be queried to identify unrecorded historic aboveground resources within the APE. Parcel data contains built year information, which can be cross-referenced with recorded resources to identify parcels that contain structures 45 years old or older without recorded resources. Historic maps and aerial photographs will be used to examine land use and development changes over time, and a historic context will be developed for the APE. Data will be further supplemented with information on unrecorded cultural resources provided by consulting parties and the public. The cumulative data will be used to develop a Geographic Information System heat map within the APE to identify areas with high concentrations of unrecorded structures that are 45 years old or older. These data sets will be used to identify and create a list of properties that will be subject to survey fieldwork. The preliminary inventory data are provided in Enclosure 2.

Second, fieldwork will be conducted with three primary objectives:

1) Conduct a windshield survey guided by the heat map discussed above, in order to identify potential historic properties.

2) Complete FMSF documentation for potential historic properties identified during the windshield survey that have a reasonable possibility to be adversely affected by the undertaking. The architectural historians will identify and photograph potential historic properties that appear to embody historic significance established in the historic context. They will also identify and document the character-defining features that are indicative of NRHP eligibility and that may be susceptible to adverse effects, as discussed in Section 1.2. All newly recorded resources will be assumed NRHP-eligible, for the purposes of Section 106 consultation.

3) Revisit NRHP-listed or eligible historic properties that are individually eligible for the NRHP and that have with a reasonable possibility to be adversely affected to reassess their integrity.

A technical report presenting the results of the identification of historic properties will be prepared and submitted to you for review.

Consultation

Please let me know if your Tribe would like to participate as a Consulting Party in the Section 106 process and if there are properties of religious or cultural importance to your Tribe within the Project Area. Early identification of Tribal concerns will allow NASA and FAA to consider ways to avoid and minimize potential impacts to Tribal resources and practices. Your timely response will greatly assist us in incorporating your comments into project planning.

If you have any questions or need further information on the project, please contact me at 321-867-8454 or via email at katherine.s.zeringue@nasa.gov.

Sincerely,

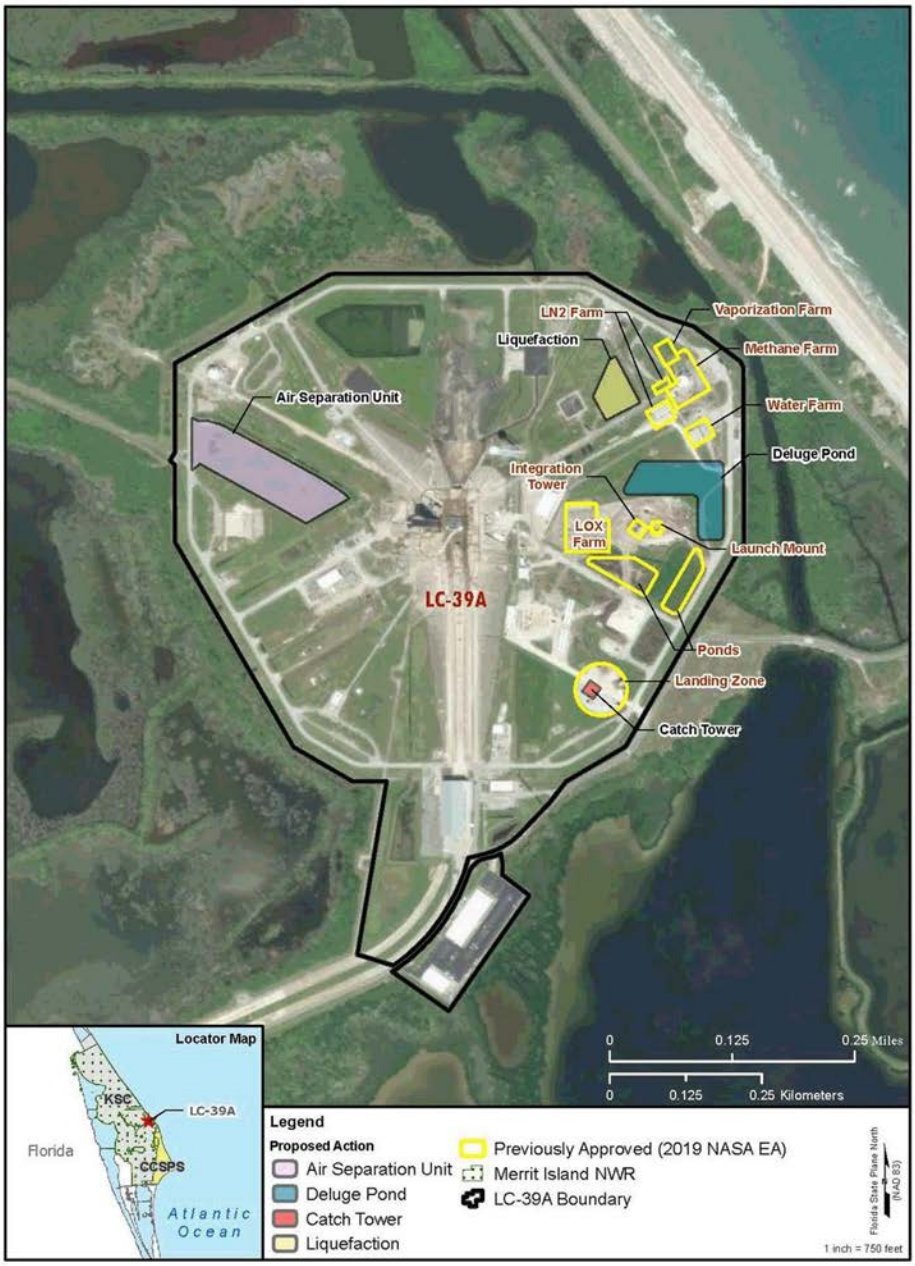
Katherine Zeringue Digitally signed by Katherine Zeringue
Date: 2024.12.20 15:36:07 -05'00'

Katherine Zeringue
KSC Cultural Resources Manger
Environmental Planning

Enclosures:

1. LC-39A Infrastructure Figure
2. Supplemental Background Information for the SpaceX Starship Super Heavy Launch and Reentry Vehicles Proposed Action at Launch Complex-39A, Kennedy Space Center

cc:
Ms. Tina Osceola, Tribal Historic Preservation Officer (THPO)
Ms. Danielle Simon, THPO Compliance Review Manager



Enclosure 1. LC-39A Infrastructure

TECHNICAL MEMORANDUM

SUPPLEMENTAL BACKGROUND INFORMATION FOR THE SPACEX STARSHIP SUPER HEAVY LAUNCH AND REENTRY VEHICLES PROPOSED ACTION AT LAUNCH COMPLEX-39A, KENNEDY SPACE CENTER

CONSULTANT:	SEARCH
AUTHORS:	Timothy Parsons, PhD; William Werner, MA; Gypsy Brafford, PhD
CLIENT:	Leidos
DATE:	December 2024
SEARCH PROJECT #:	240265

This technical memorandum presents supplementary background information in support of consultation between the National Aeronautics and Space Administration's Kennedy Space Center (NASA KSC) and the Florida State Historic Preservation Officer (SHPO) pursuant to Section 106 of the National Historic Preservation Act of 1966 as part of the Federal Aviation Administration's (FAA) environmental review for the proposed action for the SpaceX Starship Super Heavy Launch and reentry vehicles at KSC. Southeastern Archaeological Research, LLC (SEARCH) completed this cultural resources desktop study on behalf of Leidos, SpaceX, and FAA to provide additional information regarding the proposed area of potential effects (APE), known historic properties within the APE, and the approach for evaluating effects to previously unidentified historic properties within the APE.

1.1 AREA OF POTENTIAL EFFECTS

Area of potential effects means the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking [36 CFR 800.16(d)]. For launch operations, the FAA has typically selected a noise contour for a specific propulsion/engine noise level and/or a specific sonic boom/overpressure, because rocket noise has the greatest geographical extent of all of the potential sources of alterations to historic properties from launches (including landings and reentries).

In defining the APE for rocket launches, it is important to consider engine noise levels that may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register of Historic Places (NRHP) in a manner that would diminish the integrity of the property's setting or feeling. For projects at federal launch complexes, such as KSC, this typically is not an issue because of the historical nature of rocket launches occurring at the project site.

The APE considers the auditory and vibratory effects of the Starship Super Heavy Launch and reentry activities covered under the Federal Aviation Administration's operating license and is predicated on vibratory impacts based on data provided by SpaceX and prepared by Leidos. Vibratory impacts can be quantified using the Maximum Unweighted Sound Level (Bradley et al. 2020:3). Based on a study of structural damage during rocket static firing tests, Maximum Unweighted Sound Levels at 111 decibels (dB) result in one damage claim per 1,000 structures exposed, and levels at 120 dB result in one damage claim per 100 structures (Bradley et al. 2020:5). The National Academy of Sciences' "Guidelines for Preparing Environmental Impact Statements on Noise" (National Academy of Sciences 1977) state that one may conservatively consider all sound lasting more than one second with levels exceeding 130 dB (unweighted) as potentially damaging to structures. Vibratory impacts from sonic boom overpressure are quantified in pounds per square foot (psf). Studies have shown that damage from sonic booms is highly unlikely when structures are exposed to levels under 2 psf (Haber et al. 1989). However, when exposed to levels between 2 and 4 psf, structural components, including glass and plaster, demonstrate damage at a higher rate than expected due to natural wear in well-maintained structures (Haber et al. 1989).

In summary, for rocket launch undertakings at federal launch complexes, the FAA recommends defining the APE using a peak sound pressure level of 130 dB for operations with launches only or 2 psf overpressure for operations with launches and landings. In cases with both launches and landings, the total extent of both areas should be used to define the APE when one does not fully encompass the other. Additionally, effects analyses should be conducted on the resources for both launch noise and landing noise impacts to the respective identified resources.

Based on this information and previous research regarding rocket engine noise and vibration effects to structures, the APE was established as areas subjected to greater than or equal to 130 dB or overpressure levels of 2 psf associated with sonic booms (**Figure 1** and **Figure 2**) (Fenton and Methold 2016, Guest and Slone 1972, Haber et al. 1989).

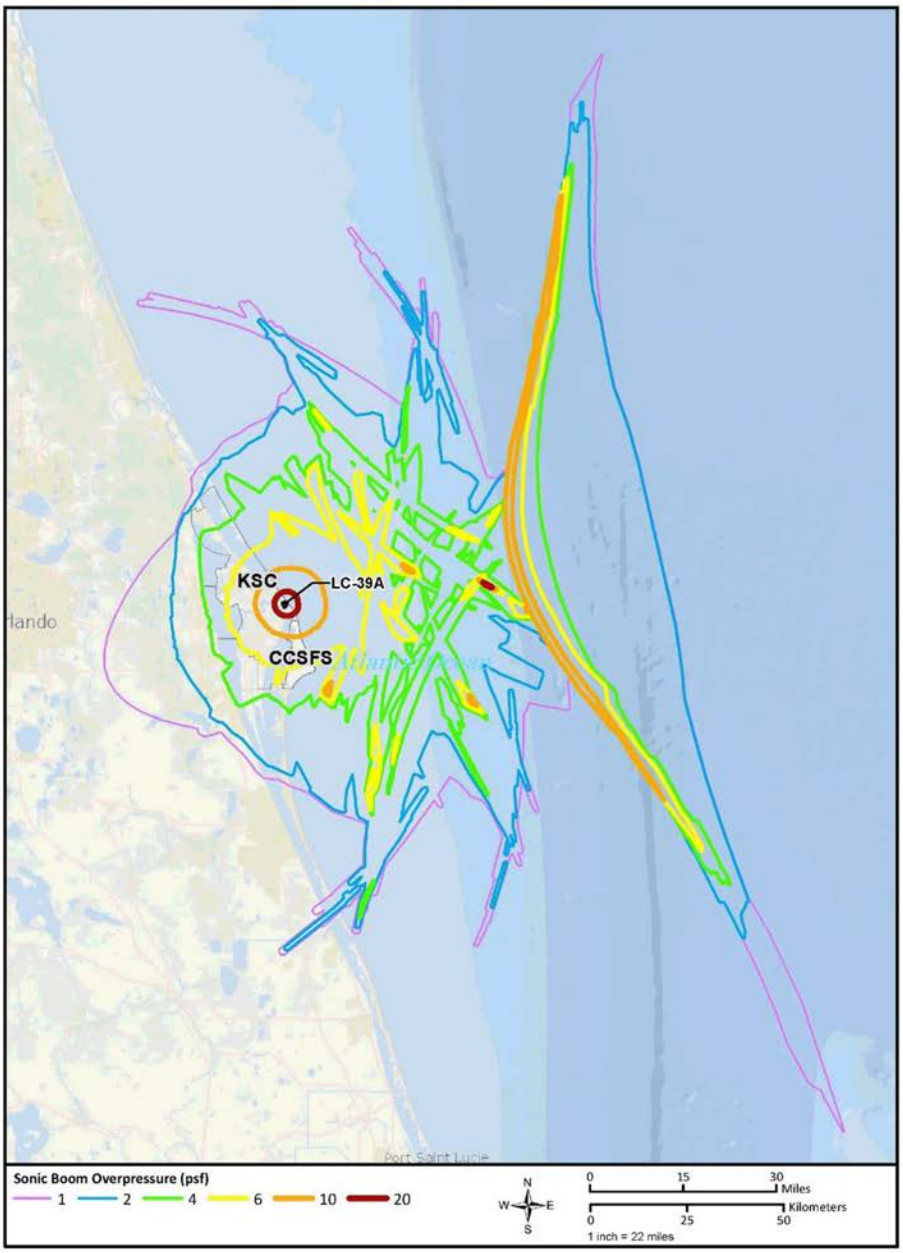


Figure 1. Sonic boom overpressure map for the Project area. The APE is defined as the area within the 2 psf contour (blue line) (Figure provided by Leidos).

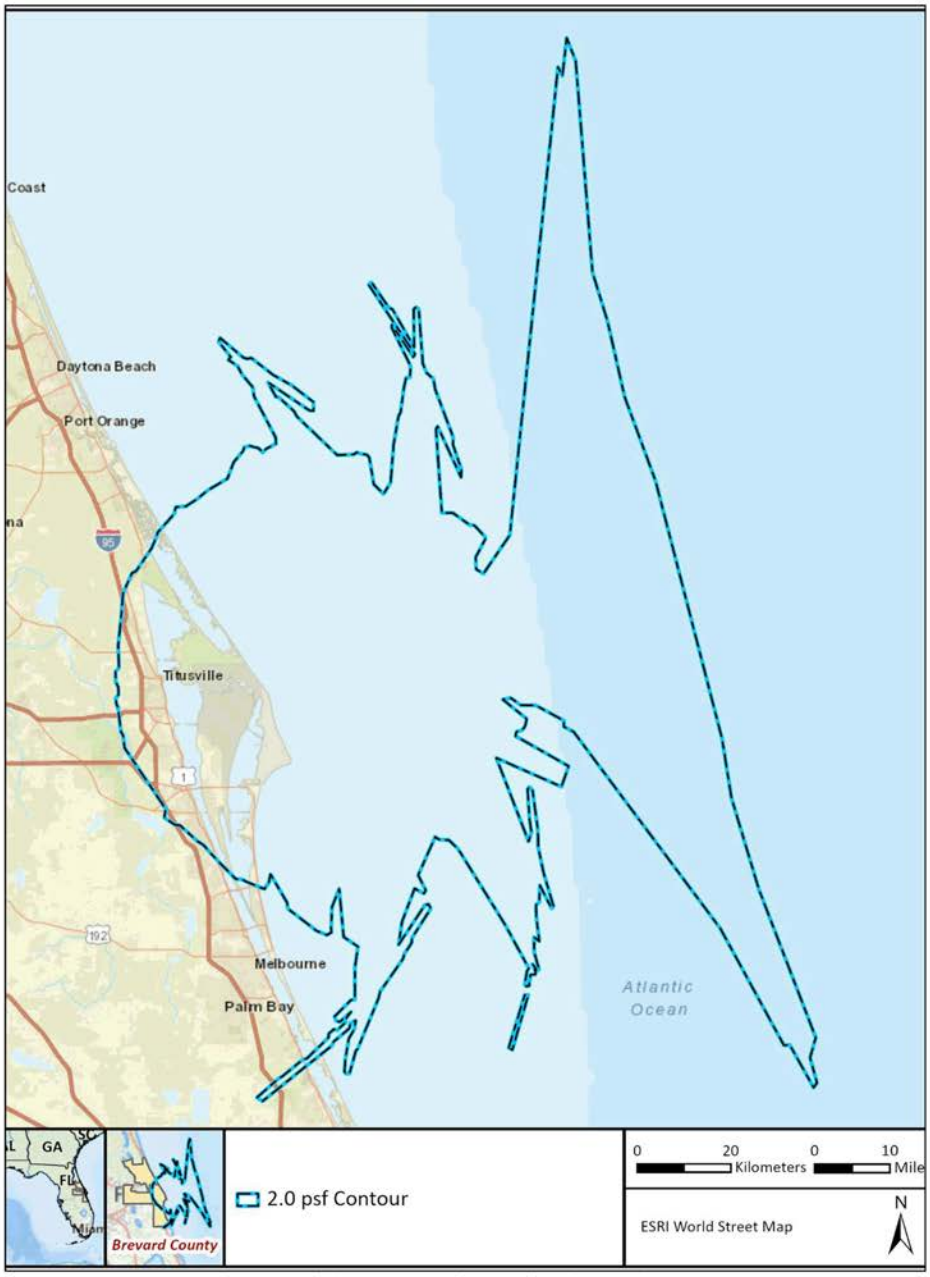


Figure 2. The APE, including portions of Brevard, Volusia, and Orange Counties.

1.2 POTENTIAL FOR ADVERSE EFFECTS

Per 36 Code of Federal Regulations 800.5, a federal undertaking has an adverse effect on a historic property when it diminishes one or more aspects of integrity to the extent that the property no longer conveys its significance per Criteria A–D for listing in the NRHP. NRHP eligibility is defined in 36 Code of Federal Regulations 60.4, under the authority of the National Historic Preservation Act of 1972, as amended:

> The quality of significance in American history, architecture, archeology, and culture is present in districts, sites, buildings, structures and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and,
>
> A. that are associated with events or activities that have made a significant contribution to the broad patterns of our history; or
> B. that are associated with the lives of persons significant in our past; or
> C. that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
> D. that have yielded, or may be likely to yield, information important in prehistory or history.

The increased vibratory impacts from the proposed project have the potential to cause adverse effects to cultural resources. High sound pressure levels and vibrations have the potential to cause building/structural damage. In general, however, structural damage to buildings due to propulsion/engine noise is rare. The historic building element "most susceptible to damage from launch vehicle noise [are] windows, and more infrequently, plastered walls and ceilings" (Nocerino et al. 2021:15). Masonry buildings and structures are most susceptible to vibration damage through the "wearing of joints…which can cause load to be redistributed due to a weakening of a structural member" (National Cooperative Highway Research Program [NCHRP] 2012:35). Further, vibration effects may be greatest to "non-structural building elements [such as] fragile glass, loose plaster mosaics or pieces of stone" (NCHRP 2012:36). Previous analysis also indicates "wood and steel are more elastic than masonry, such as brick and stone" (NCHRP 2012:2). Therefore, increased exposure to vibration may diminish the integrity of a resource's significant historic features.

Sonic booms also have the potential to result in structural damage. A large degree of variability exists in the possible effects of a sonic boom. For example, the probability of a window breaking when exposed to a sonic boom of 1 psf ranges from one in a billion to one in a million (Sutherland 1990) with much of the variability depending on the condition of the glass. At 10 psf, the probability of glass breaking is between 1 in 100 and 1 in 1,000. Laboratory tests involving glass have shown that properly installed glass will not break at overpressures below 10 psf, even when exposed to repeated sonic booms (White 1972). Damage to plaster has the potential to occur in

the same range of overpressures as damage to glass. Plaster often cracks due to shrinkage over time or due to structural settling. Sonic boom damage to plaster often occurs when internal stresses are already high as a result of these processes. In general, for well-maintained structures, the threshold for potential damage from sonic booms is 2 psf; below 2 psf, damage is unlikely (Haber and Nakaki 1989).

Archaeological resources consisting solely of surface scatters or subsurface deposits are not likely to be affected by the vibratory effects of increased sonic boom exposure due to the protective qualities of the surrounding soil matrix (Nocerino et al. 2021). Vibratory effects may be greater on historic resources, particularly those elements that predate the mid-twentieth century and were not designed or built with the impacts of the aeronautical industry in mind.

The National Park Service (NPS) provides guidelines for interpreting the seven aspects of integrity (location, design, setting, materials, workmanship, feeling, and association) as they relate to the potential effects of an undertaking (NPS 1995:45). The effects of the undertaking are unlikely to impact the location or association of historic properties within the APE. As noted above, there are limited circumstances in which the effects of vibration may result in damage to aboveground structures. Such damage may potentially affect the design, materials, and workmanship of historic properties, particularly as they relate to exterior and ornamental detailing.

Additionally, the setting and feeling of historic properties may be temporarily altered by the visual, audible, and vibratory effects of the undertaking. Setting refers to the physical environment of a resource, while feeling refers to the aesthetic qualities of a resource as they relate to the specific time during which the resource became significant. There are specific types of cultural resources for which aspects of setting and feeling are more likely to represent important components of historic integrity, such as archaeological sites with aboveground features, historic districts and landscapes, and cemeteries.

1.3 PREVIOUSLY RECORDED CULTURAL RESOURCES WITHIN THE APE

The Florida Master Site File (FMSF), maintained by the Florida Division of Historical Resources, is the primary repository for information regarding cultural resources (archaeological sites, cemeteries, buildings, bridges, linear resources [e.g., highways, railroads, canals], districts, and landscapes) that have been formally documented in Florida, typically as a result of compliance with federal, state, or municipal historic preservation statutes. SEARCH performed a query of the FMSF Geographic Information System database in December 2024 to provide the background information discussed below. Alternate sources that will be consulted to create an inventory of previously recorded cultural resources will include the NRHP database, the Integrated Cultural Resource Management Plans for KSC and the Cape Canaveral Space Force Station, and information provided by consulting parties and members of the public. Procedures for identifying additional cultural resources that have not been previously recorded are discussed in the subsequent section.

The query of the FMSF database indicated that there are 2,964 previously recorded cultural resources within the APE, including 465 archaeological sites, 2,315 structures, 31 cemeteries, 122 resource groups (including building complexes, districts, landscapes, and linear resources), and 31 historic bridges. The following sections provide overviews of each of the resource categories present within the FMSF database, including discussion of the attributes most likely to be affected by the proposed project.

1.3.1 Structures

Historic structures include architectural resources such as residential, commercial, and public buildings, as well as other elements of the built environment. To be considered significant,

> the structure must represent a part of history, architecture, archeology, engineering, or culture of an area, and it must have the characteristics that make it a good representative of properties associated with that aspect of the past. (NPS 1995:7)

The FMSF database review identified 2,315 previously recorded buildings within the APE; at least 40 have been destroyed and will not be included in further analyses. Twenty-four buildings are listed in the NRHP, 324 have been evaluated eligible for listing, seven are potentially eligible for listing, 836 are not eligible for listing, and the remaining 1,084 have not been evaluated for eligibility. Though these historic structures are distributed throughout the APE, many are concentrated around the cities of Titusville and Cocoa Beach, or are associated with KSC, Cape Canaveral Space Force Station, or Patrick Space Force Base. **Table 1** summarizes the extant NRHP-listed and -eligible structures located on nonfederal lands within the APE. An additional 1,053 structures located on nonfederal lands have yet to be evaluated and are not included in the table.

Of the 1,439 buildings that are listed, eligible for listing, potentially eligible for listing, or have not been evaluated for NRHP eligibility, at least 545 recorded structures are composed at least in part of masonry materials such as brick, concrete, stone, and structural clay tile. As discussed above, these materials are less elastic than metal or wood and may be particularly susceptible to vibratory impacts. However, minor damage may not necessarily result in an adverse effect to these resources unless it diminishes the character-defining aspects of integrity that contribute to the eligibility of these structures. Because the remaining 876 buildings were either determined ineligible for listing in the NRHP or recorded as destroyed, it can be reasonably assumed that impacts to these resources, if any, would be insignificant.

Table 1. Structures within the APE that are NRHP-Listed or -Eligible.

Site	Site Name	Year Built	Style	NRHP Status
BR00172	Launch Complex 39	1968	Other	Listed
BR00177	St. Gabriel's Episcopal Church	1887	Gothic Revival, ca. 1840–present	Listed
BR00211	Porcher, E P House	1916	Georgian Revival, ca. 1880–present	Listed
BR00278	Cocoa Junior High	ca. 1924	Masonry Vernacular	Listed
BR00282	Aladdin Theater Building	1924	Italian Renaissance Rev ca. 1880-1935	Listed

Site	Site Name	Year Built	Style	NRHP Status
BR00397	Wager House	ca. 1891	Frame Vernacular	Listed
BR00399	Robbins, George, Judge House	ca. 1892	Georgian Revival, ca. 1880–present	Listed
BR00425	422 Julia St.	1926	Mission	Eligible
BR00426	428 Julia St.	1905	Masonry Vernacular	Eligible
BR00430	423 Main St.	ca. 1910	Frame Vernacular	Eligible
BR00454	La Grange Church and Cemetery	1869	Frame Vernacular	Listed
BR00465	Brevard County Courthouse	ca. 1912	Neo-Classical Revival, ca. 1880–1940	Eligible
BR00468	Palm Ave	1925	Mission	Eligible
BR00480	Spell House	ca. 1911	Queen Anne (Revival), ca. 1880–1910	Listed
BR00524	Pritchard House	1891	Queen Anne (Revival), ca. 1880–1910	Listed
BR00581	St. Luke's Episcopal Church	1889	Frame Vernacular	Listed
BR00681	825 Osceola Dr.	ca. 1926	Mediterranean Revival, ca. 1880–1940	Eligible
BR00724	Caldwell, Troy E. Residence	ca. 1905	Georgian Revival, ca. 1880–present	Eligible
BR00730	1277 Rockledge Dr.	ca. 1915	Frame Vernacular	Eligible
BR00860	Hill, Dr. George E, House	ca. 1880	Frame Vernacular	Listed
BR01163	Lamar, Mattie House	1917	Frame Vernacular	Eligible
BR01657	City Point Community Church	1885	Frame Vernacular	Listed
BR01658	Hotel Mims	ca. 1889	Frame Vernacular	Listed
BR01684	Vehicle Assembly Building (VAB)	ca. 1966	No style	Listed
BR01685	Launch Control Center (LCC)	ca. 1966	International, ca. 1925–present	Listed
BR01688	Missile Crawler Transporter Facilities	ca. 1965	Not applicable	Listed
BR01690	Press Site: Clock and Flag Pole	1969	No style	Listed
BR01693	Operations Checkout (O&C)	ca. 1964	International, ca. 1925–present	Listed
BR01702	Field, J.R. Homestead	ca. 1900	Frame Vernacular	Listed
BR01723	Cocoa Cemetery Storage Building	ca. 1931	Masonry Vernacular	Eligible
BR01739	Ashely's Café & Lounge	ca. 1932	Tudor Revival, ca. 1890–1940	Eligible
BR01741	Rockledge Gardens Nursery & Landscaping	ca. 1930	Industrial Vernacular	Eligible
BR01744	Harvey's Groves	ca. 1939	Masonry Vernacular	Eligible
BR01765	Bohn Equipment Company	ca. 1927	Industrial Vernacular	Eligible
BR01825	Cocoa Post Office	1940	Art Deco, ca. 1920–1940	Listed
BR01988	Landing Aids Control Building (LACB)	ca. 1976	Industrial Vernacular	Eligible
BR01991	Orbiter Processing Facility (OPF)	ca. 1977	Industrial Vernacular	Eligible
BR01992	Orbiter Processing Facility High Bay 3	1987	Industrial Vernacular	Eligible
BR01994	Thermal Protection System Facility	ca. 1988	Industrial Vernacular	Eligible
BR01995	Launch Complex 39: Pad A	ca. 1965	Not applicable	Eligible
BR01997	Rotation/Processing Building	1982	Industrial Vernacular	Eligible
BR01998	SRB ARF Manufacturing Building	1986	Industrial Vernacular	Eligible
BR02010	Launch Complex 39: Pad B	ca. 1966	Not applicable	Eligible
BR02016	Canister Rotation Facility	ca. 1993	Industrial Vernacular	Eligible
BR02021	Mobile Launcher Platform	ca. 1963	Not applicable	Eligible
BR02671	Space Station Processing Facility	1992	Industrial Vernacular	Eligible
BR02704	400 Lucerne Dr	ca. 1966	Other	Eligible
BR02779	317 Rosa Jones Drive	ca. 1962	Masonry Vernacular	Eligible
BR02908	NLAX 170	ca. 1985	Not applicable	Eligible

Site	Site Name	Year Built	Style	NRHP Status
BR02969	Engineering Development Laboratory	1966	No style	Eligible
BR02990	Beach House	1962	No style	Eligible
BR03046	Foam Building	ca. 1965	Masonry Vernacular	Eligible
BR03955	2460 Courtenay Parkway N	ca. 1965	Mid-Century Modern, ca. 1940s–early 1960s	Eligible
BR04215	Imperial Towers	ca. 1963	Mid-Century Modern, ca. 1940s–early 1960s	Listed

1.3.2 Building Complexes, Districts, and Landscapes

The FMSF classifies several types of cultural resources that consist of individual resources grouped into building complexes, districts, and landscapes. The FMSF includes 51 building complexes, districts, and landscapes within the APE that are listed (*n* = 8), eligible (*n* = 32) potentially eligible (*n* = 1), or unevaluated (*n* = 10) for listing in the NRHP (**Table 2**). Of these, five are archaeological districts, two are designed historic landscapes, nine are FMSF building complexes, 33 are historic districts, and two are mixed districts. Of the 40 NRHP-listed or -eligible resources within this group, most are late nineteenth- to twentieth-century historic districts (*n* = 20) or building complexes (*n* = 2) located on Cape Canaveral and associated with the aeronautical industry. These include 12 launch complexes, two test facilities, and various operations support facilities. The remaining 18 NRHP-listed or -eligible resources within this group include aeronautical facilities in Titusville (*n* = 5), Satellite Beach (*n* = 2), and at Patrick Space Force Base (*n* = 3). Although Cape Canaveral Air Force Station (8BR00216) is not formally listed in the NRHP and is therefore not included in the sum of listed properties above, it was designated a National Historic Landmark in 1984.

Potential effects to archaeological districts and archaeological components to "mixed" districts will be included in the discussion of archaeological sites below; the current section focuses on districts and landscapes containing aboveground elements. A historic district draws its significance from the density of historic resources within it, rather than from the individual significance of a resource. A contributing resource is one that adds to a historic district's context and integrity. A district is further composed of resources unified through common historical themes or architectural types or styles (NPS 1999:6). A contributing resource adds to these overall themes not necessarily by possessing individual significance, but rather by its expression of historic integrity. Given that the potential for physical damage from the effects of the undertaking is limited to very few individual buildings, as discussed above, it is unlikely that the undertaking would significantly alter the integrity of a historic district's materials, design, and workmanship. Analysis of effects to historic districts and building complexes within the APE will focus on those that are not associated with the aeronautical industry because these are more likely to contain physical elements that may be susceptible to vibration damage or have historical associations expressed through integrity of setting and feeling that may be affected by the visual and audible effects of the undertaking.

A designed historic landscape

> has significance as a design or work of art; was consciously designed and laid out by a master gardener, landscape architect, architect or horticulturalist to a design principle, or an owner or other amateur using a recognized style or tradition; has a historical association with a significant person, trend, event, etc." (Keller and Keller n.d:2)

Examples of designed historic landscapes include estate grounds, zoological gardens, plazas or other public spaces, city planning, battlefield parks and outdoor recreation areas (such as golf courses, stadiums, and racetracks). There are no NRHP-listed designed historic landscapes within the APE, but the PAFB Airfield (8BR02439) is eligible, and the Rockledge Country Club (8BR02143) has not been evaluated for NRHP eligibility. Analysis of potential effects to these designed historic landscapes will consider whether they have contributing physical elements that maintain integrity of design, materials, and workmanship that could be susceptible to vibration damage and how their aspects of setting and feeling may be affected by the visual and audible effects of the undertaking.

Table 2. Districts and Landscapes within the APE that are Listed, Eligible, or Unevaluated for Listing in the NRHP.

Site	Site Name	Classification	Time Period	NRHP status
BR00216	Cape Canaveral Air Force Station	FMSF building complex	1950-present	National Historic Landmark
BR00238	Canaveral Town	Archaeological district	1921-1940	Not evaluated
BR00560	Titusville Commercial District	Historical district	1880-1929	Listed
BR00564	Cocoa Historic District	Historical district	1861-1899	Not evaluated
BR01611	Rockledge Drive Residential District	Historical district	1880-1929	Listed
BR01612	Valencia Subdivision Residential District	Historical district	1921-1929	Listed
BR01613	Barton Avenue Residential District	Historical district	1880-1897	Listed
BR01686	Launch Complex 39: Pad A	Historical district	1950-present	Listed
BR01687	Launch Complex 39: Pad B	Historical district	1950-present	Listed
BR01975	Banana River Naval Air Station Seaplane	Historical district	1939-1989	Potentially eligible
BR01986	Shuttle Landing Facility Area HD	Historical district	1969 to 2010	Eligible
BR01990	Orbiter Processing Historic District	Historical district	1969 to 2010	Eligible
BR01996	Solid Rocket Booster Disassembly and Refurbishment Historic District	Historical district	1969 to 2010	Eligible
BR02022	Launch Complex 21/22	Historical district	1900–present	Eligible
BR02033	Cape Canaveral Lighthouse Station District	Mixed district	Precontact; 1861–1865; 1894–present	Not evaluated

Site	Site Name	Classification	Time Period	NRHP status
BR02143	Rockledge Country Club Resource Group	Designed historic landscape	1927–1957	Not evaluated
BR02170	PAFB Missile Instrumental Station	Historical district	1950–present	Eligible
BR02181	Bommarc - Sage Radome Facility	FMSF building complex	1945-1991	Eligible
BR02188	Launch Complex 9 Resource Group	FMSF building complex	1900–present	Eligible
BR02198	Launch Complex 13	Historical district	1956–1966	Eligible
BR02209	Launch Complex 14	Historical district	1950–present	Eligible
BR02234	Launch Complex 3 & 4	Historical district	1900–present	Eligible
BR02248	Launch Complex 1-2	Historical district	1900–present,	Eligible
BR02260	Launch Complex 19	Historical district	1956–1966	Eligible
BR02272	Launch Complex 30	FMSF building complex	1950–present	Eligible
BR02279	Launch Complex 34	Historical district	1961–1971	Eligible
BR02369	Launch Complex 17	Historical district	1957–1960	Eligible
BR02438	PAFB Landplane Facilities District	FMSF building complex	1945–1991	Eligible
BR02439	PAFB Airfield	Designed historic landscape	1950–present	Eligible
BR02440	PAFB Landplane Administrative District	FMSF building complex	1945–1991	Eligible
BR02518	Launch Complex 25	Historical district	1958–1969	Eligible
BR02529	Launch Complex 29	Historical district	1958–1969	Eligible
BR02535	Launch Complex 31/32	FMSF building complex	1900–present	Not evaluated
BR02540	Fuel Storage Area 3	Historical district	1952–present	Eligible
BR02935	Titusville Downtown Residential Historic	Historical district	1821–present	Not evaluated
BR03031	Area 55: Delta Operations Support Area	Historical district	1956–1980	Eligible
BR03034	Delta II Solid Rocket Motor Area	Historical district	1963–1965	Eligible
BR03036	Delta Spin Test Facility	Historical district	1966–2010	Eligible
BR03052	LC 5/6 Spin Test Facility	Historical district	1900–present	Eligible
BR03073	CCAFS Industrial Area	Historical district	1958–present	Eligible
BR03186	Skid Strip Historic District	Historical district	1950–present	Eligible
BR03345	Cocoa Maintenance Yard	FMSF building complex	1900–present	Not evaluated
BR03369	CCAFS Industrial Area Historic District	Historical district	1946–1989	Eligible
BR03407	Carpenter Homes Complex	FMSF building complex	1950–present	Not evaluated
BR03433	Control Tower Road Tracking Sites	Historical district	1950–present	Eligible
BR03921	Richard E. Stone Historic District	Historical district	Unknown	Not evaluated
BR04000	Cape Fish Company	Archaeological district	1900–present	Eligible
BR04229	Jonathan H. Sams Farmstead	Mixed district	Precontact	Eligible
VO00259	North Mosquito Lagoon Archaeological District	Archaeological district	Precontact	Not evaluated
VO02569	Ross Hammock Complex	Archaeological district	Precontact; nineteenth century	Listed

Site	Site Name	Classification	Time Period	NRHP status
VO09407	Elliot Plantation Complex	Archaeological district	British colonial; US territorial period	Eligible

1.3.3 Cemeteries

Table 3 summarizes the 31 cemeteries within the APE that are recorded in the FMSF database. Six have been evaluated eligible for listing in the NRHP, while the remaining 25 have not been evaluated. One of the NRHP-eligible cemeteries, La Grange Cemetery (BR04541), is associated with the NRHP-listed La Grange Church (BR00454). Approximately half of the FMSF-recorded cemeteries within the APE serve African American and Native American populations. Eight are federally owned cemeteries associated with the Cape Canaveral Space Force Station, and at least seven are privately owned.

NPS guidelines state that cemeteries are typically ineligible for listing in the NRHP; however, they may be eligible if they are associated with persons of outstanding historical importance or are connected to important historical events. The materials, design, and workmanship evident in grave markers and the organization of burial grounds may reflect unique perspectives of ethnic and cultural groups in ways that can contribute to the eligibility of a cemetery. Furthermore, the analysis of the effects of the undertaking will consider whether setting and feeling potentially contribute to the eligibility of the cemeteries within the APE, as these aspects of integrity may be disrupted by visual, audible, and vibratory effects of the undertaking.

Table 3. Recorded Cemeteries in the APE.

Site	Site Name	Year Established	Ownership	Ethnicity	Status	NRHP Status
BR00186	Campbell-Jackson Cemetery	1913	Federal	African American	Maintained but not used	Not evaluated
BR00191	African American Graves/New Haulover 2	1880	Federal	African American	Maintained but not used	Not evaluated
BR00233	Cape Road Cemetery	ca. 1894	Federal	White, non-Hispanic	Abandoned	Not evaluated
BR00552	Historic Negro Cemetery	Unknown	Private-individual	African American	Abandoned	Not evaluated
BR01624	Emma Watton	ca. 1882	Federal	White, non-Hispanic	Maintained but not used	Not evaluated
BR01626	Crook/Watton	1915	Federal	White, non-Hispanic	Maintained but not used	Not evaluated
BR01631	Griffis	1897	Federal	White, non-Hispanic	Unspecified by surveyor	Not evaluated
BR01705	Pioneer Cemetery	ca. 1890	Private-community	White, non-Hispanic	Used	Eligible
BR01724	Hilltop Cemetery	ca. 1887	City	African American	Used	Eligible
BR01777	Cocoa Cemetery	ca. 1890	City	White,	Used	Eligible

Site	Site Name	Year Established	Ownership	Ethnicity	Status	NRHP Status
				non-Hispanic		
BR01979	City Point Cemetery	1878	Private-individual	African American, Native American, white, non-Hispanic	Maintained but not used	Not evaluated
BR02352	Fac. 77903-Burnham Family Cemetery	ca. 1866	Federal	White, non-Hispanic	Abandoned	Not evaluated
BR02354	Fac. 60201-Penny Family Cemetery	ca. 1890	Federal	White, non-Hispanic	Abandoned	Not evaluated
BR02355	Quarterman North	ca. 1920	Federal	White, non-Hispanic	Maintained but not used	Not evaluated
BR02356	Quarterman South	1869	Federal	White, non-Hispanic	Maintained but not used	Not evaluated
BR02357	Facility 6403-Osmon Grave	ca. 1913	Federal	White, non-Hispanic	Abandoned	Eligible
BR02358	Fac. 6405-Canaveral Fish Company Grave	1913	Federal	Other	Abandoned	Eligible
BR02401	White Lilly	ca. 1892	Private	African American	Used	Not evaluated
BR02406	Mt. Carmel Missionary Baptist Church Cem	ca. 1915	Unknown	African American	Unspecified by surveyor	Not evaluated
BR02411	Dennis Sawyer Cemetery	1956	Private	African American	Maintained but not used	Not evaluated
BR02785	Evergreen Memorial Cemetery	1942	Unknown	White, Non-Hispanic	Used	Not evaluated
BR02786	Canaveral Groves Cemetery	1884	County	White, Non-Hispanic	Used	Not evaluated
BR02808	Pinecrest Colored Cemetery	1949	Private-corporate/ nonprofit	African American	Used	Not evaluated
BR03000	Pinecrest Cemetery	1929	Private-corporate/ nonprofit	White, Non-Hispanic	Used	Not evaluated
BR03334	Fisher Plot	ca. 1884	Private-individual	Other	Maintained but not used	Not evaluated
BR03366	Fac. 77901-Wilson Brothers Cemetery	ca. 1940	Federal	White, Non-Hispanic	Abandoned	Not evaluated
BR04310	Pluckebaum's Tomb	ca. 1937	Private	White, Non-Hispanic	Unspecified by surveyor	Not evaluated
BR04482	Davis Memorial Cemetery	1956	Unknown	African American	Unspecified by surveyor	Not evaluated
BR04541	La Grange Cemetery	1875	Unknown	Unknown	Used	Eligible
BR04574	Oak Ridge Cemetery	ca. 1916	Private-corporate/ nonprofit	African American	Used	Not evaluated
BR04630	Georgiana Cemetery (aka Crooked Mile)	ca. 1884	Unknown	African American	Used	Not evaluated

1.3.4 Archaeological Sites

An archaeological property can be a precontact or postcontact district, site, structure or object. To be eligible for listing in the NRHP, an archaeological property should have local, state, or national significance, and qualities of integrity, which include location, design, setting, materials, workmanship, feeling and association (Little et al. 2000). Archaeological sites are usually eligible under NRHP Criterion D (yield or likely to yield important information), but they can be eligible under any of the criteria.

The FMSF database includes 465 previously recorded archaeological sites within the APE, including five submerged historic shipwrecks. Of these 465 previously recorded sites, one is listed in the NRHP, 40 have been evaluated eligible for listing in the NRHP, six have been evaluated potentially eligible for listing in the NRHP, and 122 have been evaluated ineligible for listing in the NRHP. The remaining 296 have not been evaluated for NRHP eligibility. As described above, the anticipated effects of the undertaking are limited to rare instances of physical damage to aboveground resources, as well as temporary visual, audible, or vibratory interruptions to historic setting and feeling. Most archaeological sites, consisting of scattered remains on or below the ground surface, are protected from vibration damage by the surrounding soil matrix (or by water in the case of maritime sites) and already lack integrity of setting and feeling. However, some archaeological sites may have preserved aboveground structural features. Furthermore, setting and feeling may be important aspects at sites that feature landscape elements, such as mounds or earthworks (Little et al. 2000:36). The 343 sites within the APE that are listed, eligible for listing, potentially eligible for listing, or have not been evaluated for NRHP eligibility were reviewed to identify those that potentially include these attributes. This review identified 103 sites, which are summarized below. The 122 sites previously found to be ineligible for listing in the NRHP presumably lack integrity, significant historical associations, or information potential; therefore impacts to these sites are not likely to be significant.

Table 4 summarizes the 103 archaeological sites that are eligible for listing, potentially eligible for listing, or have not been evaluated for NRHP listing and that also feature aboveground components or landscape features. Of these 103 sites, 43 are precontact Native American mounds, and the remaining 60 are the aboveground remains of houses, mills, historic forts, or other aboveground built structures. In total, 19 of the 103 archaeological sites summarized below are considered eligible for NRHP listing. Of these 19 sites, 15 are historic structures, which largely consist of aeronautical facilities, such as the Former NAA Control Tower Site (8BR03534) and Lighter-Than-Aircraft Factory (BR02477), and industrial facilities, such as the Ross Hommock Evaporation Plant (8VO00213) and Sugar Mill Ruins at Elliot Plantation (8VO00160). The remaining four are precontact burial mounds with associated midden deposits, including the Ross Hammock Mounds (8VO00131) and Haulover Sand Mound and Midden (A, B) (8BR01673).

Table 4. NRHP-Eligible and Unevaluated Archaeological Sites within the APE with Potential Aboveground or Landscape Features.

Site ID	Site Name	Site Type	NRHP Status
BR03279	Beachside Midden	Land (terrestrial)	Not evaluated
BR03335	Fac. 17200: Weather Theodolite Pad B	Building remains	Eligible

Site ID	Site Name	Site Type	NRHP Status
BR03336	Fac. 1331: Telemetry ELSEE 12-110-PL	Building remains	Eligible
BR03337	Fac. 1333B:Beat-Beat DOVAP 14-110-PLM	Building remains	Eligible
BR03338	Fac. 1333A:Beat-Beat DOVAP 14-110-PR	Building remains	Eligible
BR03339	Fac. 1334: Telemetry ELSEE 12-110-PRS	Building remains	Eligible
BR03341	Facility 74610: Camera Pad	Building remains	Eligible
BR00009	Indian Mound Station	Precontact burial(s)	Eligible
BR00031	Unknown	Precontact mound(s)	Not evaluated
BR00062	Moore Mound	Precontact midden(s)	Not evaluated
BR00063	Sams Mound	Land (terrestrial)	Not evaluated
BR00065	Unknown	Precontact mound(s)	Not evaluated
BR00066	Unknown	Precontact mound(s)	Not evaluated
BR00069	Unknown	Precontact burial mound(s)	Not evaluated
BR00072	Fairyland/Honeymoon Hill	Precontact burial mound(s)	Not evaluated
BR00077	Nauman's Place	Precontact burial(s)	Not evaluated
BR00078	Dummett's Place	Building remains	Not evaluated
BR00078B	Dummett Homestead	Building remains	Potentially eligible
BR00083	De Soto Grove Burial Mound	Land (terrestrial)	Eligible
BR00084	Unknown	Historic fort	Not evaluated
BR00085	Burns	Habitation (precontact)	Not evaluated
BR00086	Holmes Mound	Building remains	Eligible
BR00087	Gulbransen Mound	Habitation (precontact)	Not evaluated
BR00088A	Hammock Mound A	Habitation (precontact)	Not evaluated
BR00088B	Hammock Mound B	Habitation (precontact)	Not evaluated
BR00088C	Hammock Mound C	Habitation (precontact)	Not evaluated
BR00089	Norris Mound	Habitation (precontact)	Not evaluated
BR00090	Fuller Mound A	Precontact burial mound(s)	Not evaluated
BR00091	Fuller Mound B	Precontact burial mound(s)	Not evaluated
BR00092	Fuller Mound C	Precontact mound(s)	Not evaluated
BR00093	Fuller Mound D	Precontact burial mound(s)	Not evaluated
BR00094	Fuller Mound E	Precontact mound(s)	Not evaluated
BR00095	Fuller Mound F	Precontact mound(s)	Not evaluated
BR00142	Butler Campbell's Mound	Precontact burial(s)	Not evaluated
BR00150	Oyster Prong Creek Mound	Precontact burial mound(s)	Not evaluated
BR00151	Unknown	Precontact burial mound(s)	Not evaluated
BR00156	Unknown	Precontact mound(s)	Not evaluated
BR00162	Fairyland Hill Burial Mound	Precontact burial mound(s)	Not evaluated
BR00175	Fort Ann	Historic fort	Not evaluated
BR00205	Max Hoeck Mound and Midden	Precontact midden(s)	Not evaluated
BR00206	Pepper Hammock	Campsite (precontact)	Not evaluated
BR00223	Quarterman	Building remains	Not evaluated
BR00234	Old Lighthouse	Building remains	Not evaluated
BR00238A	Canaveral Town Site B	Building remains	Not evaluated

Site ID	Site Name	Site Type	NRHP Status
BR00238B	Canaveral Town Site C	Building remains	Not evaluated
BR00238C	Canaveral Town Site D	Building remains	Not evaluated
BR00238D	Canaveral Town Site E	Building remains	Not evaluated
BR00239	Stinktown and Jeffords	Building remains	Potentially eligible
BR00240	Hotel	Industrial	Not evaluated
BR00243	Pier Road Houses	House	Not evaluated
BR00243B	Pier Road Houses Site B	Building remains	Not evaluated
BR00243C	Pier Road Houses Site C	Building remains	Not evaluated
BR00540	Daigle Place	Building remains	Not evaluated
BR00544	Lopex Orchard	Building remains	Not evaluated
BR00567	UWF 3	Homestead	Not evaluated
BR01639	NS BR 4	Building remains	Not evaluated
BR01670	Haulover Canal Midden	Building remains	Not evaluated
BR01673	Haulover Sand Mound and Midden (A,B)	Precontact mound(s)	Eligible
BR02351	Murray Parcel	Farmstead	Not evaluated
BR02365	Fac. 1330B: Beat-Beat DOVAP 12-110-PLM	Building remains	Eligible
BR02396	Fac. 1343: East Compass Rose	Building remains	Eligible
BR02400	Ulumay Lagoon	Habitation (precontact)	Not evaluated
BR01855	Harry T. Moore Site	Building remains	Not evaluated
BR01872	Sam's Site	Agriculture/farm structure	Eligible
BR01933	Little Midden	Building remains	Eligible
BR01935	Lone Cistern	Building remains	Not evaluated
BR02052	Fac 1222 CZR Camera Pad U15R146	Building remains	Not evaluated
BR02053	Fac 36900: GLOTRAC Site	Building remains	Not evaluated
BR02054	Fac. 114-G: LC-25 Warning Horn Site	Building remains	Not evaluated
BR02055	Facility 1212-CZR Camera Site U36R175	Building remains	Not evaluated
BR02078	Pace's Landing	Building remains	Not evaluated
BR02160	FIM Van Site S-5	Building remains	Not evaluated
BR02161	Facility 1209-Rate Antenna Pad A	Building remains	Not evaluated
BR02165	Facility 289 - Flame Attenuation Site	Building remains	Not evaluated
BR02166	James W. Merchant Homestead	Building remains	Not evaluated
BR02167	Facility 1126: Telemetry ELSSE	Building remains	Not evaluated
BR02229	Clifton Schoolhouse	Agriculture/farm structure	Not evaluated
BR02477	Lighter-Than-Air Craft Factory	Building remains	Eligible
BR02507	Taylor House	Homestead	Not evaluated
BR02508	Hunters Camp	Building remains	Not evaluated
BR02509	Palm Hammock	Building remains	Not evaluated
BR02513	Facility 1390: Theodolite Tower 1.40	Building remains	Not evaluated
BR02514	Facility 1090 Security Police Bldg	Building remains	Not evaluated
BR02680	Klondike Beach Tower Ruins (2311.12)	Building remains	Not evaluated
BR03048	Old MacDonald's Farm	Farmstead	Not evaluated
BR03152	Clark Slough Earthwork	Precontact mound(s)	Not evaluated
BR03274	The Dunal Ridge Midden	Precontact mound(s)	Not evaluated
BR03534	Former NAA Control Tower Site	Building remains	Eligible
BR03998	CCAFS Facility 1430 - SHANICLE Building	Building remains	Not evaluated
IR00994	Sam Dale	Farmstead	Not evaluated
OR00008	Long Bluff 3	Precontact burial mound(s)	Not evaluated
OR10652	Streetman Cabin	Building remains	Not evaluated

Site ID	Site Name	Site Type	NRHP Status
VO02599	Mosquito Lagoon House of Refuge	Building remains	Not evaluated
VO00112	Castle Windy Midden	Precontact burial(s)	Not evaluated
VO00129	Scobey Place	Precontact burial mound(s)	Not evaluated
VO00131	Ross Hammock-Mounds	Precontact burial mound(s)	Eligible
VO00148	Griffis Place	Precontact burial mound(s)	Not evaluated
VO00149	Oak Hill Mound	Campsite (precontact)	Not evaluated
VO00160	Sugar Mill Ruins – Elliot Plantation	Building remains	Eligible
VO00213	Ross Hammock – Evaporation Plant	Building remains	Eligible
VO05312	CANA 26	Specialized procurement site	Not evaluated
VO08887	V-1 Impoundment	Land-terrestrial	Not evaluated
VO08936	Voorhees Midden	Campsite (precontact)	Not evaluated

1.3.5 Linear Resources

The FMSF includes 49 linear resources within the APE, two of which are listed in the NRHP. Fifteen have been evaluated eligible for listing in the NRHP, 24 have been evaluated ineligible for listing in the NRHP, and eight have not been evaluated for listing in the NRHP (**Table 5**). The two NRHP-eligible linear resources within the APE are the Old Haulover Canal (8BR00188), which connects the Indian River to Mosquito Lagoon north of Merritt Island, and Crawlerway (8BR01689), which connects the Vehicle Assembly Building (BR01684) and two launch pads (BR01686 and BR01687) at Launch Complex 39 at the KSC. The 24 eligible or unevaluated linear resources include canals and associated structures (*n* = 5), railroads (*n* = 5), roads (*n* = 8), trails (*n* = 3), and paved runways (*n* = 3) associated with aeronautical facilities. These include some of the oldest roads on Merritt Island (8BR04227 and 8BR04228) and sections of the Hernandez Capron Trail (8BR01766 and BR01924), which was built in part to forcefully remove the Seminole from south Florida during the Second and Third Seminole Wars. The linear resources within the APE that are associated with modern transportation uses and industrial aeronautical facilities are engineered to withstand frequent impacts and are unlikely to be affected by the undertaking. Linear resources dating to earlier historic periods typically consist of features at or below the ground surface and often lack physical integrity, so they are unlikely to be affected by the undertaking.

Table 5. Linear Resources within the APE that are NHRP-Listed, Eligible, or Unevaluated.

Site	Site Name	Classification	Date Established	NRHP status
BR04534	S Range Road Canal	Canal	Twentieth century	Not evaluated
BR00188	Old Haulover Canal	Canal	Late eighteenth–early nineteenth century	Listed
BR01689	Crawlerway	Runway	Late twentieth century	Listed
BR01766	Hernadez Trail	Trail	Mid-nineteenth century	Eligible
BR01870	Florida East Coast Railroad	Railroad	Early to mid nineteenth century	Eligible
BR01914	St. Johns Indian River RR/Tramway	Railroad	Nineteenth century	Eligible
BR01924	Old Dixie Highway	Road	Nineteenth century	Eligible
BR01987	Shuttle Landing Facility Runway	Runway	Late twentieth century	Eligible
BR02193	Magruder Road	Road	Late nineteenth–early twentieth century	Not evaluated
BR02230	New Smyrna to Haulover Canal Road	Road	Nineteenth century	Eligible
BR02258	New Haulover Canal	Canal	Nineteenth century	Not evaluated
BR02336	Facility 50305: Skid Strip	Runway	Mid to late twentieth century	Eligible
BR02363	Canaveral Beach Canal	Canal	Early twentieth century	Not evaluated
BR02544	Old Highway A-1-A	Road	Early twentieth century	Not evaluated
BR02931	NASA Railroad at Kennedy Space Center	Railroad	Mid to late twentieth century	Eligible
BR02932	NASA KSC Railroad System HD	Railroad	Mid to late twentieth century	Eligible
BR02936	Canaveral Lock	Lock	Mid to late twentieth century	Eligible
BR03051	Indian River Drive	Road	Nineteenth century	Not evaluated
BR04191	ICBM Road	Road	Mid-twentieth century	Eligible
BR04227	Homesteaders' Trail	Trail	ca. 1879	Eligible
BR04228	North Tropical Trail	Trail	ca. 1879	Eligible
BR04504	Pluckebaum Road Canal	Canal	1936–1943	Not evaluated
VO08606	Florida East Coast Railroad	Railroad	Nineteenth century	Eligible
VO08880	New Smyrna to Haulover Canal Road	Road	Nineteenth century	Eligible
VO09406	Plantation Road	Road	Nineteenth century	Not evaluated

1.3.6 Bridges

In total, 31 historic bridges are included in the FMSF database. Five of these historic bridges have been evaluated eligible for listing in the NRHP, 24 have been evaluated ineligible for listing in the NRHP, and the remaining two have not been evaluated for listing in the NRHP. A summary of NRHP-eligible and unevaluated historic bridges is provided in **Table 6**. The historic bridges within the APE were constructed in the twentieth century, and all but one are still in use. The four eligible bridges are located along roads that facilitate access to Merritt Island: two (BR01699,

BR02906) span the Indian River to the west, one spans the New Haulover Canal between the Indian River and Mosquito Lagoon to the north (BR02957), and the other spans the Banana River to the east of Merritt Island (BR02955). The eligible or unevaluated bridges within the APE are unlikely to be affected by the undertaking because they have been engineered for durability and frequent use by modern trains or motor vehicles; their construction dates range from 1948 to 1965.

Table 6. NHRP-Eligible and Unevaluated Historic Bridges within the APE.

Site	Site Name	Year Built	Ownership	Material	Status	NRHP Status
BR01699	Indian River Bridge	1948	County	Concrete, steel	Destroyed	Eligible
BR02906	Jay Jay Bridge	ca. 1963	Federal	Concrete, steel	In use	Eligible
BR02955	Banana River Bridge	1964	Federal	Steel	In use	Eligible
BR02957	Haulover Canal Bridge	1965	Federal	Steel	In use	Eligible
BR03015	Girard Blvd / Navigable Sykes Creek	1962	County	Concrete	In use	Not evaluated
VO10381	FDOT Bridge No. 790004	ca. 1956	State	Steel	In use	Not evaluated

1.4 PROPOSED APPROACH TO THE IDENTIFICATION OF PREVIOUSLY UNRECORDED HISTORIC PROPERTIES

This approach is designed to make a reasonable and good faith effort to identify historic properties within the APE that may be affected by the undertaking. Because the properties in the APE will include thousands of buildings and structures, identification efforts will focus on properties greater than 45 years of age, in areas that have not been surveyed within the last 10 years, and limited to those historic properties and potential historic properties that may reasonably be affected by the undertaking. Previously recorded resources that were determined ineligible for listing in the NRHP will be excluded from further identification and evaluation efforts.

Historic properties will be identified in two ways. First, NASA KSC, supported by SEARCH, will compile an inventory of previously recorded cultural resources within the APE that are listed in, eligible for, potentially eligible for, and unevaluated for listing in the NRHP. NASA KSC will use the FMSF database and Integrated Cultural Resource Management Plans from both KSC and the Cape Canaveral Space Force Station. Additionally, county property appraiser databases will be queried to identify unrecorded historic aboveground resources within the APE. As illustrated in **Figure 3**, parcel data contains built year information, which can be cross-referenced with recorded resources to identify parcels that contain structures 45 years old or older without recorded resources. Historic maps and aerial photographs will be used to examine land use and development changes over time, and a historic context will be developed for the APE. Data will be supplemented with information on unrecorded cultural resources provided by consulting

parties and the public. The cumulative data will be used to develop a Geographic Information System heat map of the APE to identify areas with high concentrations of unrecorded structures that are 45 years old or older. These data sets will be used to identify and create a list of properties that will be subject to survey fieldwork. The preliminary inventory data are provided in this document.

Second, fieldwork will be conducted with three primary objectives:

1) Conduct a windshield survey guided by the heat map discussed above, in order to identify potential historic properties.

2) Complete FMSF documentation for potential historic properties identified during the windshield survey that have a reasonable possibility to be adversely affected by the undertaking. The architectural historians will identify and photograph potential historic properties that appear to embody historic significance established in the historic context. They will also identify and document the character-defining features that are indicative of NRHP eligibility and that may be susceptible to adverse effects, as discussed in Section 1.2. All newly recorded resources will be assumed NRHP-eligible, for the purposes of Section 106 consultation.

3) Revisit NRHP-listed or eligible historic properties that are individually eligible for the NRHP and that have with a reasonable possibility to be adversely affected to reassess their integrity.

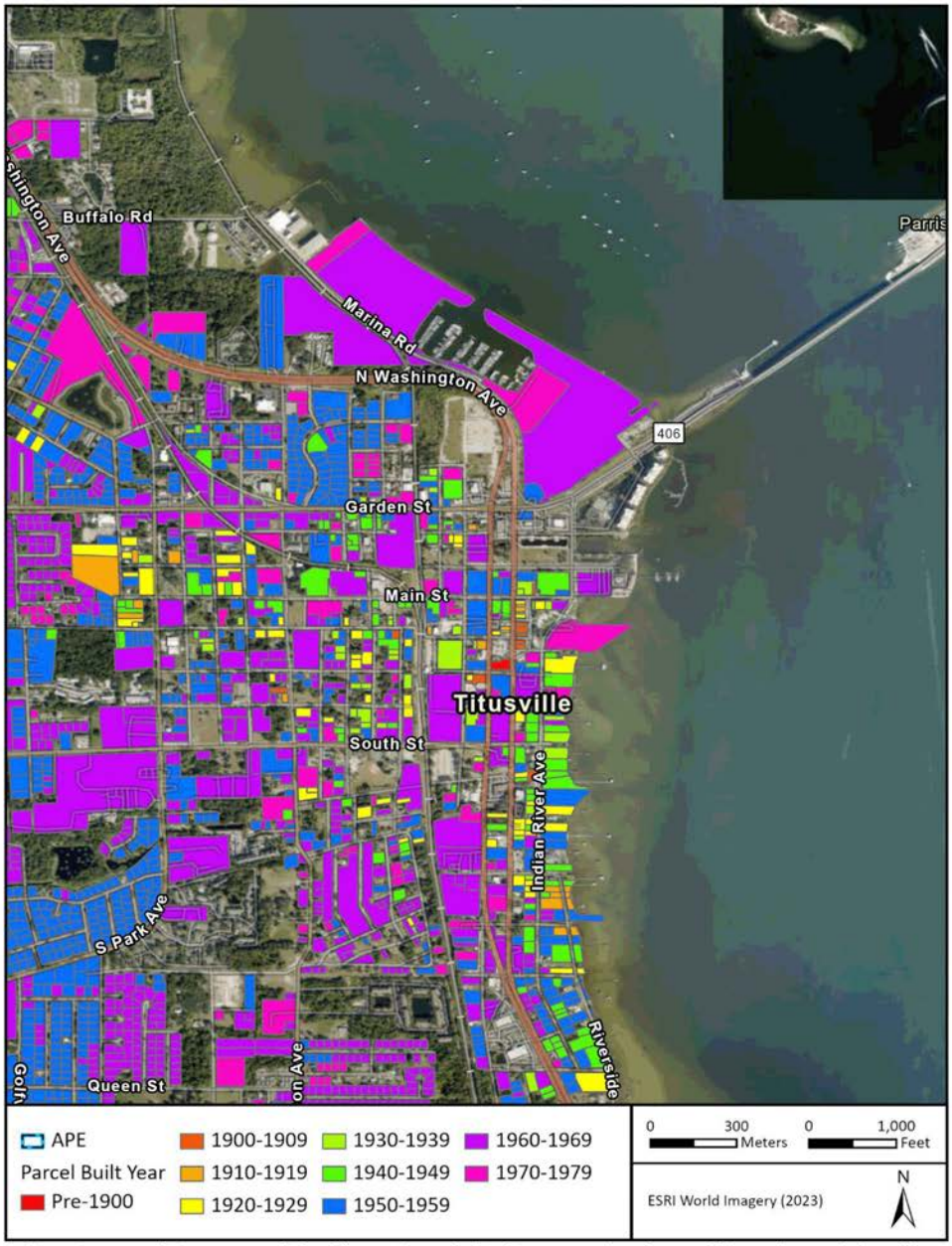


Figure 3. Brevard County parcel data illustrating variation in construction dates within and around Titusville, which lies within the APE.

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National Aeronautics and Space Administration

John F. Kennedy Space Center
Kennedy Space Center, FL 32899

December 20, 2024

Reply to Attn of: SI-E3

Alissa S. Lotane
Director and State Historic Preservation Officer
Florida Division of Historic Preservationist
R.A. Gray Building
500 S. Bronough Street
Tallahassee, FL 32399-0250

Attention: Ms. Kelly Chase, Deputy SHPO; and Mr. Scott Edwards, Historic Preservationist

Subject: SpaceX Starship Super Heavy Launch and Reentry Vehicles at Launch Complex-39A, Kennedy Space Center

Dear Ms. Lotane:

The National Aeronautics and Space Administration's Kennedy Space Center (NASA KSC) is initiating consultation with your office pursuant to Section 106 of the National Historic Preservation Act (NHPA) of 1966 as part of the Federal Aviation Administration's (FAA) environmental review of the proposed action for the SpaceX Starship Super Heavy launch and reentry vehicles at Launch Complex-39A (LC-39A). Under the supervision of the FAA's Office of Commercial Space Transportation, SpaceX is preparing an Environmental Impact Statement (EIS) to evaluate the potential impacts of proposed infrastructure construction, and ground, launch, and reentry operations associated with the Starship Super Heavy launch and reentry vehicles at LC-39A. Because SpaceX plans to apply to the FAA's Office of Commercial Space Transportation for a vehicle operator license for Starship Super Heavy, the EIS will conform to the FAA's National Environmental Policy Act (NEPA) implementing policy, FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures,* regarding the potential infrastructure construction, ground operations, launch, and reentry-related impacts. NASA KSC is acting as the lead federal agency for compliance with Section 106 of the NHPA. As such, Section 106 will be conducted pursuant to the 2009 *Programmatic Agreement Among the National Aeronautics and Space Administration, John F. Kennedy Space Center, Advisory Council on Historic Preservation, and the Florida State Historic Preservation Officer: Regarding Management of Historic Properties at the Kennedy Space Center,* or any subsequent version thereof.

Description of the Undertaking

The undertaking involves issuance of a vehicle operator license by the FAA's Office of Commercial Space Transportation that will facilitate ground, launch, and reentry operations associated with the SpaceX Starship Super Heavy at LC-39A. Specifically, this would include up to 44 launches of Starship Super Heavy per year; return of the first stage booster to LC-39A; return of Starship to LC-39A; and construction of an air separation unit for liquid oxygen and liquid nitrogen, on-site natural gas liquefaction production and cryogenic liquid storage capability, roadway improvements, other associated infrastructure, and a catch tower (see **Enclosure 1**).

Area of Potential Effects (APE)

The area of potential effects (APE) considers any physical, visual, or auditory effects that the project may have on historic properties*. As such, the APE has been developed to consider both a construction APE and an operational APE. The construction APE is limited within the existing boundaries of LC-39A. Additionally, it is anticipated that proposed new construction associated with the operation of the Starship Super Heavy will be compatible with the characteristic of other launch complex infrastructure and will not pose viewshed effects to historic properties. The operational APE considers the auditory effects of the Starship Super Heavy launch activity as well as the overpressure effects of the sonic boom generated during atmospheric reentry. FAA guidance stipulates consideration of a 130 decibel (dB) threshold for launch effects and a 2.0 pounds per square foot (psf) threshold for effects from the sonic boom. Based on this information, and previous research regarding rocket engine noise and vibration effects to structures, the APE was established as any area subjected to greater than or equal to 2.0 psf sonic booms (see **Enclosure 2, Figure 2**). This area also encompasses the 130 dB threshold for launch effects, as well as the construction APE.

**Historic property means any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria. 36 CFR 800.16(l)*

Initial Identification of Historic Properties and Proposed Identification Efforts

The proposed identification approach is designed to make a reasonable and good faith effort to identify historic properties within the APE that may be affected by the undertaking. Effects related to construction will be limited within the footprint of LC-39A. This area has already been subject to survey and evaluation and will not require additional studies. The fieldwork and analysis will therefore focus on historic properties subject to the potential effects of elevated noise and vibrations associated with the undertaking.

The undertaking has the potential to affect historic properties from increased vibratory impacts. According to data provided by SpaceX, launch and reentry events are estimated to result in Lmax levels of 130 dB and/or sonic boom impacts of 2 psf or higher within the APE.

Archaeological resources consisting solely of either surface scatters or subsurface deposits are not likely to be affected by the vibratory effects of increased sonic boom exposure due to the protective qualities of the surrounding soil matrix. Similarly, underwater archaeological sites are unlikely to be affected. However, vibratory effects may be greater on historic age resources within the built environment. Architectural elements most susceptible to damage from launch and reentry vehicle noise include windows and, infrequently, plastered walls and ceilings. Vibration effects may be greatest to non-structural elements such as fragile glass and loose plaster/stone ornamentation. The enclosed memorandum provides additional information on this summation of the potential for vibratory effects on cultural resources (see **Enclosure 2**).

Previously Recorded Resources Within the APE

Historic properties within the construction APE include the Launch Complex 39 Pad A Historic District (**8BR1686**) which is listed in the National Register of Historic Places (NRHP). The historic district is the first of two launch pads constructed by NASA in the 1960s to accommodate the Saturn V launch vehicle for Apollo missions and modified in the 1970s to accommodate the Space Shuttle Program. The historic district contains 23 extant contributing resources all used to support launch operations. One contributing resource, Launch Complex 39 Pad A (**8BR1995**), is also individually listed in the NRHP. No archaeological sites have been recorded or documented within LC-39A.

A preliminary assessment of the operational APE, using data contained in the Florida Master Site File (FMSF), identified 2,964 previously recorded resources, including 2,315 structures, 31 bridges, 465 archaeological sites, 31 cemeteries, and 122 resource groups. Of these, 35 properties are listed in the NRHP and 353 have been evaluated as eligible (see **Enclosure 2**).

Approach for the Identification of Historic Properties

In 2010, NASA KSC completed HAER documentation of the LC-39A historic district and its associated contributing resources. As such, LC-39A is well documented and no further identification or evaluation of LC-39A is proposed.

Identification efforts will focus on historic properties that may be subject to physical damage from elevated noise and vibrations as well as cultural resources whose setting and feeling may be affected by audible and acoustic effects during launch and reentry activities. This will include buildings and structures within the APE that were not specifically designed to withstand the concussive forces of launching and landing spacecraft. Additionally, there are specific types of cultural resources for which aspects of setting and feeling are more likely to represent important components of historic integrity. These types of cultural resources potentially include:

- Designed historic landscapes such as parks and gardens
- Rural historic landscapes with continuity in their traditional use (farming, hunting fishing, sports/recreation)

- Historic districts
- Historic sites that feature outdoor spaces such as yards and plazas
- Cemeteries

Since the universe of properties in the APE will include many thousands of buildings and structures, identification efforts will focus on properties greater than 45 years of age, in areas that have not been surveyed within the last 10 years, and limited to historic properties and potential historic properties that may reasonably be affected by the undertaking. Previously recorded resources that were determined ineligible for listing in the NRHP will be excluded from further identification and evaluation efforts.

Historic properties will be identified in two ways. First, NASA KSC, supported by SEARCH, will compile an inventory of previously recorded cultural resources within the APE that are listed, eligible for listing, potentially eligible for listing, and unevaluated for listing in the NRHP. NASA KSC will use the FMSF database as well as the Integrated Cultural Resource Management Plans from both KSC and the Cape Canaveral Space Force Station. Additionally, county property appraiser databases will be queried to identify unrecorded historic aboveground resources within the APE. Parcel data contains built year information, which can be cross-referenced with recorded resources to identify parcels that contain structures 45 years old or older without recorded resources. Historic maps and aerial photographs will be used to examine land use and development changes over time, and a historic context will be developed for the APE. Data will be further supplemented with information on unrecorded cultural resources provided by consulting parties and the public. The cumulative data will be used to develop a Geographic Information System heat map within the APE to identify areas with high concentrations of unrecorded structures that are 45 years old or older. These data sets will be used to identify and create a list of properties that will be subject to survey fieldwork. The preliminary inventory data are provided in Enclosure 2.

Second, fieldwork will be conducted with three primary objectives:

1) Conduct a windshield survey guided by the heat map discussed above, in order to identify potential historic properties.

2) Complete FMSF documentation for potential historic properties identified during the windshield survey that have a reasonable possibility to be adversely affected by the undertaking. The architectural historians will identify and photograph potential historic properties that appear to embody historic significance established in the historic context. They will also identify and document the character-defining features that are indicative of NRHP eligibility and that may be susceptible to adverse effects, as discussed in Section 1.2. All newly recorded resources will be assumed NRHP-eligible, for the purposes of Section 106 consultation.

3) Revisit NRHP-listed or eligible historic properties that are individually eligible for the NRHP and that have with a reasonable possibility to be adversely affected to reassess their integrity.

A technical report presenting the results of the identification of historic properties will be prepared and submitted to your office for review.

Consulting Party Identification

An initial list of Consulting Parties (see **Enclosure 3**) who will be invited to consult for this undertaking has been compiled. NASA KSC is also consulting with the following Federally-recognized Tribes directly - the Seminole Tribe of Florida, the Seminole Nation of Oklahoma, the Miccosukee Tribe of Indians of Florida, and the Muscogee (Creek) Nation of Oklahoma.

Public Involvement Plan

NASA KSC intends to post this and subsequent letters it submits to SHPO on FAA's public facing project website with instruction on how the public may provide comment. Public postings will not contain confidential or sensitive information pursuant to 36 CFR Part 800.11(c) or information that is Export Controlled.

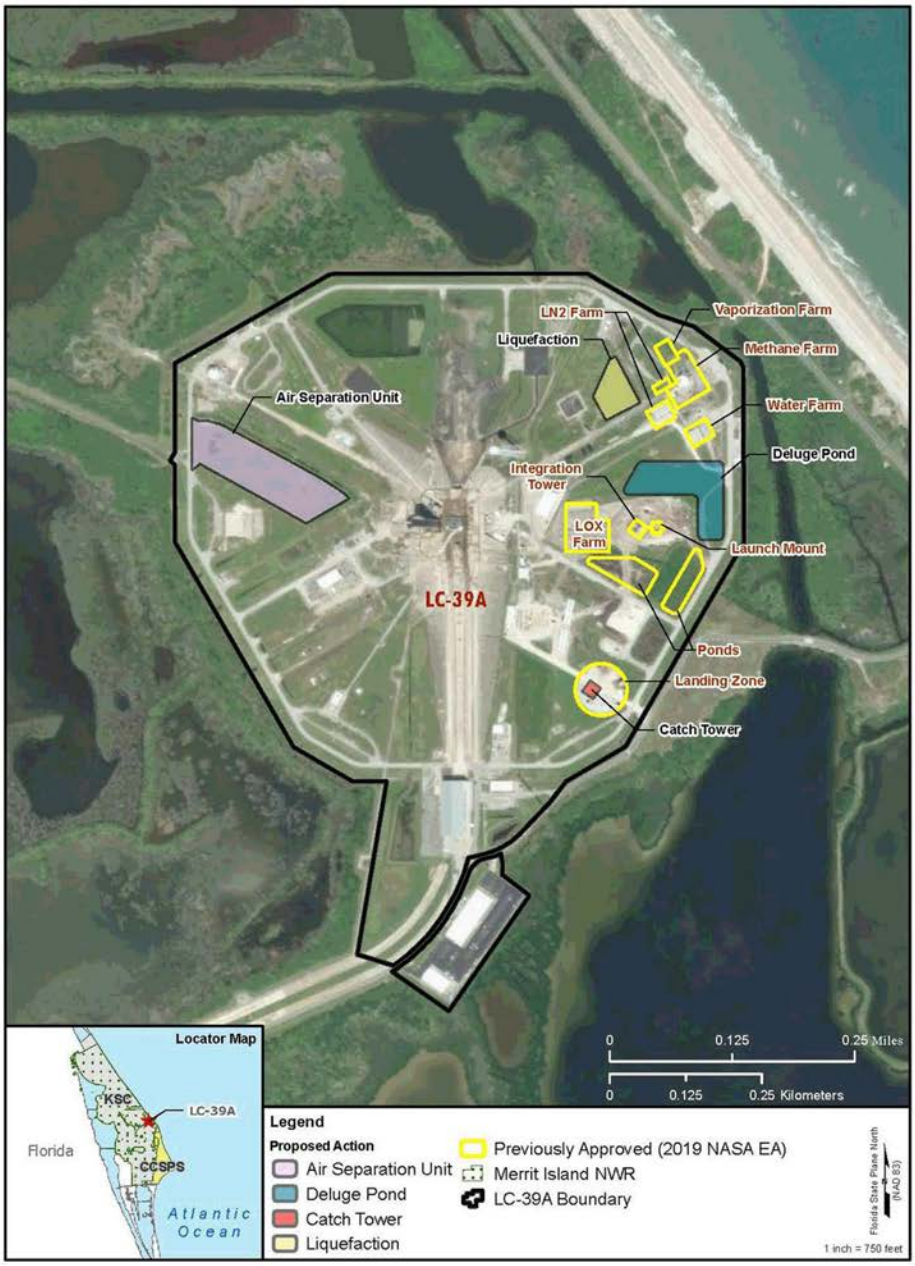
At this time, NASA KSC is requesting your comments related to: 1) the APE; 2) the proposed identification/evaluation approach, and 3) information on any additional consulting parties that should be included in our consultation effort. If you have any questions or require further assistance, please contact me at 321-867-8454.

Sincerely,

Katherine Zeringue Digitally signed by Katherine Zeringue
Date: 2024.12.20 13:11:14 -05'00'

Katherine Zeringue
KSC Cultural Resource Manager
Environmental Planning

Enclosures:
1. LC-39A Infrastructure Figure
2. Supplemental Background Information for the SpaceX Starship Super Heavy Launch and Reentry Vehicles Proposed Action at Launch Complex-39A, Kennedy Space Center
3. Initial list of Consulting Parties



Enclosure 1. LC-39A Infrastructure

TECHNICAL MEMORANDUM

SUPPLEMENTAL BACKGROUND INFORMATION FOR THE SPACEX STARSHIP SUPER HEAVY LAUNCH AND REENTRY VEHICLES PROPOSED ACTION AT LAUNCH COMPLEX-39A, KENNEDY SPACE CENTER

CONSULTANT:	SEARCH
AUTHORS:	Timothy Parsons, PhD; William Werner, MA; Gypsy Brafford, PhD
CLIENT:	Leidos
DATE:	December 2024
SEARCH PROJECT #:	240265

This technical memorandum presents supplementary background information in support of consultation between the National Aeronautics and Space Administration's Kennedy Space Center (NASA KSC) and the Florida State Historic Preservation Officer (SHPO) pursuant to Section 106 of the National Historic Preservation Act of 1966 as part of the Federal Aviation Administration's (FAA) environmental review for the proposed action for the SpaceX Starship Super Heavy Launch and reentry vehicles at KSC. Southeastern Archaeological Research, LLC (SEARCH) completed this cultural resources desktop study on behalf of Leidos, SpaceX, and FAA to provide additional information regarding the proposed area of potential effects (APE), known historic properties within the APE, and the approach for evaluating effects to previously unidentified historic properties within the APE.

1.1 AREA OF POTENTIAL EFFECTS

Area of potential effects means the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking [36 CFR 800.16(d)]. For launch operations, the FAA has typically selected a noise contour for a specific propulsion/engine noise level and/or a specific sonic boom/overpressure, because rocket noise has the greatest geographical extent of all of the potential sources of alterations to historic properties from launches (including landings and reentries).

In defining the APE for rocket launches, it is important to consider engine noise levels that may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register of Historic Places (NRHP) in a manner that would diminish the integrity of the property's setting or feeling. For projects at federal launch complexes, such as KSC, this typically is not an issue because of the historical nature of rocket launches occurring at the project site.

The APE considers the auditory and vibratory effects of the Starship Super Heavy Launch and reentry activities covered under the Federal Aviation Administration's operating license and is predicated on vibratory impacts based on data provided by SpaceX and prepared by Leidos. Vibratory impacts can be quantified using the Maximum Unweighted Sound Level (Bradley et al. 2020:3). Based on a study of structural damage during rocket static firing tests, Maximum Unweighted Sound Levels at 111 decibels (dB) result in one damage claim per 1,000 structures exposed, and levels at 120 dB result in one damage claim per 100 structures (Bradley et al. 2020:5). The National Academy of Sciences' "Guidelines for Preparing Environmental Impact Statements on Noise" (National Academy of Sciences 1977) state that one may conservatively consider all sound lasting more than one second with levels exceeding 130 dB (unweighted) as potentially damaging to structures. Vibratory impacts from sonic boom overpressure are quantified in pounds per square foot (psf). Studies have shown that damage from sonic booms is highly unlikely when structures are exposed to levels under 2 psf (Haber et al. 1989). However, when exposed to levels between 2 and 4 psf, structural components, including glass and plaster, demonstrate damage at a higher rate than expected due to natural wear in well-maintained structures (Haber et al. 1989).

In summary, for rocket launch undertakings at federal launch complexes, the FAA recommends defining the APE using a peak sound pressure level of 130 dB for operations with launches only or 2 psf overpressure for operations with launches and landings. In cases with both launches and landings, the total extent of both areas should be used to define the APE when one does not fully encompass the other. Additionally, effects analyses should be conducted on the resources for both launch noise and landing noise impacts to the respective identified resources.

Based on this information and previous research regarding rocket engine noise and vibration effects to structures, the APE was established as areas subjected to greater than or equal to 130 dB or overpressure levels of 2 psf associated with sonic booms (**Figure 1** and **Figure 2**) (Fenton and Methold 2016, Guest and Slone 1972, Haber et al. 1989).

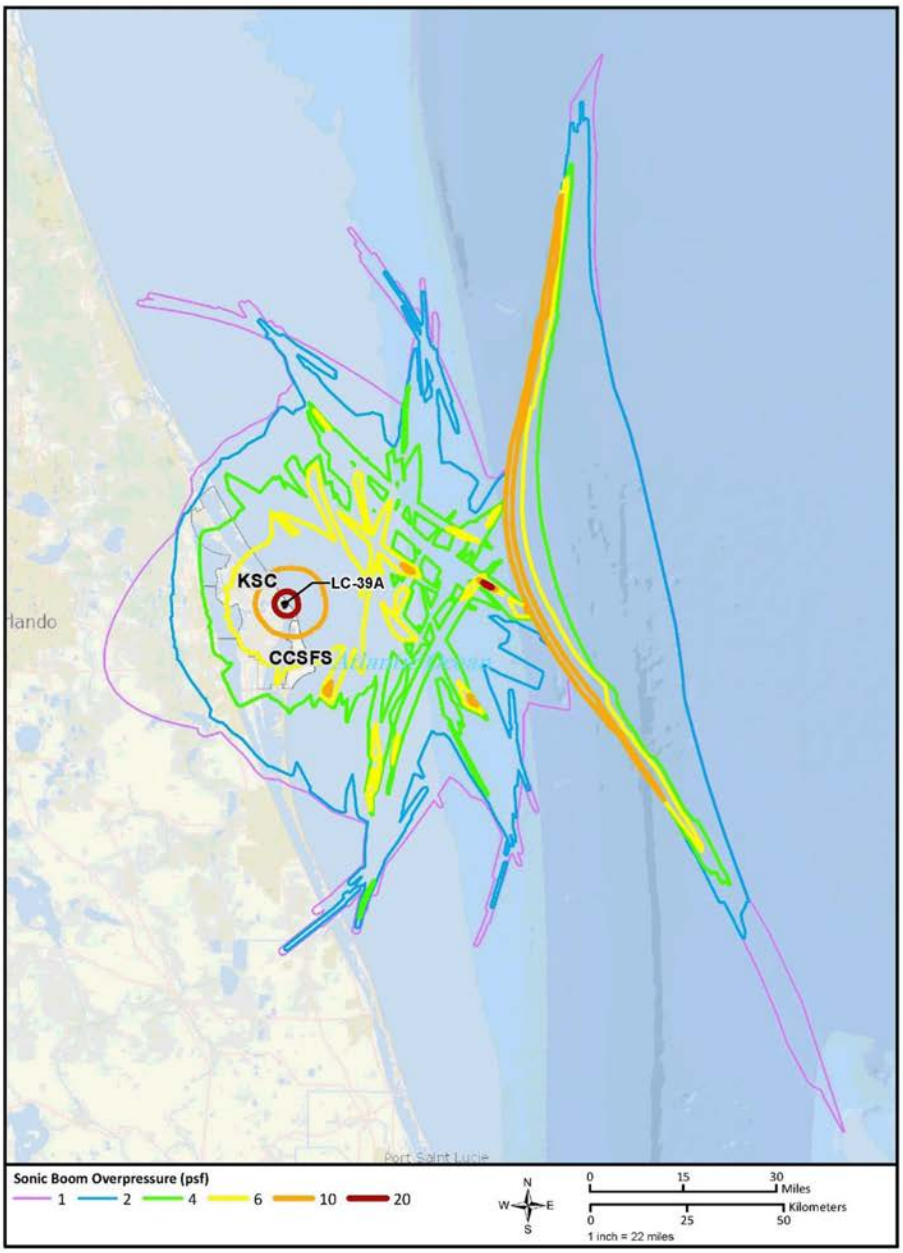


Figure 1. Sonic boom overpressure map for the Project area. The APE is defined as the area within the 2 psf contour (blue line) (Figure provided by Leidos).

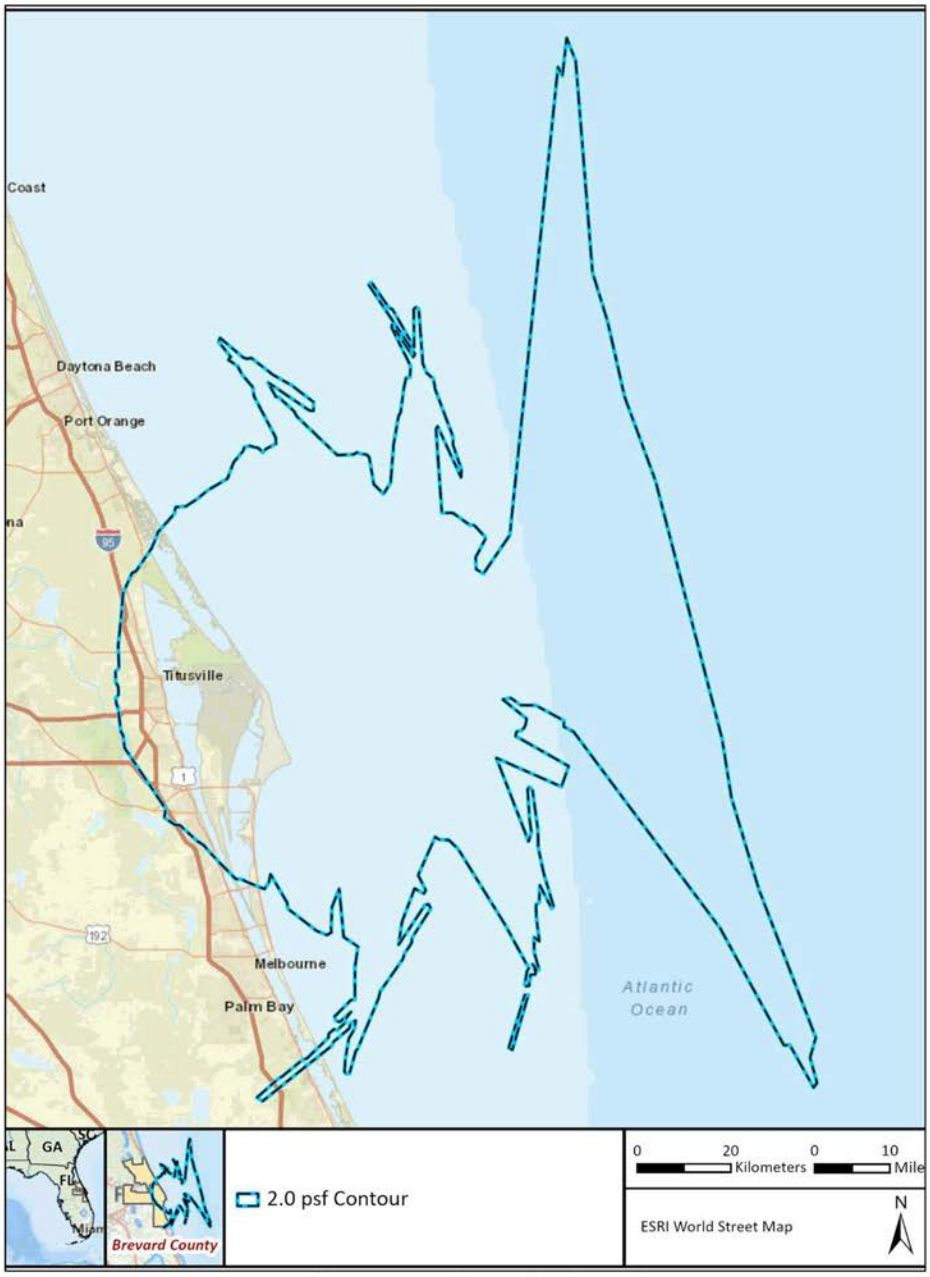


Figure 2. The APE, including portions of Brevard, Volusia, and Orange Counties.

1.2 POTENTIAL FOR ADVERSE EFFECTS

Per 36 Code of Federal Regulations 800.5, a federal undertaking has an adverse effect on a historic property when it diminishes one or more aspects of integrity to the extent that the property no longer conveys its significance per Criteria A–D for listing in the NRHP. NRHP eligibility is defined in 36 Code of Federal Regulations 60.4, under the authority of the National Historic Preservation Act of 1972, as amended:

> The quality of significance in American history, architecture, archeology, and culture is present in districts, sites, buildings, structures and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and,
>
> A. that are associated with events or activities that have made a significant contribution to the broad patterns of our history; or
> B. that are associated with the lives of persons significant in our past; or
> C. that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
> D. that have yielded, or may be likely to yield, information important in prehistory or history.

The increased vibratory impacts from the proposed project have the potential to cause adverse effects to cultural resources. High sound pressure levels and vibrations have the potential to cause building/structural damage. In general, however, structural damage to buildings due to propulsion/engine noise is rare. The historic building element "most susceptible to damage from launch vehicle noise [are] windows, and more infrequently, plastered walls and ceilings" (Nocerino et al. 2021:15). Masonry buildings and structures are most susceptible to vibration damage through the "wearing of joints…which can cause load to be redistributed due to a weakening of a structural member" (National Cooperative Highway Research Program [NCHRP] 2012:35). Further, vibration effects may be greatest to "non-structural building elements [such as] fragile glass, loose plaster mosaics or pieces of stone" (NCHRP 2012:36). Previous analysis also indicates "wood and steel are more elastic than masonry, such as brick and stone" (NCHRP 2012:2). Therefore, increased exposure to vibration may diminish the integrity of a resource's significant historic features.

Sonic booms also have the potential to result in structural damage. A large degree of variability exists in the possible effects of a sonic boom. For example, the probability of a window breaking when exposed to a sonic boom of 1 psf ranges from one in a billion to one in a million (Sutherland 1990) with much of the variability depending on the condition of the glass. At 10 psf, the probability of glass breaking is between 1 in 100 and 1 in 1,000. Laboratory tests involving glass have shown that properly installed glass will not break at overpressures below 10 psf, even when exposed to repeated sonic booms (White 1972). Damage to plaster has the potential to occur in

the same range of overpressures as damage to glass. Plaster often cracks due to shrinkage over time or due to structural settling. Sonic boom damage to plaster often occurs when internal stresses are already high as a result of these processes. In general, for well-maintained structures, the threshold for potential damage from sonic booms is 2 psf; below 2 psf, damage is unlikely (Haber and Nakaki 1989).

Archaeological resources consisting solely of surface scatters or subsurface deposits are not likely to be affected by the vibratory effects of increased sonic boom exposure due to the protective qualities of the surrounding soil matrix (Nocerino et al. 2021). Vibratory effects may be greater on historic resources, particularly those elements that predate the mid-twentieth century and were not designed or built with the impacts of the aeronautical industry in mind.

The National Park Service (NPS) provides guidelines for interpreting the seven aspects of integrity (location, design, setting, materials, workmanship, feeling, and association) as they relate to the potential effects of an undertaking (NPS 1995:45). The effects of the undertaking are unlikely to impact the location or association of historic properties within the APE. As noted above, there are limited circumstances in which the effects of vibration may result in damage to aboveground structures. Such damage may potentially affect the design, materials, and workmanship of historic properties, particularly as they relate to exterior and ornamental detailing.

Additionally, the setting and feeling of historic properties may be temporarily altered by the visual, audible, and vibratory effects of the undertaking. Setting refers to the physical environment of a resource, while feeling refers to the aesthetic qualities of a resource as they relate to the specific time during which the resource became significant. There are specific types of cultural resources for which aspects of setting and feeling are more likely to represent important components of historic integrity, such as archaeological sites with aboveground features, historic districts and landscapes, and cemeteries.

1.3 PREVIOUSLY RECORDED CULTURAL RESOURCES WITHIN THE APE

The Florida Master Site File (FMSF), maintained by the Florida Division of Historical Resources, is the primary repository for information regarding cultural resources (archaeological sites, cemeteries, buildings, bridges, linear resources [e.g., highways, railroads, canals], districts, and landscapes) that have been formally documented in Florida, typically as a result of compliance with federal, state, or municipal historic preservation statutes. SEARCH performed a query of the FMSF Geographic Information System database in December 2024 to provide the background information discussed below. Alternate sources that will be consulted to create an inventory of previously recorded cultural resources will include the NRHP database, the Integrated Cultural Resource Management Plans for KSC and the Cape Canaveral Space Force Station, and information provided by consulting parties and members of the public. Procedures for identifying additional cultural resources that have not been previously recorded are discussed in the subsequent section.

The query of the FMSF database indicated that there are 2,964 previously recorded cultural resources within the APE, including 465 archaeological sites, 2,315 structures, 31 cemeteries, 122 resource groups (including building complexes, districts, landscapes, and linear resources), and 31 historic bridges. The following sections provide overviews of each of the resource categories present within the FMSF database, including discussion of the attributes most likely to be affected by the proposed project.

1.3.1 Structures

Historic structures include architectural resources such as residential, commercial, and public buildings, as well as other elements of the built environment. To be considered significant,

> the structure must represent a part of history, architecture, archeology, engineering, or culture of an area, and it must have the characteristics that make it a good representative of properties associated with that aspect of the past. (NPS 1995:7)

The FMSF database review identified 2,315 previously recorded buildings within the APE; at least 40 have been destroyed and will not be included in further analyses. Twenty-four buildings are listed in the NRHP, 324 have been evaluated eligible for listing, seven are potentially eligible for listing, 836 are not eligible for listing, and the remaining 1,084 have not been evaluated for eligibility. Though these historic structures are distributed throughout the APE, many are concentrated around the cities of Titusville and Cocoa Beach, or are associated with KSC, Cape Canaveral Space Force Station, or Patrick Space Force Base. **Table 1** summarizes the extant NRHP-listed and -eligible structures located on nonfederal lands within the APE. An additional 1,053 structures located on nonfederal lands have yet to be evaluated and are not included in the table.

Of the 1,439 buildings that are listed, eligible for listing, potentially eligible for listing, or have not been evaluated for NRHP eligibility, at least 545 recorded structures are composed at least in part of masonry materials such as brick, concrete, stone, and structural clay tile. As discussed above, these materials are less elastic than metal or wood and may be particularly susceptible to vibratory impacts. However, minor damage may not necessarily result in an adverse effect to these resources unless it diminishes the character-defining aspects of integrity that contribute to the eligibility of these structures. Because the remaining 876 buildings were either determined ineligible for listing in the NRHP or recorded as destroyed, it can be reasonably assumed that impacts to these resources, if any, would be insignificant.

Table 1. Structures within the APE that are NRHP-Listed or -Eligible.

Site	Site Name	Year Built	Style	NRHP Status
BR00172	Launch Complex 39	1968	Other	Listed
BR00177	St. Gabriel's Episcopal Church	1887	Gothic Revival, ca. 1840–present	Listed
BR00211	Porcher, E P House	1916	Georgian Revival, ca. 1880–present	Listed
BR00278	Cocoa Junior High	ca. 1924	Masonry Vernacular	Listed
BR00282	Aladdin Theater Building	1924	Italian Renaissance Rev ca. 1880-1935	Listed

Site	Site Name	Year Built	Style	NRHP Status
BR00397	Wager House	ca. 1891	Frame Vernacular	Listed
BR00399	Robbins, George, Judge House	ca. 1892	Georgian Revival, ca. 1880–present	Listed
BR00425	422 Julia St.	1926	Mission	Eligible
BR00426	428 Julia St.	1905	Masonry Vernacular	Eligible
BR00430	423 Main St.	ca. 1910	Frame Vernacular	Eligible
BR00454	La Grange Church and Cemetery	1869	Frame Vernacular	Listed
BR00465	Brevard County Courthouse	ca. 1912	Neo-Classical Revival, ca. 1880–1940	Eligible
BR00468	Palm Ave	1925	Mission	Eligible
BR00480	Spell House	ca. 1911	Queen Anne (Revival), ca. 1880–1910	Listed
BR00524	Pritchard House	1891	Queen Anne (Revival), ca. 1880–1910	Listed
BR00581	St. Luke's Episcopal Church	1889	Frame Vernacular	Listed
BR00681	825 Osceola Dr.	ca. 1926	Mediterranean Revival, ca. 1880–1940	Eligible
BR00724	Caldwell, Troy E. Residence	ca. 1905	Georgian Revival, ca. 1880–present	Eligible
BR00730	1277 Rockledge Dr.	ca. 1915	Frame Vernacular	Eligible
BR00860	Hill, Dr. George E, House	ca. 1880	Frame Vernacular	Listed
BR01163	Lamar, Mattie House	1917	Frame Vernacular	Eligible
BR01657	City Point Community Church	1885	Frame Vernacular	Listed
BR01658	Hotel Mims	ca. 1889	Frame Vernacular	Listed
BR01684	Vehicle Assembly Building (VAB)	ca. 1966	No style	Listed
BR01685	Launch Control Center (LCC)	ca. 1966	International, ca. 1925–present	Listed
BR01688	Missile Crawler Transporter Facilities	ca. 1965	Not applicable	Listed
BR01690	Press Site: Clock and Flag Pole	1969	No style	Listed
BR01693	Operations Checkout (O&C)	ca. 1964	International, ca. 1925–present	Listed
BR01702	Field, J.R. Homestead	ca. 1900	Frame Vernacular	Listed
BR01723	Cocoa Cemetery Storage Building	ca. 1931	Masonry Vernacular	Eligible
BR01739	Ashely's Café & Lounge	ca. 1932	Tudor Revival, ca. 1890–1940	Eligible
BR01741	Rockledge Gardens Nursery & Landscaping	ca. 1930	Industrial Vernacular	Eligible
BR01744	Harvey's Groves	ca. 1939	Masonry Vernacular	Eligible
BR01765	Bohn Equipment Company	ca. 1927	Industrial Vernacular	Eligible
BR01825	Cocoa Post Office	1940	Art Deco, ca. 1920–1940	Listed
BR01988	Landing Aids Control Building (LACB)	ca. 1976	Industrial Vernacular	Eligible
BR01991	Orbiter Processing Facility (OPF)	ca. 1977	Industrial Vernacular	Eligible
BR01992	Orbiter Processing Facility High Bay 3	1987	Industrial Vernacular	Eligible
BR01994	Thermal Protection System Facility	ca. 1988	Industrial Vernacular	Eligible
BR01995	Launch Complex 39: Pad A	ca. 1965	Not applicable	Eligible
BR01997	Rotation/Processing Building	1982	Industrial Vernacular	Eligible
BR01998	SRB ARF Manufacturing Building	1986	Industrial Vernacular	Eligible
BR02010	Launch Complex 39: Pad B	ca. 1966	Not applicable	Eligible
BR02016	Canister Rotation Facility	ca. 1993	Industrial Vernacular	Eligible
BR02021	Mobile Launcher Platform	ca. 1963	Not applicable	Eligible
BR02671	Space Station Processing Facility	1992	Industrial Vernacular	Eligible
BR02704	400 Lucerne Dr	ca. 1966	Other	Eligible
BR02779	317 Rosa Jones Drive	ca. 1962	Masonry Vernacular	Eligible
BR02908	NLAX 170	ca. 1985	Not applicable	Eligible

Site	Site Name	Year Built	Style	NRHP Status
BR02969	Engineering Development Laboratory	1966	No style	Eligible
BR02990	Beach House	1962	No style	Eligible
BR03046	Foam Building	ca. 1965	Masonry Vernacular	Eligible
BR03955	2460 Courtenay Parkway N	ca. 1965	Mid-Century Modern, ca. 1940s–early 1960s	Eligible
BR04215	Imperial Towers	ca. 1963	Mid-Century Modern, ca. 1940s–early 1960s	Listed

1.3.2 Building Complexes, Districts, and Landscapes

The FMSF classifies several types of cultural resources that consist of individual resources grouped into building complexes, districts, and landscapes. The FMSF includes 51 building complexes, districts, and landscapes within the APE that are listed (*n* = 8), eligible (*n* = 32) potentially eligible (*n* = 1), or unevaluated (*n* = 10) for listing in the NRHP (**Table 2**). Of these, five are archaeological districts, two are designed historic landscapes, nine are FMSF building complexes, 33 are historic districts, and two are mixed districts. Of the 40 NRHP-listed or -eligible resources within this group, most are late nineteenth- to twentieth-century historic districts (*n* = 20) or building complexes (*n* = 2) located on Cape Canaveral and associated with the aeronautical industry. These include 12 launch complexes, two test facilities, and various operations support facilities. The remaining 18 NRHP-listed or -eligible resources within this group include aeronautical facilities in Titusville (*n* = 5), Satellite Beach (*n* = 2), and at Patrick Space Force Base (*n* = 3). Although Cape Canaveral Air Force Station (8BR00216) is not formally listed in the NRHP and is therefore not included in the sum of listed properties above, it was designated a National Historic Landmark in 1984.

Potential effects to archaeological districts and archaeological components to "mixed" districts will be included in the discussion of archaeological sites below; the current section focuses on districts and landscapes containing aboveground elements. A historic district draws its significance from the density of historic resources within it, rather than from the individual significance of a resource. A contributing resource is one that adds to a historic district's context and integrity. A district is further composed of resources unified through common historical themes or architectural types or styles (NPS 1999:6). A contributing resource adds to these overall themes not necessarily by possessing individual significance, but rather by its expression of historic integrity. Given that the potential for physical damage from the effects of the undertaking is limited to very few individual buildings, as discussed above, it is unlikely that the undertaking would significantly alter the integrity of a historic district's materials, design, and workmanship. Analysis of effects to historic districts and building complexes within the APE will focus on those that are not associated with the aeronautical industry because these are more likely to contain physical elements that may be susceptible to vibration damage or have historical associations expressed through integrity of setting and feeling that may be affected by the visual and audible effects of the undertaking.

A designed historic landscape

> has significance as a design or work of art; was consciously designed and laid out by a master gardener, landscape architect, architect or horticulturalist to a design principle, or an owner or other amateur using a recognized style or tradition; has a historical association with a significant person, trend, event, etc." (Keller and Keller n.d:2)

Examples of designed historic landscapes include estate grounds, zoological gardens, plazas or other public spaces, city planning, battlefield parks and outdoor recreation areas (such as golf courses, stadiums, and racetracks). There are no NRHP-listed designed historic landscapes within the APE, but the PAFB Airfield (8BR02439) is eligible, and the Rockledge Country Club (8BR02143) has not been evaluated for NRHP eligibility. Analysis of potential effects to these designed historic landscapes will consider whether they have contributing physical elements that maintain integrity of design, materials, and workmanship that could be susceptible to vibration damage and how their aspects of setting and feeling may be affected by the visual and audible effects of the undertaking.

Table 2. Districts and Landscapes within the APE that are Listed, Eligible, or Unevaluated for Listing in the NRHP.

Site	Site Name	Classification	Time Period	NRHP status
BR00216	Cape Canaveral Air Force Station	FMSF building complex	1950-present	National Historic Landmark
BR00238	Canaveral Town	Archaeological district	1921-1940	Not evaluated
BR00560	Titusville Commercial District	Historical district	1880-1929	Listed
BR00564	Cocoa Historic District	Historical district	1861-1899	Not evaluated
BR01611	Rockledge Drive Residential District	Historical district	1880-1929	Listed
BR01612	Valencia Subdivision Residential District	Historical district	1921-1929	Listed
BR01613	Barton Avenue Residential District	Historical district	1880-1897	Listed
BR01686	Launch Complex 39: Pad A	Historical district	1950-present	Listed
BR01687	Launch Complex 39: Pad B	Historical district	1950-present	Listed
BR01975	Banana River Naval Air Station Seaplane	Historical district	1939-1989	Potentially eligible
BR01986	Shuttle Landing Facility Area HD	Historical district	1969 to 2010	Eligible
BR01990	Orbiter Processing Historic District	Historical district	1969 to 2010	Eligible
BR01996	Solid Rocket Booster Disassembly and Refurbishment Historic District	Historical district	1969 to 2010	Eligible
BR02022	Launch Complex 21/22	Historical district	1900–present	Eligible
BR02033	Cape Canaveral Lighthouse Station District	Mixed district	Precontact; 1861–1865; 1894–present	Not evaluated

Site	Site Name	Classification	Time Period	NRHP status
BR02143	Rockledge Country Club Resource Group	Designed historic landscape	1927–1957	Not evaluated
BR02170	PAFB Missile Instrumental Station	Historical district	1950–present	Eligible
BR02181	Bommarc - Sage Radome Facility	FMSF building complex	1945-1991	Eligible
BR02188	Launch Complex 9 Resource Group	FMSF building complex	1900–present	Eligible
BR02198	Launch Complex 13	Historical district	1956–1966	Eligible
BR02209	Launch Complex 14	Historical district	1950–present	Eligible
BR02234	Launch Complex 3 & 4	Historical district	1900–present	Eligible
BR02248	Launch Complex 1-2	Historical district	1900–present,	Eligible
BR02260	Launch Complex 19	Historical district	1956–1966	Eligible
BR02272	Launch Complex 30	FMSF building complex	1950–present	Eligible
BR02279	Launch Complex 34	Historical district	1961–1971	Eligible
BR02369	Launch Complex 17	Historical district	1957–1960	Eligible
BR02438	PAFB Landplane Facilities District	FMSF building complex	1945–1991	Eligible
BR02439	PAFB Airfield	Designed historic landscape	1950–present	Eligible
BR02440	PAFB Landplane Administrative District	FMSF building complex	1945–1991	Eligible
BR02518	Launch Complex 25	Historical district	1958–1969	Eligible
BR02529	Launch Complex 29	Historical district	1958–1969	Eligible
BR02535	Launch Complex 31/32	FMSF building complex	1900–present	Not evaluated
BR02540	Fuel Storage Area 3	Historical district	1952–present	Eligible
BR02935	Titusville Downtown Residential Historic	Historical district	1821–present	Not evaluated
BR03031	Area 55: Delta Operations Support Area	Historical district	1956–1980	Eligible
BR03034	Delta II Solid Rocket Motor Area	Historical district	1963–1965	Eligible
BR03036	Delta Spin Test Facility	Historical district	1966–2010	Eligible
BR03052	LC 5/6 Spin Test Facility	Historical district	1900–present	Eligible
BR03073	CCAFS Industrial Area	Historical district	1958–present	Eligible
BR03186	Skid Strip Historic District	Historical district	1950–present	Eligible
BR03345	Cocoa Maintenance Yard	FMSF building complex	1900–present	Not evaluated
BR03369	CCAFS Industrial Area Historic District	Historical district	1946–1989	Eligible
BR03407	Carpenter Homes Complex	FMSF building complex	1950–present	Not evaluated
BR03433	Control Tower Road Tracking Sites	Historical district	1950–present	Eligible
BR03921	Richard E. Stone Historic District	Historical district	Unknown	Not evaluated
BR04000	Cape Fish Company	Archaeological district	1900–present	Eligible
BR04229	Jonathan H. Sams Farmstead	Mixed district	Precontact	Eligible
VO00259	North Mosquito Lagoon Archaeological District	Archaeological district	Precontact	Not evaluated
VO02569	Ross Hammock Complex	Archaeological district	Precontact; nineteenth century	Listed

Site	Site Name	Classification	Time Period	NRHP status
VO09407	Elliot Plantation Complex	Archaeological district	British colonial; US territorial period	Eligible

1.3.3 Cemeteries

Table 3 summarizes the 31 cemeteries within the APE that are recorded in the FMSF database. Six have been evaluated eligible for listing in the NRHP, while the remaining 25 have not been evaluated. One of the NRHP-eligible cemeteries, La Grange Cemetery (BR04541), is associated with the NRHP-listed La Grange Church (BR00454). Approximately half of the FMSF-recorded cemeteries within the APE serve African American and Native American populations. Eight are federally owned cemeteries associated with the Cape Canaveral Space Force Station, and at least seven are privately owned.

NPS guidelines state that cemeteries are typically ineligible for listing in the NRHP; however, they may be eligible if they are associated with persons of outstanding historical importance or are connected to important historical events. The materials, design, and workmanship evident in grave markers and the organization of burial grounds may reflect unique perspectives of ethnic and cultural groups in ways that can contribute to the eligibility of a cemetery. Furthermore, the analysis of the effects of the undertaking will consider whether setting and feeling potentially contribute to the eligibility of the cemeteries within the APE, as these aspects of integrity may be disrupted by visual, audible, and vibratory effects of the undertaking.

Table 3. Recorded Cemeteries in the APE.

Site	Site Name	Year Established	Ownership	Ethnicity	Status	NRHP Status
BR00186	Campbell-Jackson Cemetery	1913	Federal	African American	Maintained but not used	Not evaluated
BR00191	African American Graves/New Haulover 2	1880	Federal	African American	Maintained but not used	Not evaluated
BR00233	Cape Road Cemetery	ca. 1894	Federal	White, non-Hispanic	Abandoned	Not evaluated
BR00552	Historic Negro Cemetery	Unknown	Private-individual	African American	Abandoned	Not evaluated
BR01624	Emma Watton	ca. 1882	Federal	White, non-Hispanic	Maintained but not used	Not evaluated
BR01626	Crook/Watton	1915	Federal	White, non-Hispanic	Maintained but not used	Not evaluated
BR01631	Griffis	1897	Federal	White, non-Hispanic	Unspecified by surveyor	Not evaluated
BR01705	Pioneer Cemetery	ca. 1890	Private-community	White, non-Hispanic	Used	Eligible
BR01724	Hilltop Cemetery	ca. 1887	City	African American	Used	Eligible
BR01777	Cocoa Cemetery	ca. 1890	City	White,	Used	Eligible

Site	Site Name	Year Established	Ownership	Ethnicity	Status	NRHP Status
				non-Hispanic		
BR01979	City Point Cemetery	1878	Private-individual	African American, Native American, white, non-Hispanic	Maintained but not used	Not evaluated
BR02352	Fac. 77903-Burnham Family Cemetery	ca. 1866	Federal	White, non-Hispanic	Abandoned	Not evaluated
BR02354	Fac. 60201-Penny Family Cemetery	ca. 1890	Federal	White, non-Hispanic	Abandoned	Not evaluated
BR02355	Quarterman North	ca. 1920	Federal	White, non-Hispanic	Maintained but not used	Not evaluated
BR02356	Quarterman South	1869	Federal	White, non-Hispanic	Maintained but not used	Not evaluated
BR02357	Facility 6403-Osmon Grave	ca. 1913	Federal	White, non-Hispanic	Abandoned	Eligible
BR02358	Fac. 6405-Canaveral Fish Company Grave	1913	Federal	Other	Abandoned	Eligible
BR02401	White Lilly	ca. 1892	Private	African American	Used	Not evaluated
BR02406	Mt. Carmel Missionary Baptist Church Cem	ca. 1915	Unknown	African American	Unspecified by surveyor	Not evaluated
BR02411	Dennis Sawyer Cemetery	1956	Private	African American	Maintained but not used	Not evaluated
BR02785	Evergreen Memorial Cemetery	1942	Unknown	White, Non-Hispanic	Used	Not evaluated
BR02786	Canaveral Groves Cemetery	1884	County	White, Non-Hispanic	Used	Not evaluated
BR02808	Pinecrest Colored Cemetery	1949	Private-corporate/ nonprofit	African American	Used	Not evaluated
BR03000	Pinecrest Cemetery	1929	Private-corporate/ nonprofit	White, Non-Hispanic	Used	Not evaluated
BR03334	Fisher Plot	ca. 1884	Private-individual	Other	Maintained but not used	Not evaluated
BR03366	Fac. 77901-Wilson Brothers Cemetery	ca. 1940	Federal	White, Non-Hispanic	Abandoned	Not evaluated
BR04310	Pluckebaum's Tomb	ca. 1937	Private	White, Non-Hispanic	Unspecified by surveyor	Not evaluated
BR04482	Davis Memorial Cemetery	1956	Unknown	African American	Unspecified by surveyor	Not evaluated
BR04541	La Grange Cemetery	1875	Unknown	Unknown	Used	Eligible
BR04574	Oak Ridge Cemetery	ca. 1916	Private-corporate/ nonprofit	African American	Used	Not evaluated
BR04630	Georgiana Cemetery (aka Crooked Mile)	ca. 1884	Unknown	African American	Used	Not evaluated

1.3.4 Archaeological Sites

An archaeological property can be a precontact or postcontact district, site, structure or object. To be eligible for listing in the NRHP, an archaeological property should have local, state, or national significance, and qualities of integrity, which include location, design, setting, materials, workmanship, feeling and association (Little et al. 2000). Archaeological sites are usually eligible under NRHP Criterion D (yield or likely to yield important information), but they can be eligible under any of the criteria.

The FMSF database includes 465 previously recorded archaeological sites within the APE, including five submerged historic shipwrecks. Of these 465 previously recorded sites, one is listed in the NRHP, 40 have been evaluated eligible for listing in the NRHP, six have been evaluated potentially eligible for listing in the NRHP, and 122 have been evaluated ineligible for listing in the NRHP. The remaining 296 have not been evaluated for NRHP eligibility. As described above, the anticipated effects of the undertaking are limited to rare instances of physical damage to aboveground resources, as well as temporary visual, audible, or vibratory interruptions to historic setting and feeling. Most archaeological sites, consisting of scattered remains on or below the ground surface, are protected from vibration damage by the surrounding soil matrix (or by water in the case of maritime sites) and already lack integrity of setting and feeling. However, some archaeological sites may have preserved aboveground structural features. Furthermore, setting and feeling may be important aspects at sites that feature landscape elements, such as mounds or earthworks (Little et al. 2000:36). The 343 sites within the APE that are listed, eligible for listing, potentially eligible for listing, or have not been evaluated for NRHP eligibility were reviewed to identify those that potentially include these attributes. This review identified 103 sites, which are summarized below. The 122 sites previously found to be ineligible for listing in the NRHP presumably lack integrity, significant historical associations, or information potential; therefore impacts to these sites are not likely to be significant.

Table 4 summarizes the 103 archaeological sites that are eligible for listing, potentially eligible for listing, or have not been evaluated for NRHP listing and that also feature aboveground components or landscape features. Of these 103 sites, 43 are precontact Native American mounds, and the remaining 60 are the aboveground remains of houses, mills, historic forts, or other aboveground built structures. In total, 19 of the 103 archaeological sites summarized below are considered eligible for NRHP listing. Of these 19 sites, 15 are historic structures, which largely consist of aeronautical facilities, such as the Former NAA Control Tower Site (8BR03534) and Lighter-Than-Aircraft Factory (BR02477), and industrial facilities, such as the Ross Hommock Evaporation Plant (8VO00213) and Sugar Mill Ruins at Elliot Plantation (8VO00160). The remaining four are precontact burial mounds with associated midden deposits, including the Ross Hammock Mounds (8VO00131) and Haulover Sand Mound and Midden (A, B) (8BR01673).

Table 4. NRHP-Eligible and Unevaluated Archaeological Sites within the APE with Potential Aboveground or Landscape Features.

Site ID	Site Name	Site Type	NRHP Status
BR03279	Beachside Midden	Land (terrestrial)	Not evaluated
BR03335	Fac. 17200: Weather Theodolite Pad B	Building remains	Eligible

Site ID	Site Name	Site Type	NRHP Status
BR03336	Fac. 1331: Telemetry ELSEE 12-110-PL	Building remains	Eligible
BR03337	Fac. 1333B:Beat-Beat DOVAP 14-110-PLM	Building remains	Eligible
BR03338	Fac. 1333A:Beat-Beat DOVAP 14-110-PR	Building remains	Eligible
BR03339	Fac. 1334: Telemetry ELSEE 12-110-PRS	Building remains	Eligible
BR03341	Facility 74610: Camera Pad	Building remains	Eligible
BR00009	Indian Mound Station	Precontact burial(s)	Eligible
BR00031	Unknown	Precontact mound(s)	Not evaluated
BR00062	Moore Mound	Precontact midden(s)	Not evaluated
BR00063	Sams Mound	Land (terrestrial)	Not evaluated
BR00065	Unknown	Precontact mound(s)	Not evaluated
BR00066	Unknown	Precontact mound(s)	Not evaluated
BR00069	Unknown	Precontact burial mound(s)	Not evaluated
BR00072	Fairyland/Honeymoon Hill	Precontact burial mound(s)	Not evaluated
BR00077	Nauman's Place	Precontact burial(s)	Not evaluated
BR00078	Dummett's Place	Building remains	Not evaluated
BR00078B	Dummett Homestead	Building remains	Potentially eligible
BR00083	De Soto Grove Burial Mound	Land (terrestrial)	Eligible
BR00084	Unknown	Historic fort	Not evaluated
BR00085	Burns	Habitation (precontact)	Not evaluated
BR00086	Holmes Mound	Building remains	Eligible
BR00087	Gulbransen Mound	Habitation (precontact)	Not evaluated
BR00088A	Hammock Mound A	Habitation (precontact)	Not evaluated
BR00088B	Hammock Mound B	Habitation (precontact)	Not evaluated
BR00088C	Hammock Mound C	Habitation (precontact)	Not evaluated
BR00089	Norris Mound	Habitation (precontact)	Not evaluated
BR00090	Fuller Mound A	Precontact burial mound(s)	Not evaluated
BR00091	Fuller Mound B	Precontact burial mound(s)	Not evaluated
BR00092	Fuller Mound C	Precontact mound(s)	Not evaluated
BR00093	Fuller Mound D	Precontact burial mound(s)	Not evaluated
BR00094	Fuller Mound E	Precontact mound(s)	Not evaluated
BR00095	Fuller Mound F	Precontact mound(s)	Not evaluated
BR00142	Butler Campbell's Mound	Precontact burial(s)	Not evaluated
BR00150	Oyster Prong Creek Mound	Precontact burial mound(s)	Not evaluated
BR00151	Unknown	Precontact burial mound(s)	Not evaluated
BR00156	Unknown	Precontact mound(s)	Not evaluated
BR00162	Fairyland Hill Burial Mound	Precontact burial mound(s)	Not evaluated
BR00175	Fort Ann	Historic fort	Not evaluated
BR00205	Max Hoeck Mound and Midden	Precontact midden(s)	Not evaluated
BR00206	Pepper Hammock	Campsite (precontact)	Not evaluated
BR00223	Quarterman	Building remains	Not evaluated
BR00234	Old Lighthouse	Building remains	Not evaluated
BR00238A	Canaveral Town Site B	Building remains	Not evaluated

Site ID	Site Name	Site Type	NRHP Status
BR00238B	Canaveral Town Site C	Building remains	Not evaluated
BR00238C	Canaveral Town Site D	Building remains	Not evaluated
BR00238D	Canaveral Town Site E	Building remains	Not evaluated
BR00239	Stinktown and Jeffords	Building remains	Potentially eligible
BR00240	Hotel	Industrial	Not evaluated
BR00243	Pier Road Houses	House	Not evaluated
BR00243B	Pier Road Houses Site B	Building remains	Not evaluated
BR00243C	Pier Road Houses Site C	Building remains	Not evaluated
BR00540	Daigle Place	Building remains	Not evaluated
BR00544	Lopex Orchard	Building remains	Not evaluated
BR00567	UWF 3	Homestead	Not evaluated
BR01639	NS BR 4	Building remains	Not evaluated
BR01670	Haulover Canal Midden	Building remains	Not evaluated
BR01673	Haulover Sand Mound and Midden (A,B)	Precontact mound(s)	Eligible
BR02351	Murray Parcel	Farmstead	Not evaluated
BR02365	Fac. 1330B: Beat-Beat DOVAP 12-110-PLM	Building remains	Eligible
BR02396	Fac. 1343: East Compass Rose	Building remains	Eligible
BR02400	Ulumay Lagoon	Habitation (precontact)	Not evaluated
BR01855	Harry T. Moore Site	Building remains	Not evaluated
BR01872	Sam's Site	Agriculture/farm structure	Eligible
BR01933	Little Midden	Building remains	Eligible
BR01935	Lone Cistern	Building remains	Not evaluated
BR02052	Fac 1222 CZR Camera Pad U15R146	Building remains	Not evaluated
BR02053	Fac 36900: GLOTRAC Site	Building remains	Not evaluated
BR02054	Fac. 114-G: LC-25 Warning Horn Site	Building remains	Not evaluated
BR02055	Facility 1212-CZR Camera Site U36R175	Building remains	Not evaluated
BR02078	Pace's Landing	Building remains	Not evaluated
BR02160	FIM Van Site S-5	Building remains	Not evaluated
BR02161	Facility 1209-Rate Antenna Pad A	Building remains	Not evaluated
BR02165	Facility 289 - Flame Attenuation Site	Building remains	Not evaluated
BR02166	James W. Merchant Homestead	Building remains	Not evaluated
BR02167	Facility 1126: Telemetry ELSSE	Building remains	Not evaluated
BR02229	Clifton Schoolhouse	Agriculture/farm structure	Not evaluated
BR02477	Lighter-Than-Air Craft Factory	Building remains	Eligible
BR02507	Taylor House	Homestead	Not evaluated
BR02508	Hunters Camp	Building remains	Not evaluated
BR02509	Palm Hammock	Building remains	Not evaluated
BR02513	Facility 1390: Theodolite Tower 1.40	Building remains	Not evaluated
BR02514	Facility 1090 Security Police Bldg	Building remains	Not evaluated
BR02680	Klondike Beach Tower Ruins (2311.12)	Building remains	Not evaluated
BR03048	Old MacDonald's Farm	Farmstead	Not evaluated
BR03152	Clark Slough Earthwork	Precontact mound(s)	Not evaluated
BR03274	The Dunal Ridge Midden	Precontact mound(s)	Not evaluated
BR03534	Former NAA Control Tower Site	Building remains	Eligible
BR03998	CCAFS Facility 1430 - SHANICLE Building	Building remains	Not evaluated
IR00994	Sam Dale	Farmstead	Not evaluated
OR00008	Long Bluff 3	Precontact burial mound(s)	Not evaluated
OR10652	Streetman Cabin	Building remains	Not evaluated

Site ID	Site Name	Site Type	NRHP Status
VO02599	Mosquito Lagoon House of Refuge	Building remains	Not evaluated
VO00112	Castle Windy Midden	Precontact burial(s)	Not evaluated
VO00129	Scobey Place	Precontact burial mound(s)	Not evaluated
VO00131	Ross Hammock-Mounds	Precontact burial mound(s)	Eligible
VO00148	Griffis Place	Precontact burial mound(s)	Not evaluated
VO00149	Oak Hill Mound	Campsite (precontact)	Not evaluated
VO00160	Sugar Mill Ruins – Elliot Plantation	Building remains	Eligible
VO00213	Ross Hammock – Evaporation Plant	Building remains	Eligible
VO05312	CANA 26	Specialized procurement site	Not evaluated
VO08887	V-1 Impoundment	Land-terrestrial	Not evaluated
VO08936	Voorhees Midden	Campsite (precontact)	Not evaluated

1.3.5 Linear Resources

The FMSF includes 49 linear resources within the APE, two of which are listed in the NRHP. Fifteen have been evaluated eligible for listing in the NRHP, 24 have been evaluated ineligible for listing in the NRHP, and eight have not been evaluated for listing in the NRHP (**Table 5**). The two NRHP-eligible linear resources within the APE are the Old Haulover Canal (8BR00188), which connects the Indian River to Mosquito Lagoon north of Merritt Island, and Crawlerway (8BR01689), which connects the Vehicle Assembly Building (BR01684) and two launch pads (BR01686 and BR01687) at Launch Complex 39 at the KSC. The 24 eligible or unevaluated linear resources include canals and associated structures (*n* = 5), railroads (*n* = 5), roads (*n* = 8), trails (*n* = 3), and paved runways (*n* = 3) associated with aeronautical facilities. These include some of the oldest roads on Merritt Island (8BR04227 and 8BR04228) and sections of the Hernandez Capron Trail (8BR01766 and BR01924), which was built in part to forcefully remove the Seminole from south Florida during the Second and Third Seminole Wars. The linear resources within the APE that are associated with modern transportation uses and industrial aeronautical facilities are engineered to withstand frequent impacts and are unlikely to be affected by the undertaking. Linear resources dating to earlier historic periods typically consist of features at or below the ground surface and often lack physical integrity, so they are unlikely to be affected by the undertaking.

Table 5. Linear Resources within the APE that are NHRP-Listed, Eligible, or Unevaluated.

Site	Site Name	Classification	Date Established	NRHP status
BR04534	S Range Road Canal	Canal	Twentieth century	Not evaluated
BR00188	Old Haulover Canal	Canal	Late eighteenth–early nineteenth century	Listed
BR01689	Crawlerway	Runway	Late twentieth century	Listed
BR01766	Hernadez Trail	Trail	Mid-nineteenth century	Eligible
BR01870	Florida East Coast Railroad	Railroad	Early to mid nineteenth century	Eligible
BR01914	St. Johns Indian River RR/Tramway	Railroad	Nineteenth century	Eligible
BR01924	Old Dixie Highway	Road	Nineteenth century	Eligible
BR01987	Shuttle Landing Facility Runway	Runway	Late twentieth century	Eligible
BR02193	Magruder Road	Road	Late nineteenth–early twentieth century	Not evaluated
BR02230	New Smyrna to Haulover Canal Road	Road	Nineteenth century	Eligible
BR02258	New Haulover Canal	Canal	Nineteenth century	Not evaluated
BR02336	Facility 50305: Skid Strip	Runway	Mid to late twentieth century	Eligible
BR02363	Canaveral Beach Canal	Canal	Early twentieth century	Not evaluated
BR02544	Old Highway A-1-A	Road	Early twentieth century	Not evaluated
BR02931	NASA Railroad at Kennedy Space Center	Railroad	Mid to late twentieth century	Eligible
BR02932	NASA KSC Railroad System HD	Railroad	Mid to late twentieth century	Eligible
BR02936	Canaveral Lock	Lock	Mid to late twentieth century	Eligible
BR03051	Indian River Drive	Road	Nineteenth century	Not evaluated
BR04191	ICBM Road	Road	Mid-twentieth century	Eligible
BR04227	Homesteaders' Trail	Trail	ca. 1879	Eligible
BR04228	North Tropical Trail	Trail	ca. 1879	Eligible
BR04504	Pluckebaum Road Canal	Canal	1936–1943	Not evaluated
VO08606	Florida East Coast Railroad	Railroad	Nineteenth century	Eligible
VO08880	New Smyrna to Haulover Canal Road	Road	Nineteenth century	Eligible
VO09406	Plantation Road	Road	Nineteenth century	Not evaluated

1.3.6 Bridges

In total, 31 historic bridges are included in the FMSF database. Five of these historic bridges have been evaluated eligible for listing in the NRHP, 24 have been evaluated ineligible for listing in the NRHP, and the remaining two have not been evaluated for listing in the NRHP. A summary of NRHP-eligible and unevaluated historic bridges is provided in **Table 6**. The historic bridges within the APE were constructed in the twentieth century, and all but one are still in use. The four eligible bridges are located along roads that facilitate access to Merritt Island: two (BR01699,

BR02906) span the Indian River to the west, one spans the New Haulover Canal between the Indian River and Mosquito Lagoon to the north (BR02957), and the other spans the Banana River to the east of Merritt Island (BR02955). The eligible or unevaluated bridges within the APE are unlikely to be affected by the undertaking because they have been engineered for durability and frequent use by modern trains or motor vehicles; their construction dates range from 1948 to 1965.

Table 6. NHRP-Eligible and Unevaluated Historic Bridges within the APE.

Site	Site Name	Year Built	Ownership	Material	Status	NRHP Status
BR01699	Indian River Bridge	1948	County	Concrete, steel	Destroyed	Eligible
BR02906	Jay Jay Bridge	ca. 1963	Federal	Concrete, steel	In use	Eligible
BR02955	Banana River Bridge	1964	Federal	Steel	In use	Eligible
BR02957	Haulover Canal Bridge	1965	Federal	Steel	In use	Eligible
BR03015	Girard Blvd / Navigable Sykes Creek	1962	County	Concrete	In use	Not evaluated
VO10381	FDOT Bridge No. 790004	ca. 1956	State	Steel	In use	Not evaluated

1.4 Proposed Approach to the Identification of Previously Unrecorded Historic Properties

This approach is designed to make a reasonable and good faith effort to identify historic properties within the APE that may be affected by the undertaking. Because the properties in the APE will include thousands of buildings and structures, identification efforts will focus on properties greater than 45 years of age, in areas that have not been surveyed within the last 10 years, and limited to those historic properties and potential historic properties that may reasonably be affected by the undertaking. Previously recorded resources that were determined ineligible for listing in the NRHP will be excluded from further identification and evaluation efforts.

Historic properties will be identified in two ways. First, NASA KSC, supported by SEARCH, will compile an inventory of previously recorded cultural resources within the APE that are listed in, eligible for, potentially eligible for, and unevaluated for listing in the NRHP. NASA KSC will use the FMSF database and Integrated Cultural Resource Management Plans from both KSC and the Cape Canaveral Space Force Station. Additionally, county property appraiser databases will be queried to identify unrecorded historic aboveground resources within the APE. As illustrated in **Figure 3**, parcel data contains built year information, which can be cross-referenced with recorded resources to identify parcels that contain structures 45 years old or older without recorded resources. Historic maps and aerial photographs will be used to examine land use and development changes over time, and a historic context will be developed for the APE. Data will be supplemented with information on unrecorded cultural resources provided by consulting

parties and the public. The cumulative data will be used to develop a Geographic Information System heat map of the APE to identify areas with high concentrations of unrecorded structures that are 45 years old or older. These data sets will be used to identify and create a list of properties that will be subject to survey fieldwork. The preliminary inventory data are provided in this document.

Second, fieldwork will be conducted with three primary objectives:

1) Conduct a windshield survey guided by the heat map discussed above, in order to identify potential historic properties.

2) Complete FMSF documentation for potential historic properties identified during the windshield survey that have a reasonable possibility to be adversely affected by the undertaking. The architectural historians will identify and photograph potential historic properties that appear to embody historic significance established in the historic context. They will also identify and document the character-defining features that are indicative of NRHP eligibility and that may be susceptible to adverse effects, as discussed in Section 1.2. All newly recorded resources will be assumed NRHP-eligible, for the purposes of Section 106 consultation.

3) Revisit NRHP-listed or eligible historic properties that are individually eligible for the NRHP and that have with a reasonable possibility to be adversely affected to reassess their integrity.

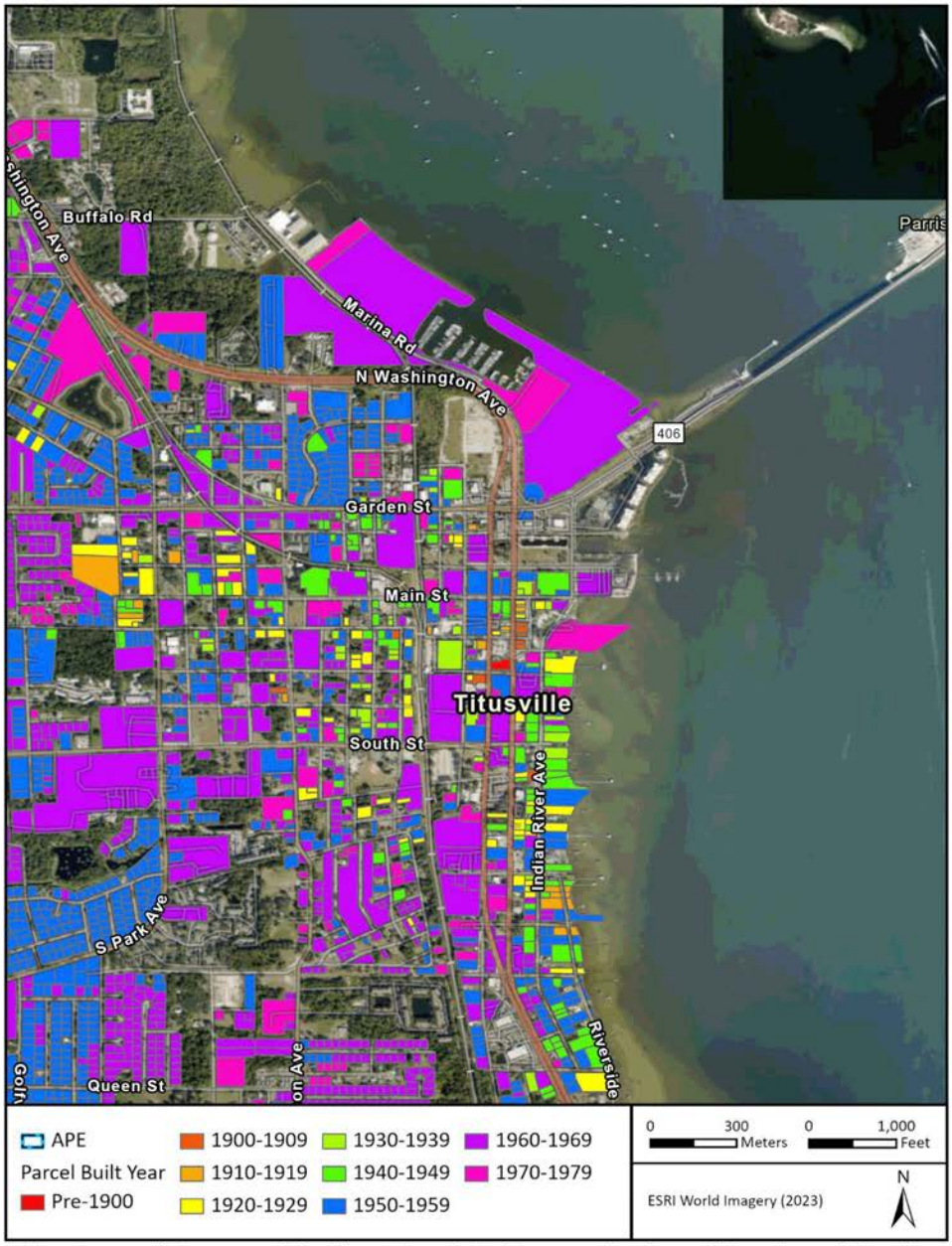


Figure 3. Brevard County parcel data illustrating variation in construction dates within and around Titusville, which lies within the APE.

1.5 REFERENCES CITED

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White, R.W.
1972 Effects of Repetitive Sonic Booms on Glass Breakage. Report No. FAA-RD-72 43, Wyle Laboratories. Huntsville, Alabama.

Enclosure 3. Consulting Parties List

- American Space Museum and Space Walk of Fame
- Apollo One Memorial Foundation, Inc.
- Brevard County Historical Commission
- Brevard Museum of History and Natural Science
- Cape Canaveral Lighthouse Foundation
- Cape Canaveral Space Force Museum (formerly Air Force Space and Missile Museum)
- Cape Canaveral Space Force Station
- City of Titusville
- City of Titusville Historic Preservation Board
- Department of Anthropology, University of Central Florida
- Florida Anthropological Society
- Florida Historical Society
- Florida Public Archaeology Network – East Central Region
- Historical Society of North Brevard
- Indian River Anthropological Society
- Merritt Island National Wildlife Refuge
- NASA Alumni League-Florida Chapter
- National Park Service, Canaveral National Seashore
- National Park Service, National Historic Landmark Program Southeast Region
- National Space Club
- North Brevard Heritage Foundation
- North Brevard Historical Museum
- South Brevard Historical Society

6. **Name and title of federal agency official and contact person for this undertaking**, including email address and phone number:

Katherine Zeringue
Katherine.s.zeringue@nasa.gov
321-867-8454

II. Information on the Undertaking*

7. Describe the undertaking and nature of federal involvement (if multiple federal agencies are involved, specify involvement of each):

NASA KSC is lead federal agency for Section 106 as part of the Federal Aviation Administration's (FAA) environmental review of the proposed action for the SpaceX Starship Super Heavy launch and reentry vehicles at Launch Complex-39A (LC-39A). Under the supervision of the FAA's Office of Commercial Space Transportation, SpaceX is preparing an Environmental Impact Statement (EIS) to evaluate the potential impacts of proposed infrastructure construction, and ground, launch, and reentry operations associated with the Starship Super Heavy launch and reentry vehicles at LC-39A. Because SpaceX plans to apply to the FAA's Office of Commercial Space Transportation for a vehicle operator license for Starship Super Heavy, the EIS will conform to the FAA's National Environmental Policy Act (NEPA) implementing policy, FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures,* regarding the potential infrastructure construction, ground operations, launch, and reentry-related impacts. NASA KSC is acting as the lead federal agency for compliance with Section 106 of the NHPA. As such, Section 106 will be conducted pursuant to the 2009 *Programmatic Agreement Among the National Aeronautics and Space Administration, John F. Kennedy Space Center, Advisory Council on Historic Preservation, and the Florida State Historic Preservation Officer: Regarding Management of Historic Properties at the Kennedy Space Center*.

The undertaking involves issuance of a vehicle operator license by the FAA's Office of Commercial Space Transportation that will facilitate ground, launch, and reentry operations associated with the SpaceX Starship Super Heavy at LC-39A. Specifically, this would include up to 44 launches of Starship Super Heavy per year; return of the first stage booster to LC-39A; return of Starship to LC-39A; and construction of an air separation unit for liquid oxygen and liquid nitrogen, onsite natural gas liquefaction production and cryogenic liquid storage capability, roadway improvements, other associated infrastructure, and a catch tower.

8. Describe the Area of Potential Effects (APE):

See Enclosure 1, Figures 1 and 2 in the attached document titled "SpaceX SH Launch. Reentry Final SHPO".

The APE has been developed to consider both a construction APE and an operational APE. The construction APE is limited within the existing boundaries of LC-39A. Additionally, it is anticipated that proposed new construction associated with the operation of the Starship Super Heavy will be compatible with the characteristic of other launch complex infrastructure and will not pose viewshed effects to historic properties. The operational APE considers the auditory effects of the Starship Super Heavy launch activity as well as the overpressure effects of the sonic boom generated during atmospheric

reentry. FAA guidance stipulates consideration of a 130 decibel (dB) threshold for launch effects and a 2.0 pounds per square foot (psf) threshold for effects from the sonic boom. Based on this information, and previous research regarding rocket engine noise and vibration effects to structures, the APE was established as any area subjected to greater than or equal to 2.0 psf sonic booms. This area also encompasses the 130 dB threshold for launch effects, as well as the construction APE. The operational APE totals 2,050,232.71 acres (ac), the majority of which is over the Atlantic Ocean; 168,770.55 ac is terrestrial. A visual of the APE is provided with the materials referenced in question #10.

9. Describe steps taken to identify historic properties:

The proposed identification approach was designed, in consultation with SHPO, to make a reasonable and good faith effort to identify historic properties within the APE that may be affected by the undertaking. Effects related to construction will be limited within the footprint of LC-39A. This area has already been subject to survey and evaluation and will not require additional studies. The fieldwork and analysis therefore focused on historic properties subject to the potential effects of elevated noise and vibrations associated with the undertaking.

NASA KSC and Cape Canaveral Space Force Station (CCSFS) historic properties, including NHLs, are within the APE. Inventories and descriptions of architectural history resources from each agency's Integrated Cultural Resource Management Plan (ICRMP) were used to identify NRHP listed, NRHP-eligible, and contributing elements to listed and eligible resources. No additional architectural survey was completed within KSC and CCSFS.

Because thousands of unrecorded buildings and structures are within the operational APE outside of federal lands, NASA KSC, in consultation with the FAA and the Florida SHPO, developed an identification approach to make a reasonable and good faith effort to identify historic properties within the APE that may be affected by the undertaking. Identification efforts focused on historic properties greater than 45 years of age, in areas that have not been surveyed within the last 10 years and limited to those historic properties and potential historic properties that may reasonably be affected by the undertaking. This identification and evaluation approach aligns with standard FAA practice for compliance with Section 106 of the NHPA and its implementing regulations and is consistent with Chapter 8 of the FAA Order 1050.1F, Environmental Impacts: Policies and Procedures.

The architectural history field methods consisted of an intensive architectural survey of previously recorded architectural resources and a windshield survey of unrecorded architectural resources that are likely to be 45 years or older. The Florida Master Site File (FMSF) was used to inform the strategy of the field methods. In addition, USGS quadrangle maps and available parcel data were reviewed (Brevard County Property Appraiser 2025) for buildings and/or structures built prior to 1980 and placed into color-coded "heat maps" to identify areas of concentration in which previously unrecorded structures are likely to be 45 years or older. This will further inform general interpretations on architectural styles, integrity, and development patterns. Following the background research, architectural history fieldwork was conducted and included an intensive architectural survey focused on previously recorded architectural resources within the APE, and a windshield survey focused on previously unrecorded architectural resources that are likely to be 45 years or older within the APE. Additional windshield survey efforts used the "heat maps" to identify concentrated areas of unrecorded resources, focus the identification effort, and inform interpretations on architectural styles, distinguishing characteristics, integrity, and notable development patterns.

The FMSF Geographic Information System database was researched to identify all archaeological sites previously documented within the operational APE. Archaeological sites with aboveground components have the potential to be affected by vibratory and overpressure effects like those described for

architectural resources. Sites in the FMSF that included a site type description with a clear aboveground component such as precontact mound, building remains, or structures were further researched. Sites that were previously found to be ineligible for listing in the NRHP presumably lack integrity, significant historical associations, and information potential, and were excluded because impacts to these sites are not likely to be significant. Archaeological sites that met all the following criteria within the APE were considered to have the potential for aboveground components that could contribute to NRHP eligibility and be affected by vibratory and overpressure effects:

- A site type description with a clear aboveground component such as precontact mound, building remains, or structures and also;
- Sites that the SHPO has not evaluated or determined the site to be eligible or potentially eligible for listing in the NRHP.

Sites that have the potential to contain human remains were accounted for regardless of the presence of aboveground components or NRHP eligibility due to their sensitive nature. For sites that met the above criteria, modern aerial imagery (Google Earth Pro 2025) and site details recorded in the FMSF for the last field visit were reviewed to assess the likelihood for aboveground components to be extant that may contribute to NRHP eligibility.

Additionally, federally-recognized Indian tribes, Consulting Parties and the public were asked to provide any information they had regarding historic resources. Two consulting parties, the City of Titusville CLG and the Cape Canaveral Lighthouse Foundation, provided information regarding historic resources within the APE. Canaveral National Seashore confirmed they had shared information regarding historic properties with us previously independent of this project but didn't have anything new to offer. No other information was received from tribes, Consulting Parties, or the public.

10. Describe the historic property (or properties) and any National Historic Landmarks within the APE (or attach documentation or provide specific link to this information):

A link to access the Cultural Resources Survey (CRAS) will be provided by SEARCH Inc. The file is too large to email. The Cape Canaveral Air Force Station NHL is within the operational APE.

11. Describe the undertaking's effects on historic properties:

See Sections 1.1, 4.2.1 and 5.1 of the CRAS.

Within the construction APE, Historic American Engineering Record (HAER FL-8-11-F), at a Level II, for LC-39A was completed in 2010 to mitigate for "adverse effects" that might occur with post Shuttle Program redevelopment. The Florida SHPO, in a letter dated May 10, 2013, concurred future consultation is not required for future modifications to LC-39A. Furthermore, it is anticipated that proposed new construction associated with the operation of the SSH will be compatible with the characteristics of other launch complex infrastructure and will not pose viewshed effects to historic properties.

Within the operational APE, adverse effects resulting from the undertaking are not likely but are possible. Vibratory and sonic-boom events could result in window breakage, damage to character-defining plaster and masonry features, and structural damage to highly vulnerable or poorly maintained buildings. Although it is similarly unlikely—because the nature of longitudinal effects of vibratory and overpressure events on archaeological sites has not been studied thoroughly—adverse effects to such resources cannot be ruled out. The majority of documented resources outside of NASA KSC and CCSFS are within the 2 psf overpressure contour. However, resources located on KSC and CCSFS are within the 20, 10, 6, and 4 psf contours. Resources subjected to higher overpressure resulting from sonic booms may be more susceptible to adverse effects.

12. Explain how this undertaking would adversely affect historic properties (include information on any conditions or future actions known to date to avoid, minimize, or mitigate adverse effects):

A final determination of how SSH launch and landing activities will affect historic properties is not possible at this time. NASA KSC will develop a programmatic agreement to monitor for and mitigate potential adverse effects, should they occur. SHPO has indicated they would like to use the SpaceX Starship Superheavy Boca Chica Launch Site Programmatic Agreement in Texas as a model for the development of the Programmatic Agreement for this project. See: Appendix C - National Historic Preservation Act Section 106 Consultation | Federal Aviation Administration

NASA KSC will propose the following measures for the Programmatic Agreement:

- **Additional efforts to identify and evaluate historic properties**. Due to the size of the operational APE and the thousands of resources within its boundary, not all of the many thousands of previously recorded resources within the APE could be discussed. Specifically, 164 previously recorded architectural history resources that have been evaluated by previous surveyors as "NRHP Eligible as Potential Resource Group Contributors" but not evaluated by SHPO were identified within the APE during background research and are omitted from the identification and evaluation efforts. It is possible that these resources contribute significance to existing resource groups or comprise unrecorded resource groups or historic districts. Additional survey, documentation, and evaluation is necessary to determine if these resource groups contribute to existing or unrecorded NRHP eligible historic districts. Additionally, previously recorded architectural history resources that were determined by SHPO to be ineligible for listing in the NRHP were excluded from this study. Although background research does not capture these data at the individual resource level, some of these ineligible resources were surveyed and recorded in the FMSF more than 10 years ago. The Florida SHPO frequently recommends that properties determined ineligible more than 10 years ago be resurveyed and reevaluated for NRHP eligibility, as it is possible that they have developed significance individually or as contributors to resource groups in the intervening years. Similarly, additional field survey and updates to FMSF historic structure forms for buildings recommended eligible for NRHP listing either individual or as contributors to resource groups may support long-term efforts to assess effects to NRHP-eligible resource groups.

- **Monitoring historic properties within different psf contours for effects**. The potential for adverse effects to historic properties within the 2 psf is possible, though unlikely, based on existing data. While most historic properties in Titusville and outside of NASA KSC and CCSFS are within the 2 psf contour, several are within the 4 psf counter. However, numerous resources on NASA KSC and CCSFS are within the 4, 6, 10, and 20 psf contours. There is limited data on how historic buildings and structures may be affected by repeated exposure to sonic booms. A longitudinal study monitoring the effects of sonic boom and vibratory effects on historic properties over the long-term could inform consulting parties on the nature and severity of adverse effects to different property types and would serve as a resource for future studies evaluating the potential effects of future undertakings involving spacecraft launches and landings.

- **Monitoring sonic boom overpressure and vibration at archaeological sites.** Previous studies on effects to archaeological sites resulting from sonic boom overpressure are limited in scope and make assumptions related to the lack of subsurface effects. Additionally, similar studies focused on resource types such as those within the APE (shell and sand mounds, for example) have not been conducted, and existing archaeological literature does not specifically note, describe, or discuss effects resulting from vibratory and sonic boom-related effects resulting from spacecraft launches (if any). A longitudinal study of surface and subsurface exposure to launch-related

overpressure and vibratory events at archaeological sites, combined with targeted excavations to evaluate subsurface integrity of archaeological deposits, may inform whether such exposure results in effects to subsurface archaeological deposits. Additionally, such a study would serve as a resource for future studies evaluating the potential effects of future undertakings involving spacecraft launches and landings.

13. Provide copies or summaries of the views provided to date by any consulting parties, Indian tribes or Native Hawai'ian organizations, or the public, including any correspondence from the SHPO and/or THPO.

Tribal responses: KSC has contacted 5 Tribes with a known interest in the area including the Seminole Tribe of Florida, the Seminole Nation of Oklahoma, the Miccosukee Tribe, the Muscogee (Creek) Nation, and the Thlopthlocco Tribal Town. NASA KSC has received responses from 3 of the 5 tribes.

- The **Seminole Tribe of Florida** requested copies of studies relevant to effects to archaeological sites and responded: The proposed undertaking does fall within the STOF Area of Interest. Therefore, we would like to accept your invitation to consult on this project pursuant to Section 106 of the National Historic Preservation Act (16 USC 470) as amended and its implementing regulations (36 CFR 800). Our preferred methods of engagement are written correspondence and supplemental virtual and/or in-person Government-to-Government consultations. It is our hope that any formal engagement with our office will facilitate meaningful discussion and integrate Indigenous Traditional Ecological Knowledge (ITEK), and general comments, into project design/implementation.
- The **Miccosukee** had questions related to effects to archaeological resources and requested information related to launch and landing trajectories stating, "this could be a potential concern, depending upon the answer."
- The **Seminole Nation of Oklahoma** stated they wanted to continue to consult on the project but would defer to the Seminole Tribe of Florida in decision making.

Consulting party responses: A full list of consulting parties invited to consult can be found in the attached document titled "SpaceX SH Launch.Reentry Final SHPO".

- The **City of Titusville** (CLG) requested consulting party status and provided the following information related to historic resources: Here is the sharelink with the City's historic preservation files: https://titusville.sharefile.com/ds91f2e071167b41ef934c3d01bcf91265. Here is a link to a storymap of national and local designated historic resources in Titusville: Historic Titusville.
- The **North Brevard Historical Society and Museum** requested consulting party status and stated the following: Being located in downtown Titusville we are definitely in the APE for this project and would like to be kept apprised of its progress. It looks like a lot of the historical buildings in this area have already been identified. Our museum does have information on quite a few of the structures in this area. Please feel free to use our resources in any of your investigations.
- The **North Brevard Heritage Foundation, Inc.** requested consulting party status and provided the following statement: I have reviewed the attached reports and find that you have identified the historic structures and archaeological sites that are located within the identified APE area. Our concerns are the noise and vibration impacts of both launches and landings to the respective identified resources and how they would also impact the general public. I would like to see results of a recent impact study at Boco Chico site in regard to noise and vibration of both launches and landings to the surrounding area. I think that the SpaceX Starship Project and Super Heavy Launch and Reentry Vehicles are extremely important to the future of space exploration and development of KSC for future generations.

- The **Canaveral National Seashore**, who is also a Cooperating Agency in the development of the EIS, requested consulting party status and provided the following statement: Our agency has shared cultural resource information with KSC NASA previously via the NPS database, the Historic Resource Study, the Archeological Overview and Assessment, and reports on individual sites and projects that are north of the secure area. Canaveral National Seashore also has a museum building located at the southern boundary adjacent to the launch pads. The museum building houses important archeological, biological, paleontological, historical, and archival objects from the Seashore and KSC. Some of these objects are breakable and/or stored in flammable liquids (in a flammable cabinet) which could be susceptible to damage from strong vibrations which is a concern.
- The **Cape Canaveral Lighthouse Foundation** requested consulting party status and provided the following statement: Our historic properties include the lighthouse, constructed in 1868 on the tip of Cape Canaveral, and moved to its current location in 1894. Adjacent to the lighthouse is an oil house constructed circa 1900. Original brick work and foundations are also located underground at the same location. We appear to be just outside the area of most danger, but would like to follow the discussion going forward, in case additional information relative to impacts on the lighthouse arise.
- The **NPS National Historic Landmark Program Southeast Region** was invited to participate as a consulting party and was non-responsive.

Members of the public submitted comments during initial public scoping meetings. Five comments were received regarding concern for potential effects to the structural integrity of historic properties.

III. Additional Information

14. Please indicate the status of any consultation that has occurred to date, including whether there are any unresolved concerns or issues the ACHP should know about in deciding whether to participate in consultation. Providing a list of consulting parties, including email addresses and phone numbers if known, can facilitate the ACHP's review response.

General Section 106 Consultation Materials Distributed:

- December 20, 2024 – Initiation of Section 106 Consultation
- March 17, 2025 – Continuing Consultation – Identification, Evaluation, Assessment of Effects (review and comment period closes April 18, 2025)

SHPO Engagement:

- January 23, 2025 Meeting – Discussed proposed APE, the proposed identification and evaluation approach, potential effects and cumulative Effects, the need for an agreement document, and consulting parties. Meeting notes are attached.
- February 13, 2025 Meeting – Discussed initial finding of identification and evaluation fieldwork. Meeting notes are attached.
- February 17 – 28, 2025 – SHPO informally reviewed a draft of the CRAS before it was formally distributed for review and comment on March 17, 2025. Their informal comments are attached; the majority of their comments were addressed prior to CRAS finalization and distribution.

Tribal Engagement:

- NASA KSC has followed up with all Tribes via email and phone calls after the distribution of the December 20, 2024 Section 106 consultation materials.
- Seminole Tribe of Florida has provided responses in writing. See #13 above.
- Miccosukee has provided responses in writing and NASA KSC has engaged in direct

conversation with the THPO.
- The THPO for the Seminole Nation of Oklahoma visited NASA KSC for an on-site tour of KSC and discussion about the project on January 31, 2025.

15 Does your agency have a website or website link where the interested public can find out about this project and/or provide comments? Please provide relevant links:

- FAA's website: https://www.faa.gov/space/stakeholder_engagement/spacex_starship_ksc
- KSC's website: Section 106 – Environmental

16. Is this undertaking considered a "major" or "covered" project listed on the Federal Infrastructure Projects Permitting Dashboard? If so, please provide the link:

Yes. See: https://www.permits.performance.gov/permitting-project/dot-projects/spacex-starship-super-heavy-project-kennedy-space-center-launch

The following are attached to this form (check all that apply):

☒ Section 106 consultation correspondence (SHPO, sample Tribal letters, sample consulting party invite)

☐ Maps, photographs, drawings, and/or plans (Will be included in the CRAS provided by SEARCH Inc. The file is too large to attach.)

☐ Additional historic property information

☒ Consulting party list with known contact information

☒ Other: SHPO Meeting Minutes. SHPO comments on draft CRAS. Tribal engagement tracker.

National Aeronautics and Space Administration

John F. Kennedy Space Center
Kennedy Space Center, FL 32899

March 17, 2025

Reply to Attn of: SI-E3

Alissa S. Lotane
Director and State Historic Preservation Officer
Florida Division of Historical Resources
R.A. Gray Building
500 S. Bronough Street
Tallahassee, Florida 32399-0250

Attn: Ms. Kelly Chase, Deputy SHPO
Mr. Scott Edwards, Historic Preservationist

Subject: Continuing Consultation, SpaceX Starship Super Heavy Launch and Reentry Vehicles at Launch Complex (LC)-39A, Kennedy Space Center (KSC)

Dear Ms. Lotane:

The National Aeronautics and Space Administration's (NASA) KSC is continuing consultation with your office pursuant to Section 106 of the National Historic Preservation Act (NHPA) of 1966 as part of the Federal Aviation Administration's (FAA) environmental review of the proposed action for the SpaceX Starship-Super Heavy launch and reentry vehicles at LC-39A. The undertaking involves issuance of a vehicle operator license by the FAA's Office of Commercial Space Transportation that will facilitate ground, launch, and reentry operations associated with the SpaceX Starship Super Heavy at LC-39A. Specifically, this would include up to 44 launches of Starship Super Heavy per year; return of the first stage booster to LC-39A; return of Starship to LC-39A; and construction of an air separation unit for liquid oxygen and liquid nitrogen, onsite natural gas liquefaction production and cryogenic liquid storage capability, roadway improvements, other associated infrastructure, and a catch tower. As noted in our initiation letter sent on December 20, 2024, NASA KSC is acting as the lead Federal agency for compliance with Section 106 of the NHPA.

This letter addresses the identification, evaluation, and assessment of effects for this undertaking. Relevant information can be found in the following sections of the enclosed Cultural Resource Survey for the Starship-Super Heavy Project at LC-39A:

- Methods for the identification of historic properties can be found in Section 5.2. Identification efforts included the following resources:
  - Previously recorded historic resources including cemeteries; and
  - Unrecorded resources; and
  - Archaeological resources.
- Identification results and recommendations for determinations of eligibility can be found in Sections 4.2 and 6.
- A discussion of how historic properties may be affected by the undertaking can be found in Sections 1.1 and 5.1.
- Anticipated findings of effects can be found in Section 6.

NASA KSC agrees with the conclusions and recommendations in the Cultural Resource Survey, including SEARCH Inc.'s eligibility recommendations. However, at this time, NASA KSC cannot make a definitive effect finding of how SpaceX Starship-Super Heavy launch and landing activities will affect historic properties. Evidence suggests that adverse effects resulting from the undertaking are not likely but are possible. Because a final determination of effect is inconclusive, the development of a programmatic agreement to monitor for and resolve adverse effects is proposed pursuant to 36 CFR Part 800.14(b)(1)(ii). The development of this agreement will be done in consultation with your office, Consulting Parties, and federally-recognized Indian Tribes.

Consulting Parties, who accepted the invitation to consult on this undertaking, are copied on this correspondence. This letter acts as their notification and invitation to review and provide comments on the enclosed materials. NASA KSC also continues to consult with federally-recognized Indian Tribes directly.

NASA KSC requests your concurrence with our determinations of eligibility as well as the development of a Programmatic Agreement. We respectfully request a response, and any comments, within 30 days of receipt. If you have any questions or need additional information, please contact me at 321-867-8454 or Katherine.s.zeringue@nasa.gov.

Sincerely,

Katherine Zeringue Digitally signed by Katherine Zeringue
Date: 2025.03.17 09:07:28 -04'00'

Katherine Zeringue
NASA KSC Cultural Resources Manager

Enclosures:
Cultural Resource Survey for the Starship-Super Heavy Project at LC-39A

cc:
HQS FPO/R. Klein
KSC/SI-E3/D. Dankert
KSC/AD/D. Thorpe
KSD/AD/J. Krouchick
KSC/CC/T. Tezel
KSC/SI-C2/R. Griffin
FAA/E. Long
FAA/A. Hanson
FAA/S. Zee

Consulting Parties:
Canaveral National Seashore/K. Kneifl
Cape Canaveral Lighthouse Foundation/B. Zingarelli
Cape Canaveral Space Force Station/T. Penders
City of Titusville/B. Parrish
Historical Society of North Brevard/P. Alix
U.S. Fish and Wildlife Service/R. Kanaski
North Brevard Heritage Foundation/R. Foster

National Aeronautics and Space Administration

John F. Kennedy Space Center
Kennedy Space Center, FL 32899

March 17, 2025

Reply to Attn of: SI-E3

Tine Osceola
Tribal Historic Preservation Officer
Seminole Tribe of Florida
Heritage & Environment Resources Office
30290 Josie Billy Hwy., PMB 1004
Clewiston FL 33440

Subject: Continuing Consultation, SpaceX Starship Super Heavy Launch and Reentry Vehicles at Launch Complex (LC)-39A, Kennedy Space Center (KSC)
THPO Compliance Tracking Number: 0034641

Dear Ms. Osceola:

The National Aeronautics and Space Administration's (NASA) KSC is continuing consultation with your Tribe pursuant to Section 106 of the National Historic Preservation Act (NHPA) of 1966 as part of the Federal Aviation Administration's (FAA) environmental review of the proposed action for the SpaceX Starship-Super Heavy launch and reentry vehicles at LC-39A. The undertaking involves issuance of a vehicle operator license by the FAA's Office of Commercial Space Transportation that will facilitate ground, launch, and reentry operations associated with the SpaceX Starship Super Heavy at LC-39A. Specifically, this would include up to 44 launches of Starship Super Heavy per year; return of the first stage booster to LC-39A; return of Starship to LC-39A; and construction of an air separation unit for liquid oxygen and liquid nitrogen, onsite natural gas liquefaction production and cryogenic liquid storage capability, roadway improvements, other associated infrastructure, and a catch tower. As noted in our initiation letter sent on December 20, 2024, NASA KSC is acting as the lead Federal agency for compliance with Section 106 of the NHPA and FAA is leading Government to Government consultation.

This letter addresses the identification, evaluation, and assessment of effects for this undertaking. Relevant information can be found in the following sections of the enclosed Cultural Resource Survey for the Starship-Super Heavy Project at LC-39A:

- Methods for the identification of historic properties can be found in Section 5.2. Identification efforts included the following resources:
  - Previously recorded historic resources including cemeteries; and
  - Unrecorded resources; and
  - Archaeological resources.
- Identification results and recommendations for determinations of eligibility can be found in Sections 4.2 and 6.
- A discussion of how historic properties may be affected by the undertaking can be found in Sections 1.1 and 5.1.
- Anticipated findings of effects can be found in Section 6.

NASA KSC agrees with the conclusions and recommendations in the Cultural Resource Survey, including SEARCH Inc.'s eligibility recommendations. However, at this time, NASA KSC cannot make a definitive effect finding of how SpaceX Starship-Super Heavy launch and landing activities will affect historic properties. Evidence suggests that adverse effects resulting from the undertaking are not likely but are possible. Because a final determination of effect is inconclusive, the development of a programmatic agreement to monitor for and resolve adverse effects is proposed pursuant to 36 CFR Part 800.14(b)(1)(ii). The development of this agreement will be done in consultation with your Tribe.

NASA KSC requests your review and comment on our determinations of eligibility, effect finding, as well as the development of a Programmatic Agreement. Your timely response will greatly assist us in incorporating your comments into project planning. If you have any questions or need additional information, please contact me at 321-867-8454 or Katherine.s.zeringue@nasa.gov.

Sincerely,

Katherine Zeringue Digitally signed by Katherine Zeringue
Date: 2025.03.17 09:04:46 -04'00'

Katherine Zeringue
NASA KSC Cultural Resources Manager

Enclosures:
Cultural Resource Survey for the Starship-Super Heavy Project at LC-39A

cc:
THPO Compliance Manager/D. Simon
THPO Compliance Analyst II/V. Menchaca

Entity (Organization/Tribe)	POC Name	CC:	Address	Email	Phone	Initial Correspondence Type			Initial Correspondence Date	Response	Response Date	Follow-Up		Follow-Up Date	Notes	Project File No.
						Mail	Email	Phone				Yes	No			
Seminole Tribe of Florida	Esq. Osceola, THPO	Danielle Simon (DanielleSimon@semtribe.com), THPO Compliance Manager Victoria Menchaca (VictoriaMenchaca@semtribe.com), THPO Compliance Analyst II	Heritage & Environment Resources Office 30290 Josie Billy Hwy., PMB 1004 Clewiston FL 33440	thpocompliance@semtribe.com DanielleSimon@semtribe.com VictoriaMenchaca@semtribe.com	(863) 983-6549 Ext. 12257	X	X		12/20/2024 (email); 1/7/2025 (hard copy mailed)	Request to be consulting parties; request to integrate TCK into project design and implementation.	1/30/72025	X			Initiation Letter sent to Tribal Chair w/cc: to THPO 1/6/2025 - Tribal RFI requesting copy of the following documents: Rocket Exhaust Noise Effects on Cultural Resources Addendum to the Section 106 Compliance Report for the Blue Origin Orbital Launch Site Project, Vandenberg Space Force Base, Santa Barbara, California. Prepared by Applied Earth Works, Inc. for Tetra Tech, November 2021. 1/30/2025 - KSC sent report electronically (as introduced)	TePO Compliance Tracking Number: 0036643
Miccosukee Tribe of Indians of Florida	Jason Daniel, THPO		Tamiami Station, P.O. Box 440021, Miami, Florida 33144	tdaniel@miccosukeetribe.com	Phone: (305) 223-8380, ext. 6061 or Mobile: (786) 835-7391	X	X		12/20/2024 (email); 1/7/2025 (hard copy mailed)			X			Initiation Letter sent to Tribal Chair w/cc: to THPO 1/31/20205 - KSC phone crll. Spoke to Jason Daniel. Initially stated no comments, but will verify in follow-up. 1/23/25 - Tribal RFI Received 1/27/25 - KSC response to RFI 2/6/25 - KSC phone call and email follow up.	
Mvskoke (Creek) Nation	Dr. Savannah Wilkes, THPO		3906F East Eufaula Street, Okmulgee, OK, 74447	section106@mvskokenation.com; swilkes@mvskokenation.com	918-732-7852	X	X		12/20/2024 (email); 1/7/2025 (hard copy mailed)			X			Initiation Letter sent to Tribal Chair w/cc: to THPO 1/31/2025 Change in THPO confirmed. KSC follow-up phone call. Left message. Electronic materials emailed to new THPO.	
Seminole Nation of Oklahoma	Jeff Harjo, THPO		26845 U.S. 270, Wewoka, OK 74884	harjo.j@sno-nsn.gov	405-257-7200 ext. 7892	X	X		12/20/2024 (email); 1/7/2025 (hard copy mailed)	Request to be consulting parties.	1/22/2025	X			Initiation Letter sent to Tribal Chair w/cc: to THPO 1/31/2025 - In person meeting at KSC with KSC CRM, 1/27/25 - Change in THPO confirmed. THPO requested site visit on 1/31/25. Materials emailed to Mr. Harjo.	
Thlopthlocco Tribal Town	David Hunt, THPO		P.O. Box 188, Okemah, OK 74859	thpo@tttown.org	(918) 560-6113	X	X		12/2/2025 (email); hard copy mailed 1/31/2025			X			12/2/2025 Initiation letter emailed to Tribal Chair w/cc: to THPO; hard copy mailed 1/31/2025. 2/10/25 follow-up call - left message.	

Entity (Organization/Tribe)	POC Name	Address	Email	Phone	Initial Correspondence Type			Initial Correspondence Date	Response	Response Date	Follow-Up		Follow-Up Date	Notes
					Mail	Email	Phone				Yes	No		

Name	Organization	Line Number	Comment	SEARCH Response
Kelly Chase	DHR		The executive summary makes no mention of efforts to identify historic properties that were not previously recorded.	
Kelly Chase	DHR	862	Why were linear resources omitted? We understand the omission of canals, but historic bridges and railroads could reasonably be affected by the undertaking.	
Kelly Chase	DHR	1129	formatting error, "i" should be "a"	
Kelly Chase	DHR	1136-1138	We understand that not every property over 50 years within the APE can or should be recorded and evaluated as a part of this undertaking. However, we disagree with the decision to omit previously recorded resources outside of existing resource groups (n=164 according to line 1367) from survey especially if they were identified as potential contributors to a historic distirct. Perhaps efforts to formally identify and evaluate these reosurces can be addressed in the PA, but that should be mentioned in the report.	
Kelly Chase	DHR	1133-1135	When were the previous surveys conducted and why were these resources recommended as ineligible? If these evaluations were made more than 10 years ago, revisiting these properties may be worthwhile.	
Kelly Chase	DHR	1117	What categories of resources, please provide more detail and/or examples.	
Kelly Chase	DHR	976-977	When were the previous surveys conducted and why were these resources recommended as ineligible? If these evaluations were made more than 10 years ago, revisiting these properties may be worthwhile.	
Kelly Chase	DHR	1651	We recommend consulting FDOT's "Post WWII Florida Context" and "Post WWII Style Guide," https://www.fdot.gov/environment/cultmgmt/cultural-resources-guidance.	
Scott Edwards	DHR	862	Hisotirc bridges and possible railroads have the potential to be affected	

March 31, 2025

Katherine Zeringue
Cultural Resources Manager
Kennedy Space Center
Kennedy Space Center, FL 32899

Ref: *SpaceX Starship Super Heavy Launch and Reentry Vehicles at Launch Complex-39A*
Kennedy Space Center, Merritt Island, Florida
ACHP Project Number: 020937

Dear Ms. Zeringue:

On March 30, 2025, the Advisory Council on Historic Preservation (ACHP) received your notification and supporting documentation regarding the potential adverse effects of the referenced undertaking on a property or properties listed or eligible for listing in the National Register of Historic Places. Based upon the information you provided, we have concluded that Appendix A, *Criteria for Council Involvement in Reviewing Individual Section 106 Cases*, of our regulations, "Protection of Historic Properties" (36 CFR Part 800) implementing Section 106 of the National Historic Preservation Act, does not apply to this undertaking. Accordingly, we do not believe our participation in the consultation to resolve adverse effects is needed.

However, if we receive a request for participation from the State Historic Preservation Officer (SHPO), Tribal Historic Preservation Officer, affected Indian tribe, a consulting party, or other party, we may reconsider this decision. Should the undertaking's circumstances change, consulting parties cannot come to consensus, or you need further advisory assistance to conclude the consultation process, please contact us.

Pursuant to Section 800.6(b)(1)(iv), you will need to file the final Section 106 agreement document (Agreement), developed in consultation with the Florida SHPO and any other consulting parties, and related documentation with the ACHP at the conclusion of the consultation process. The filing of the Agreement and supporting documentation with the ACHP is required in order to complete the requirements of Section 106 of the National Historic Preservation Act.

Thank you for providing us with your notification of adverse effect. If you have any questions or require our further assistance, please contact Christopher Daniel at (202) 517-0223 or by e-mail at cdaniel@achp.gov and reference the ACHP Project Number above.

Sincerely,

Dana Daniels
Historic Preservation Technician
Office of Federal Agency Programs

ADVISORY COUNCIL ON HISTORIC PRESERVATION

401 F Street NW, Suite 308 • Washington, DC 20001-2637
Phone: 202-517-0200 • Fax: 202-517-6381 • achp@achp.gov • www.achp.gov


Seminole Tribe of Florida Meeting
SpaceX Starship-Super Heavy Launch Vehicle at Launch Complex 39A
at the Kennedy Space Center, Florida
8 April 2025
Federal Aviation Administration
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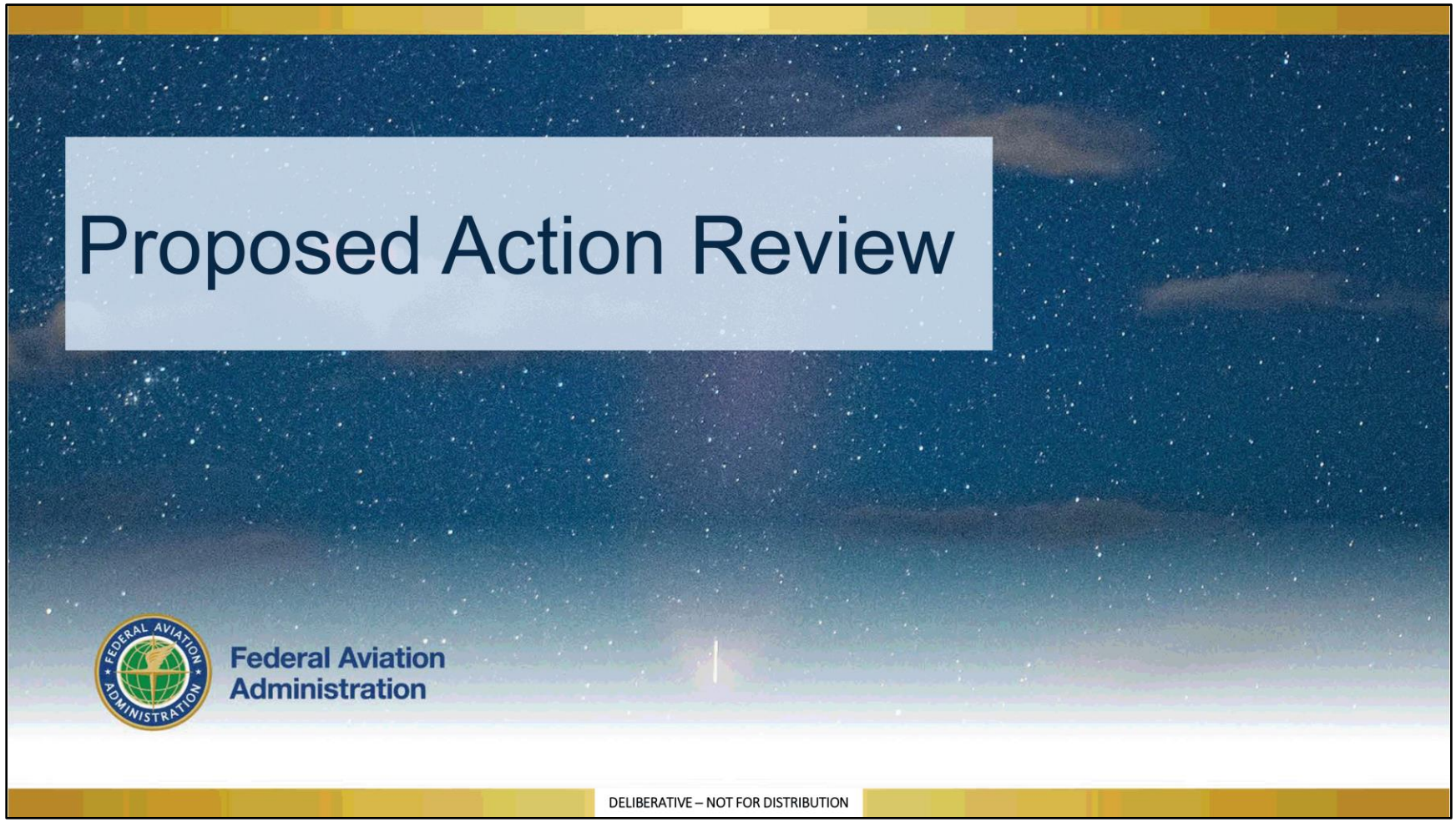
Proposed Action Review
Federal Aviation Administration
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Starship-Super Heavy LC-39A

Federal Aviation Administration

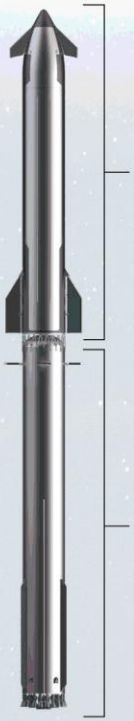
Proposed Action Review

Starship-Super Heavy Vehicle

- Composed of 2 stages
  - Super Heavy (booster) – 35 Raptor Engines
  - Starship – 9 Raptor Engines

Operations

- Pre-launch – testing and rehearsals
  - Static Fires – 1 for each stage prior to launch (88 total)
- Starship-Super Heavy Launches – 44
  - 50% Day / Night (10pm – 7am) Split
- Starship Landings - 44
  - LC-39A, droneship in Atlantic, expended in Atlantic / Pacific / Indian Ocean >5nm
  - Contingency: soft water landing 1nm-5nm in Atlantic 50 nm north/south of LC-39A
- Super Heavy Landings – 44
  - LC-39A, droneship in Atlantic, expended in Atlantic >5nm



Starship
(second stage)

Super Heavy Booster
(first stage)

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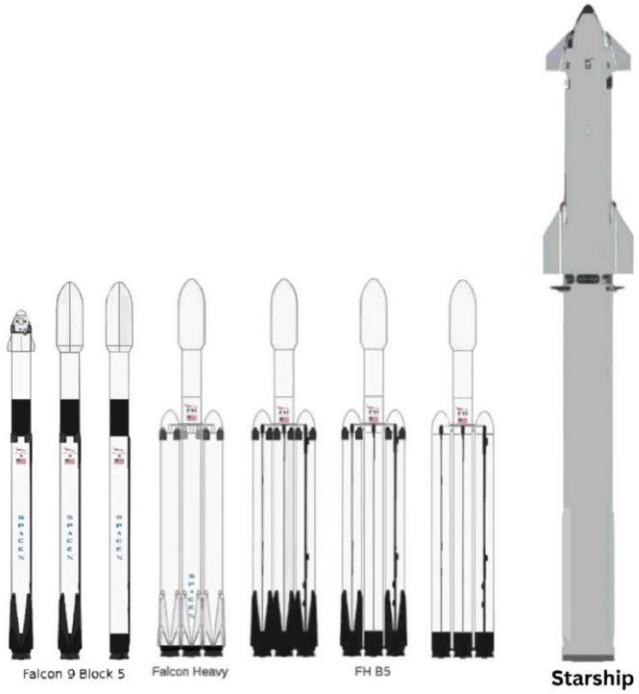
SpaceX Launch Vehicle Comparison

Federal Aviation Administration



	Falcon 9	Falcon 9 Heavy	Starship Superheavy
Engines	9	27	35
Thrust	1,710,000 lbf	5,130,000 lbf	23,000,000 lbf
Duration – Static Fire	7-15 seconds		
Duration - Launch	<7-15 seconds		

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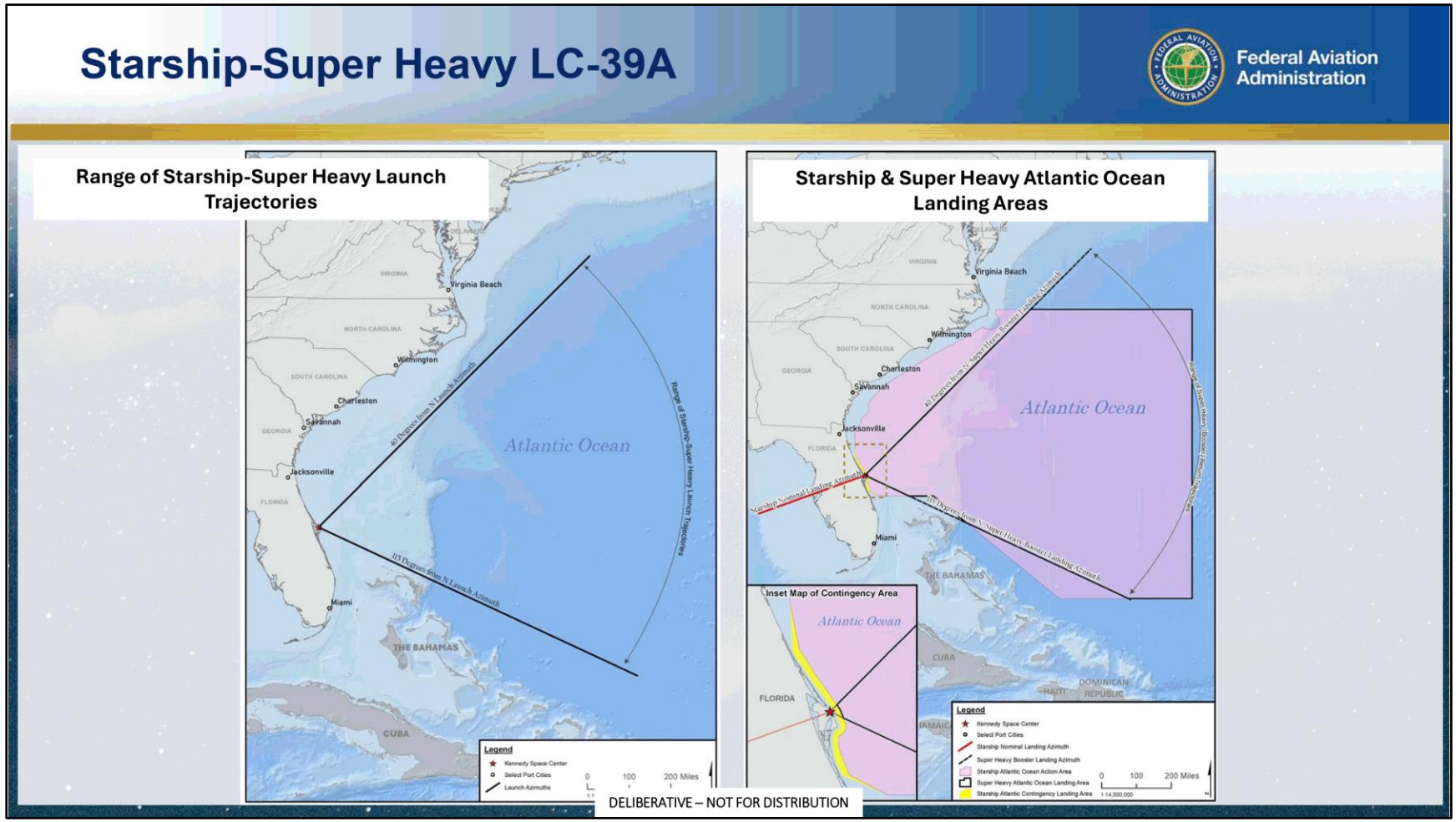
Starship-Super Heavy LC-39A
Federal Aviation Administration
Range of Starship-Super Heavy Launch Trajectories
Starship & Super Heavy Atlantic Ocean Landing Areas
Atlantic Ocean
Virginia Beach
Wilmington
Charleston
Savannah
Jacksonville
Miami
THE BAHAMAS
CUBA
Inset Map of Contingency Area
Legend
Kennedy Space Center
Select Port Cities
Launch Azimuths
Starship Nominal Landing Azimuth
Super Heavy Booster Landing Azimuth
Starship Atlantic Ocean Action Area
Super Heavy Atlantic Ocean Landing Area
Starship Atlantic Contingency Landing Area
0 100 200 Miles
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Starship-Super Heavy LC-39A

Federal Aviation Administration

Proposed LC-39A Infrastructure

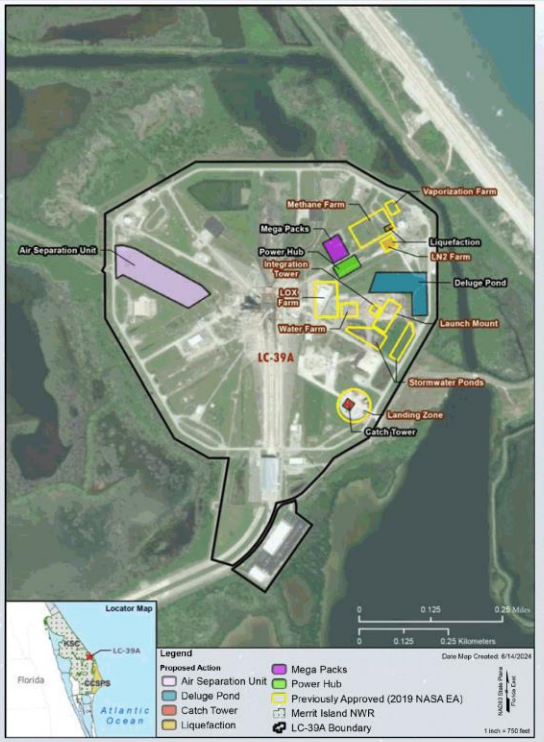
Previously approved (2019 NASA EA*):

- LOX Farm (65,454 square feet [SF])
- Methane Farm (78,876 SF)
- Launch Mount (36,568 SF)
- Integration Tower (6,184 SF)
- Ponds (68,799 SF)
- Vaporization Farm (9,650 SF)
- LZ (72,672 SF)
- LN2 Farm (13,342 SF)
- Water Farm (17,955 SF)

Included as part of this Action:

- Air Separation Unit (222,071 SF)
- Catch Tower (5,992 SF)
- Deluge Pond (121,963 SF)
- Liquefaction – includes natural gas pretreatment and methane liquefier (17,246 SF)
- MegaPacks (34,979 SF)
- Power Hub (28,998 SF)

*Final Environmental Assessment for the SpaceX Starship and Super Heavy Launch Vehicle at Kennedy Space Center



Total Approximate Square Footage: 800,647

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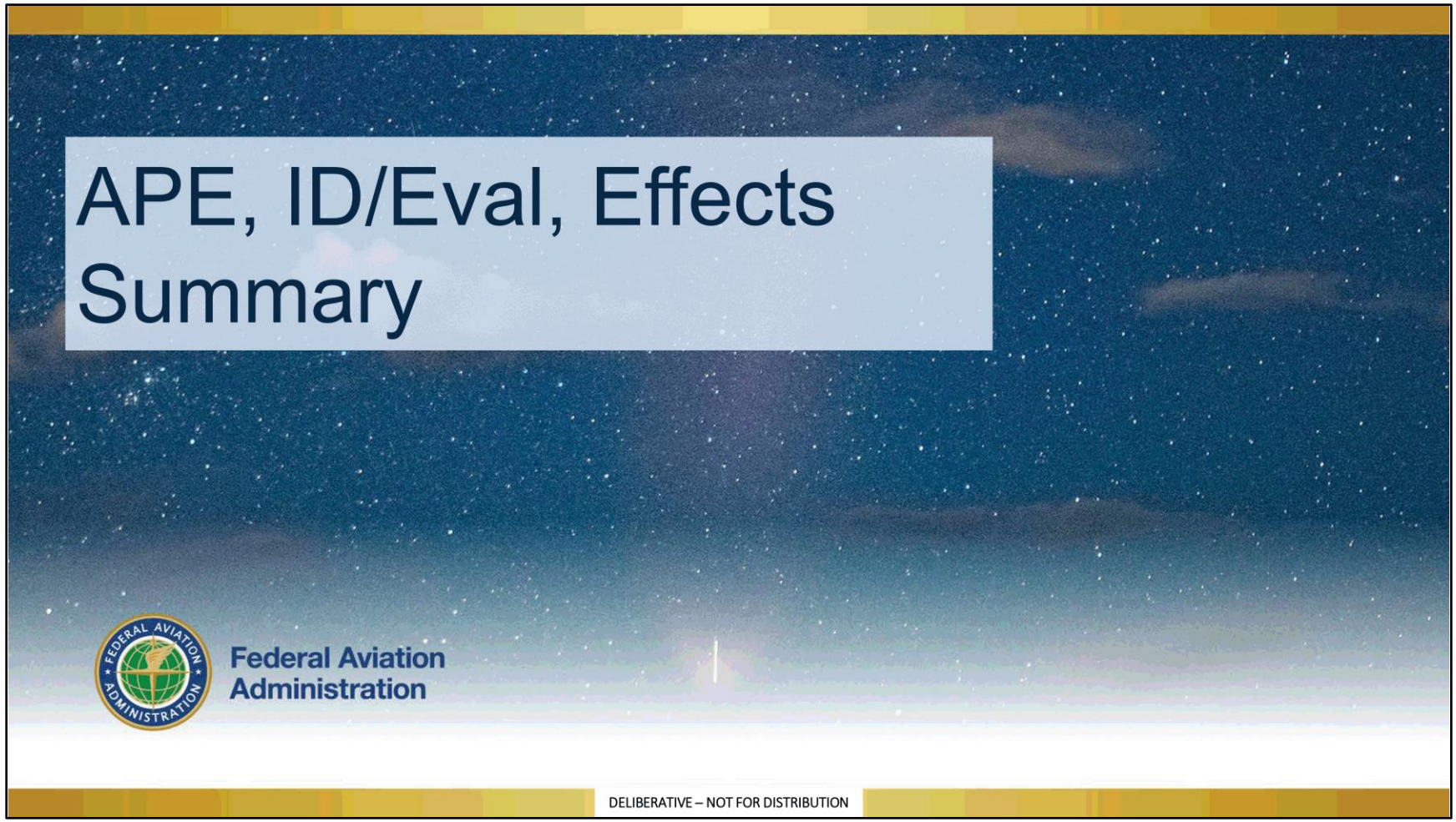
APE, ID/Eval, Effects Summary
Federal Aviation Administration
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HISTORICAL RESOURCES – Area of Potential Effects

Federal Aviation Administration

Construction APE

- Previously surveyed/existing boundary of LC-39A

Operational APE

- Considers auditory and vibratory effects of launch and landing activities
- Area of Lmax sound level ≥ 130 dB from launch effects
- Area of ≥ 2 pounds per square foot (psf) of sonic boom overpressure from reentry effects

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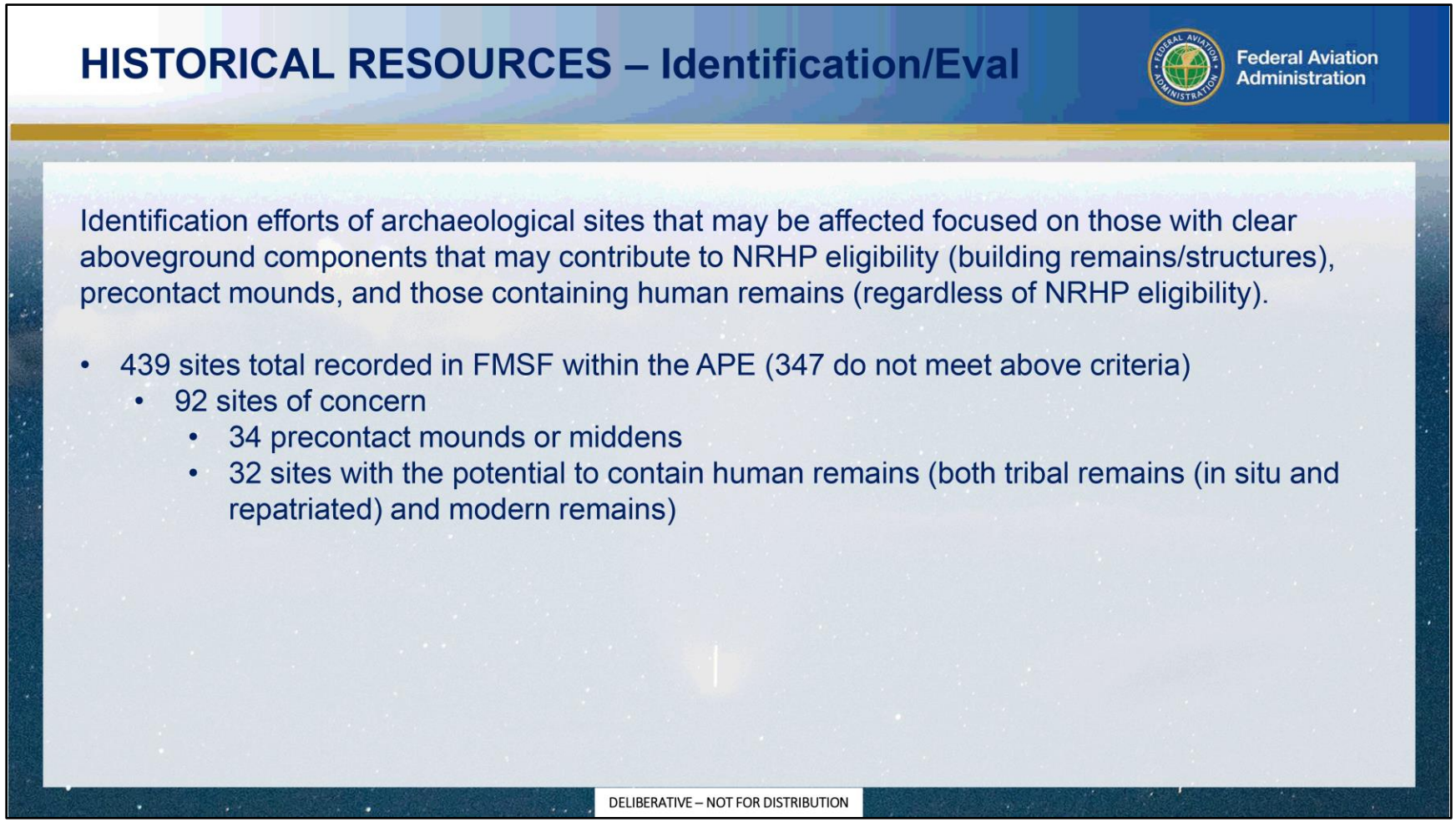
HISTORICAL RESOURCES – Identification/Eval
Federal Aviation Administration
Identification efforts of archaeological sites that may be affected focused on those with clear aboveground components that may contribute to NRHP eligibility (building remains/structures), precontact mounds, and those containing human remains (regardless of NRHP eligibility).
• 439 sites total recorded in FMSF within the APE (347 do not meet above criteria)
• 92 sites of concern
• 34 precontact mounds or middens
• 32 sites with the potential to contain human remains (both tribal remains (in situ and repatriated) and modern remains)
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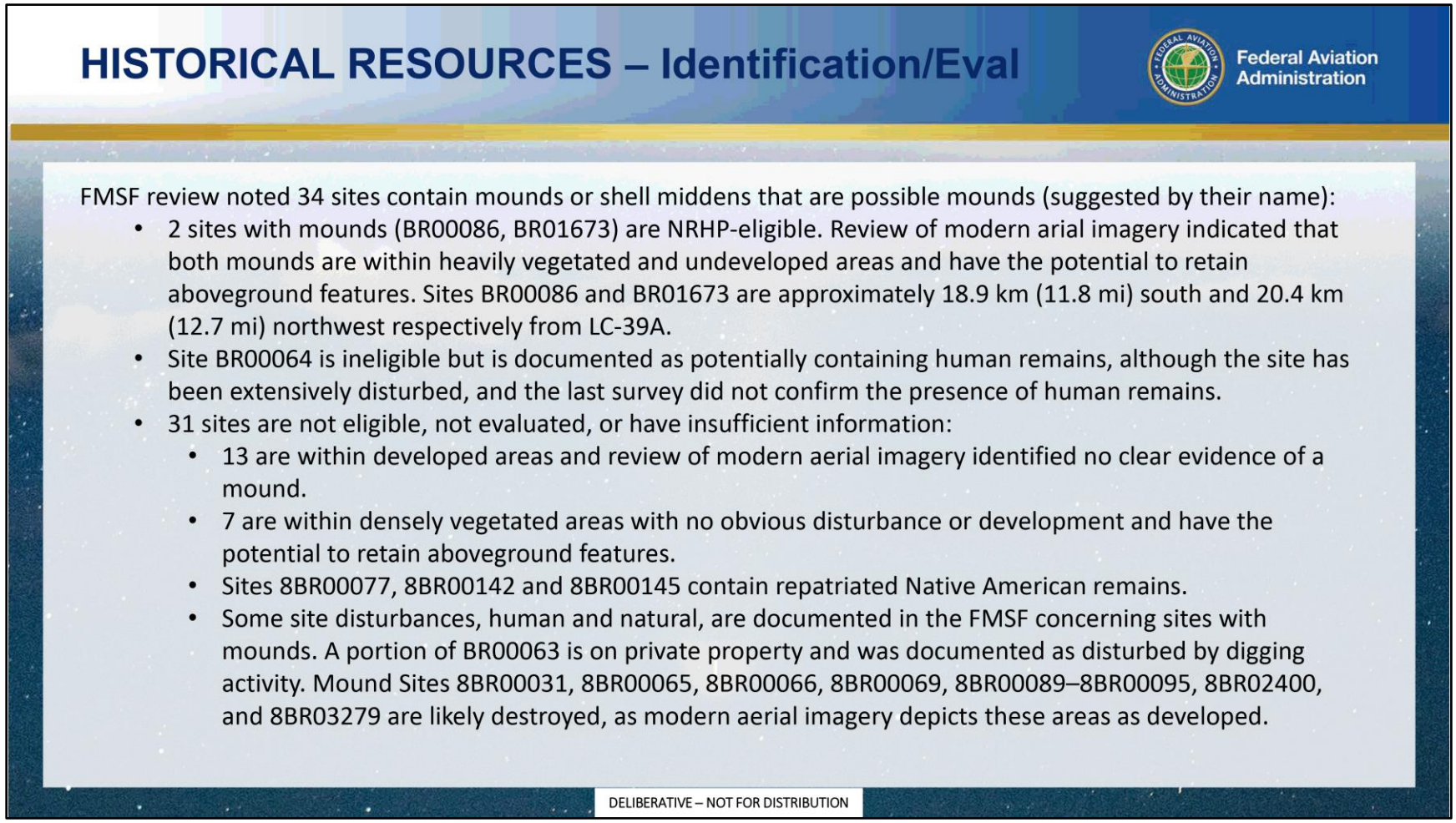
HISTORICAL RESOURCES – Identification/Eval
Federal Aviation Administration
FMSF review noted 34 sites contain mounds or shell middens that are possible mounds (suggested by their name):
• 2 sites with mounds (BR00086, BR01673) are NRHP-eligible. Review of modern arial imagery indicated that both mounds are within heavily vegetated and undeveloped areas and have the potential to retain aboveground features. Sites BR00086 and BR01673 are approximately 18.9 km (11.8 mi) south and 20.4 km (12.7 mi) northwest respectively from LC-39A.
• Site BR00064 is ineligible but is documented as potentially containing human remains, although the site has been extensively disturbed, and the last survey did not confirm the presence of human remains.
• 31 sites are not eligible, not evaluated, or have insufficient information:
• 13 are within developed areas and review of modern aerial imagery identified no clear evidence of a mound.
• 7 are within densely vegetated areas with no obvious disturbance or development and have the potential to retain aboveground features.
• Sites 8BR00077, 8BR00142 and 8BR00145 contain repatriated Native American remains.
• Some site disturbances, human and natural, are documented in the FMSF concerning sites with mounds. A portion of BR00063 is on private property and was documented as disturbed by digging activity. Mound Sites 8BR00031, 8BR00065, 8BR00066, 8BR00069, 8BR00089–8BR00095, 8BR02400, and 8BR03279 are likely destroyed, as modern aerial imagery depicts these areas as developed.
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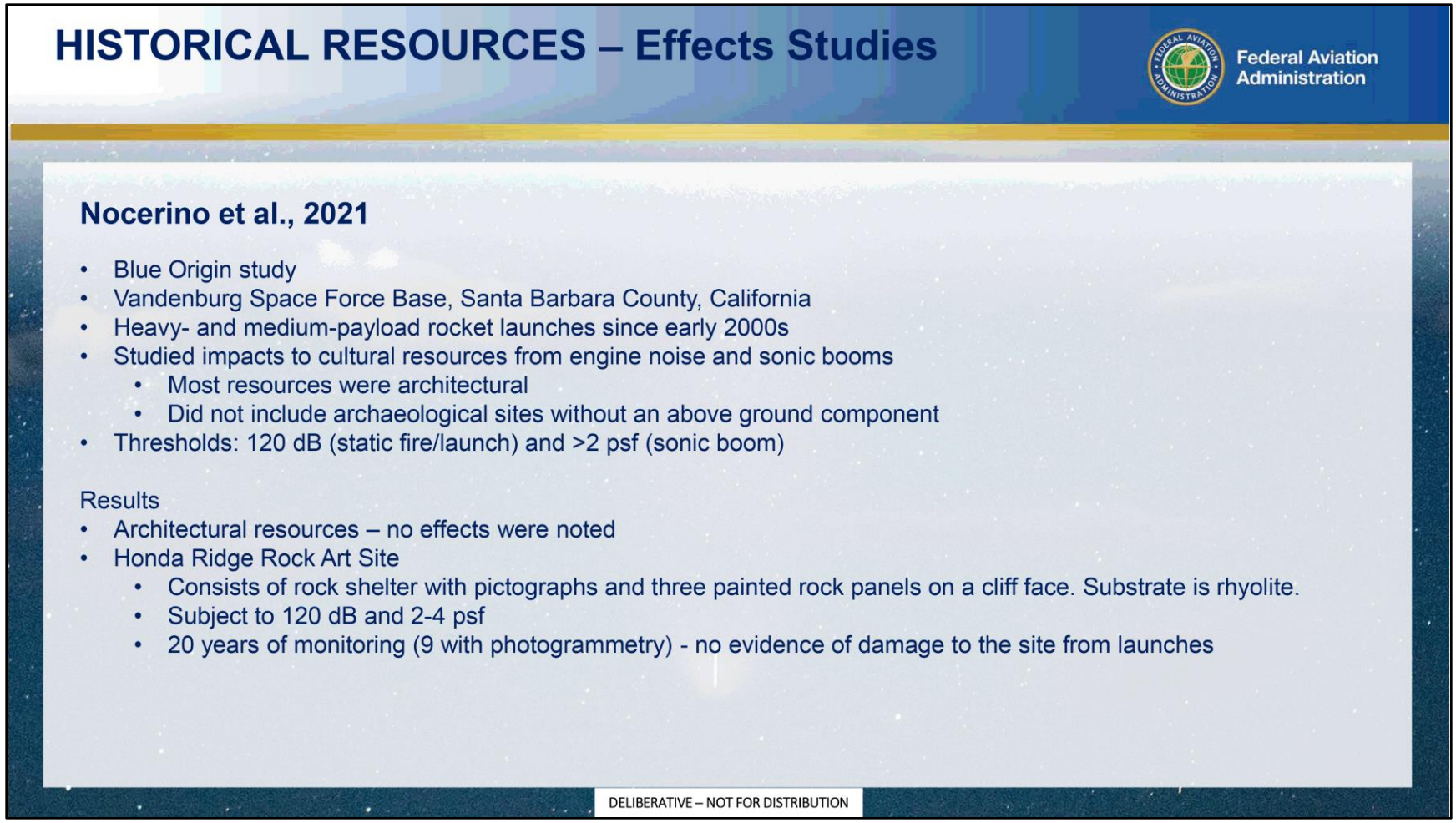
HISTORICAL RESOURCES – Effects Studies
Federal Aviation Administration
Nocerino et al., 2021
• Blue Origin study
• Vandenburg Space Force Base, Santa Barbara County, California
• Heavy- and medium-payload rocket launches since early 2000s
• Studied impacts to cultural resources from engine noise and sonic booms
• Most resources were architectural
• Did not include archaeological sites without an above ground component
• Thresholds: 120 dB (static fire/launch) and >2 psf (sonic boom)
Results
• Architectural resources – no effects were noted
• Honda Ridge Rock Art Site
• Consists of rock shelter with pictographs and three painted rock panels on a cliff face. Substrate is rhyolite.
• Subject to 120 dB and 2-4 psf
• 20 years of monitoring (9 with photogrammetry) - no evidence of damage to the site from launches
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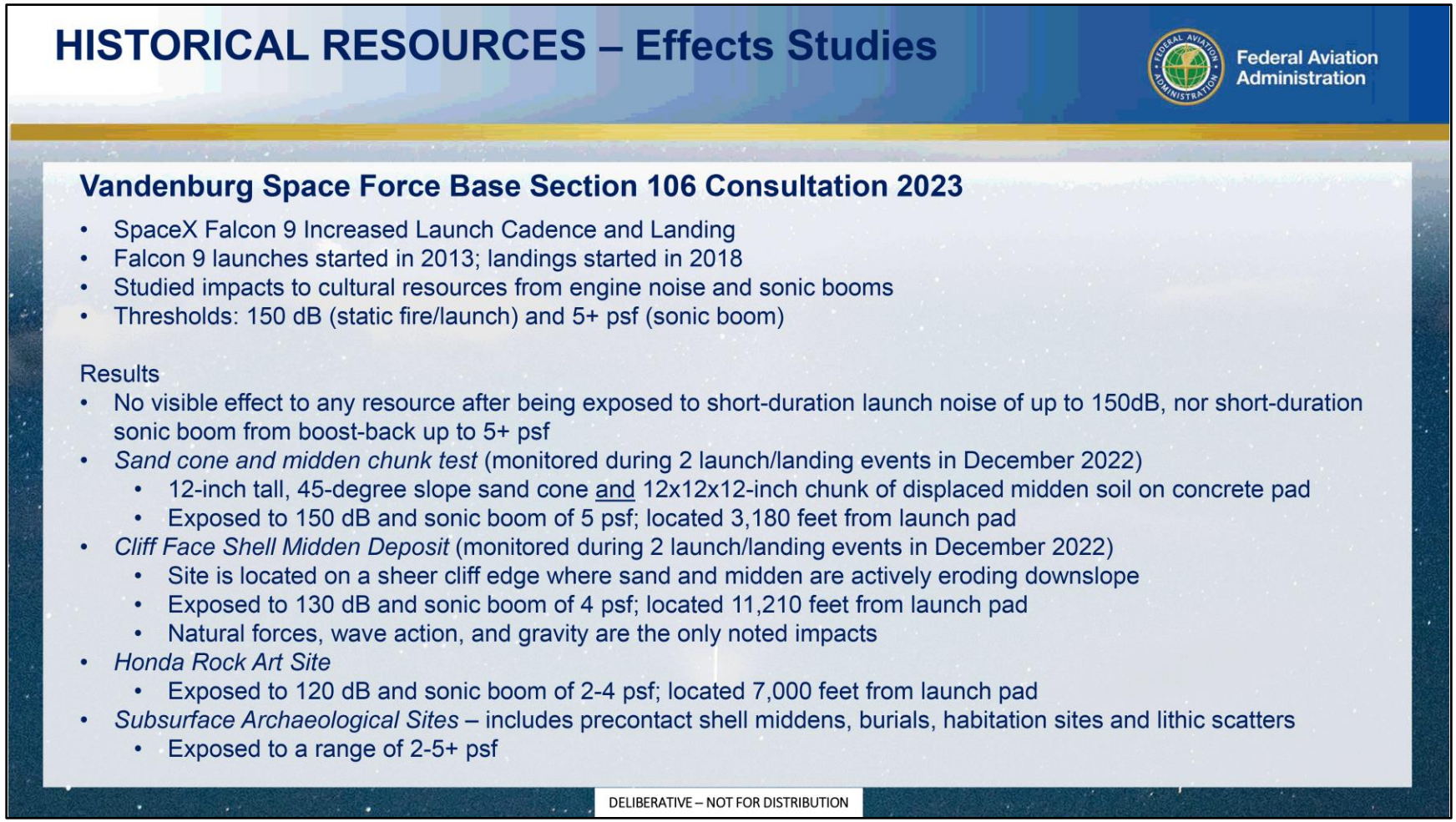
HISTORICAL RESOURCES – Effects Studies
Federal Aviation Administration
Vandenburg Space Force Base Section 106 Consultation 2023
• SpaceX Falcon 9 Increased Launch Cadence and Landing
• Falcon 9 launches started in 2013; landings started in 2018
• Studied impacts to cultural resources from engine noise and sonic booms
• Thresholds: 150 dB (static fire/launch) and 5+ psf (sonic boom)
Results
• No visible effect to any resource after being exposed to short-duration launch noise of up to 150dB, nor short-duration sonic boom from boost-back up to 5+ psf
• Sand cone and midden chunk test (monitored during 2 launch/landing events in December 2022)
• 12-inch tall, 45-degree slope sand cone and 12x12x12-inch chunk of displaced midden soil on concrete pad
• Exposed to 150 dB and sonic boom of 5 psf; located 3,180 feet from launch pad
• Cliff Face Shell Midden Deposit (monitored during 2 launch/landing events in December 2022)
• Site is located on a sheer cliff edge where sand and midden are actively eroding downslope
• Exposed to 130 dB and sonic boom of 4 psf; located 11,210 feet from launch pad
• Natural forces, wave action, and gravity are the only noted impacts
• Honda Rock Art Site
• Exposed to 120 dB and sonic boom of 2-4 psf; located 7,000 feet from launch pad
• Subsurface Archaeological Sites – includes precontact shell middens, burials, habitation sites and lithic scatters
• Exposed to a range of 2-5+ psf
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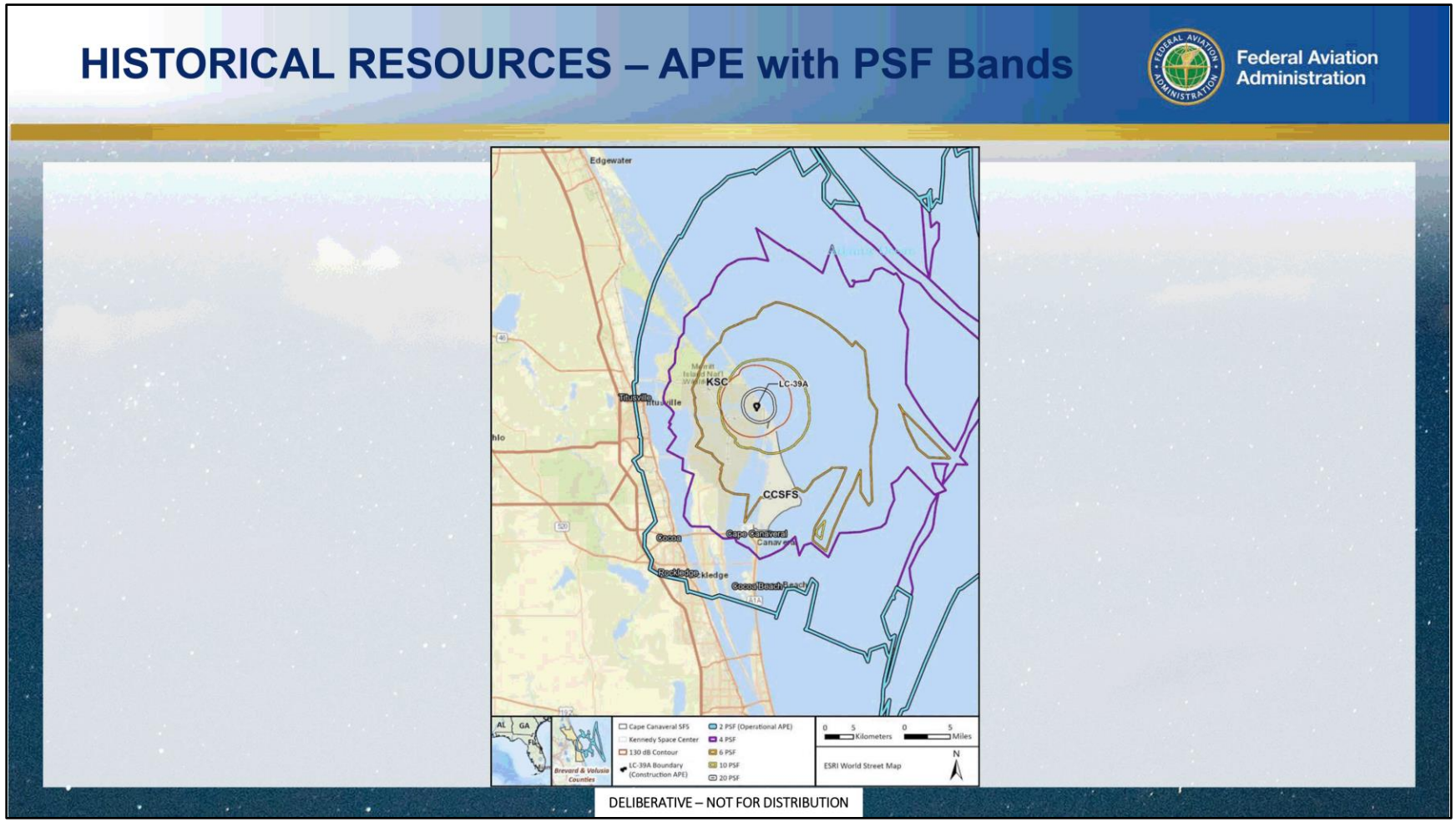
HISTORICAL RESOURCES – APE with PSF Bands
Federal Aviation Administration
Edgewater
KSC
LC-39A
CCSFS
Cape Canaveral
Cocoa
Rockledge
Cocoa Beach
AL
GA
FL
Brevard & Volusia Counties
Cape Canaveral SFS
Kennedy Space Center
130 dB Contour
LC-39A Boundary (Construction APE)
2 PSF (Operational APE)
4 PSF
6 PSF
10 PSF
20 PSF
0 5 0 5
Kilometers Miles
ESRI World Street Map
N
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HISTORICAL RESOURCES – Archaeological Sites

Federal Aviation Administration

psf	Number of Sites	Site List	
20 psf	1	8BR206 (Pepper Hammock)	
10 psf	2	8BR151 (NN*) 8BR205 (Max Hoeck Mound and Midden)	
6 psf	5	8BR83 (De Soto Grove Burial Mound*) 8BR150 (Oyster Prong Creek Mound*) 8BR145 (Clark Slough*) 8BR158 (Penny Plot*) 8BR3152 (Clark Slough Earthwork)	
4 psf	20	8BR62 (Moore Mound*) 8BR63 (Sams Mound*) 8BR64 (Tiffin Mound*) 8BR77 (Nauman's Place*) 8BR85 (Burns*) 8BR86 (Holmes Mound*) 8BR87 (Gulbransen Mound) 8BR88A (Hammock Mound A*) 8BR88C (Hammock Mound C) 8BR89 (Norris Mound*)	8BR90 (Fuller Mound A*) 8BR91 (Fuller Mound B*) 8BR92 (Fuller Mound C) 8BR93 (Fuller Mound D*) 8BR94 (Fuller Mound E*) 8BR95 (Fuller Mound F) 8BR156 (NN) 8BR161 (Cocoa Beach Mound*) 8BR2085 (Odyssey Street Remains*) 8BR3274 (The Dunal Ridge Midden)

* = potential for human remains

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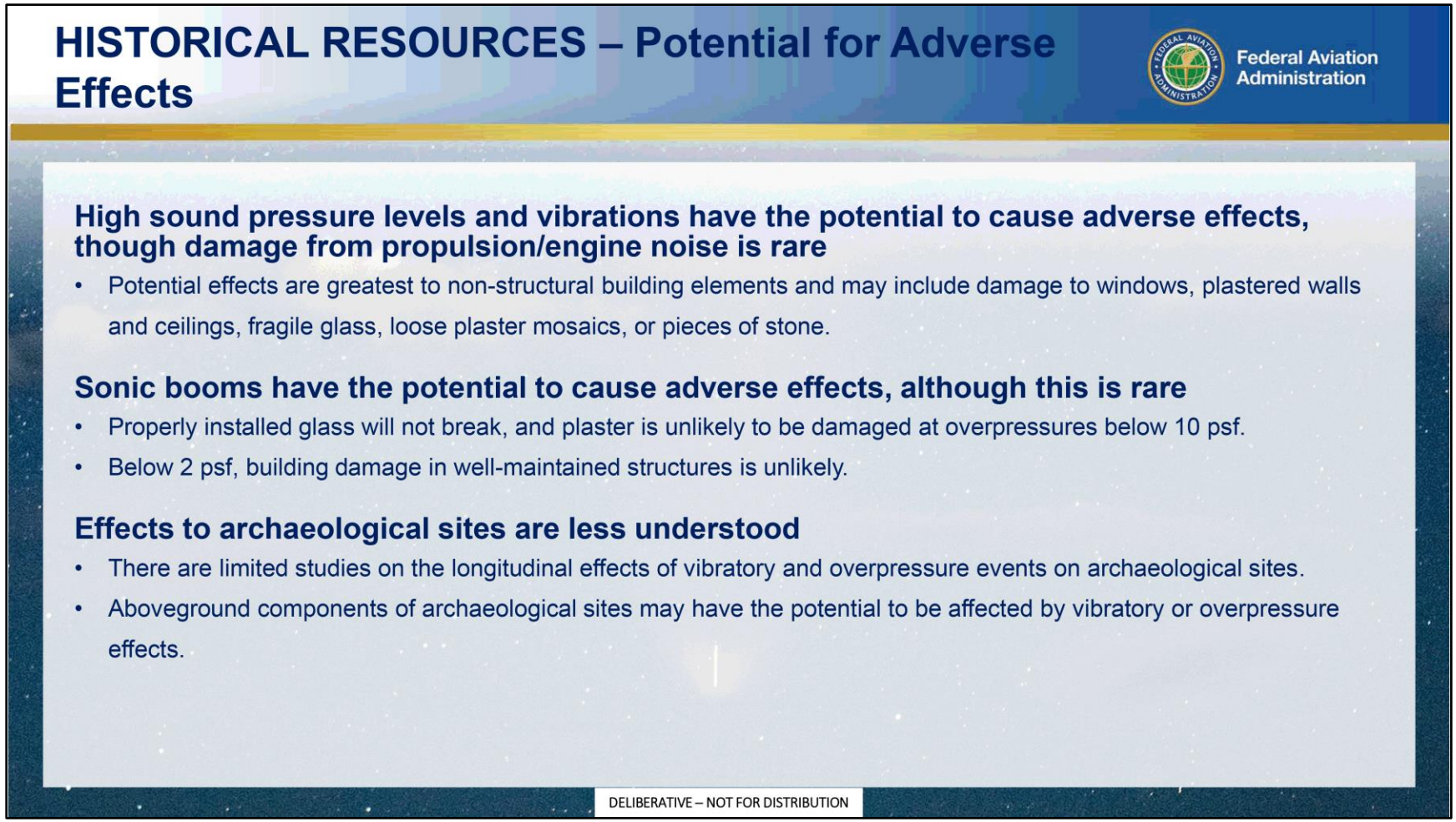
HISTORICAL RESOURCES – Potential for Adverse Effects
Federal Aviation Administration
High sound pressure levels and vibrations have the potential to cause adverse effects, though damage from propulsion/engine noise is rare
• Potential effects are greatest to non-structural building elements and may include damage to windows, plastered walls and ceilings, fragile glass, loose plaster mosaics, or pieces of stone.
Sonic booms have the potential to cause adverse effects, although this is rare
• Properly installed glass will not break, and plaster is unlikely to be damaged at overpressures below 10 psf.
• Below 2 psf, building damage in well-maintained structures is unlikely.
Effects to archaeological sites are less understood
• There are limited studies on the longitudinal effects of vibratory and overpressure events on archaeological sites.
• Aboveground components of archaeological sites may have the potential to be affected by vibratory or overpressure effects.
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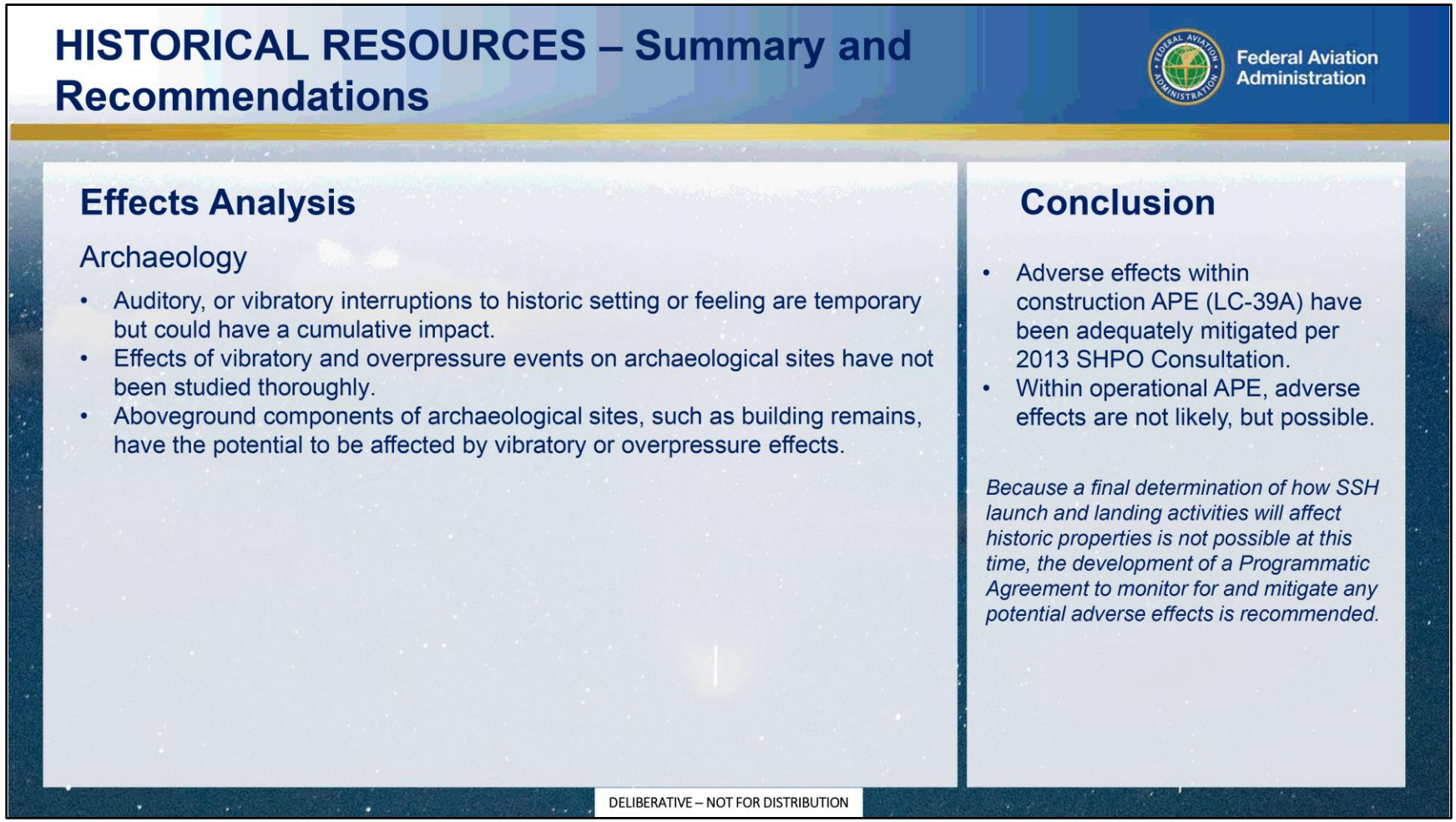
HISTORICAL RESOURCES – Summary and Recommendations
Federal Aviation Administration
Effects Analysis
Archaeology
• Auditory, or vibratory interruptions to historic setting or feeling are temporary but could have a cumulative impact.
• Effects of vibratory and overpressure events on archaeological sites have not been studied thoroughly.
• Aboveground components of archaeological sites, such as building remains, have the potential to be affected by vibratory or overpressure effects.
Conclusion
• Adverse effects within construction APE (LC-39A) have been adequately mitigated per 2013 SHPO Consultation.
• Within operational APE, adverse effects are not likely, but possible.
Because a final determination of how SSH launch and landing activities will affect historic properties is not possible at this time, the development of a Programmatic Agreement to monitor for and mitigate any potential adverse effects is recommended.
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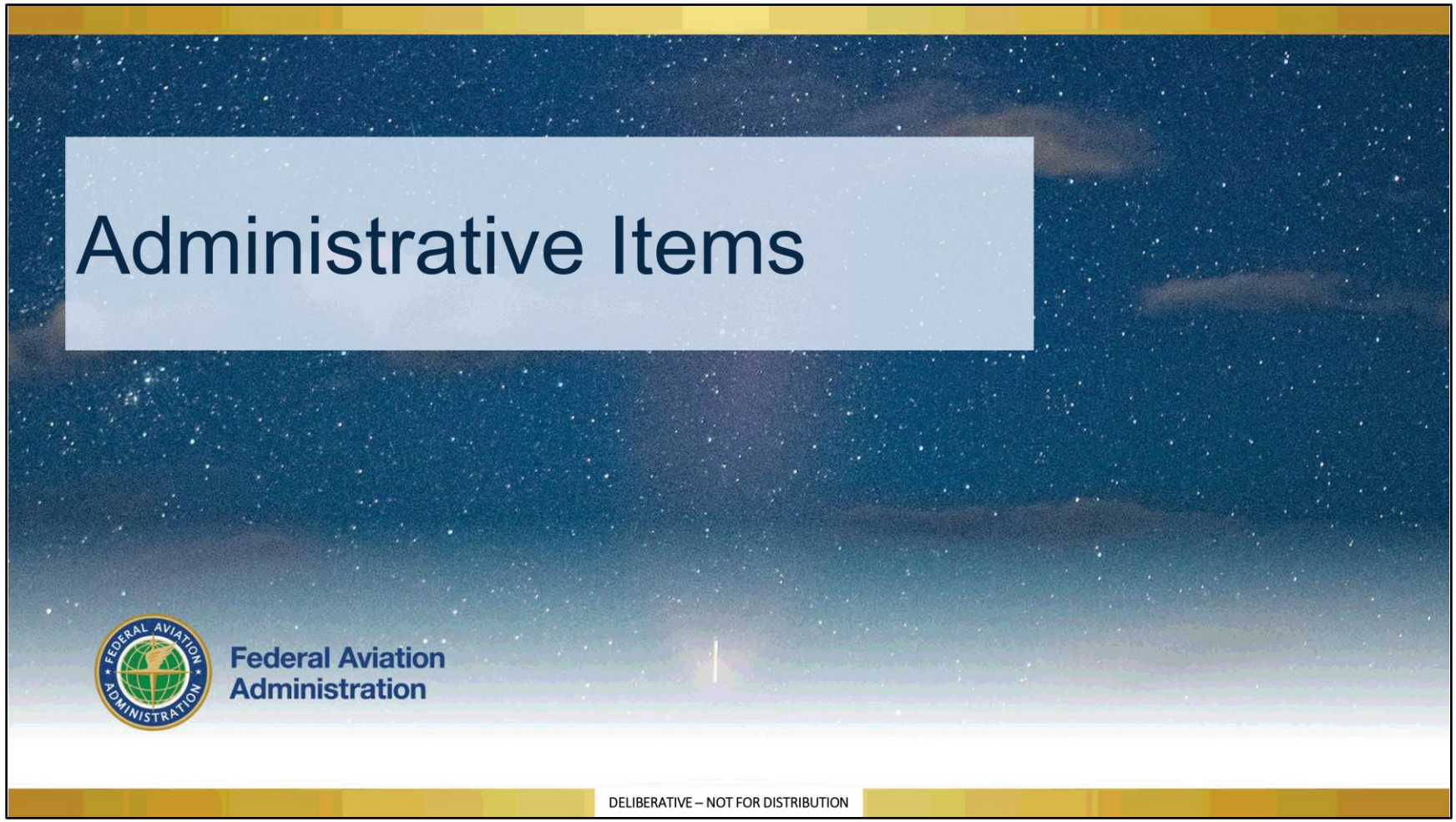
Administrative Items
Federal Aviation Administration
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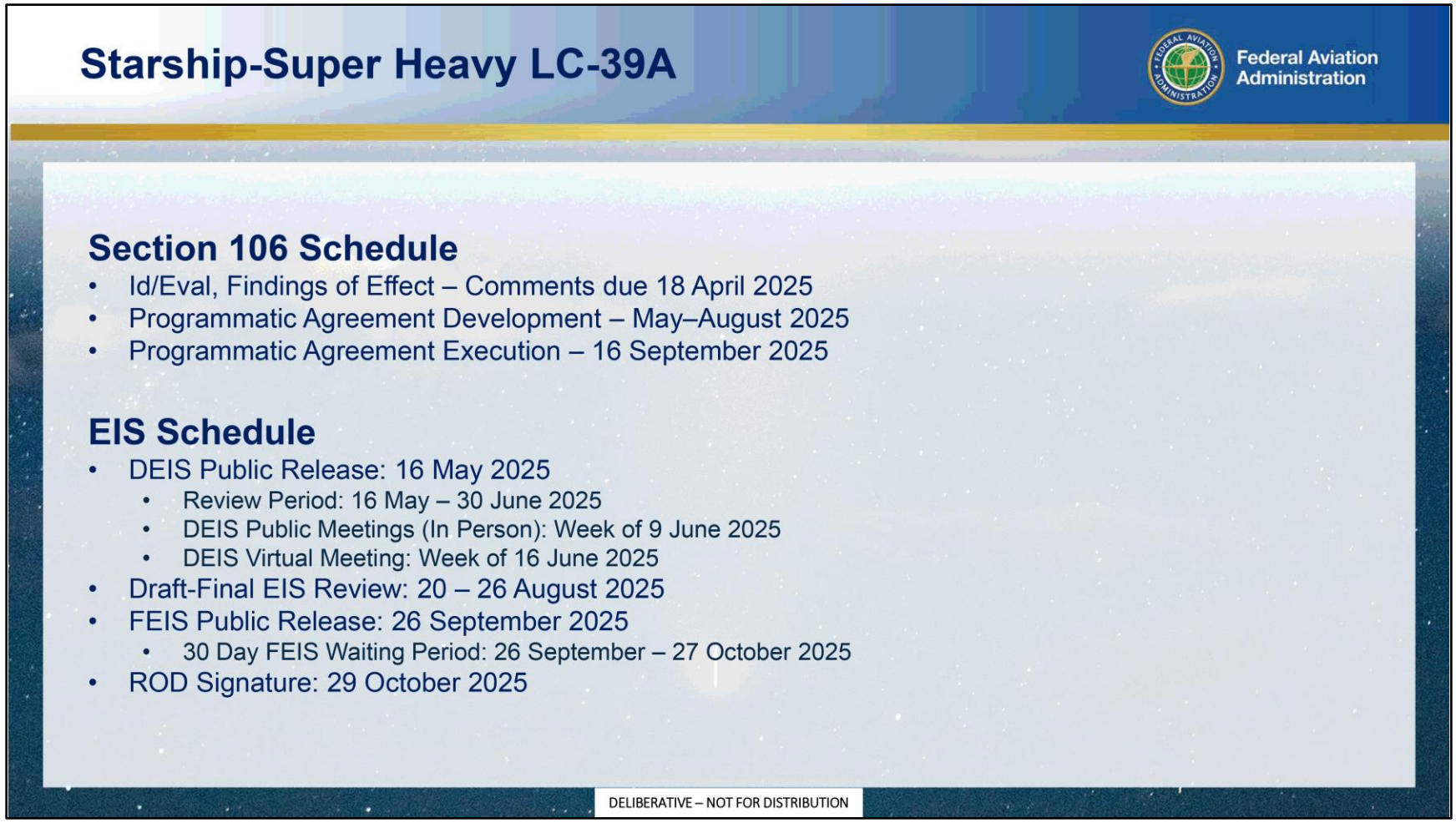
Starship-Super Heavy LC-39A
Federal Aviation Administration
Section 106 Schedule
• Id/Eval, Findings of Effect – Comments due 18 April 2025
• Programmatic Agreement Development – May–August 2025
• Programmatic Agreement Execution – 16 September 2025
EIS Schedule
• DEIS Public Release: 16 May 2025
• Review Period: 16 May – 30 June 2025
• DEIS Public Meetings (In Person): Week of 9 June 2025
• DEIS Virtual Meeting: Week of 16 June 2025
• Draft-Final EIS Review: 20 – 26 August 2025
• FEIS Public Release: 26 September 2025
• 30 Day FEIS Waiting Period: 26 September – 27 October 2025
• ROD Signature: 29 October 2025
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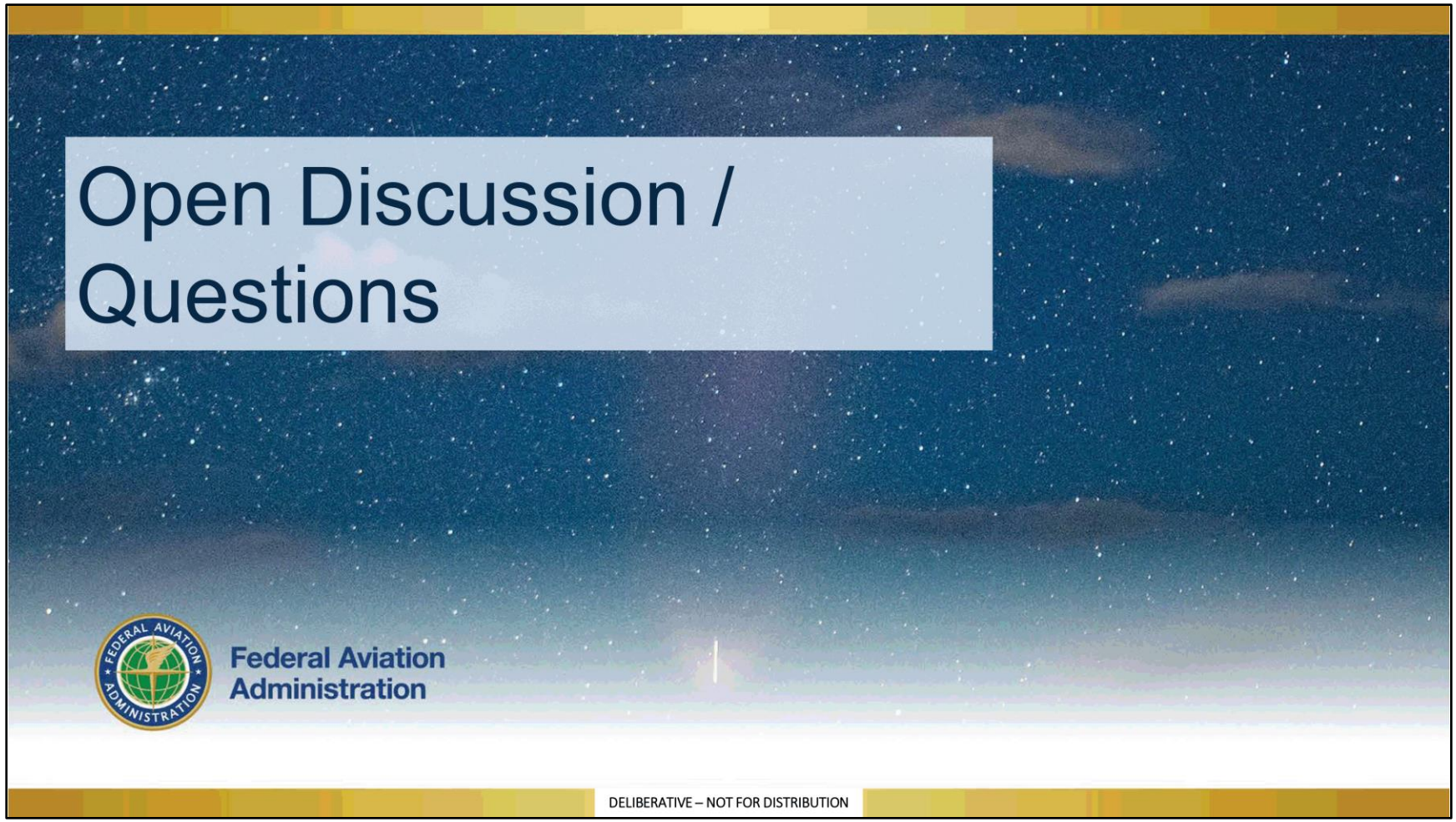
Open Discussion / Questions
Federal Aviation Administration
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From: Zeringue, Katherine S. (KSC-SIE30)
To: Akstulewicz, Kevin D. [US-US]; tim.parsons@searchinc.com; Bill Werner
Cc: Steven.Sherman@icf.com; Schanel, Pam; Hanson, Amy (FAA); Brooks, James T. (KSC-SIE30); Long, Eva (FAA); Dankert, Donald J. (KSC-SIE30); Kim Tice; Ward, Carmen J. [US-US]; Hall, Patrice (KSC-SIE30)
Subject: 4_8_25 STOF Meeting Outcomes SpaceX SSH LC-39A EIS - NHPA Consultation
Date: Thursday, April 10, 2025 1:00:00 PM
Attachments: image001.png
image002.png

Hi All,

We had a really good meeting with the Seminole Tribe of Florida. Here are some key take aways:

1. **ID Approach**: We will need to change our identification approach to archaeological sites. Since we don't have any statistically valid studies to point to that definitely say archaeological sites (subsurface or otherwise) won't be affected, STOF has requested that the list of archaeological sites within the APE include ALL NRHP-listed or NRHP-eligible, or those whose NRHP eligibility is unknown. They are primarily concerned with those in the 4+psf bands. They have discussed their concerns with the FL SHPO; so I suspect we will see similar comments from SHPO as well.
2. **Paleo Concerns**: They also asked about and expressed concerns related to the juxtaposition of paleo sites and near shore water landings. They stated they are not concerned with anything past the shelf.
3. **Effects**: Their concerns are related to long-term, cumulative effects of archaeological sites. The two studies we have are the Nocerino and the Vandenburg study which are limited in scope and duration. The Vandenburg study, which builds upon the Nocerino study, only notes effects to archaeological sites that were visible to the naked eye, only covered 2 launches, and only accounted for sites exposed to 5psf or less. At KSC, we have multiple sites within the 20 – 5 psf bands which is beyond the Vandenburg scope.
4. **Monitoring**: We conceptually spoke about designing a monitoring program that would address these concerns. They would like monitoring to account for the subsidence and compaction of subsurface site components, the movement of artifacts within the strata, as well as accelerated erosion rates to shoreline sites resulting from vibration and overpressure effects (i.e. BR206/Pepper Hammock which is eroding into the Banana River and within the 20 psf band). One suggestion would be to do baseline subsurface test units at/around sites where stratigraphy and measurements are clearly noted in past survey reports (pre-project baseline). They want some sort of appropriate sample size and sampling strategy on a variety of site types in the different psf bands and also emphasized the testing locations should be accessible. Don Dankert has explored the potential for non-invasive methods using NASA Helio physics folks utilizing seismographic data; we'll still need to have conversations to determine if their methods would be able to address soils within roughly 4 feet of soil. So we'll have to put our heads together on suggestions for what makes sense. The Tribe definitely would prefer non-invasive methods to avoid impacting sites through our monitoring program.

5. **Study Accessibility**: They are supportive of having this study completed especially to inform future actions with the hope that future Section 106 consultation that may be able to conclude "No Effects".
6. **Tribal Monitoring**: They do not have the capacity or ability to engage in tribal monitoring, but are supportive if other tribes have the desire and ability to do so.
7. **Programmatic Agreement**: As for the PA, they potentially requested Invited Signatory status on the Programmatic Agreement but will need to verify with the Tribal council. They feel our timeline is doable, but noted that if they are Signatories, they may need 3-4 weeks to get a Signature on the document (depending upon whether the THPO or the Tribal Chief will sign on behalf of the Tribe).
8. **Communication/Engagement**: STOF stated that they may participate in group tribal meetings that offer project/information updates, but if feedback or workshopping is necessary, it should be done one-on-one with the Tribe. They are not seeking formal government to government consultation at this time.

Do Outs:

1. I need an updated list of archaeological sites that includes ALL listed- or NRHP-eligible sites, sites whose NRHP status is unknown, or sites with human remains (regardless of NRHP status); a general descriptor of each site type; and the sites organized in numerical order according to the psf band in which they fall. We should also create maps to help facilitate discussions with the Tribes.
2. I must admit that I don't fully understand their paleo/ocean shelf concerns – so if anyone has any insight or suggestions on how to address this, let me know.
3. After the meeting Eva and I also spoke about FAA's role within the PA (Signatory, Invited Signatory). I had assumed that FAA would be a Signatory since they have a federal action for which Section 106 compliance is required, but it sounds like FAA will need to discuss this internally. So the do out is for FAA to let us know what role they want in the document as we being drafting it. This decision will affect language within the roles and responsibilities Stipulations.

Other future actions:

1. SEARCH to begin drafting PA (already requested)
2. We should start planning dates for our PA kick-off consulting party meetings – one will be with SHPO and consulting parties; tribes should also be invited. However, we should also plan on having a separate tribal kick-off with all Tribes either on the same date or within a day or two of that meeting. We should also plan out future meetings and internal drafting deadlines for the PA. The schedule right now only accounts for one round of draft PA review with consulting parties which I don't think is realistic. I think it will take at least 2 draft versions before we have a final document for signature. I think we will likely also need at least 2 total consulting party meetings and at least 2 group Tribal meetings. HOWEVER, all of this is doable

within the schedule timeframe. But I'd like to start planning out a more detailed schedule. If its easier for Tim and I to workshop this off line and bring something back to the group, let me know.

Talk to you on Wednesday,

Katherine Zeringue
Cultural Resources Manager
Spaceport Integration and Services
Kennedy Space Center
Mail Code: SI-E3
Kennedy Space Center, FL 32899
O: 321-867-8454
katherine.s.zeringue@nasa.gov

FLORIDA DEPARTMENT of STATE

RON DESANTIS
Governor

CORD BYRD
Secretary of State

Katherine Zeringue
NASA KSC Cultural Resources Manager
John F. Kennedy Space Center
Kennedy Space Center, FL 32899

April 18, 2025

RE: DHR Project File No.: 2024-3285-C, Received by DHR: March 17, 2025
Continuing Consultation, SpaceX Starship Super Heavy Launch and Reentry Vehicles at Launch Complex (LC)-39A, Kennedy Space Center (KSC)

To Whom It May Concern:

The Florida State Historic Preservation Officer reviewed the referenced project for possible effects on historic properties listed, or eligible for listing, on the *National Register of Historic Places (NRHP).* The review was conducted in accordance with Section 106 of the *National Historic Preservation Act of 1966*, as amended, and its implementing regulations in *36 CFR Part 800: Protection of Historic Properties.*

Thank you for continuing consultation with our office and providing us with an opportunity to review and comment on the *Cultural Resource Survey for the Starship-Superheavy Project at LC-39A, Kennedy Space Center, Brevard County, Florida (CRS),* which details NASA KSC's efforts to identify and evaluate properties within the undertaking's area of potential effects (APE).

We concur with NASA KSC's determination that the undertaking's effects to historic properties cannot be definitively determined at this time and their proposal for the development of a programmatic agreement pursuant to 36 CFR Part 800.14(b)(1)(ii). We will provide comments or concurrence with the NRHP eligibility recommendations provided in the CRS via separate letter.

If you have any questions, please contact me by email at *Kelly.Chase@dos.myflorida.com*, or by telephone at 850.245.6344.

Sincerely,

Kelly L Chase
For

Alissa Lotane
Director, Division of Historical Resources
& State Historic Preservation Officer

Division of Historical Resources
R.A. Gray Building • 500 South Bronough Street• Tallahassee, Florida 32399
850.245.6300 • 850.245.6436 (Fax) • FLHeritage.com

United States Department of the Interior

NATIONAL PARK SERVICE
Canaveral National Seashore
212 S. Washington Ave.
Titusville, FL 32796

IN REPLY REFER TO:
1.A.2 (CANA)

Ms. Katherine Zeringue
Cultural Resources Manager
Kennedy Space Center
Kennedy Space Center, FL 32899

Dear Ms. Zeringue:

Canaveral National Seashore (CANA), a unit of the National Park Service (NPS) has received your letter regarding SpaceX Starship Super Heavy Launch and Reentry Vehicles at Launch Complex (LC)-39A dated March 17, 2025. As a consulting party for this undertaking CANA offers the following comments regarding the identification, evaluation and assessment of effects contained within the Cultural Resource Survey (CRS) completed by SEARCH.

It should be acknowledged that NASA owns the majority of land under CANA's jurisdiction, however, as CANA serves a wholly distinct purpose from NASA, it is important to acknowledge CANA's boundary throughout the document, including in all relevant figures and texts.

CANA agrees with many of the conclusions and recommendations in the CRS. It appears from the CRS that properties on federal lands, including CANA, were not evaluated further and that eligibility determinations are based upon Integrated Cultural Resource Management Plans. While helpful, those plans may not be accurate. The NPS National Historic Landmark (NHL) program has consulted previously on potential adverse effects to the Cape Canaveral Space Force Station NHL. During that consultation, it became clear that Launch Complex (LC)-13 had been demolished in 2015. In addition, much of LC-14 was proposed for demolition by that United States Space Force (USSF) undertaking and the USSF shared its self-reported intention of managing the NHL through "demolition by neglect." As a result, the regional NHL team recommended (in a letter dated 4/2/2024) that USSF initiate the process to have the property studied for withdrawal of designation following the NHL regulations at 36 CFR 65.9. The State Historic Preservation Office (SHPO) staff to whom this letter is addressed and copied (Chase and Lotane) were party to that consultation. It becomes relevant on this project as Table 4-7 might benefit from (1) distinguishing the resources that are contributing resources to the NHL and (2) updating that table to differentiate those NHL resources that have subsequently been demolished. As such, this will inform the identification effort and therefore any resulting Programmatic Agreement.

The discussion of Effects Evaluation (p. 6-25), notes less possibility for adverse effects "in well-maintained structures . . ." Does the management strategy of demolition by neglect, acknowledged as being in force for LC-14, apply to other locations across the USSF property? That information would be a key component of the effects evaluation.

The CRS notes that adaptation efforts and retrofitting may reduce the potential for adverse effects but it does not identify whether these adaptations have been done to historic buildings. Many of the historic buildings have not been altered and the CRS does not address the potential that adverse effects may be heightened by the fact that historic materials may not meet modern thresholds and standards.

CANA agrees that the potential for adverse effects does exist and those effects have not been adequately evaluated at this time. Therefore, CANA will continue to be a consulting party for this undertaking and in developing a Programmatic Agreement pursuant to 36 CFR 800.14(b)(1)(ii).

Sincerely,

JOHN REUS Digitally signed by JOHN REUS
Date: 2025.04.18 11:48:50 -04'00'

for Superintendent,
Canaveral National Seashore

CONSULTING PARTY MEETING #1 MINUTES:

SpaceX Starship-Super Heavy Launch and Landing at LC-39A, Kennedy Space Center

Date: 13 May 2025
Location: Microsoft Teams Virtual Meeting

ATTENDEES:
NASA KSC: Katherine Zeringue, James Brooks
FAA: Eva Long, Amy Hanson, Nicholas Baker
SpaceX: Brian Pownall
ICF (Contractor Support): Pam Schanel, Steve Sherman
Leidos (Contractor Support): Kevin Akstulewicz, Jay Austin, Carmen Ward
SEARCH (Contractor Support): Tim Parsons, Bill Werner
Florida Division of Historical Resources: Alissa Lotane, Kelly Chase, Scott Edwards
Seminole Tribe of Florida: Danielle Simon, Victoria Menchaca
Seminole Nation of Oklahoma: Jeff Harjo
Canaveral National Seashore: Carmen Thompson, Kristen Kneifl, Meredith Dennis, Steve Rogers
Cape Canaveral Lighthouse Foundation: Becky Zingarelli
City of Titusville: Tabitha Armstrong
North Brevard Heritage Foundation: Roz Foster

MEETING SUMMARY

- Introductions
- Mr. Akstulewicz provided a brief overview of the proposed action and area of potential effects (APE)
  - Noise and vibration effects are the main concern for Section 106
  - Construction APE is previously surveyed; no effects anticipated
  - Super Heavy booster return/landing is the focus of the Operational APE (sonic boom overpressure of 2 psf or greater)
  - Starship-Super Heavy launch effects (measured at 130 dB or greater) are accounted for within the Operational APE
  - The majority of noise exceeding 2 psf associated with Super Heavy booster return is over water
- Dr. Parsons summarized the historic property identification efforts
  - Ms. Chase asked a question regarding federal versus non-federal resources within the APE. Dr. Parsons clarified that the Operational APE is inclusive of both federal and non-federal lands.
  - Discussion of resources within the 130 dB contour for launch effects

        - The Beach House is the only non-purpose-built historic structure within the 130 dB contour
        - There are 14 archaeological sites within the 130 dB contour
    - The handouts include additional information about resources
- Discussion of effects from noise, vibration, and overpressure
    - Ms. Simon asked about cumulative effects; how does the frequency of launches and landings proposed at KSC compare to that addressed in previous studies of effects to cultural resources?
        - Dr. Parsons clarified that there are no longitudinal studies of effects to archaeological sites for analogous actions.
    - Ms. Chase requested to be provided GIS shapefiles of the psf and dB contours.
    - Ms. Simon asked about the number of proposed launches per year.
        - Mr. Akstulewicz clarified that there are 220 separate static fire, launch or landing events planned per year (44 integrated launches, 88 static fires, and 88 returns).
    - Ms. Simon asked about the effects of weather cancellations on the number of proposed launches.
        - Mr. Akstulewicz indicated that this would be difficult to predict, but that the number of actual launches would not be higher than the number of planned launches. We're assessing what is being planned as the conservative approach. The number of launches will never go over but may be less than what is being presented.
- Discussion of previous studies from Boca Chica and Vandenburg Space Force Base that examined effects of noise and vibration to cultural resources.
    - Ms. Zeringue caveated that the infrastructure at the Boca Chica site is different than what will be at LC-39A and will result in different noise and vibration effects, so Boca Chica and KSC should not be understood as analogous.
        - Ms. Hanson elaborated on the differences between the launch infrastructure (trench and deluge systems) at the two locations; effects at KSC will be significantly less than at Boca Chica
    - Ms. Zingarelli asked how far the lighthouse at Boca Chica is from the launch pad.
        - FAA confirmed the distance is approximately 8 miles.
    - Ms. Zingarelli asked how the Fresnel lens at the Boca Chica lighthouse was hardened prior to launches (the Cape Canaveral Lighthouse Museum also has a Fresnel lens within its museum, not within the lighthouse itself).
        - Ms. Hanson explained that the Boca Chica lighthouse staff manage the protective systems themselves with training that was provided. Also, it should be noted that the Fresnel lens at Boca is modern, not historical. So, its protection is for operational purposes, not historic preservation purposes.
    - Ms. Foster asked if there were any studies of effects from the Saturn V launches.
        - Dr. Parsons noted that there were some studies completed in the 1960s to examine effects from the Apollo program and that the conclusions were similar to those of later studies discussed in the presentation and the CRAS,

e.g., that vulnerable features such as single-pane windows are susceptible to breakage at noise levels of 130 dB or greater.
    - Dr. Parsons pointed out that studies from the Apollo era did not consider effects to archaeological sites.
  - Ms. Foster also asked about the significance of the 150 dB threshold noted in the Vandenburg studies versus the 130 dB threshold discussed in relation to the current proposed action.
    - Ms. Zeringue noted that the 150 dB is where the resource being monitored was located and the dB to which the resource was exposed.
    - Dr. Parsons noted that even with exposure to 150 dB no effects to historic properties were noted. Additionally, the APE is following FAA's standard approach by using the 130 dB threshold as the limit for possible effects, which includes any resources that may be exposed to the 150 dB.
  - Ms. Lotane asked about a previous comment by Dr. Parsons that buildings are unlikely to be affected unless they are "poorly maintained" and noted that this may be a subjective quality
    - Dr. Parsons clarified that he meant that certain structures may be at greater risk due to multiple factors related to physical condition, including condition of joints, types of windows, etc.
- Ms. Zeringue discussed the development of a Programmatic Agreement
  - Ms. Zeringue stated that the need for a Programmatic Agreement is derived from the fact that effects are unknown, so the agreement document will focus more on processes than outcomes.
  - Ms. Zeringue requested that the consulting parties provide feedback on additional efforts for historic properties identification and monitoring, including specific details regarding expectations for the scope and duration of a monitoring program.
    - Ms. Chase elaborated on the SHPO's request for additional survey/identification efforts. These efforts should focus on recording the historic districts discussed in the cultural resource survey report and identifying the contributing resources. The goal is not to record every structure in the APE but rather to provide additional information about the specific areas of concern in order to focus the additional identification and monitoring efforts.
    - Ms. Lotane added that resource forms are primarily needed for districts and resource groups in order to assign numbers and boundaries; forms are not needed for every building.
    - Ms. Lotane noted that monitoring should focus on resources previously listed or determined eligible for listing on the NRHP.
    - Ms. Chase added that cumulative effects are the biggest concern and that formally recording the historic districts is needed in order to start assessing long-term effects.
  - Ms. Zeringue asked the FAA representatives to comment on their standard approach and treatment of historic districts under Section 106.

        - Ms. Hanson noted that for similarly large APEs the focus has been on existing districts, not the nomination of new districts.
        - Ms. Lotane clarified that SHPO is not expecting NRHP nominations to be part of the survey and recordation effort.
    - Ms. Zeringue asked FAA or SpaceX to speak to SpaceX's damage reporting program.
        - Mr. Pownall noted that SpaceX is required to hold liability insurance by the Commercial Space Launch Act.
        - Ms. Dennis asked whether the claims include interior/non-structural damage.
        - Ms. Long noted that window damage is certainly covered.
        - Mr. Pownall said he would get more details on what is covered under the program.
    - Ms. Foster would like more information on whether the liability insurance would include elements susceptible to cracking such as brick/concrete piers, foundations, and chimneys and asked that the monitoring program document any such features exposed to greater than 130 dB noise levels.
        - Ms. Zeringue clarified that the 130 dB threshold does not extend outside of federal property.
        - Mr. Akstulewicz noted that the 150 dB contour is very close to the launch pad itself.
        - Dr. Parsons noted that the same is true at Vandenburg.
        - Mr. Akstulewicz commented that the decibel contours are based on noise modeling that takes into account atmospheric conditions (wind, temperature, humidity) that vary daily and seasonally by location and should not be construed as definitive boundaries.
- Ms. Zeringue concluded the meeting by summarizing the next steps
    - The cultural resource assessment survey report will be updated based on comments received to date from Tribes regarding archaeological sites as well as minimal updates to architectural resources.
    - Consulting parties need to provide input regarding scope of the monitoring program by May 23.
    - Ms. Lotane asked the other consulting parties, especially residents local to the APE, to identify historic buildings of the most concern. Ms. Zeringue requested that both SHPO and NASA KSC be copied if this information is sent.

ACTION ITEMS

All

- Provide feedback on the preferred scope of the monitoring program and any additional historic properties identification efforts that are requested.

SEARCH

- Provide shapefile of psf and dB contours to FDHR.

SpaceX

- Provide consulting parties with information about the scope of the liability insurance coverage.

From: Zeringue, Katherine S. (KSC-SIE30)
To: Long, Eva (FAA); Hanson, Amy (FAA); Tim Parsons; Bill Werner; Akstulewicz, Kevin D. [US-US]; Austin, Jay K. [US-US]; thpocompliance@semtribe.com; DanielleSimon@semtribe.com; VictoriaMenchaca@semtribe.com; JasonD@miccosukeetribe.com; Section106@muscogeenation.com; swaters@muscogeenation.com; Logan Guthrie; Jeffery Harjo; thpo@tttown.org
Cc: Dankert, Donald J. (KSC-SIE30); Bremner, Paul M. (MSFC-ST13); Steven Sherman; Schanel, Pam
Subject: EXTERNAL: RE: Tribal Specific Meeting - NASA KSC SpaceX Starship Superheavy
Date: Monday, May 19, 2025 5:12:08 PM
Attachments: image001.png
image002.png
5_13_2025 CP SpaceX SSH Mtg 1.pdf
SSH LC-39A Tribal Consultation Meeting 5-16-25_Minutes.docx
SpaceX Starship Superheavy Monitoring Plan Feedback.docx

Hello All,

Thank you to those who were able to join us on Friday. I have attached a few items for your records:

- The PPT presentation
- Meeting minutes – if anyone has any edits or corrections, please forward those to me NLT May 30.
- Consulting Party Feedback Questionnaire – NASA KSC requested feedback from Tribes related to the development of the historic property monitoring program. This questionnaire identifies the critical elements for which NASA KSC is seeking feedback. However, feel free to provide any information you feel is relevant. We request feedback from the Tribes NLT **May 30**.

I look forward to hearing from you by May 30. In the meantime, should you have any questions, feel free to reach out.

Sincerely,

Katherine Zeringue
Cultural Resources Manager
Spaceport Integration and Services
Kennedy Space Center
Mail Code: SI-E3
Kennedy Space Center, FL 32899
O: 321-867-8454
katherine.s.zeringue@nasa.gov

-----Original Appointment-----
From: Zeringue, Katherine S. (KSC-SIE30)
Sent: Friday, May 2, 2025 3:24 PM
To: Zeringue, Katherine S. (KSC-SIE30); Long, Eva (FAA); Hanson, Amy (FAA); Tim Parsons; Bill Werner; Akstulewicz, Kevin D. [US-US]; Austin, Jay K. [US-US]; thpocompliance@semtribe.com; DanielleSimon@semtribe.com; VictoriaMenchaca@semtribe.com; JasonD@miccosukeetribe.com; Section106@muscogeenation.com; swaters@muscogeenation.com; Logan Guthrie; Jeffery Harjo; thpo@tttown.org
Cc: Dankert, Donald J. (KSC-SIE30); Bremner, Paul M. (MSFC-ST13); Steven Sherman; Schanel, Pam
Subject: Tribal Specific Meeting - NASA KSC SpaceX Starship Superheavy

TRIBAL CONSULTATION MEETING MINUTES:

SpaceX Starship-Super Heavy Launch and Landing at LC-39A, Kennedy Space Center

Date: 16 May 2025
Location: Microsoft Teams Virtual Meeting

ATTENDEES:
NASA KSC: Katherine Zeringue, Paul Bremner, Aiden Woo
FAA: Eva Long, Nicholas Baker
ICF (Contractor Support): Pam Schanel
Leidos (Contractor Support): Kevin Akstulewicz, Jay Austin
SEARCH (Contractor Support): Tim Parsons, Bill Werner
Miccosukee Tribe of Indians of Florida: Jason Daniel
Seminole Tribe of Florida: Danielle Simon, Victoria Menchaca

MEETING SUMMARY

- Introductions
- Mr. Akstulewicz provided a brief overview of the proposed action and area of potential effects (APE)
- Dr. Parsons summarized the historic property identification efforts and the potential effects of noise, vibration, and overpressure to historic properties
- Dr. Parsons discussed previous studies from Boca Chica and Vandenburg Space Force Base that examined effects of noise and vibration to cultural resources.
    - Ms. Zeringue noted that Vandenburg has been monitoring archaeological sites for years via surface inspection and laser imagery (for rock art) and has not observed any effects from noise, vibration, or overpressure
- Ms. Zeringue discussed the development of a Programmatic Agreement
    - Ms. Zeringue stated that the need for a Programmatic Agreement is derived from the fact that effects are unknown, so the agreement document will focus more on processes than outcomes.
- Open Discussion
    - Ms. Menchaca asked about baseline noise/vibration conditions
        - Mr. Akstulewicz explained that baseline measurements are an average over time and are not directly comparable to the effects of specific events
        - Mr. Austin added that baseline overpressure is not a focus of the study
        - Baseline/no action scenarios are described in the EIS but this information is presented in terms of C-weighted Day-Night Average Noise Levels (CDNL), which is a measurement provided in decibels that incorporates the effects of overpressure

- Ms. Zeringue summarized various ideas that have been discussed for monitoring effects to subsurface archaeological sites
- Ms. Simon asked about the planned sample size for monitoring archaeological sites
  - Ms. Zeringue responded that we are seeking Tribes' feedback on this question
  - Ms. Simon stated that they would like to ensure that Seminole Tribe of Florida requests are reasonable with consideration of time, expense, and research validity
  - Dr. Parsons suggested that the archaeological monitoring program should prioritize a robust research design over statistical sampling; statistical sampling has been problematic for the discipline of archaeology
  - Ms. Simon stated that they aim for a purposeful study that can serve as a useful reference point for future consultations.
- Mr. Bremner summarized his seismographic research at KSC and how it might be applied to the monitoring of archaeological sites.
  - Mr. Bremner and his colleagues use an array of sensors to create a "heat map" showing how seismic waves propagate through the ground
  - Additional sensors can be placed in specific areas of interest, once special interest areas are defined, such as archaeological sites, to provide more granular data
  - Generally speaking, data at a 1-centimeter scale of accuracy would require up to 100 sensors at a single archaeological site
- Ms. Simon stated that they would like to minimize destructive testing and recommended selecting sites with previously documented stratigraphy.
- Ms. Zeringue summarized several sites within KSC's secure areas that are able to be located, accessible, and that may be good candidates for monitoring based on 2024 field visits; this includes 8BR206 (Pepper Hammock)/20 psf, 8BR170 (Opposite Futch Cove)/10 psf, and 8BR62 (Moore Mound)/4 psf
- General discussion of accessibility of federal vs. non-federal lands; placement on non-federal lands presents additional logistical and security challenges.
- Mr. Bremner explained that impervious surfaces (e.g., paved parking lots at 8BR170)/Opposite Futch Cove) would not impede placement of sensors on the ground surface. However, Mr. Bremner described that it would be better to observe sites without public traffic (e.g., at nighttime or within zones that are restricted during launches) to minimize noise interference. Since 8BR170 is co-located at the Saturn V/Apollo Visitor Center site, this may pose monitoring challenges.
- Ms. Simon noted that the Seminole Tribe of Florida would need to discuss internally whether to consider including sites with burials within the monitoring program (e.g. 8BR62/Moore Mound).
- Ms. Simon asked about the possibility of including Cape Canaveral Space Force Station in the discussion of monitoring plans, to prevent redundancy of

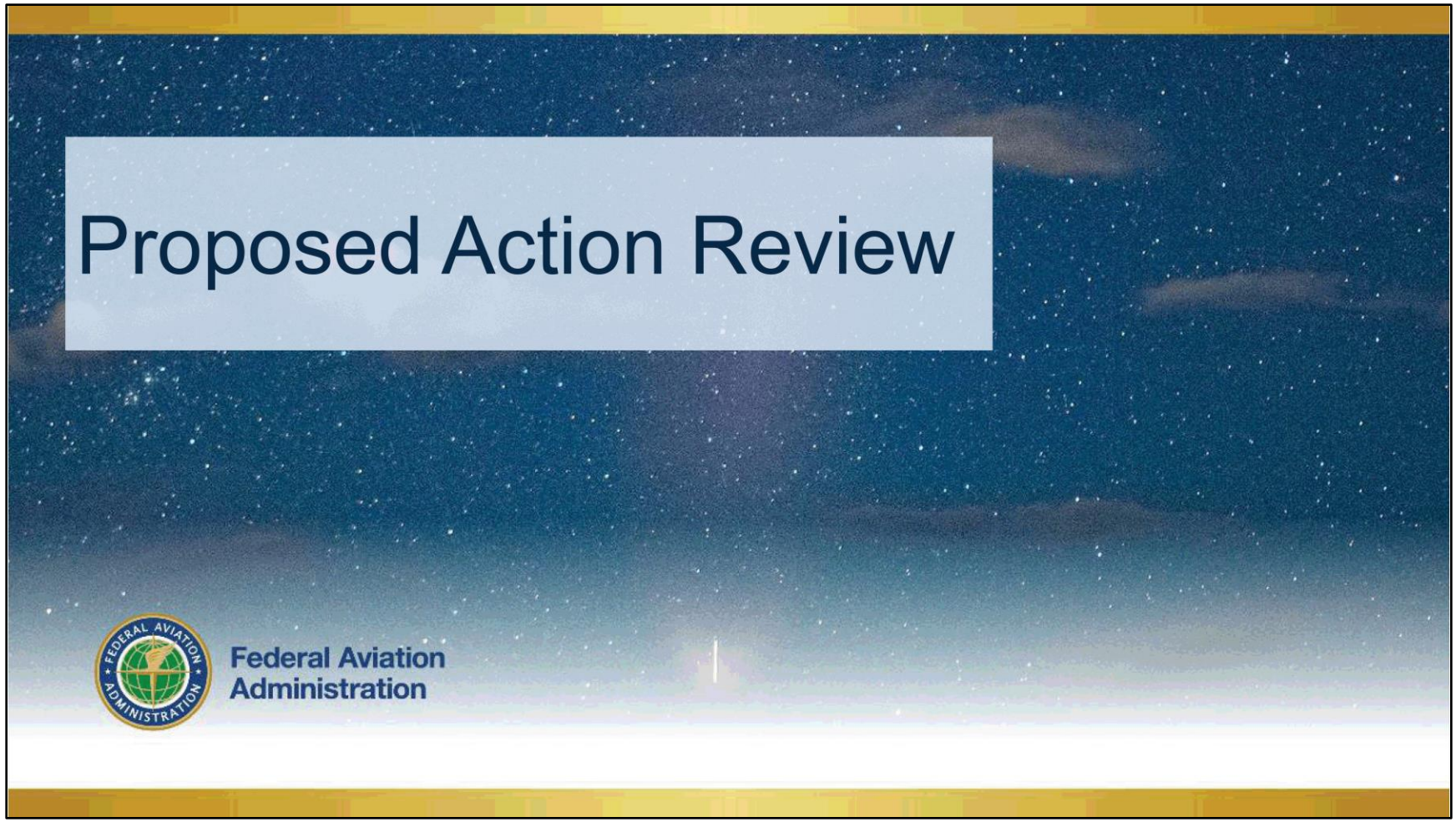
conversation and monitoring/research efforts. She also asked if a joint or collaborative PA is possible.
    - Ms. Zeringue advised that although a joint PA is not possible, there is a desire on everyone's part for coordination between KSC and CCSFS.
    - Ms. Long elaborated that there is a desire for consistency but confirmed that two PAs are necessary. She plans to engage with colleagues at DAR/CCSFS more moving forward to sync up as much as possible.
- Mr. Bremner noted that LiDAR has potential for monitoring ground water to a limited extent, and that other methods, in addition to seismic studies, may be possible. His team is researching these other methods and more details are forthcoming.
- Ms. Simon said that the Seminole Tribe of Florida will confer internally to identify suitable candidates for site monitoring and will provide feedback.
- Ms. Long asked Mr. Bremner about the duration of deployment for sensors, and about the logistics for the seismic studies.
    - Mr. Bremner replied that senor rentals can be for years at a time, and that extended sensor placement is possible and that there is flexibility. Some coordination is necessary to ensure that the sensors do not interfere with daily operations at KSC or with mission operations.
- Ms. Long asked if the sensor data can be remotely accessed or if it is stored locally.
    - Mr. Bremner replied that remote access is possible, but that data cards can be swapped out at intervals and that physical data would be preferable at the KSC and CCSFS facilities.

ACTION ITEMS

Tribes
- Provide feedback on the preferred scope of the monitoring program by May 30

SEARCH
- Provide access to KSC archaeological sites technical memo through SharePoint (completed 5.16.25).


Consulting Party Meeting #1
SpaceX Starship-Super Heavy Launch Vehicle at Launch Complex 39A
at the Kennedy Space Center, Florida
13 May 2025
National Aeronautics and Space Administration
Federal Aviation Administration


Proposed Action Review
Federal Aviation
Administration

Starship-Super Heavy LC-39A

Federal Aviation Administration

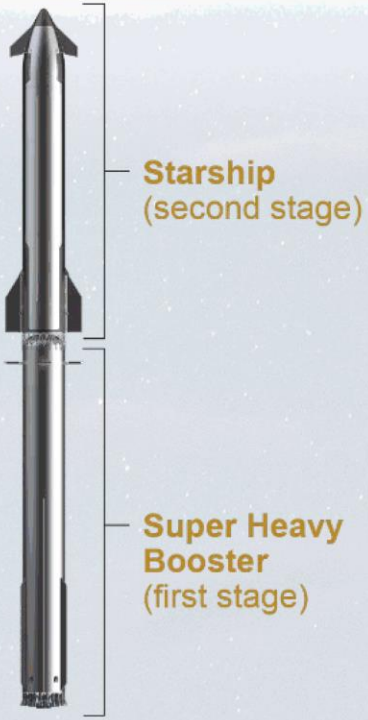
Proposed Action Review

Starship-Super Heavy Vehicle

- Composed of 2 stages
  - Super Heavy (booster) – 35 Raptor Engines
  - Starship – 9 Raptor Engines

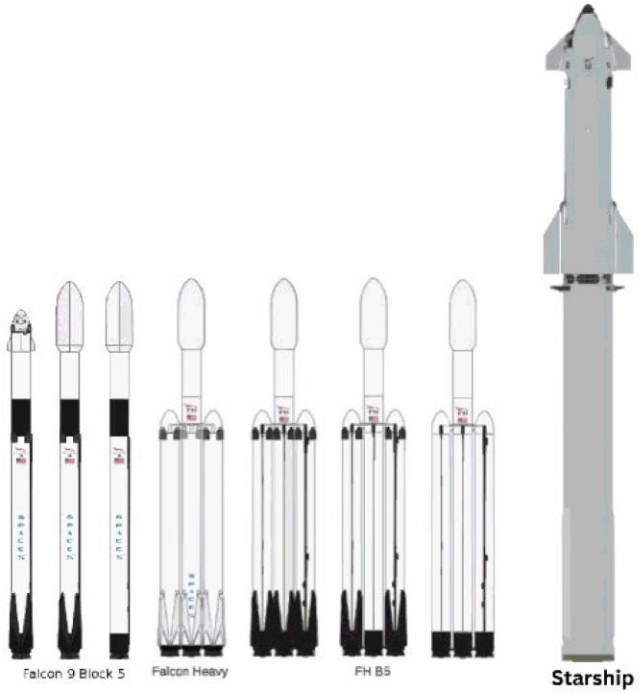
Operations

- Pre-launch – testing and rehearsals
  - Static Fires – 1 for each stage prior to launch (88 total)
- Starship-Super Heavy Launches – 44
  - 50% Day / Night (10pm – 7am) Split
- Starship Landings - 44
  - LC-39A, droneship in Atlantic, expended in Atlantic / Pacific / Indian Ocean >5nm
  - Contingency: soft water landing 1nm-5nm in Atlantic 50 nm north/south of LC-39A
- Super Heavy Landings – 44
  - LC-39A, droneship in Atlantic, expended in Atlantic >5nm

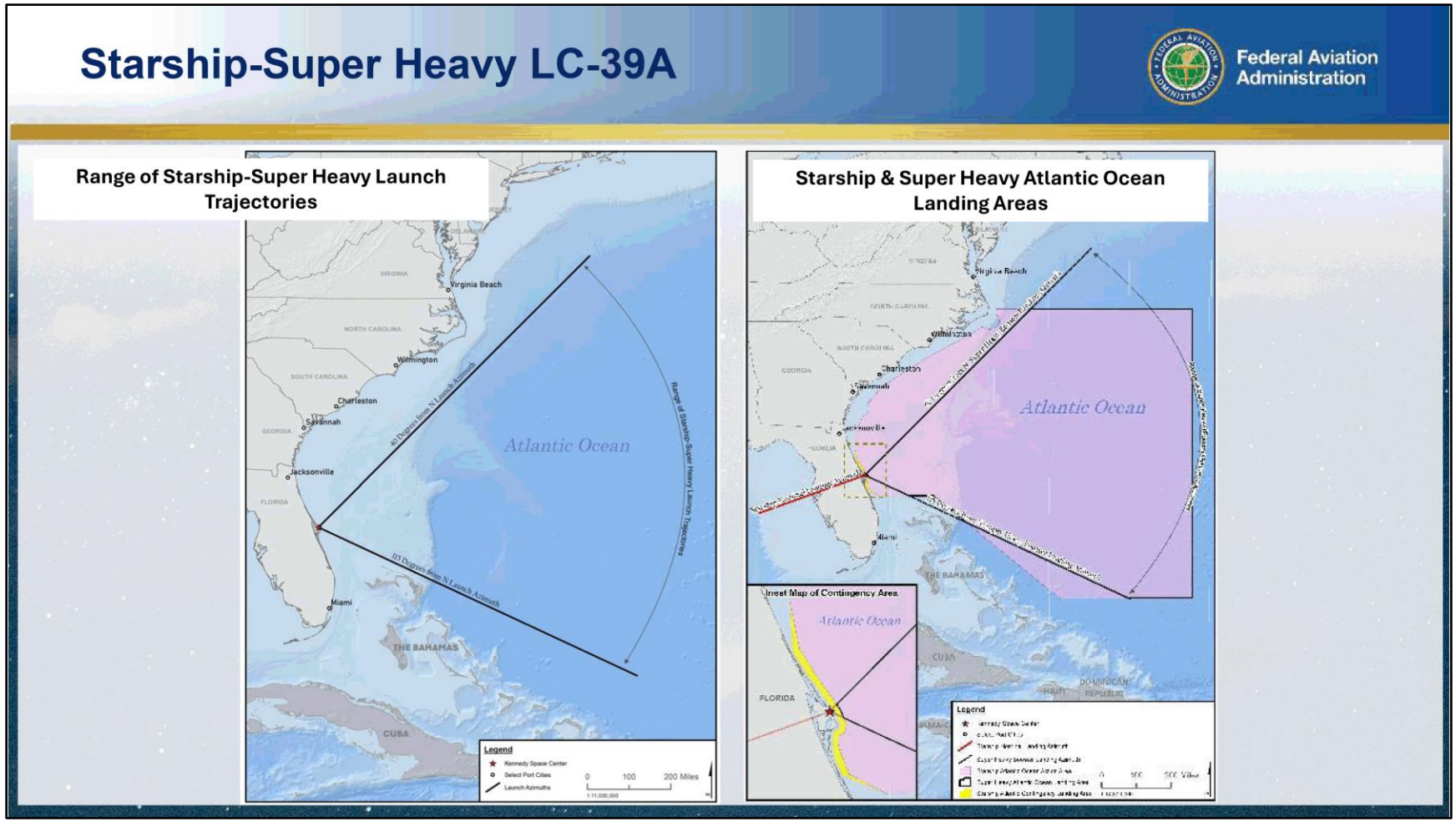


SpaceX Launch Vehicle Comparison

Federal Aviation Administration



	Falcon 9	Falcon 9 Heavy	Starship Superheavy
Engines	9	27	35
Thrust	1,710,000 lbf	5,130,000 lbf	23,000,000 lbf


Starship-Super Heavy LC-39A
Federal Aviation Administration
Range of Starship-Super Heavy Launch Trajectories
Virginia Beach
Wilmington
Charleston
Savannah
Jacksonville
Miami
Atlantic Ocean
THE BAHAMAS
CUBA
Legend
Kennedy Space Center
Select Port Cities
Launch Azimuths
0 100 200 Miles
Starship & Super Heavy Atlantic Ocean Landing Areas
Inset Map of Contingency Area
Atlantic Ocean
FLORIDA
CUBA
Legend

Starship-Super Heavy LC-39A

Federal Aviation Administration

Proposed LC-39A Infrastructure

Previously approved (2019 NASA EA*):

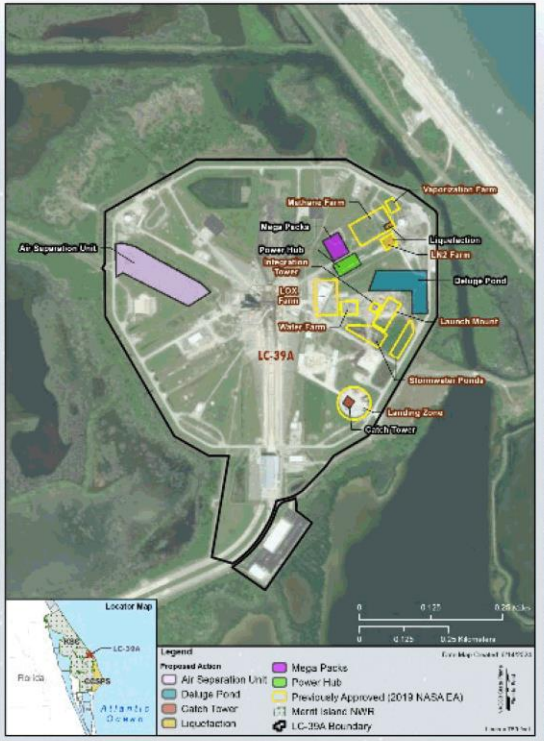
- LOX Farm (65,454 square feet [SF])
- Methane Farm (78,876 SF)
- Launch Mount (36,568 SF)
- Integration Tower (6,184 SF)
- Ponds (68,799 SF)
- Vaporization Farm (9,650 SF)
- LZ (72,672 SF)
- LN2 Farm (13,342 SF)
- Water Farm (17,955 SF)

Included as part of this Action:

- Air Separation Unit (222,071 SF)
- Catch Tower (5,992 SF)
- Deluge Pond (121,963 SF)
- Liquefaction – includes natural gas pretreatment and methane liquefier (17,246 SF)
- MegaPacks (34,979 SF)
- Power Hub (28,998 SF)

*Final Environmental Assessment for the SpaceX Starship and Super Heavy Launch Vehicle at Kennedy Space Center

Total Approximate Square Footage: 800,647



Area of Potential Effects (APE) Summary

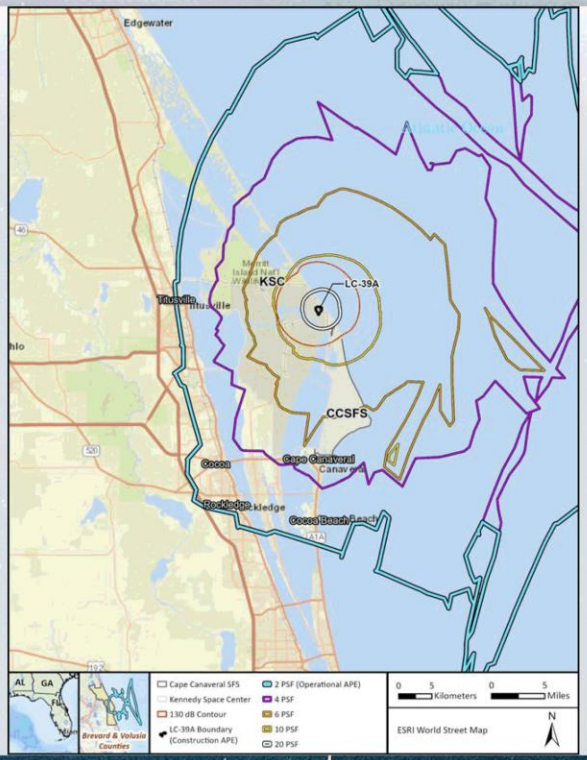
Federal Aviation Administration

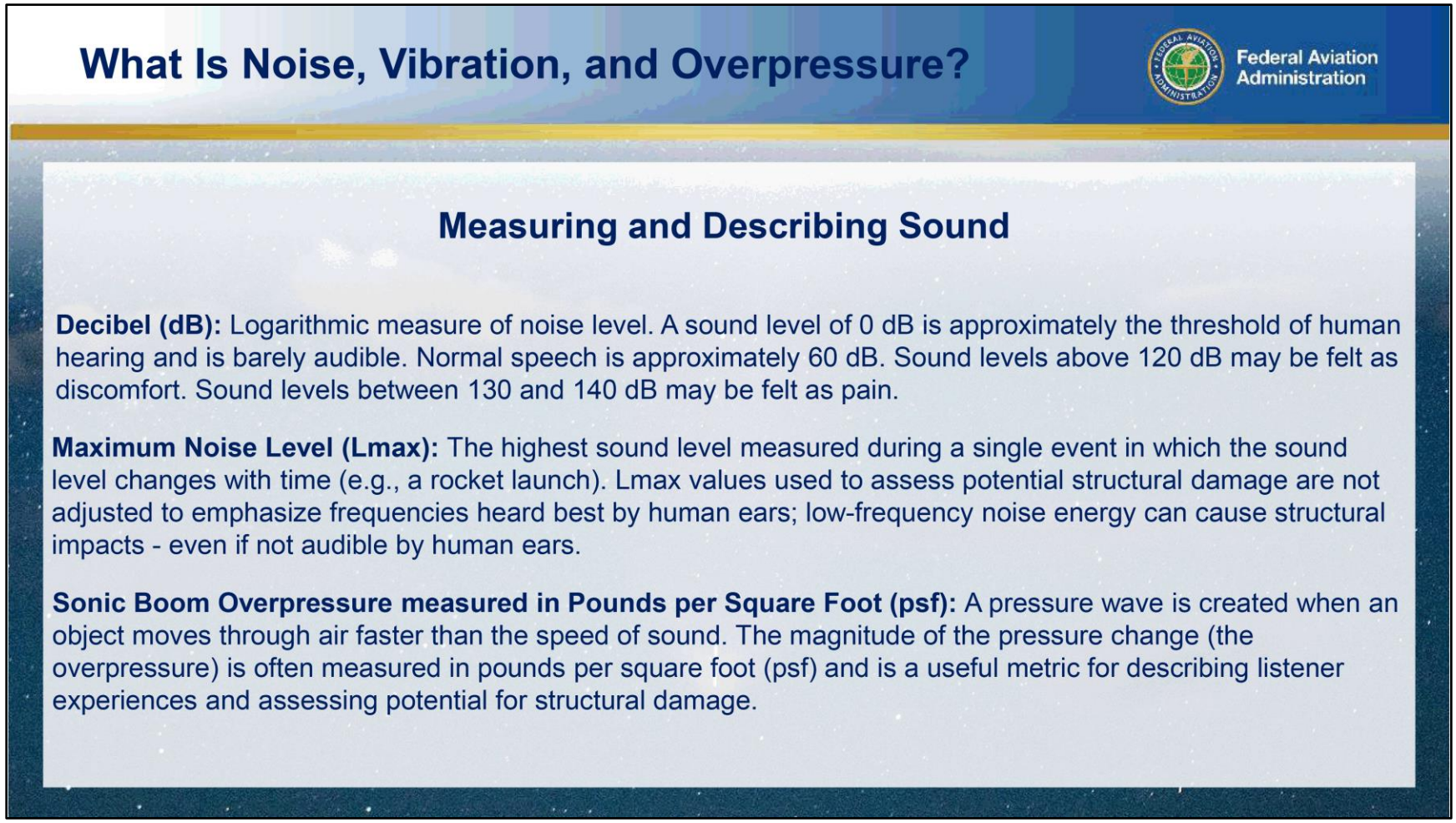
Construction APE

- Previously surveyed/existing boundary of LC-39A

Operational APE

- Considers auditory and vibratory effects of launch and landing activities
- Area of Lmax sound level ≥ 130 dB from launch effects
- Area of ≥ 2 pounds per square foot (psf) of sonic boom overpressure from reentry effects




What Is Noise, Vibration, and Overpressure?
Federal Aviation Administration
Measuring and Describing Sound
Decibel (dB): Logarithmic measure of noise level. A sound level of 0 dB is approximately the threshold of human hearing and is barely audible. Normal speech is approximately 60 dB. Sound levels above 120 dB may be felt as discomfort. Sound levels between 130 and 140 dB may be felt as pain.
Maximum Noise Level (Lmax): The highest sound level measured during a single event in which the sound level changes with time (e.g., a rocket launch). Lmax values used to assess potential structural damage are not adjusted to emphasize frequencies heard best by human ears; low-frequency noise energy can cause structural impacts - even if not audible by human ears.
Sonic Boom Overpressure measured in Pounds per Square Foot (psf): A pressure wave is created when an object moves through air faster than the speed of sound. The magnitude of the pressure change (the overpressure) is often measured in pounds per square foot (psf) and is a useful metric for describing listener experiences and assessing potential for structural damage.