APPENDIX C

Public Comments and Reponses

1. Introduction

The Federal Aviation Administration (FAA) is evaluating Space Exploration Technologies Corporation's (SpaceX's) proposal to increase the launch and landing cadence of the Starship/Super Heavy launch vehicle at its existing Boca Chica Launch Site in Cameron County, Texas. SpaceX must obtain a new license or a license modification from the FAA in order to launch and land Starship and Super Heavy and to use associated launch systems at a higher cadence than analyzed in the 2022 *Final Programmatic Environmental Assessment for the SpaceX Starship/Super Heavy Launch Vehicle Program at the SpaceX Boca Chica Launch Site in Cameron County, Texas* (PEA; FAA 2022). FAA evaluated the potential environmental effects of the activities associated with the federal action of modifying SpaceX's vehicle operator license in a tiered environmental assessment (EA).

A 30-day public comment period was initiated with the publication of the Draft EA on July 29, 2024. FAA encouraged the public, agency representatives, and other interested parties to provide comments. The public comment period ended on August 29, 2024. FAA received 112 public, state, and federal government agency comments during the public comment period. After this public comment period, FAA prepared a Revised Draft EA and initiated a new 45-day public comment period on November 20, 2024. The Revised Draft EA public comment period ended on January 17, 2025. FAA received 12,303 public, state, and federal government agency comments during the Revised Draft EA public comment period. Two public meetings were held: one in-person meeting in Brownsville, Texas, on January 7, 2025, and one virtual meeting on January 13, 2025. Twenty-six attendees provided oral comments at the January 7 meeting, and 47 attendees provide oral comments at the January 13 meeting.

The Final Tiered EA considers all input provided on the Draft and Revised Draft EAs and addresses comments received, as appropriate.

2. Methodology

Section 6-2.2(h) of FAA Order 1050.1F states, "[a]lthough the FAA is not required to formally respond to public comments concerning EAs, EAs should reflect the FAA's consideration of such comments." The FAA reviewed each written public submission received during the Draft EA and Revised Draft EA public comment periods as well as verbal comments received during the virtual public meeting. The FAA identified individual comments within each submission (i.e., a portion of the comment submission that addresses a specific subject) and grouped substantive comments by topic. FAA defined substantive comments as comments (1) on the factual accuracy of and analysis, methodologies, or information in the EA; (2) that identify effects not analyzed or developed and evaluate reasonable alternatives or feasible mitigation measures not considered by the FAA; or (3) that offer specific information that may have a bearing on the decision, such as differences in interpretations of significance and scientific and technical conclusions. FAA also received non-substantive comments (i.e., comments that expressed a non-substantive personal preference or opinion not tied to a specific topic) and non-germane comments (i.e., comments outside the scope of the Proposed Action).

FAA developed comprehensive responses for eight individual Federal Docket Management System submissions that contained many substantive comments within the submission and warranted individual responses. These are addressed in Section 5.

3. Issues Evaluated in the EA

A. Air Quality/Climate

Comment Summary

Commenters expressed concerns about the environmental and health impacts of project emissions. Commenters requested the inclusion of a NO_x conformity determination, analysis of dust plumes from prior launches, and additional justification that air quality and climate impacts would not be significant.

Commenters also expressed concern regarding emissions of methane and other greenhouse gases (GHGs), as well as associated impacts of rockets on the ozone layer and climate. Commenters requested that the FAA 1) disclose the amount of methane leaked or intentionally discharged the source methane fuel, and how and the fuel is transported, and discuss potential significance of methane emissions on climate change; 2) provide quantitative estimates of GHG emissions from traffic; 3) include the full scope of project emissions, including emissions from anomalies and from fracking and processing natural gas to supply the fuel for the rockets; 4) compare project emissions to similar industry emissions or other applicable metrics; and 5) justify and provide detailed assumptions underlying the conclusion that the project's economic benefits will offset the social cost of carbon.

One commenter also encouraged SpaceX to conduct advanced combustion monitoring, plume dispersion modeling, and lifecycle assessments of methane usage to optimize emissions and guide future propulsion technology development, as well as to report emissions and implement innovative methane mitigation technologies.

Comment Response 1

An analysis of potential air quality impacts, including GHGs, is provided in Sections 3.2.1 and 3.2.2 of the Final Tiered EA. The analysis of potential air quality and climate impacts was conducted pursuant to the FAA's policy, procedures, and guidance.

The USEPA General Conformity Rule applies to federal actions occurring in nonattainment or maintenance areas when the total direct and indirect emissions of nonattainment pollutants (or their precursors) exceed specified thresholds. According to § 176(c) of the Clean Air Act (2 USC 7506(c)), a conformity determination is not required for the proposed action because Cameron County is designated as in attainment for all criteria pollutants. In nonattainment areas, Federal actions are exempt from conformity determinations if their emissions do not exceed designated *de minimis* levels for criteria pollutants (40 CFR Part 93.153(c)). Although this standard does not apply given the County's attainment status, estimated emission rates for CO and NOx would still be below the Environmental Protection Agency (EPA) *de minimis* conformity thresholds, with estimated rates of 45 and 98 tons per year of CO and NOx, respectively.

As discussed in Sections 3.2.1 and 3.2.12.2 of the Final Tiered EA, the creation of a dust plume is not expected, and corrective actions and launch pad modifications made by SpaceX are expected to prevent dust (particulate matter) impacts. The size of previous dust plumes is disclosed in Section 3.2.8.1 of the Final Tiered EA. Further analysis on the composition and dispersion of dust plumes is not required.

The Final Tiered EA notes that the projected methane vented will increase from the 2022 PEA and quantifies this increase in Table 4 of Section 3.2.2 of the Final Tiered EA. The climate impacts of GHGs, including methane, is analyzed in Section 3.2.2 of the Final Tiered EA. The transportation of hazardous materials, including methane, would continue to occur in a manner consistent with applicable federal,

state, and local environmental, public, and occupational health and safety regulations. This is further described in Section 3.2.10 of the Final Tiered EA.

The FAA believes the Final Tiered EA discloses climate change impacts that are reasonably certain to occur. Emissions from upstream activities like fracking and natural gas transport are beyond the scope of proximate effects that NEPA requires agencies to evaluate.

The FAA has addressed comments about quantifying the climate effects of the proposed action by quantifying the anticipated GHG emissions from the proposed action (see Table 4) and comparing these emissions to the emissions evaluated in the 2022 PEA. FAA has compared project's emissions to annual state, national, and global GHG emissions (see Table 5 of the Final Tiered EA). The Final Tiered EA quantifies the increase in truck traffic in Section 3.2.2 but concludes that GHG emissions from vehicle sources would not constitute an appreciable increase in GHGs associated with the proposed action to change the finding of significant impacts to climate change and are not required to be assessed quantitatively.

The FAA concluded that the proposed action will not significantly affect air quality or climate based on the expected air emissions; the relatively small climate effects compared to state, federal, and global emissions; and the mitigation measures SpaceX is required to implement. FAA notes that SpaceX has taken action since publication of the PEA to further reduce potential fugitive air emissions by installing steel plates over the launch pad and a deluge system to cool the launch pad and suppress fire, dust, and potential debris.

Recommendations for future technological advancements are outside the scope of this Final Tiered EA and are not addressed by the FAA.

B. Alternatives

Comment Summary

Commenters requested consideration of a broader range of alternatives to minimize the environmental effects associated with SpaceX's operations. Recommended alternatives included:

- Reducing the number of permitted SpaceX rocket launches
- Using other open-ocean splashdown sites located further away from sensitive ecosystems and cultural sites or locations that avoid water landings altogether
- Implementing advanced debris recovery and mitigation technologies
- Requiring SpaceX to achieve carbon neutrality
- Implementing a "Nationalize SpaceX" alternative where the federal government assumes control over the Starship/Super Heavy Program

Comment Response 2

The EA evaluates the proposed increase in launch cadence at Boca Chica based on SpaceX's stated programmatic needs, operational feasibility, and regulatory requirements. FAA's consideration of alternatives is consistent with NEPA requirements that agencies need only review alternatives that will meet the purpose and need of a proposed action. The FAA screened alternatives for consideration based on the following criteria:

1. Ability to meet necessary launch rate/frequency demanded by DOD and NASA contractual obligations by 2025, including the Human Landing System and Rocket Cargo contracts.
2. Ability to support both low Earth orbit and geostationary transfer orbit trajectories. To reach these trajectories, the launch site must have the ability to support launches towards the east to avoid a "dogleg," a bent trajectory which severely compromises the performance to orbit.
3. Location must be at a low latitude in order to maximize the payload mass that the launch vehicle can place into orbit.
4. Ability to provide geographic diversity from existing or proposed launch facilities in Florida to diversify risk and operations. Geographical diversity is necessary to allow the program to continue to operate/exist/provide capability if one site is disabled (e.g., terrorist attack, natural disaster, vehicle anomaly). SpaceX must diversify risk and operations by operating from multiple locations located in different geographic regions.

The increase from 5 to 25 annual launches and up to 50 total annual landings (25 of the Starship and 25 of the Super Heavy) is necessary to support the rapid iteration, testing, and development of the Starship/Super Heavy program, which is essential for achieving full operational capability. This rate is the reasonably foreseeable rate at which SpaceX has the capability to launch, and the rate SpaceX expected is needed to fulfill contractual obligations with federal agencies. The proposed launch cadence is necessary to advance the vehicle's design and operationalize rapid reuse to support national space policies and other priorities, including under the Artemis and Human Landing System programs, which are currently set to be complete before the end of the decade. A lower launch cadence alternative would not

support the project's purpose and need, which requires frequent testing, iteration, and reusability validation.

Other SpaceX launch facilities, such as Kennedy Space Center (KSC) and Cape Canaveral Space Force Station (CCSFS), are subject to different operational constraints and high demand for launch resources. Boca Chica provides a dedicated testing site without interfering with other national spaceflight operations and allows for rapid prototyping, iterative testing, and advancements in Starship's fully reusable architecture. The FAA also evaluated the feasibility of distributing launches among multiple sites, but this alternative would not meet the program's need for rapid reusability demonstrations and operational efficiency.

Splashdown sites were selected primarily based on the Purpose and Need of the Proposed Action, which prioritizes safety, mission success, and environmental minimization while fulfilling DOD and NASA contractual obligations. Alternative locations would fail to meet operational needs, increase risks, and complicate recovery efforts.

In response to concerns raised by DAR and other commenters, however, the FAA revised the Final Tiered EA to remove the Pacific action area from the Hawaiian Exclusive Economic Zone (EEZ) and establish a 50-nautical mile buffer zone around the Papahānaumokuākea Marine National Monument. These changes will further reduce potential environmental impacts and ensure there will be no significant effects by:

- Protecting Sensitive Ecosystems: The removal of the Pacific action area from the Hawaiian EEZ ensures that operations avoid areas of unique biodiversity and cultural significance, thereby minimizing risks to marine life and ecosystems associated with the monument.
- Avoiding Overlap with Protected Areas: The establishment of a buffer zone around the monument ensures that activities remain at a safe distance from the boundary, reducing the likelihood of any adverse impacts on the marine environment.
- Mitigating Potential Cross-Boundary Impacts: By revising the action area, the likelihood of debris dispersion affecting the Hawaiian Islands and surrounding waters is significantly decreased and expected to be negligible.

The FAA was not required to consider alternatives that minimize environmental effects, such as carbon neutrality or the implementation of advanced debris recovery and mitigation technologies, that are not consistent with the purpose and need and are not reasonably achievable due to the operational constraints.

C. Biological Resources

Comment Summary

Commenters expressed concerns regarding the potential of the Proposed Action to significantly affect wildlife (including threatened and endangered species) and critical habitat. Species of concern that commenters stated were being significantly affected included, but were not limited to, migratory birds, sea turtles, whales, ocelot, and the Hawaiian monk seal. More specifically, commenters indicated that the EA fails to fully analyze:

- the impacts of noise, vibrations, and artificial lighting on sea turtle nesting success and hatchling orientation, as well as increased detection of false crawls
- the impacts of noise, heat, debris/gravel plumes, and increased human activity on migratory bird nesting success and egg viability
- impacts to the habitat and reproductive success of monk seals, as well as stress and behavioral changes induced by launch noise
- the impacts of overlapping landing zones with whale migration routes, as well as launch-related noise and vibration effects on whale communication and navigation
- the impacts of potential debris strikes on Rice's whales and effects to their critical habitat from the proposed landing zones and potential contamination from rocket debris and residual propellant
- the impact of vibrations from launches on fish behavior, including prey detection and predator avoidance
- the impact of changes in salinity and potential pollutants from altered stormwater runoff on South Bay's fish nursery and seagrasses
- the potential physical damage to marine ecosystems (including coral reefs) from falling debris, light and noise impacts, and potential contamination from rocket fuel and other hazardous materials
- The impacts to Papahānaumokuākea Marine National Monument and Flower Garden Banks National Marine Sanctuary due to the proximity of proposed landing zones
- traffic impacts using comprehensive data on roadkill incidents
- the impacts on ocelot movement/corridors and population viability, including mitigation of lands to compensate for loss of connectivity
- cumulative impacts, including potential long-term effects and mitigation measures

Commenters indicated that the EA should be revised to incorporate recent independent scientific research. Commenters also indicated that no testing or launching should be allowed during nesting of birds and sea turtles and that any launch-related damage to active migratory bird nests violates the Migratory Bird Treaty Act. Additionally, commenters requested monitoring be conducted and that FAA require additional mitigation by SpaceX, as current measures were deemed to be inadequate. A request was also made to make the Biological Assessment available for public review.

Comment Response 3

The FAA has concluded that effects to wildlife and habitats, including federally listed species and critical habitat, will not be significant. Impacts to terrestrial and marine wildlife are addressed in the 2022 EA as well as in the Final Tiered EA Section 3.2.8, *Biological Resources*. This Final Tiered EA addresses the impacts of the increased cadence of launches and landings which increase the frequency of impacts discussed in the 2022 EA. Reasonably foreseeable impacts to biological resources in context of past, present, and future actions are discussed in Section 3.3.1.8 of the Final Tiered EA. A summary of impacts to species listed under the Endangered Species Act (ESA), including piping plover, ocelot, and sea turtles, due to potential noise, heat, lighting, vibration, hazardous materials, debris, anomalies, traffic, and visitor increases is provided in Final Tiered EA Table 7. A detailed analysis of impacts to ESA-listed species and critical habitat, including the Hawaiian monk seal and Rice's whale, is provided in 1) the U.S. Fish and Wildlife Service's (USFWS) Biological Opinion (BO) (Final Tiered EA Appendix A), and 2) the National Marine Fisheries Service's (NMFS's) Conference and Biological Opinion (BCO) (Final Tiered EA Appendix A). Note that the Draft EA mistakenly stated in one location (on page 5) that the BA was attached in Appendix A, however the BA was still in-progress at the time of Draft EA publication. The ESA consultation documents (Final Biological Assessment and Final Biological Opinion) are included in the Final Tiered EA and posted to the project website.

SpaceX conducts extensive monitoring of air, water, soil, and biological resources as documented throughout the Final Tiered EA. SpaceX's biological monitoring results have not shown significant effects from launch- and landing-related noise, vibration, lighting, or heat / dust plumes. No dead or injured animals have been observed in SpaceX's biological monitoring in the vicinity of the launch site following launches, and potential impacts to animals are discussed in the Final Tiered EA. The effects of small fires following launches have also not been significant, resulting only in temporary ecosystem disturbances. Avian monitoring since 2015 has not demonstrated any long-term negative population trends in avian species in the vicinity of Boca Chica. Impacts to birds from noise, heat, and debris/gravel plumes are discussed in Section 3.2.8 of the Final Tiered EA. SpaceX's ongoing work with Sea Turtle, Inc. to monitor sea turtles and remove sea turtle eggs from Boca Chica beach prior to launch events also ensures that effects to sea turtle species will not be significant. Notably, SpaceX's installation of the deluge system at the launch pad has helped dampen noise from launches and minimize the spread of dust and debris that could affect wildlife. While monitoring has detected a higher frequency of false crawls by green sea turtles, it is not known at this time whether and to what extent this increased false crawl frequency is attributable to SpaceX's activities at Boca Chica, another factor, or simply increased detection of sea turtle crawls due to increased monitoring required by the PEA and BCO. SpaceX is seeking an increase in authorized take of green sea turtles based on these monitoring results. The mitigation measures imposed by the PEA, as well as the reasonable and prudent measures and associated terms and conditions required by USFWS in authorizing incidental take, will ensure that effects to green sea turtles and other sea turtle species are not significant (i.e., do not jeopardize the continued existence of the species).

Regarding increased traffic, the FAA acknowledges that changes in traffic patterns may alter species behavior near roadways. The Final Tiered EA and 2025 BO evaluate the potential for increased vehicle collisions and other traffic-related effects and mitigation measures to ensure that traffic effects are not significant. No ESA-listed species have been injured or killed due to operational traffic to date. FAA has mandated the following specific mitigation measures to avoid or minimize potential adverse effects on biological resources from traffic:

- Employee Shuttle Service: To reduce traffic volume, SpaceX must provide a shuttle service for employees traveling to and from the launch site. This is in use and is used heavily by SpaceX employees.
- Wildlife Crossing Signage: The installation of wildlife crossing signs along State Highway 4 is required to alert drivers to the presence of wildlife and encourage cautious driving. SpaceX implemented this measure in 2022.
- Wildlife Corridor Construction: SpaceX is tasked with constructing wildlife corridors to facilitate safe animal crossings and reduce habitat fragmentation. SpaceX continues to work with TXDOT and USFWS on the implementation of this measure. SpaceX is working with TXDOT to have these included in TXDOT's planned upgrades to State Highway 4.

Regarding fish and marine species, as discussed in Final Tiered EA Section 3.2.8.3, *Marine Resources*, single-event impulse noise levels and sonic booms would not affect marine species or essential fish habitat (EFH), as little energy is transferred into the water column as a result of these events (FAA 2017). NMFS guidance on marine mammal noise thresholds is incorporated into the Final Tiered EA analysis. The FAA has also ensured that landing zones minimize overlap with protected marine habitats and whale migration corridors. Mitigation measures include designated avoidance areas and tracking of marine wildlife presence to adjust operations when necessary.

In response to concerns regarding potential effects in the Pacific Ocean near Hawaii, the FAA has revised the Final Tiered EA to remove the Pacific action area from the Hawaiian Exclusive Economic Zone (EEZ), establish a buffer zone around the Papahānaumokuākea Marine National Monument and avoid the Flower Garden Banks National Marine Sanctuary. These changes respond to public concerns and ensure that potential environmental impacts will not be significant by:

- Avoiding Sensitive Ecosystems: The removal of the Pacific action area from the Hawaiian EEZ ensures that operations avoid areas of the Pacific Ocean with unique biodiversity and cultural significance, thereby minimizing risks to marine life and ecosystems.
- Avoiding Overlap with Protected Areas: The establishment of a buffer zone around the monument ensures that activities remain at a safe distance from the boundary, reducing the likelihood of any adverse impacts on the marine environment.
- Mitigating Potential Cross-Boundary Impacts: By shifting the action area, the likelihood of debris dispersion affecting the Hawaiian Islands and surrounding waters is significantly decreased and expected to be negligible.

Regarding commenters' concerns about ocelot, the FAA notes that ocelot have not been observed in the vicinity of the launch site in over 25 years, and the nearest ocelot population is located 20 miles away across the shipping channel in the Laguna Atascosa National Wildlife Refuge (NWR). Nevertheless, SpaceX has implemented mitigation measures to reduce any effects to ocelot, including contributing to the Friends of Laguna Atascosa NWR Adopt-an-Ocelot Program, building vehicle barriers along State Highway 4, and working to construct wildlife crossings.

Regarding commenters' concerns about debris and hazardous material effects on marine ecosystems and marine species, the Final Tiered EA notes that the intentional jettisoning of debris (the heat shield) during landing would not occur over intertidal areas, marshes, estuaries, or coral reefs. The debris would sink

quickly to the bottom of the Ocean. Moreover, given the size of the heat shield, a direct strike to marine species is highly unlikely. While debris from an unplanned anomaly could also fall into the ocean, the likelihood of this occurring is low and will decrease over time as Starship/Super Heavy operations improve. Any debris would be limited and non-hazardous and most would be expected to quickly sink to the bottom of the ocean. FAA requires SpaceX to recover large floating debris from ocean landings as necessary. More information on the potential effects of hazardous materials can be found in Response to Comment 12 below.

FAA clarifies that SpaceX operations at the Vertical Launch Area (VLA) do not discharge into South Bay. Any water that leaves the VLA has the potential to discharge in and around the water bodies adjacent to the VLA, which does not include South Bay. The VLA is separated from South Bay by State Highway 4. Starbase operations beyond those licensed by the FAA have independent utility and are not subject to review under NEPA in connection with the current Proposed Action. As such, discharge to South Bay from other SpaceX operations is outside the scope of the current analysis and does not impact the adequacy of the Final Tiered EA's assessment of biological resources.

D. Coastal Resources

Comment Summary

Some commenters state that the EA should be revised to include discussion of the Coastal Barrier Resources Act compliance and provide detailed financial information to ensure no federal funds were used for SpaceX's development at Boca Chica. One other commenter emphasized the need for continued collaboration to address potential hazards such as falling debris, explosive events, and sunken obstructions. More specifically, they requested the following:

- SpaceX should continue to work with the U.S. Coast Guard (USCG) and industry stakeholders to ensure that ship hazard areas (SHAs) issued in notices to mariners (NOTMARs) are properly marked and include areas where potential hazards to navigation related to SpaceX launch or landing/reentry activity could impact maritime operations.
- All potential hazards to navigational safety, including falling debris, explosive events on the water's surface, jettisoned heat shields, and sunken obstructions, should be addressed by SpaceX.
- The project team should continue to work under the letter of intent (LOI) with the USCG to minimize the risk of potential hazards to maritime operations.
- If the establishment of a Limited Access Area (LAA) is deemed necessary, the project team and USCG should engage with local operators and allow for a public comment period of at least 30 days to ensure that LAAs do not place unnecessarily onerous restrictions on vessel operations.

Comment Response 4

Consultation under the Coastal Barrier Resources Act is not required because the FAA is not authorizing any form of loan, grant, guaranty, insurance, payment, rebate, subsidy, or any other form of direct or indirect federal assistance to SpaceX as part of this decision. *See* 16 USC §§ 3502(3), 3504(a).

As described in Section 2.5 of the Final Tiered EA, all launch and reentry operations would comply with necessary notification requirements and promote navigational safety, including through the USCG's issuance of NOTMAR, as defined in agreements required for a launch license issued by FAA, such as an LOI (described below). A NOTMAR provides a notification regarding a temporary hazard within a defined area (e.g., an SHA) to ensure public safety during proposed operations. A NOTMAR itself does not alter or restrict vessel movement; rather, the NOTMAR disseminates relative information regarding maritime activity and temporary hazards within a defined area to ensure public awareness and safety during the proposed operations.

SpaceX and USCG have agreed to an LOI which establishes procedures for the issuance of a NOTMAR prior to a launch or reentry, as well as other measures necessary to protect public health and safety, promoting safe operations over navigable waters. The LOI describes the required responsibilities and procedures for both SpaceX and USCG during the event.

In addition to publishing NOTMARs, USCG has broad authority to establish LAAs, which may include Safety and/or Security Zones, and Regulated Navigation Areas on Navigable Waters subject to U.S. authority. These may be scheduled in advance to minimize interruption to the maritime community.

In response to concerns raised by DAR and other commenters, the FAA revised the Final Tiered EA to remove the Pacific action area from the U.S. Exclusive Economic Zone (EEZ) (12-200 NM) and establish a

50-nautical mile buffer zone around the Papahānaumokuākea Marine National Monument. These changes will further reduce potential environmental impacts and ensure there will be no significant effects by:

- Protecting Sensitive Ecosystems: The removal of the Pacific action area from the Hawaiian EEZ ensures that operations avoid areas of unique biodiversity and cultural significance, thereby minimizing risks to marine life and ecosystems associated with the monument.
- Avoiding Overlap with Protected Areas: The establishment of a buffer zone around the monument ensures that activities remain at a safe distance from the boundary, reducing the likelihood of any adverse impacts on the marine environment.
- Mitigating Potential Cross-Boundary Impacts: By revising the action area, the likelihood of debris dispersion affecting the Hawaiian Islands and surrounding waters is significantly decreased and expected to be negligible.

As described in Section 3.2.13 of the Final Tiered EA, no significant impacts to Texas coastal resources would occur, as no coastal construction or seafloor disturbing activities would take place, and any downrange landings would occur no closer than 19 miles offshore. The Proposed Action includes downrange landings no closer than 1 nautical mile offshore and the jettison of the heat shield no closer than 1 nm offshore. Landing and recovery operations, including the jettisoned heat shield would not take place in intertidal areas, salt marshes, estuaries, or coral reefs. Finally, the Texas General Land Office (TGLO) determined it does not require a consistency review under the Texas Coastal Management Plan since it is not included on the state's "Listed Activities Subject to CZMA Review" list. As the activity type has not changed, no additional consistency review is needed.

E. Consultation

Comment Summary

Commenters emphasize the need for consultation with the Mexican government due to the shared airshed between Matamoros Tamaulipas, Mexico, and Brownsville, Texas, and consultation with the Office of Hawaiian Affairs. Some commentors brought up the federal government's trust responsibility to native people, claiming that the FAA was violating this trust responsibility by failing to consult, particularly with Native Hawaiians. Other commentors were concerned about the lack of consultation with the Carrizo/Comecrudo Tribe in Texas.

Comment Response 5

The FAA considered effects to Mexico as part of its review of SpaceX's new or modified license for this cadence increase. Under Part 450, launch operators such as SpaceX are required to perform robust risk analyses, including trajectory simulations and failure probabilities, to ensure risks to the general public and the environment remain within acceptable limits. These analyses account for potential cross-border impacts, particularly in areas near the operational site. The FAA engaged with Mexican authorities in dialogue through established diplomatic channels to align efforts in safety and environmental management. In accordance with FAA Order 1050.1F, FAA analyzed environmental impacts in Mexico in the EA, including noise, biological, and cultural resource impacts.

FAA thanks the Hawaiian community for its expansive involvement in this process. The FAA acknowledges concerns regarding the potential environmental, cultural, and economic impacts in the Pacific Ocean near Hawaii and has revised the Final Tiered EA to address these issues. The FAA has taken the concerns to the applicant, and it has been able to revise the potential landing area to create a large buffer outside the U.S. Exclusive Economic Zone (EEZ) (12-200 nm) around Hawaii and to establish an additional 50-nautical mile buffer zone outside the 200 nm boundary of the Papahānaumokuākea Marine National Monument. The FAA notes this extensive engagement in the public process by the Hawaii community and has modified the project as possible, to address these concerns. Specifically, the modification of the landing area to be further away from Hawaii and the Monument, and now entirely in international waters, addresses the concerns that were raised.

These changes significantly reduce potential environmental impacts by:

- Protecting Sensitive Ecosystems: The removal of the U.S. EEZ from the Pacific action area from the U.S. EEZ ensures that operations avoid areas of unique biodiversity and cultural significance, thereby minimizing risks to marine life and ecosystems associated with the monument.
- Avoiding Overlap with Protected Areas: The establishment of a buffer zone around the monument ensures that activities remain at a safe distance from the boundary, reducing the likelihood of any adverse impacts on the marine environment.
- Mitigating Potential Cross-Boundary Impacts: By revising the action area, the likelihood of debris dispersion affecting the Hawaiian Islands and surrounding waters is significantly decreased and expected to be negligible.

Given that the Pacific Landing area no longer occurs within the U.S. EEZ, there are no consultation requirements.

While the Carrizo/Comecrudo Tribe is not federally recognized, the FAA previously invited the Carrizo/Comecrudo Tribe to consult on multiple occasions to discuss proposed operations at this site and have not received a response. Closures are necessary for public safety during launch and testing activities, and SpaceX has worked to minimize these disruptions and balance access considerations for cultural resources the community, including the Carrizo/Comecrudo Tribe.

F. Cultural Resources

Comment Summary

Commenters expressed a desire to protect both the Hawaiian Kingdom and the sacred sites of the Carrizo/Comecrudo Tribe of Texas. Commenters also emphasize the need for archaeological surveys and studies in areas impacted by SpaceX's activities to prevent important cultural and historical sites from being disturbed or destroyed, such as Palmito Ranch Battlefield National Historic Landmark and the Papahānaumokuākea Marine National Monument, which is a United Nations Educational, Scientific and Cultural Organization (UNESCO) world heritage site. Commenters stated that the lack of tribal consultation and failure to assess the potential loss of cultural heritage constitutes a violation of the Native American Graves Protection and Repatriation Act (NAGPRA) and the United Nations Declaration on the Rights of Indigenous Peoples, and that FAA and SpaceX must respect the cultural and historical significance of the lands.

Comment Response 6

As stated in Section 3.2.5 of the Final Tiered EA, the Proposed Action would not include construction for launch operations beyond the boundary analyzed in the 2022 PEA, and SpaceX is not proposing any additional access restrictions that would impact visitation to the cultural resources. As explained in 2022 PEA Section 3.7, in accordance with 36 CFR § 800.4(a)(1), the FAA, in consultation with the Texas State Historic Preservation Officer (SHPO), determined an Area of Potential Effects (APE) in consideration of the undertaking's potential effects on cultural resources. In defining the APE, the FAA considered the potential visual, auditory, and vibrational effects on historic properties from launches and daily operations, including engine noise and sonic booms, potential direct effects from ground-disturbing activities from potential anomalies and construction, increased traffic and visitors, and temporary access restrictions for launch operation or anomalies. The APE is a 10-mile area centered at the VLA. Within the APE, the FAA, in consultation with the SHPO, identified an archeological resources study area for the ground-disturbing activities, including construction activities and potential launch anomalies. The Carrizo/Comecrudo commented that an Esto'k Gna village site lies within an area known as Garcia Pasture. Garcia Pasture is located outside of the archeological resources study area for the ground-disturbing activities. Garcia Pasture would not be impacted by ground-disturbing activities or potential launch anomalies. Therefore, no additional effects to cultural resources would result from the Proposed Action beyond those described in the 2022 Programmatic EA (PEA), and no additional surveys were deemed necessary. Access restrictions are discussed further in Comment Section 3M.

Noise impacts to Palmito Ranch Battlefield National Historic Landmark are addressed in Section 3.2.5 of the Final Tiered EA, and the FAA determined that effects from the proposed action will not be significant. The avoidance, minimization, and mitigation recommendations in the Programmatic Agreement (as currently stands under this Final Tiered EA, if applicable) would continue to be implemented to ensure that any effects to the Palmito Ranch Battlefield National Historic Landmark and other historic resources are not significant.

The Final Tiered EA provides an updated assessment of potential landing areas based on mission requirements, safety considerations, and trajectory optimizations for Starship operations. The FAA acknowledges concerns regarding the potential environmental, cultural, and economic impacts in the Pacific Ocean near Hawaii and has revised the Final Tiered EA to address these issues. The FAA has taken

the concerns to the applicant who has been able to revise the potential landing area to create a large buffer outside the U.S. Exclusive Economic Zone (EEZ) (12-200 nm) around Hawaii and to establish an additional 50-nautical mile buffer zone outside the 200 nm boundary of the Papahānaumokuākea Marine National Monument. The FAA notes this extensive engagement in the public process by the Hawaii community and has modified the project as possible, to address these concerns. Specifically, the modification of the landing area to be further away from Hawaii and the Monument, and now entirely in international waters, addresses the concerns that were raised.

These changes significantly reduce potential environmental impacts by:

- Protecting Sensitive Ecosystems: The removal of the U.S. EEZ from the Pacific action area from the U.S. EEZ ensures that operations avoid areas of unique biodiversity and cultural significance, thereby minimizing risks to marine life and ecosystems associated with the monument.
- Avoiding Overlap with Protected Areas: The establishment of a buffer zone around the monument ensures that activities remain at a safe distance from the boundary, reducing the likelihood of any adverse impacts on the marine environment.
- Mitigating Potential Cross-Boundary Impacts: By revising the action area, the likelihood of debris dispersion affecting the Hawaiian Islands and surrounding waters is significantly decreased and expected to be negligible.

Given that the Pacific Landing area no longer occurs within the U.S. EEZ, there are no consultation requirements.

G. Department of Transportation 4(f) Resources

Comment Summary

Commenters state that SpaceX would impact Section 4(f) of the U.S. Department of Transportation (DOT) Act of 1966 properties to include Boca Chica State Park, Brazos Island State Park, South Bay Coastal Preserve, and major portions of Lower Rio Grande Valley National Wildlife Refuge during launches. Commenters also requested clarification on how listed mitigation measures in Section 3.2.6 of the Draft EA avoid use of public parks; recreation areas; wildlife or waterfowl refuges of national, state, or local significance; and land of an historic site of national, state, or local significance.

One commenter also expressed concern that noise model issues could lead to an underestimation of noise impacts to Section 4(f) properties.

Comment Response 7

The FAA has expanded this section's consideration of effects on noise and access conditions for Section 4(f) resources. The 2022 PEA analysis and final Section 4(f) evaluation determined that the proposed action would not result in more than a minimal (i.e., *de minimis*) physical use of any Section 4(f) resources and would not constitute a constructive use. The TGLO, THC, TPWD, NPS and USFWS concurred with FAA's *de minimis* determination. NPS, however, did not agree with FAA's determination of no constructive use on NPS properties. In December 2024, the FAA initiated Section 4(f) consultation to evaluate whether the changes to the proposed action would result in the use of Section 4(f) properties through permanent incorporation, temporary occupancy, or constructive use. Results from this consultation are incorporated in the Final Tiered EA and the consultation letters are in Appendix A. For responses to comments regarding noise effects to Section 4(f) resources, see Section 3P, Noise and Noise-Compatible Land Use.

The TGLO, THC, TPWD and USFWS concurred with FAA's determination that the changes to the project would not result in the use of Section 4(f) properties through permanent incorporation, temporary occupancy, or constructive use with incorporation of appropriate mitigation measures.

The NPS, in a response letter dated January 31, 2025, indicated that they did not agree with the FAA's 2022 determination that the project would not result in more than a minimal physical use of any Section 4(f) resources and would not constitute a constructive use. NPS notes that they believe the adverse visual effects of structures greater than 100 feet tall at the VLA represent a long-term diminishment of the setting and feeling of the Palmito Ranch Battlefield National Historic Landmark, and that access restrictions may result in a constructive use. In addition, NPS has continuing concerns regarding noise at the Palmito Ranch Battlefield National Historic Landmark.

As stated in FAA's March 11, 2025 response letter to NPS:

> "The cadence increase proposed by SpaceX is not anticipated to require changes or increase the overall number of contemplated access restriction hours evaluated in the PEA, FONSI/ROD, and prior Section 4(F) consultation. This is because SpaceX has, since Flight 1, increased the efficiency of launch operations and reduced the projected duration of access restrictions on a per operation basis. Additionally, SpaceX would continue to adhere to mitigation measures listed in the 2022 PEA and FONSI/ROD and incorporated into its FAA vehicle operator license as required terms and conditions.

These requirements include:

- Providing the public and land management agencies a forecast of planned access restrictions 1-2 weeks in advance, notifications 48 hours before a launch, and real-time status updates as plans finalize.
- Releasing the closure areas west of the "All Hard Checkpoint" following an anomaly to ensure access to the NHL while anomaly response occurs.
- Not imposing access restrictions on the following holidays, or on weekends where these holidays fall on a Monday or Friday: Memorial Day, Labor Day, July 4th, Martin Luther King Jr. Day, Presidents' Day, Texas Independence Day, Cesar Chavez Day, Emancipation Day in Texas (also referred to as Juneteenth), Veteran's Day, Good Friday, Easter, Father's Day, Mother's Day, Thanksgiving Day, Christmas Day, and New Year's Day.
- Not imposing access restrictions on Fridays or weekends from Memorial Day to Labor Day, or on weekends the rest of the year.

SpaceX has adhered to these requirements over the past three years.

SpaceX has also taken steps to enhance recreational opportunities and visitors' experiences of the NHL, at NPS's request. SpaceX has constructed a viewing platform and interpretive signage to give visitors a better view and greater understanding of the NHL and local wildlife occurring there. SpaceX has also prepared a historical context report and funded educational outreach to inform visitors about the area's cultural and historical heritage

…

During launches and landings, humans will not be present in the vicinity of the NHL because of temporary access restrictions necessary to protect public safety, so human enjoyment of the NHL will not be impacted by launch noise. In any event, launch noise effects in the vicinity of the NHL will continue to be only intermittent and of short duration.

…

SpaceX's launch towers, the only structures over 100 feet tall at the VLA, were assessed as a part of a previously approved action. SpaceX is not proposing to add any additional launch-related infrastructure as a part of this proposed action. SpaceX's manufacturing structures are not part of the Federal action or the proposed action. NHL. Although there would be more launches and landings under the proposed action, the NHL would continue be restricted to visitors during launch operations, and no new adverse visual impacts are anticipated.

Moreover, SpaceX will continue to implement the measures in the PEA and FONSI/ROD to minimize visual effects, including minimizing launch site lighting, turning off lights when not needed, and using lowpressure sodium and/or amber LED lighting to the extent practicable. While nighttime visitation to the NHL is low, these measures help ensure that any lighting effects that may disrupt the nighttime viewshed from the NHL are mitigated."

H. General Effects and Cumulative Analysis

Comment Summary

Commenters stated that the Draft EA inadequately addresses significant impacts associated with increased launch frequency, such as noise, lighting impacts, air quality, water quality, and impacts to local communities. Commenters expressed concern that the Draft EA focuses on the similarity of the impacts to those described in the PEA while downplaying substantive changes. Commenters have requested additional discussion on why an expanded splash down area around the Hawaiian Islands is necessary. Commenters also have concerns on the structural integrity of buildings and cumulative impacts to wildlife due to an increased frequency of sonic booms. Commenters claim the FAA failed to take a "hard look" at the impacts to public access to cultural resources.

Commenters also emphasized the need for analysis of the cumulative impacts of current and future SpaceX operations, alongside other industrial activities such as proposed liquified natural gas (LNG) terminals, the Jupiter oil refinery, and oil and gas pipelines in the area, as well as hovercraft activities.

Comment Response 8

The FAA disagrees that the analysis in the Draft and Final Tiered EA is insufficient and fails to focus on substantive changes associated with the cadence increase compared to the proposed action evaluated in the 2022 PEA. The proposed changes do not introduce new or significantly different environmental effects that would rise to the level of significance under NEPA. The overall scope and nature of operations remain aligned with those previously assessed, with no substantial deviation in the types or severity of impacts expected. The changes do not materially alter the environmental footprint or introduce new categories of impact beyond those already evaluated. The FAA's noise, air quality, water quality, and biological resource analyses confirm that the potential effects remain within the bounds of prior assessments, ensuring that cumulative impacts remain below thresholds of significance. The FAA's thresholds for determining significance consider factors such as human health, safety, and ecological integrity, and the proposed action does not introduce any new exceedances in these areas. Existing mitigation measures remain effective and are being enhanced through adaptive management, ensuring that potential effects on wildlife, marine environments, and protected areas are minimized.

As noted in the Final Tiered EA, impacts by fallen objects and hazardous materials under the Proposed Action would remain highly unlikely to occur and thus discountable, as the amount of material or debris would not increase per landing, but only the frequency at which the landings occur. There may be residual propellent on board during splashdown, however a spacecraft's propellant storage is designed to retain residual propellant, so any propellant remaining in the spacecraft is not expected to be released into the ocean. In an unlikely event the propellant tank ruptures on impact, the propellant would evaporate or be quickly diluted and buffered by seawater. Additionally, the number of noise events generated by launch operations would increase from 10 to 25 and would still last minutes. The number of noise events generated by landing operations would increase and would less than a minute. Based on the still relatively intermittent launch frequency, short duration of launch and landing events, however, the Proposed Action is not expected to significantly affect any listed species due to the little to no evidence of the launch activity impacting trends to wildlife species. Furthermore, a Programmatic Agreement (PA) executed between the FAA, THC, NPS, USFWS, TWPD, the Advisory Council on Historic Preservation, and SpaceX

stipulated processes for minimizing and mitigating adverse effects on historical, architectural, archaeological, or cultural resources.

While operational refinements have been incorporated into the analysis, the nature and magnitude of the impacts remain within the range of those previously analyzed in the PEA. The FAA has determined that the proposed action does not introduce new significant impacts, and all environmental effects remain below the NEPA's thresholds of significance.

The Final Tiered EA does not consider the effects of hovercraft activities on their own because these activities have independent utility from the proposed action and would occur regardless of whether FAA approves the cadence increase. Hovercrafts are used by SpaceX for non-launch related activities that are not subject to the FAA's regulation. Additionally, during FAA regulated activities (e.g., launches), SpaceX limits the volume of onsite employees due to regulatory safety requirements.

As described in Section 3.3 of the Revised Draft EA, the cumulative effects analysis considers all reasonably foreseeable SpaceX projects, including the Starfactory construction at SpaceX's production and manufacturing area, housing developments in Boca Chica Village and at Rio East and West (located near State Highway 4 and Richardson Avenue), vehicle engineering testing at SpaceX's property known as Massey's, and construction of a water and other utility lines from Brownsville to the Boca Chica along State Highway 4. Analysis of the potential reasonably foreseeable effects in context of past, present, and future actions[1] to environmental resources including from these actions is disclosed in Section 3.3 of the Final Tiered EA.

Impacts associated with the operation of other existing facilities and infrastructure, including previous SpaceX development, LNG terminals, Jupiter oil refinery, and the oil and gas pipelines, are not anticipated to result in new impacts to resources during implementation of the Project; therefore, the impacts of these existing operations are accounted for in the description of the affected environment and not in the cumulative effects analysis.

[1] Section 3.3 of the FAA's Draft Revised Tiered EA (Draft) refers to the impacts discussed in this section as "Cumulative Impacts." This term is used in CEQ's NEPA-implementing regulations. 40 CFR § 1508(i)(3) (2024). Since the publication of the Draft, however, CEQ issued an interim final rule to remove these regulations in accordance with E.O. 14154, *Unleashing American Energy*. As explained by CEQ in its February 19, 2025 memorandum, *Implementation of the National Environmental Policy Act*, NEPA, as amended, does not employ the term "cumulative effects" or "cumulative impacts." CEQ instead directs agencies to consider "'reasonably foreseeable' effects, regardless of whether or not those effects might be characterized as 'cumulative,'" consistent with NEPA. 42 U.S.C. § 4332(2)(C)(i). In accordance with this direction, the FAA has removed the term "cumulative effects" and "cumulative impacts" wherever previously used, but retains with edits the underlying analysis in Section 3.3 of the Draft.

I. General Opposition

Comment Summary

Commenters stated that they are not in support of SpaceX launches due to human and environmental impacts. Other commenters stated their general distrust of SpaceX and/or Elon Musk, do not support privatizing space exploration, or generally stated that the project would negatively impact the local community's quality of life and economic conditions.

Comment Response 9

FAA appreciates the public's input on the proposed project. Comments regarding the proposed actions reasonably foreseeable impacts on the human environment have been addressed in the Final Tiered EA. This Appendix provides detailed responses regarding the above concerns including, but not limited to; Biological Resources (see Section 3C); Cultural Resources (see Section 3F); Purpose and Need and Proposed Action (see Section 3R); and Socioeconomics and Environmental Justice (see Section 3S).

J. General Support

Comment Summary

Commenters stated that they are in support of SpaceX's proposal to increase the launch and landing cadence of its Starship and Super Heavy vehicles at the Boca Chica launch site. They emphasize the economic benefits, such as job creation and local economic growth, and highlight SpaceX's commitment to environmental stewardship. Many believe that the increased launch cadence is crucial for maintaining U.S. leadership in space exploration, enhancing national security, and advancing technological innovation. Commenters also stress the importance of space exploration for the future of humanity, advocating for fewer regulatory obstacles. Additionally, some express excitement about the educational and inspirational impact of SpaceX's activities on future generations.

Comment Response 10

FAA recognizes the public’s support on the proposed project.

K. Hawaii Concerns

Comment Summary

Commenters expressed concern that SpaceX's proposed splashdown near Hawai'i could threaten marine ecosystems, cultural heritage, and the future sustainability of Hawai'i. The ocean, which is vital for food, livelihoods, and spiritual practices, could be severely impacted by spacecraft debris and toxic contamination. More specifically, commenters expressed concern about potential environmental and cultural impacts to Papahānaumokuākea Marine National Monument, a UNESCO World Heritage Site, which supports species such as the Hawaiian monk seal, green sea turtle, and various seabirds and holds profound cultural and spiritual significance for Native Hawaiians. Commenters request the FAA engage in meaningful consultation with local communities, stakeholders, and the Office of Hawaiian Affairs to protect this invaluable ecological and cultural treasure.

Comment Response 11

FAA received thousands of comments expressing concern about the potential landing area and impacts to Hawaiians and resources in that area. This fulsome public engagement by the Hawaiian community and others in the Hawaiian Islands was helpful to FAA and the applicant and has resulted in revision to the landing area to address these concerns. The FAA has taken the concerns to the applicant who has been able to revise the potential landing area to create a large buffer outside the U.S. Exclusive Economic Zone (EEZ) (12-200 nm) around Hawaii and to establish an additional 50-nautical mile buffer zone outside the 200 nm boundary of the Papahānaumokuākea Marine National Monument. The FAA notes this extensive engagement in the public process by the Hawaii community and has modified the project as possible, to address these concerns. Specifically, the modification of the landing area to be further away from Hawaii and the Monument, and now entirely in international waters, addresses the concerns that were raised.

These changes significantly reduce potential environmental impacts by:

- Protecting Sensitive Ecosystems: The removal of the U.S. EEZ from the Pacific action area from the U.S. EEZ ensures that operations avoid areas of unique biodiversity and cultural significance, thereby minimizing risks to marine life and ecosystems associated with the monument.
- Avoiding Overlap with Protected Areas: The establishment of a buffer zone around the monument ensures that activities remain at a safe distance from the boundary, reducing the likelihood of any adverse impacts on the marine environment.
- Mitigating Potential Cross-Boundary Impacts: By revising the action area, the likelihood of debris dispersion affecting the Hawaiian Islands and surrounding waters is significantly decreased and expected to be negligible.

The Revised Draft EA comment period was extended from November 20, 2024, to January 16, 2025, to provide sufficient opportunity to comment and to provide more than 30 days for the public to review the Revised Draft EA prior to the meetings. The FAA also provided an opportunity to submit comments during these meetings and encouraged all interested public and stakeholders to submit comments on the Revised Draft EA.

Public comments related to consultation with Hawaiian groups and opportunities for public involvement are also addressed in Section 3E. Consultation and Section 3Q. Public Involvement.

L. Hazardous Material

Comment Summary

Commenters asked to define a soft water landing. Commenters expressed concern that the Proposed Action could increase the possibility of producing space debris that could fall into the ocean. Commenters stated that debris, which includes hazardous materials such as unspent fuel and metal fragments, can pose significant threats to marine life and water quality and that such practices violate the Ocean Dumping Act, stressing that SpaceX should be required to recover all debris rather than using the ocean as a dumping ground. The comments argue that SpaceX's proposal to discard debris into the ocean would require a permit. Comments also highlighted past incidents where rocket anomalies have exploded and caused extensive damage and stated that the FAA has failed to take a "hard look" at these worst-case scenarios such as rapid unscheduled disassembly events and the cumulative risks associated with increased launch frequencies, including the potential dangers of launching rockets near existing LNG depots or other critical infrastructure and threats to public health.

Some commenters criticized FAA's reliance on the assumption that the reliability of SpaceX's rockets will improve over time with increased launch frequency and requested further evidence to support the claim of improved reliability.

Commenters also raised concerns about the impact of SpaceX's launch operations on the National Airspace System (NAS). Commenters highlighted potential risks to air traffic safety due to the lack of adequate real-time tracking and alerting systems for falling debris during rocket launches and reentries, and commenters also highlighted the need for further analysis using real-world data as well as advanced automation tools to provide real-time surveillance and immediate alerts to flight crews about potential hazards from space operations. Specific EA requests included additional information on 1) the amount of time involved in the operation from take-off, reentry, and landing; 2) airspace impacts on surrounding/adjacent airports, based on vehicle trajectories; and 3) operational impacts for airspace closures such as longer flight routes, additional fuel burn/carbon emissions, longer flight duration, and delays to access airports.

Commenters also requested that the EA provide more detailed information on the risks and effects of future liquid oxygen spills, including their potential to contaminate sensitive habitats and public lands in the HazMat section. Commenters similarly requested a more thorough analysis of contaminants present in the deluge water and the potential to accumulate in sediments and bioaccumulate in aquatic life as well as a more detailed analysis of the potential consequences of fuel spills, leaks, and residual propellants.

Several comments questioned whether Mexico or Tamaulipas can intervene to protect their property and people from hazards associated with the launch activities, especially since the established launch hazard zone extends into Mexican territory and waters.

Comment Response 12

Under 14 CFR Part 450, the FAA requires launch and reentry operators to provide detailed safety analyses and demonstrate compliance with risk thresholds for the uninvolved public and the National Airspace System (NAS). SpaceX must develop robust debris risk analyses for both nominal and off-nominal events, including reentry failures, to meet regulatory safety standards. The Air Line Pilots Association (ALPA) recommendation to enhance real-time tracking and alerting tools for falling debris is noted. Real time

communications do occur through use of the Air Traffic Organization (ATO) Space Operations' Mission Hotline, which includes the space operator, ATO, including facilities actively working the sectors surrounding Notice to Airmen (NOTAM) airspace, and any other entity whose presence may facilitate real-time management of the release and return of airspace associated with the entry. Some operators, including SpaceX, stream vehicle telemetry to the FAA's Space Data Integrator (SDI) which provides real-time location of the vehicle to the ATO Space Operations.

The FAA acknowledges the request to further clarify the parameters of soft water landings. A soft water landing is when the launch vehicle intentionally slows its speed to land in the water without damaging the vehicle.

Hazardous materials transportation, storage, and disposal is discussed in Section 3.2.10 of the Final Tiered EA. Both the 2022 PEA and Final Tiered EA impose numerous mitigation measures on SpaceX to ensure that the effects of hazardous materials transportation, storage, and disposal are not significant, including:

- Debris and Fire Management: Coordination with agencies like the USFWS, the Texas Parks and Wildlife Department (TPWD), and others ensures debris removal, fire response, and habitat restoration.
- Traffic and Closure Plans: SpaceX is required to notify residents and manage traffic disruptions under approved closure and traffic control plans.

Additionally, SpaceX must implement:

- Spill Prevention, Control, and Countermeasures (SPCC) Plan: Required for hazardous material handling to prevent spills and address emergencies.
- Stormwater Pollution Prevention Plan (SWPPP): Implemented to manage stormwater discharges and prevent contamination.

Commenters raised specific concerns about debris effects on marine environments. The FAA requires SpaceX to recover large floating debris from ocean landings as necessary. The Final Tiered EA includes analysis of how structural debris interacts with marine environments and considers the inert nature of remaining debris after controlled ocean landings.

Commenters also raised specific concerns about cumulative effects of rocket launches on marine and atmospheric environments. The FAA is aware of ongoing scientific discussions regarding the cumulative effects of rocket activity on atmospheric and marine environments. However, many of the studies cited in comments pertain to: different rocket technologies (such as solid rocket boosters, which produce aluminum oxide) than Starship/Super Heavy that cause different emissions. Starship and Super Heavy use methane and liquid oxygen, which do not generate aluminum particulates. Liquid methane and liquid oxygen become gaseous and would evaporate quickly and would not impact the marine environment. As discussed above, methane emissions associated with Starship/Super Heavy launches are not expected to significantly affect air quality or have significant climate effects.

Additionally, analysis of atmospheric environments is limited by available data. There is neither a generally accepted method for analyzing impacts to stratospheric ozone depletion because the necessary data and tools do not exist to accurately estimate emissions of black carbon from rockets and any associated radiative forcing effects nor a way to identify potential mitigation measures to address such emissions if effects were foreseeable. While the FAA does not object to including a concise high-level summary of

climate or ozone-related effects noted in the comments, a detailed analysis or effort to quantify the atmospheric effects of this project is not feasible. Any quantification would be based on speculative assumptions and hypotheses rather than actual data.

Commenters also raised specific concerns about debris impacts. The FAA requires SpaceX to assess and mitigate risks associated with anomalies and falling debris and comply with the Commercial Space Launch Act's (CSLA) demanding safety requirements. Landing areas are carefully selected to avoid populated regions, and debris recovery protocols are in place. The FAA analyzes each anomaly to refine safety measures and ensure that corrective actions are incorporated into future operations.

Regarding the evaluation of worst-case scenario effects to nearby operations such as the LNG terminals, NEPA does not require evaluation of worst-case scenarios that are not reasonably foreseeable. Other FAA commercial space regulations require the FAA to coordinate with neighboring potentially hazardous operations, including industrial facilities such as LNG terminals, to assess and mitigate any risks posed by space operations. This coordination process includes evaluating safety and property risks caused by space launches and reentries and meeting conservative safety requirements, with particular attention to safety zones, noise impacts (including sonic booms), and other operational risks. But any consideration of worst-case scenarios is outside the scope of NEPA review. Finally, commenters raised concerns about whether the proposed action would result in dumping requiring a permit under the Ocean Dumping Act. The FAA does not propose authorizing any activities that would be constitute "dumping" under the Ocean Dumping Act. The intentional disposal of waste into the ocean is distinct from incidental material release during space operations, which falls outside the Ocean Dumping Act's regulatory scope. The Ocean Dumping Act regulates the deliberate disposal of waste materials into U.S. territorial waters and designated dumping sites. It applies primarily to dredged material, industrial waste, sewage sludge, and other designated pollutants requiring an EPA permit. Here, planned downrange activities associated with Starship involve only the incidental jettisoning of components designed for atmospheric reentry and controlled descent. Unintentional marine debris from space activities is governed by FAA regulations, international treaties, and MARPOL Annex V. Further, FAA has responded to commenters' concerns by revising the Final Tiered EA to remove the Pacific action area from the U.S. Exclusive Economic Zone (EEZ) (12-200 NM) and establish a buffer zone around the boundary of the Papahānaumokuākea Marine National Monument to protect it from spacecraft debris.

See Section 3C, Biological Resources, for further discussion of marine resource impacts associated with hazardous materials and debris.

M. Land Use

Comment Summary

Commenters expressed concern that increased launches would reduce public access to Boca Chica Beach, Boca Chica State Park, South Bay, the Boca Chica Unit of the Lower Rio Grande Valley National Wildlife Refuge, and Palmito Ranch Battlefield National Historic Landmark. These commenters requested further data to support the EA language that closure hours would not change and indicated any closures violate the Texas Constitution, the Texas Open Beaches Act, and other legal frameworks such as the Coastal Zone Management Act and the National Wildlife Refuge System Improvement Act. Commenters said that the closures could also impact the community's recreational activities and could disrupt the cultural practices of the Carrizo/Comecrudo Nation. Commenters stated that the EA fails to thoroughly analyze impacts to recreational boating, both in terms of access and safety risks, and that more accurate and reliable communication methods are necessary to inform the public about closures. Additionally, commenters recommended that the EA assess or quantify waterway closures or redirection of marine vehicles for the increased number launches and landings.

Commenters also expressed concern that increased project traffic will exacerbate congestion, hinder public access, and strain local infrastructure and that a more in-depth traffic analysis is necessary.

Comment Response 13

The proposed increase in launch cadence does not change the total number of authorized access restriction hours, which remains at 500 hours per year for general operations and 300 hours for anomaly response. Actual access restrictions have not exceeded these authorized limits, and operational efficiencies have led to a 95% decrease in hours needed per launch compared to earlier launches in the program. SpaceX has also implemented measures to reduce access restrictions, including moving certain testing operations to Massey's Test Site, which increases access to Boca Chica Beach. Temporary access restrictions also remain subject to an existing Memorandum of Agreement between Cameron County and the Texas General Land Office and the requirements in SpaceX's Roadway Closure Traffic Control Plan. Based on these findings, the FAA has concluded that public access and road traffic would not be significantly, adversely affected by increased launch operations. While the Proposed Action would have some unavoidable impacts due to increased traffic, lighting during nighttime operations, and intermittent and temporary access restrictions to Boca Chica Beach (see Section 3.2.12.2), these impacts would be minimized and not significant based on SpaceX's ongoing implementation of its Roadway Closure Traffic Control Plan, SpaceX's ongoing notification of the mitigation measures identified in the 2022 PEA.

While closures are necessary for public safety during launch and testing activities, the FAA has worked to minimize these disruptions and balance access considerations for the community and cultural resources, including the Carrizo/Comecrudo Nation. Boca Chica Beach and State Highway 4 remains accessible to the public outside of the 500 hours of scheduled access restrictions, which are necessary to protect public safety during launch operations.

The FAA has worked with local agencies to communicate closure schedules effectively, ensuring that the public is informed and can plan visits accordingly.

As discussed in the 2022 PEA, these closures have and will continue to be conducted in accordance with all applicable laws and regulations, including the Texas Open Beaches Act, the Texas Constitution, the Coastal Zone Management Act, and the National Wildlife Refuge System Improvement Act. As in the 2022

PEA, the FAA has determined that the access restrictions do not constitute a violation of these statutes, as they are temporary, legally authorized for public safety, and implemented in coordination with relevant state and federal agencies.

Waterway closures are also discussed in Section 2.5 of the Final Tiered EA. The Final Tiered EA considers potential disruptions to marine traffic due to launch, landing, and recovery operations. The FAA coordinates with the U.S. Coast Guard (USCG) and other relevant authorities to assess and mitigate risks associated with waterway closures. While temporary access restrictions may be necessary for safety, the FAA works with stakeholders to minimize impacts on commercial and industrial activities. All launch and reentry operations would comply with necessary notification requirements, including issuance of NOTMARs, as defined in agreements required for a launch license issued by FAA. These measures would help to ensure public awareness and safety during the proposed operations.

N. Level of Environmental Review/NEPA Process

Comment Summary

Some commenters argued that an EA is insufficient and requested a more robust analysis of environmental impacts of the Proposed Action or preparation of an EIS. Commenters who were not satisfied with the current environmental review stated that the EA relies on outdated data and does not reflect the proposed scope and scale of SpaceX's operations, does not fully account for environmental impacts deemed to be significant by commenters, does not provide sufficient mitigation measures, and does not meet the legal requirements of NEPA and other relevant environmental regulations.

Commenters were concerned about sufficient analysis of environmental impacts due to fire, debris, nighttime lighting, sonic booms, wastewater discharges, and release of hazardous materials, related to impacts to:

- Damage to wildlife and habitats, including migratory birds, sea turtles, whales, seals, corals, fisheries, endangered species, species endemic to Hawaii, National Wildlife Refuges, and Marine National Monuments
- Impacts to water quality and wetlands
- Beach access restrictions and non-compliance with the Texas Open Beaches Act
- Impacts to land and waters of Hawaii that are of cultural importance to Native Hawaiians
- Sound and vibration impacts to nearby residents and their buildings/properties as well as local historic properties and transportation infrastructure
- Impacts to amount of local water supply

Some commenters requesting an EIS noted that an EIS has never been prepared for the Starship Super Heavy construction, testing, and launch operations at Boca Chica. Commenters stated that the preparation of a separate or tiered EA and previous Written Re-evaluations did not fully consider cumulative impacts of the program. Some commenters asked why an EIS was not being prepared for Starship Super Heavy operations at Boca Chica when EISs are being prepared for the same vehicle at KSC and CCSFS. One commenter requested separate EISs for launching and landing activities, as they affect different locations.

Some commenters requested additional or compensatory mitigation to offset impacts.

Some commenters stated that an EA is not appropriate if it was “unknown” whether impacts would be significant, or because the commenters felt that the FAA should have concluded impacts were significant. Commenters also stated that the EA did not sufficiently analyze launch failure scenarios. Some commenters requested analysis of long-term impacts.

Some commenters requested that an EIS (or revised EA) be prepared by “independent and impartial assessors”.

Comment Response 14

The EA was prepared consistent with NEPA, and the FAA’s NEPA-implementing regulations, FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*. The Final Tiered EA tiers off the 2022 PEA

prepared for the Starship/Super Heavy program by incorporating information about effects from the PEA and evaluating effects that would change under the Proposed Action.

The current Final Tiered EA evaluates the increased cadence of Starship/Super Heavy launches at the Boca Chica launch site based on the impacts of the new maximum number of annual launches for this specific vehicle. For example, emissions and noise/sonic booms were modeled specifically for the Starship/Super Heavy vehicle and the current proposed activity. Construction analyzed in previous environmental documents related to SpaceX activities at the Boca Chica launch site has already been completed, and would therefore not happen as a part of the Proposed Action in the current Final Tiered EA. The Final Tiered EA considers cumulative impacts related to all ongoing and reasonably foreseeable activities relevant to the Boca Chica launch site (Section 3.3 of the Final Tiered EA).

As the Starship/Super Heavy program moves from testing to nominal operations, it is not expected to increase the probability of an anomaly occuring due to the increase in reliability and capability of the vehicle. To respond to anomalies affecting adjacent properties, SpaceX has implemented a fire suppression system and deluge system to prevent the risk of fire and suppression of debris at the launch pad (analyzed in the April 2023 and November 2023 Written Re-evaluations), which will continue as a part of the Proposed Action and mitigate impacts in the unlikely event of future anomalies.

The FAA independently evaluated the Final Tiered EA. The FAA considered the comments provided on the Draft EA during the public review period and has made changes as described in Appendix C. As explained in the Affected Environment and Environmental Consequences chapter of the Final Tiered EA (Section 3) and further addressed in responses to comments (Final Tiered EA Appendix C), the Proposed Action would not introduce new or significantly different environmental effects that would rise to the level of significance under NEPA. Therefore, an EIS has not been prepared for this project.

The FAA is preparing EISs for Starship/Super Heavy operations at KSC and CCSFS due to the scope of those Proposed Actions and potential impacts compared to the significance thresholds under NEPA.

Regarding potential environmental impacts in Mexico, the FAA coordinated with the U.S. State Department and Mexico consistent with FAA Order 1050.1F, Paragraph 8-6, and Executive Order 12114, *Environmental Effects Abroad of Major Federal Actions*, 44 *Federal Register* 1957 (January 9, 1979).

O. Mitigation

Comment Summary

Commenters expressed concern that the EA mitigation measures are ineffective at avoiding or minimizing the impacts of SpaceX operations. Commenters viewed as insufficient proposed new mitigation measures included in the EA, such as developing field experiments to determine the extent of the gravel plume impact area, investigating field techniques to protect identified nests during launch events, a literature review of impulsive noise effects, financial contributions, identifying and prioritizing a list of research studies, and monitoring the impacts of SpaceX's operations. Commenters contend that these measures are inadequate to mitigate significant effects because SpaceX is not required to implement them before the Proposed Action begins, and these measures fail to address the immediate need for proven techniques to minimize impacts. Commenters called for realistic, enforceable new on-site and off-site mitigation measures and information on compliance with all existing mitigation measures.

Several commenters also recommended new measures, including SpaceX financial contributions to the state of Hawaii and avoiding rocket launches and other activities during the migratory bird breeding season (mid-February through August), and requiring use of an employee shuttle.

Comment Response 15

The FAA coordinated with agencies such as USFWS, NMFS, and the Texas Parks and Wildlife Department (TPWD) to assess environmental risks and determine appropriate mitigation measures. The EA builds upon previous environmental reviews and incorporates new data from:

- Biological Opinions & Environmental Monitoring – Informing species protection strategies
- Public & Agency Feedback – Addressing concerns from conservation groups and regulatory agencies
- Updated Acoustic & Air Quality Modeling – Refining impact predictions and mitigation strategies
- Operational Experience from Prior Launches – Incorporating lessons learned from previous Starship test flights

Key Mitigation Measures and Their Effectiveness

A. Wildlife Protection Measures

- Expanded Biological Monitoring & Habitat Protection
    - Increased monitoring of protected species, including the piping plover, red knot, sea turtles, and ocelots will facilitate continued tracking of effects and inform adaptive management.
    - Pre- and post-launch surveys to assess impacts and adapt mitigation strategies will continue to provide information on the effects of SpaceX's activities and inform strategies to further mitigate any adverse effects.
    - FAA coordinates with USFWS and TPWD to ensure mitigation measures are implemented effectively.
    - SpaceX would continue to conduct biological monitoring pre- and post-launch to evaluate avian species and vegetation changes due to SpaceX activities.

- Relative to plumes, SpaceX will monitor for impacts to nesting MBTA species through use of infrared drone surveillance. SpaceX commits to working with USFWS to develop a protocol to conduct pre-launch drone surveys in order to detect avian nests in open wind/tidal flat habitat south of the VLA, within the identified impact area. SpaceX would also perform a post-launch survey to evaluate identified nests in coordination with USFWS, TPWD, and/or a USFWS-approved biologist. SpaceX, or their contractor, would obtain necessary permits as applicable. SpaceX would provide pre-and post-launch nesting bird reports to the FAA and USFWS within two weeks of each launch event taking place during the avian breeding season (February 15 through August 31).

- Lighting and Activity Restrictions for Sensitive Species
  - Shielded and reduced-intensity lighting minimizes disruption to sea turtle nesting and migratory birds.
  - Elimination of nighttime static fires further reduces light and noise exposure, mitigating potential adverse effects.
  - Regulatory agencies have reviewed and approved these measures as effective at reducing wildlife impacts.

- Rocket Debris Recovery & Habitat Restoration
  - SpaceX is required to recover debris and restore impacted habitats under a formal Memorandum of Understanding (MOU) with TPWD.
  - Ongoing compliance monitoring ensures prompt recovery of debris and restoration efforts to mitigate habitat disturbances.
  - Regulatory agencies, including TPWD and USFWS, have determined these measures mitigate impacts through concurrence of a *de minims* under Section 4(f).

B. Marine Protection Measures

- Designated Avoidance Areas for Marine Mammals & Fisheries
  - Established marine avoidance zones for Rice's whale and other ESA-listed species reduce potential disturbances.
  - The Pacific action area has been removed from the Hawaiian EEZ, ensuring operations avoid unique biodiversity and cultural areas such as Papahānaumokuākea Marine National Monument.
  - In response to public comment, the FAA has made modifications to ensure that landing zones minimize overlap with protected marine habitats and whale migration corridors. Mitigation measures include designated avoidance areas and tracking of marine wildlife presence to adjust operations when necessary, as follows:
    - A designated buffer zone around the Papahānaumokuākea Marine National Monument ensures activities remain at a safe distance, reducing the risk of adverse impacts.
    - By shifting the action area, the likelihood of debris dispersion impacts affecting the Hawaiian Islands is expected to be negligible and not significant.

        - Post-launch evaluations track potential impacts in marine species to inform adaptive management.

C. Air & Water Quality Protections

- Deluge Water & Stormwater Management
    - SpaceX's use of the deluge water system helps suppress dust, debris, and fire and protect the launch system. The deluge system also helps dampen noise near the launch site, thus further reducing noise effects on nearby wildlife and humans.
    - SpaceX has implemented a water sampling program to monitor chemical composition and ensure compliance with Texas Surface Water Quality Standards. Data collected to date indicates no impacts to water quality have occurred.
    - The FAA has determined that these measures effectively prevent significant water quality impacts.
- Pollutant Control & Waste Management
    - Ongoing air quality monitoring ensures emissions remain within regulatory limits and do not exceed significance thresholds.
    - Strict hazardous material handling procedures prevent contamination and ensure compliance with environmental laws.3. Adaptive Management & Ongoing Monitoring

In general, the mitigation framework in the EA follows an adaptive management approach, meaning that mitigations will evolve based on ongoing monitoring, regulatory feedback, and environmental assessments. This allows for continuous improvements to minimize impacts as SpaceX operations progress.

- Real-time environmental monitoring and impact assessments ensure timely mitigation.
- Regular collaboration with regulatory agencies facilitates necessary mitigation updates.
- Commitment to ongoing data collection and public transparency ensures mitigation efforts remain effective.

Additionally, SpaceX is working with Cameron County to enhance natural and recreational resources through projects that provide the public with improved access to public beaches, greater community recreational, and educational opportunities, and improved parks and park amenities. SpaceX is contributing $15,000,000 to Cameron County towards these efforts which include:

- Andy Bowie Park and Pavilions & Parking Lot Improvements
- Isla Blanca/Amphitheater Road Improvements
- Beach Access #3 Improvements
- Laguna Madre Estuary
- Adolph Thomae Boat ramp Dock Renovations
- Pedro "Peter" Benavides Park Mountain Bike Trail Improvement
- Santa Maria Park Improvements/Community Center

- Jaime Zapata Boat Ramp Improvements
- Isla Blanka Park Entrance Improvements
- Boat Ramp/SPI Convention Center

The 2022 PEA and Finding of No Significant Impact (FONSI)/Record of Decision (ROD) included numerous mitigation measures to ensure that the potential impacts of SpaceX's launch program would not have significant impacts on the environment. SpaceX maintains ongoing compliance with all such mitigation measures. SpaceX must continue to adhere to these mitigation measures, as well as any additional mitigation measures imposed by the Final Tiered EA, under any new or modified license.

P. Noise and Noise-Compatible Land Use

Comment Summary

Commenters expressed concern that noise levels would cause negative impacts to local residents and wildlife. More specifically, commenters expressed concern for damage to personal property (e.g., house/window breaking/rattling) due to noise, vibrations, and sonic booms, as well as potential harm to historical sites and cultural landmarks within community hubs and other critical infrastructure. Commenters also had questions about whether insurance will cover damage caused by rocket launches and the process for filing claims against SpaceX or the FAA. Commenters requested that the FAA continue monitoring potential noise disturbances and monitor ground motion at greater distances from the launch site, as well as ensure unbiased third-party oversight of claims related to structural damage caused by launches and landings.

One commenter stated that the noise model used in the assessment for SpaceX's increased launch frequency is flawed because 1) the model's assumptions about ground impedance are incorrect, as the model treats large reflective water bodies, such as South Bay, Bahia Grande, and Laguna Madre, as absorptive land, which could lead to a significant underestimation of noise levels in surrounding areas, particularly populated regions; 2) the model fails to disclose essential inputs and assumptions, such as specific ground impedance values, atmospheric conditions, and sound power levels, preventing a thorough evaluation of its accuracy and reliability; 3) the model does not account for the cumulative impacts of noise from all sources, including launches, landings, and sonic booms, instead analyzing each event separately instead; 4) the model relies on outdated and insufficiently protective noise thresholds, such as OSHA's 115 A-weighted decibels (dBA) standard for hearing conservation; and 5) the model inappropriately uses a supplemental metric (C-weighted day-night average sound level) as the primary metric, contrary to FAA guidelines that mandate the use of A-weighted day-night average sound level for cumulative impacts. The same commenter requested an expanded noise health analysis to include children's heath, sleep interference, and learning impacts and questioned whether the FAA's Office of Environment and Energy provided prior approval for the use of RNOISE. Commenters requested that the noise section be updated with additional, recently published literature.

Commenters also called for a more accurate and transparent representation of the expanded noise impact area, ensuring that all affected regions are fully considered and adequately protected in the environmental review process.

Comment Response 16

Potential for structural damage due to noise events generated by the Proposed Action, including overpressure and vibration effects, is disclosed in EA Section 3.2.3. Potential impacts to wildlife due to noise is discussed in section 3.2.8 in the EA. Noise and sonic booms were modeled using RNOISE and PCBOOM. PCBOOM is an FAA-approved model for calculating the location and magnitude of sonic boom overpressures on the ground from supersonic flight. The FAA's Office of Environment and Energy approved the use of RNOISE (described below) for predicting propulsion (engine) noise of Starship/Super Heavy operations. The EA analyzed the significance of noise levels and impacts in accordance with FAA Order 1050.1F and Order 1050.1 Desk Reference, Chapter 11. Additional responses on noise are provided in Section 5 DD below.

RNOISE

The RNOISE model is a tool specifically designed for predicting far-field community noise from launch vehicles. Developed in the 1990s by Dr. Ken Plotkin of Wyle Laboratories, RNOISE incorporates advanced algorithms and has been validated through numerous applications, including the Evolved Expendable Launch Vehicle Program at Vandenberg Air Force Base in 1998. RNOISE employs a spectral time simulation approach, generating predictions of one-third octave band spectra on the ground as a function of time. This model accounts for various factors, including the moving source characteristics of launch vehicles and atmospheric propagation effects. While it assumes uniform ground elevation and a single ground impedance value, these assumptions are standard in environmental noise modeling and have been shown to provide reliable predictions. The FAA acknowledges commenters' concern that RNOISE assumes uniform ground elevation but disagrees with commenters' contention that this leads to underestimation of noise levels. Rather, the fact that RNOISE assumes uniform impedance values for all surfaces may lead to minor overpredictions of noise levels in areas with significant terrain variations. Consequently, RNOISE generates conservative estimates that ensure that potential impacts are not underestimated. Additionally, the ground impedance values used in the model are representative of the prevalent land cover types in the vicinity of the launch site, aligning with standard practices in environmental noise assessments.

In the EA, SpaceX updated the noise and sonic boom modeling to account for the increased thrust, increased frequency of launch activity, and a more comprehensive suite of trajectories and weather conditions that could occur with an increased launch rate. Additionally, SpaceX has provided launch and landing noise measurement data to the FAA, which demonstrates an agreement with the predicted (modeled) sound levels and deviations are on par with the measurement uncertainty. Consistent with FAA guidance, the FAA and SpaceX used A-weighted DNL and supplemented the analysis with the use of C-weighted DNL (CDNL), which is more appropriate for assessing impulsive noise events such as sonic booms, because C-weighting accounts for low-frequency energy in launch noise, which can cause vibrations and impact structures. Using both DNL and CDNL ensures that both general noise exposure and low-frequency noise impacts are accurately assessed, providing a more complete evaluation of potential noise impacts.

PCBOOM

PCBOOM is a physics-based sonic boom modeling tool developed to predict the propagation, intensity, and geographical extent of sonic booms generated by supersonic vehicles. The model has been widely used in aerospace and environmental studies, including FAA assessments for commercial space and aviation projects. PCBOOM incorporates nonlinear acoustic propagation principles to estimate the sound levels and pressure waves experienced on the ground due to supersonic flight or reentry events.

In the context of the SpaceX Starship/Super Heavy program, PCBOOM was utilized in the EA's Noise Assessment to estimate sonic boom impacts from landings.

The PCBOOM analysis for the Proposed Action included the following key parameters:

- Vehicle Trajectory Data: SpaceX provided vehicle flight paths, descent angles, and velocities, which are critical for determining where and how sonic booms would be generated.
- Boom Overpressure Estimates: The model calculated peak overpressure values (measured in pounds per square foot or psf) at various locations under the vehicle's flight path.

- Atmospheric & Environmental Conditions: The model accounts for temperature, humidity, and wind effects, which influence how sonic booms propagate and where they are perceived.
- Geographical Considerations: The analysis considered overwater and overland boom effects, focusing on marine sanctuaries, inhabited areas, and critical habitats.

Noise monitoring results

Based on the EA findings, the FAA has determined that no significant effects are anticipated from launch-related noise, including sonic booms. For noise effects on humans, the FAA appropriately used OSHA's threshold for noise exposure in addition to the 65-dBA significance threshold, both of which the FAA recommends using in its NEPA guidance. The OSHA standard of 115 dBA is a health-protective standard meant to protect against hearing damage. DNL and CDNL are used to assess potential human annoyance from launch and landing noise. The EA concludes that the proposed action would not exceed the thresholds identified for hearing damage (115 dbA) or annoyance (DNL 65 dBA; CDNL 60 dBC) in areas where humans would be present during a launch or landing activity.

The FAA appropriately used CDNL as its primary metric for evaluating noise effects from supersonic operations. As stated above, CDNL more accurately assesses the potential annoyance of low-frequency noise. Refer to EA Section 3.2.3 for DNL and CDNL predictions.

Commenters expressed concern that recent studies indicate that sonic boom levels from Starship/Super Heavy launches may be higher than modeled. The commenters refer to the data collection efforts of Brigham Young University (BYU) researchers during the first land landing of the Super Heavy booster at the VLA. The BYU study states: "(a) A-weighted sound exposure levels during launch are 18 dB less than predicted at 35 km; (b) the flyback sonic boom exceeds 10 psf at 10 km; and (c) comparing Starship launch noise to Space Launch System and Falcon 9 shows that Starship is substantially louder; the far-field noise produced during a Starship launch is at least ten times that of Falcon 9."

The FAA acknowledges this study and recognizes this is a single data point set and does not necessarily represent the median result/expectation. Complete comparison of the data SpaceX collected and provided to the FAA and BYU's measurements are in agreement with the exception of the 10 psf outlier. This was the only measurement placed on the roof of a building, which could indicate reflective surfaces or other cause for deviation.

As described in the EA, at 10.0 psf, the likelihood of superficial (e.g., plaster, bric a brac) damage and window damage becomes more plausible but is generally still expected to be a very low probability and predominantly due to poor existing conditions, such as pre-cracked, pre-stressed, older and weakened, or poorly mounted windows (Benson 2013, White 1972, Fenton 2016, Maglieri 2014). Additionally, section 3.2.3.6 of the draft Final PEA notes that although recent modeling predicted that noise contours would extend slightly further than predicted in the 2022 PEA, no structural damage or significant impact to third-party structures is anticipated (FAA 2023).

In the unlikely event that a launch or landing results in structural damage, the FAA requires that SpaceX carry insurance in the amount of the "Maximum Probable Loss," which is determined on a launch-by-launch basis by the FAA and is up to $500,000,000 per launch. FAA requires SpaceX to maintain insurance in the unlikely event of claims of structural damage resulting from flight of the Starship/Super Heavy launch vehicle. Property owners may contact SpaceX directly (insurance@spacex.com) to submit claims and evidence in support of the damage claim.

While noise effects on humans and structures are not expected to be significant, SpaceX will continue to implement their public notification plan to educate the public and announce when a launch or landing event would occur in order to reduce potential startle responses from high-noise activities and thus mitigate the potential effects of high-noise activities by increasing public awareness. Additionally, in accordance with the 2022 PEA, and the SpaceX Boca Chica Vibration Monitoring Plan, SpaceX would continue to monitor launch vibrations for a total of 5 orbital launches at various locations 2, 3, 5, and 8 miles from the VLA to confirm that vibration does not pose a risk of structural damage. SpaceX would also continue to enforce access restrictions during launch operations so that no visitors or village residents would be present at noise sensitive areas within a 4-mile radius.

Q. Public Involvement

Comment Summary

Commenters stated that the public involvement process is inadequate and excludes low-income, marginalized, bilingual, and primarily people of color and Indigenous communities of the Rio Grande Valley. These commenters also stated that FAA has not provided sufficient notice, Spanish-translated materials, or adequate time for public comment. Commenters requested engagement with local stakeholder groups, including the Carrizo/Comecrudo Tribe of Texas, as well as extension of the comment period, additional open public meetings in Brownsville, Texas, and other impacted areas, and a meeting that allow attendees to hear the public comments from their peers. Commenters noted that last-minute cancellations of in-person and virtual meetings caused inconvenience and mistrust among residents. Commenters also emphasized a need to engage with Native Hawaiian organizations, institutions, and residents. In addition, concern was expressed that the EA references numerous documents from agencies like FAA, the National Aeronautics and Space Administration, NMFS, and USFWS that are not included or easily accessible to the public for review and comment. One commenter requested the FAA coordinate with the Mexican Space Agency.

Comment Response 17

FAA published the Revised Draft EA for public review and comment and provided notice of public meetings on November 12, 2024. Public meetings were held in-person on January 7, 2025, in Brownsville, Texas, and virtually on January 13, 2025. Spanish newspaper ads were published on November 22 and 23, 2024, announcing the publication of the Revised Draft EA and the public meetings. Therefore, both English and Spanish notices of the Revised Draft EA publication and public meetings were made more than 30 days prior to the public meetings. Additionally, a Spanish-language executive summary was prepared for the Revised Draft EA. Additional public meetings scheduled for January 9, 2025, in Port Isabel were cancelled due to the designation of that day as a National Day of Mourning to honor the late former President Jimmy Carter. Both the in-person and virtual public meetings included attendance by FAA staff and offered Spanish-translated materials and interpreters. Meeting materials were also available in English and Spanish FAA's website: https://www.faa.gov/space/stakeholder_engagement/spacex_starship. The Revised Draft EA comment period was extended to 59 days to provide sufficient opportunity to comment and to provide more than 30 days for the public to review the Revised Draft EA prior to the meetings. The FAA also provided an opportunity to submit comments during these meetings and encouraged all interested public and stakeholders to submit comments on the EA.

The FAA previously published a Tiered Draft EA for public review and comment on July 30, 2024. This Tiered Draft EA also analyzed an increased cadence of Starship/Super Heavy launches at the Boca Chica launch site. Due to additional information from SpaceX on the Proposed Action during the Tiered Draft EA public review period, the FAA cancelled public meetings associated with the Tiered Draft EA and began preparing a Revised Tiered Draft EA. During preparation of the Revised Tiered Draft EA, the FAA considered public comments received during the Tiered Draft EA public review period.

While the Carrizo/Comecrudo Tribe is not federally recognized, the FAA previously invited the Carrizo/Comecrudo Tribe to consult on multiple occasions to discuss proposed operations at this site and have not received a response.

The USFWS and NMFS BAs, along with additional agency consultation letters received after the Draft EA was published, are provided in Appendix A of the Final Tiered EA. Agency consultation letters associated with the 2022 PEA and subsequent WRs are available on the FAA's website: https://www.faa.gov/space/stakeholder_engagement/spacex_starship.

Regarding potential transboundary environmental impacts in Mexico, the FAA coordinated with the U.S. State Department and Mexico consistent with FAA Order 1050.1F, Paragraph 8-6, and Executive Order 12114, *Environmental Effects Abroad of Major Federal Actions*, 44 *Federal Register* 1957 (January 9, 1979). The FAA has addressed concerns related to impacts in the waters around Hawaii in Section 3K.

R. Purpose and Need and Proposed Action

Comment Summary

One commenter stated that the EA's purpose and need is too broad and fails to both consider negative social impacts and to quantify the number of launches that are needed to achieve rapid launch capability and increase operational efficiency, capabilities, and cost effectiveness of the Starship/Super Heavy program.

Comment Response 18

The purpose and need is consistent with the U.S. government's space transportation goals of fostering a robust commercial space program that benefits the public in general, as well as the specific needs of Starship/Super Heavy launch program to provide greater mission capability to NASA and DOD. *See, e.g.*, National Space Transportation Policy of 1994 (goal of "assuring reliable and affordable access to space through U.S. space transportation capabilities is a fundamental goal of the U.S. space program"); 2021 Space Priorities Framework's Mission ("The United States will bolster the health and vitality of our space sectors – civil, commercial, and national security – for the benefit of the American people and leverage that strength to lead the international community in preserving the benefits of space for future generations."). SpaceX's Proposed Action would benefit government and public interests and reduce operational costs by including greater mission capability for space exploration and advancing reliable and affordable access to space, which in turn would advance the scientific and national security benefits of the U.S. space program as a whole. Demand for launch services has continued to increase over the past 20 years; increased launch cadence considered in this EA is based on the need to meet the space industry's growth projections into the foreseeable future.

SpaceX's proposed increase to up to 25 launches and 50 total landings (25 Starship landings and 25 Super Heavy landings) per year, as well as vehicle and operational upgrades, is necessary to support the rapid iteration, testing, and development of the Starship/Super Heavy program, which is essential for achieving full operational capability. The 25 launches per year is the reasonably foreseeable rate at which SpaceX has the engineering capability to launch. Starship is designed as a fully reusable system, and a higher launch cadence is required to validate reusability, refine vehicle performance, and progress toward operational goals such as lunar and Mars missions.

S. Socioeconomics

Comment Summary

Commenters stated that the EA did not sufficiently analyze the impact on local communities due to air emissions, noise, and environmental degradation, as well as reduced public access to local areas such as Boca Chica Beach, South Bay, the Boca Chica Unit of the Lower Rio Grande Valley National Wildlife Refuge, and Palmito Ranch Battlefield National Historic Landmark. Commenters said that frequent closures of Boca Chica Beach are a major issue because the area is an important recreational space for lower-income residents and leads to the disruption of traditional cultural ceremonies. Commenters expressed concern that the FAA's proposed mitigation measures are insufficient to address project-related impacts and concern over the creation of a "company town" at Boca Chica Village and its potential to adversely affect community well-being.

Commenters also criticize the FAA for failing to comply with NEPA by not conducting meaningful outreach and engagement with environmental justice communities and indigenous groups, such as the Carrizo/Comecrudo Tribe of Texas and the Kanaka Maoli (Native Hawaiian people) to address their cultural, environmental, and human rights concerns. Additionally, commenters state that the FAA and SpaceX have not secured Free, Prior, and Informed Consent (FPIC) from indigenous communities, violating the United Nations Declaration on the Rights of Indigenous Peoples and the American Indian Religious Freedoms Act.

Commenters also expressed concerns about impacts on the recreational fishing and shrimping industries, particularly in the South Bay area, and requested a thorough analysis of the cumulative effects of SpaceX's wastewater discharges on the recreational and commercial activities in the region.

Coordination takes place with both the Texas Shrimp Association and the Navy of Mexico to ensure that fisherman are aware of test operations. Should there be changes to schedule, this information is conveyed in an effort to minimize impact on local shrimping and fishing activities.

Comment Response 19

As explained in the EA and above in Comment Response 13, the FAA has concluded that temporary access restrictions associated with the proposed action would not significantly affect the environment (Section 2.1.3.5 of the PEA and Section 3.2.12.2 of the EA). Licensed access restrictions would not change under the Proposed Action and would continue to be limited to 500 hours per year for operations plus 300 hours per year to address anomalies. Moreover, SpaceX will continue to implement its temporary access restriction notification system to ensure residents are aware of upcoming temporary closures and to minimize the duration of any such closures. SpaceX is also required to limit temporary access restrictions during holidays and summer months to accommodate access. SpaceX is working with Cameron County to enhance natural and recreational resources through projects that provide the public with improved access to public beaches, greater community recreational, and educational opportunities, and improved parks and park amenities. SpaceX is contributing $15,000,000 to Cameron County towards these efforts.

Changes to Boca Chica Village and its development—referred to as a "company town"—are independent of FAA-licensed launch and reentry operations and are not subject to review under NEPA in connection with the current Proposed Action. The EA evaluates the potential environmental impacts of FAA’s licensing actions related to launch and reentry operations, not SpaceX’s independent business or community

development decisions. Because these activities have independent utility and are not directly tied to the FAA's licensing decision, they fall outside the scope of the EA.

FAA clarifies that SpaceX operations at the Vertical Launch Area (VLA) do not discharge into South Bay. Any water that leaves the VLA has the potential to discharge in and around the water bodies adjacent to the VLA, which does not include South Bay. The VLA is separated from South Bay by State Highway 4. Starbase operations beyond those licensed by the FAA have independent utility and are not subject to review under NEPA in connection with the current Proposed Action. As such, discharge to South Bay from other SpaceX operations is outside the scope of the current analysis and does not impact the adequacy of the EA's assessment of biological resources.

For responses to commenters' concerns regarding air quality, biological resources, tribal outreach and engagement, and noise, see Sections 3A, Air Quality/Climate; 3C, Biological Resources; 3F, Cultural Resources; 3P, Noise and Noise-Compatible Land Use; and 3K, Hawaii Concerns.

T. Visual Resources

Comment Summary

Commenters expressed concern that the increase in frequency of nighttime launches could potentially affect nighttime views. Commenters also stated that the baseline condition of the site should not be described as industrial.

Comment Response 20

While the number of nighttime launches would increase from one orbital and one suborbital launch to up to three nighttime launches, SpaceX has significantly increased the efficiency of vehicle preparations, which results in a decrease in the amount of nighttime activity required per launch, thereby maintaining overall impacts at levels similar to those assessed in the 2022 PEA.

To further mitigate the effects of nighttime launch events, SpaceX will adhere to the conditions and measures outlined in the Lighting Management Plan. This plan includes minimizing the use of spotlights when not launching, directing light downward and low, and using amber lights to the greatest extent possible. Consequently, the Proposed Action is expected to have similar impacts on nighttime views compared to the impacts stated in the 2022 PEA and would not result in significant visual resource impacts. See Section 3.2.4 of the Final Tiered EA for additional discussion on visual resource impacts.

As described in Section 3H, General Effects and Cumulative Analysis, impacts associated with the operation of other existing facilities and infrastructure, including previous SpaceX development, are accounted for in the description of the affected environment. Therefore, no change to the baseline condition was made.

U. Water Resources

Comment Summary

Commenters expressed concern that SpaceX has failed to comply with Texas Commission on Environmental Quality (TCEQ) regulations for their SpaceX water deluge system for launching rockets, operating without the required permit, and increasing local environmental degradation. Commenters also expressed skepticism about the adequacy of the Texas Pollutant Discharge Elimination System (TPDES) industrial wastewater discharge permit, as it did not include discharge limitations for certain contaminants despite data suggesting their necessity. Commenters criticized the FAA for not fully analyzing the impacts of these activities, particularly the discharge of contaminants such as oil, grease, copper, mercury, thallium, and zinc into public lands and waterways. Commenters stated the contaminants have the potential to adhere to sediments and bioaccumulate in fish and birds, leading to long-term ecological damage and requested that the FAA ensures that SpaceX adheres to all applicable compliance terms and monitoring effluent to meet water quality standards.

Comments regarding liquid oxygen primarily focus on the need for greater transparency and thorough analysis of its potential environmental impacts on water resources, including wetlands, floodplains, surface waters, groundwater, and ocean waters.

Commenters also requested that the FAA 1) verify the impermeability of retention ponds used by SpaceX for managing deluge water discharge and to include those findings in the EA; 2) disclose the details of any Contaminant Monitoring Plan in the EA; and 3) commenters stated that SpaceX's purchasing of millions of gallons of water from the Brownsville Public Utilities Board results in water scarcity for the region and requested that the FAA evaluate the broader impact of SpaceX's water usage on the Rio Grande Valley water resources and provide measures to ensure sustainable water management in the EA.

Comment Response 21

The FAA does not administer the TPDES permit. The permitting process is overseen by the TCEQ which ensures compliance with Texas Surface Water Quality Standards (TSWQS) and includes measures to protect aquatic ecosystems and water quality. The TPDES permit for the deluge water system includes an antidegradation review by TCEQ to ensure that discharges will not degrade water quality or impair existing uses of affected water bodies. While concerns were raised about pollutants such as copper, mercury, zinc, and hexavalent chromium, the EA notes in Section 3.2.7 that water, air, and soil sampling from previous uses of the deluge system has not identified contamination levels that would exceed state or federal thresholds for water quality or shown that any ablation is occurring.

While the source of the water used in the deluge system is potable water trucked to Starbase from the Brownsville Public Utilities Board (BPUB), the FAA concludes that the deluge system will not have significant effects. Discussion of water usage and potential impacts to water availability within the region are discussed in Section 3.2.11 of the Final Tiered EA.

Testing of soil samples to date, indicate concentrations of stainless-steel constituents are variable, with some sites showing stable trends and others increasing and decreasing as compared to baseline or previous post-flight samples. Variation among samples is expected in most environmental media. There is no discernable trend to indicate that ablation of launch infrastructure is causing deposition of stainless-steel constituents into soil or benthic community. Soil chemical analysis results for the 21 sample locations reflect to be below Texas-specific soil background concentrations for post-launch sampling events.

Because the post-launch samples continue to remain below the background levels that naturally occur in the environment, the variations seen in the results are likely due to negligible changes in the environment and not from a point source.

The tidal wetlands within the Lower Rio Grande Valley National Wildlife Refuge are not expected to be impacted, and it is not anticipated that discharges will reach the Rio Grande River. Discharge will occur onto SpaceX-owned property and is expected to flow toward state water. Moreover, the volume of water discharged by the deluge system is comparable to natural precipitation events in the region and is therefore unlikely to result in significant habitat alteration.

Commenters raised concern about whether SpaceX was operating the deluge system with TPDES industrial wastewater discharge permit. SpaceX previously operated the deluge system under a multi-sector general permit. TCEQ subsequently told SpaceX that it had to apply for an individual TPDES permit to operate the deluge system. SpaceX has submitted that application and has been permitted by TCEQ to continue operating the deluge system. The final individual TPDES permit was issued to SpaceX on February 18, 2025. SpaceX has also resolved alleged violations associated with its past deluge system discharges with both TCEQ and EPA.

Regarding comments about effects of liquid oxygen on water quality, SpaceX has implemented containment measures, including an 83,000-gallon concrete basin, to manage liquid oxygen vents and prevent environmental damage. SpaceX vents oxygen as part of its standard test and launch operations. Typically, residual liquid propellant is returned to storage tanks for re-use, and is not regularly discharged or released into the environment. Minor impacts to vegetation could occur with the oxygen vent/release due to the cold temperature of the oxygen but impacts would be temporary (see discussion of impacts in Section 3.2.7 of the Final Tiered EA).

4. FAA Responses to Agency Comments

Agencia Federal de Aviación Civil
Dirección Ejecutiva de Aviación

No. de Oficio 4.1.4.- 1541/2024
Ciudad de México, a 22 de agosto de 2024

Mtra. Wilma Laura Gandoy Vázquez
Directora General de Asuntos Especiales
Secretaría de Relaciones Exteriores
Presente

Por medio de este conducto, se hace referencia a su Oficio Núm. DAE-02021/2024 de fecha 5 de agosto, mediante el cual comunica a esta Agencia Federal de Aviación Civil (AFAC) sobre la disponibilidad de la Evaluación Ambiental (EA), relacionada con la propuesta de SpaceX para aumentar el número de lanzamientos y aterrizajes de su vehículo "***Starship/Super Heavy***" en el sitio de lanzamiento de Boca Chica, Texas, Estados Unidos de América (EUA); promovida por la Administración Federal de Aviación de los Estados Unidos de Norteamérica en México.

Sobre el particular, esta AFAC toma nota del comunicado y en caso de aplicar enviará comentarios sobre la disponibilidad de la Evaluación Ambiental Preliminar por niveles (EA Preliminar), asimismo toma nota de las sesiones relacionadas con el tema en cuestión. No omito mencionar que, mediante Oficio Núm. DAE-02105/2024 de fecha 14 de agosto, emitido por la Dirección a su cargo, se ha dado aviso de la cancelación de las reuniones públicas; por lo que esta AFAC estará atenta a futuros comunicados sobre el tema.

Finalmente, se le hace la recomendación en lo concerniente a que este tipo de temas, tenga a bien incluir a la Agencia Espacial Mexicana quien cuenta con la capacidad técnica para estar en posibilidades de emitir comentarios acerca de los temas relacionados a actividades espaciales, a través de su titular Dr. Salvador Landeros Ayala, landeros.salvador@aem.gob.mx; serrano.antonio@aem.gob.mx; de igual forma hacer partícipe al Titular de la Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT).

Al agradecer la atención otorgada al presente, aprovecho la ocasión para enviarle un cordial saludo.

Atentamente

Cancela Pegasus: **EE000024-2593**

Ing. Pablo Carranza Plata
Director Ejecutivo de Aviación

c.c.p. Gral. Div. P.A. D.E.M.A. Ret. Miguel Enrique Vallin Osuna – Director General de la Agencia Federal de Aviación Civil

FRO / FJCM / JEVG / EBH

U.S. Department
of Transportation
**Federal Aviation
Administration**

Office of Commercial Space Transportation

800 Independence Ave., SW.
Washington, DC 20591

April 11, 2025

Eng. Pablo Carranza Plata, Executive Director of Aviation
Federal Civil Aviation Agency
1700 North Congress Avenue
Mexico City, Mexico

Dear Pablo Carranza Plata,

The Federal Aviation Administration (FAA) appreciates the comments the Federal Civil Aviation Agency (AFAC) submitted on August 22, 2024 (Email:_Sending comments Space X pegasus EE000024-2593 - EN), regarding the SpaceX Draft Tiered Environmental Assessment for SpaceX's proposal to increase the number of launches and landings of its Starship/Super Heavy Vehicle at the Boca Chica Launch Site. AFAC's comment and FAA's response are provided below.

AFAC Comment – Consultation

> *Finally, a recommendation is made to please include in these topics the Mexican Space Agency, which has the technical capacity to issue comments on issues related to space activities, through its General Director, Dr. Salvador Landeros Ayala, landeros.salvador@aem.gob.mx; serrano.antonio@aem.qob.mx; Likewise, we recommend to involve the Head of the Secretariat of the Environment and Natural Resources (SEMARNAT).*

FAA's Response

Thank you for the comment. FAA prepared a Revised Draft EA and re-initiated the public comment period on November 12, 2024. Additional public meetings were held in-person on January 7, 2025, in Brownsville, Texas, and virtually on January 13, 2025. Public meetings included attendance by FAA staff. Spanish-translated materials and interpreters were also available. The comment period was extended to 45 days to provide sufficient opportunity to comment. In accordance with 40 CFR Part 15019(d), FAA released the Revised Draft EA at least 15 days in advance of the public meetings. FAA provided an opportunity to submit comments during these meetings and encouraged all interested public and stakeholders to submit comments on the EA. At least one individual that resides in Mexico attended a meeting on January 7, 2025.

The FAA shared the announcement regarding the issuance of the Revised Draft EA and related public meetings with the Mexican Government through the FAA Office of International Affairs Senior Representative at the US Embassy in Mexico City. This oficio was published on November 21, 2024.

If you have questions or concerns regarding FAA's responses, please contact Norma V. Campos, FAA Senior Representative (Attaché) at U.S. Embassy Mexico City at Norma.V.Campos@faa.gov or +1-202-856-1626 or +52-56-4170-6400

Sincerely,

STACEY MOLINICH ZEE

Digitally signed by STACEY MOLINICH ZEE
Date: 2025.04.11 16:31:27 -04'00'

Stacey M. Zee
Manager
Operations Support Branch

Estado Mayor Conjunto
CENAVI No. 7067

Lomas de Sotelo, Cd. de México, a 29 de agosto de 2024.

Mtra. Wilma Laura Gandoy Vázquez
Dir. Gral. Asuntos Especiales
Secretaria de Relaciones Exteriores
Av. Juárez No. 20
Col. Centro, Alcaldía Cuauhtémoc
C.P. 06010, Cd. Méx.

Aprovecho la oportunidad para enviarle un cordial saludo y hacer referencia a su Oficio No. DAE-02019/2024 de fecha 05 de agosto de 2024, relativo a la Evaluación Ambiental Preliminar por Niveles (EA Preliminar) elaborada por la Administración Federal de Aviación de los E.U.A. (F.A.A.), con motivo de la propuesta de la empresa SpaceX para aumentar el número de lanzamientos y aterrizajes de los vehículos Starship/Super Heavy en el sitio de lanzamiento de Boca Chica, Texas, E.U.A.

Por lo anterior, el Centro Nacional de Vigilancia y Protección del Espacio Aéreo (CENAVI) emite los siguientes comentarios:

A. El incremento de las operaciones espaciales de la empresa SpaceX tiene por objeto desarrollar las capacidades de despegue y aterrizaje del Departamento de Defensa (DoD) y de la Administración Nacional Aeronáutica y del Espacio (NASA).

B. La EA Preliminar elaborada en Julio de 2024 tomó como referencia la Evaluación Programática Ambiental (PEA) elaborada por la F.A.A. en el año 2022, en la que se autorizó el otorgamiento de la licencia y los permisos para que la empresa SpaceX llevara a cabo sus operaciones espaciales desde Boca Chica, Texas.

C. La PEA de 2022 examinó los impactos potenciales que representan las operaciones espaciales de los vehículos Starship/Super Heavy desde el sitio de lanzamiento de Boca Chica, Texas, en la que se evaluaron las posibles áreas de afectación, entre las que se encuentran: calidad del aire, clima, ruido, recursos visuales, recursos culturales, recursos acuáticos, recursos biológicos, uso de tierra, materiales peligrosos, recursos naturales, logística energética, impacto socioeconómico, justicia ambiental y salud infantil.

A la hoja dos...

D. La F.A.A. concluyó en su EA Preliminar de 2024 que la solicitud de la empresa SpaceX para incrementar sus operaciones espaciales no constituye un impacto negativo en el medio ambiente o en la población, toda vez que el aumento de dichas operaciones no representa una diferencia significativa respecto a la PEA elaborada en el año 2022.

E. Sin embargo, al analizar el contenido de la EA Preliminar de julio de 2024, este organismo considera conveniente tener en cuenta lo siguiente:

a. Impactos Ambientales Compartidos.

1. Emisiones y Desechos Espaciales.

i. Cada lanzamiento genera emisiones significativas de gases de efecto invernadero y otros contaminantes, además de la posibilidad de producir escombros espaciales que podrían caer en el Golfo de México o en el territorio mexicano.

ii. Si estos desechos no son gestionados adecuadamente, podrían afectar los ecosistemas marinos y terrestres, incluyendo áreas protegidas y reservas naturales en la región fronteriza, así como en áreas urbanas de México.

2. Efectos Acumulativos.

i. El incremento en la frecuencia de las operaciones también implica una acumulación de impactos ambientales a lo largo del tiempo. Esto incluye la erosión costera debido a las explosiones controladas, la contaminación del aire y el agua, y el ruido, que podría afectar la vida silvestre en áreas transfronterizas.

ii. México, específicamente la Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT), debe asegurarse de que se realicen estudios de impacto ambiental detallados que consideren estos efectos acumulativos y no solo los impactos inmediatos en el territorio nacional, en coordinación con la F.A.A.

A la hoja tres...

b. Recomendaciones para incrementar la Colaboración México-EE.UU.

1. Solicitudes de información a la F.A.A. Para garantizar que México pueda proteger adecuadamente su territorio y su población, las autoridades mexicanas deben solicitar información detallada sobre:

i. Evaluaciones de riesgo de cada lanzamiento y aterrizaje, con simulaciones de trayectorias y análisis de posibles fallos.

ii. Planes de contingencia en caso de emergencias que puedan afectar territorio mexicano, incluyendo procedimientos de comunicación y coordinación entre agencias de ambos países.

iii. Estudios de impacto ambiental actualizados, con un enfoque en los **efectos transfronterizos** y acumulativos de las operaciones espaciales.

c. Establecimiento de Procedimientos Conjuntos. Es fundamental que México y EE.UU. desarrollen y acuerden procedimientos conjuntos para la gestión de emergencias ambientales relacionadas con las operaciones de SpaceX. Estos podrían incluir:

1. Capacitaciones conjuntas para los organismos de seguridad y protección civil de ambos países en manejo de incidentes espaciales.

2. Monitoreo constante de las actividades de SpaceX, con participación de las autoridades mexicanas en los procesos de evaluación.

3. Activación de zonas restringidas aéreas y marítimas durante los lanzamientos y aterrizajes, asegurando que las áreas en riesgo sean desocupadas y monitorizadas.

F. Conclusiones.

a. La expansión de las operaciones de SpaceX en Boca Chica presenta tanto oportunidades para diversas agencias estadounidenses, así como riesgos binacionales en la región fronteriza entre México y EE.UU, los cuales deben ser gestionados de manera coordinada.

A la hoja cuatro...

b. Es imperativo que las autoridades mexicanas colaboren con la F.A.A. y SpaceX, asegurando que las medidas de seguridad y protección ambiental sean suficientes para mitigar cualquier riesgo que pueda afectar a México.

c. A través de un esfuerzo conjunto y coordinado, ambos países podrán establecer mecanismos para preservar el medio ambiente y la seguridad de la población durante la ejecución de estas actividades.

d. Para llevar a cabo lo anterior, es imprescindible establecer canales de comunicación entre las autoridades mexicanas y estadounidenses, con la finalidad de intercambiar información de manera oportuna para prevenir afectaciones al territorio, ecosistemas y población nacionales, así como adoptar las medidas necesarias para protegerlos en caso de alguna contingencia.

Sin más por el momento aprovecho la ocasión para enviarle un cordial saludo y reiterarle mi más atenta y distinguida consideración.

Sufragio efectivo. No reelección.
El Cmte. del CE.NA.VI., E.M.C.D.N.

Gral. De Ala P.A. E.M. Javier Sandoval Dueñas

U.S. Department
of Transportation
**Federal Aviation
Administration**

Office of Commercial Space Transportation

800 Independence Ave., SW.
Washington, DC 20591

April 11, 2025

Javier Sandoval Dueñas, Wing General P.A. E.M.
National Center for Airspace Surveillance and Protection
600 E. Harrison Street, Room 1006
Lomas de Sotelo, Mexico City

Dear Javier Sandoval Duenas,

The Federal Aviation Administration (FAA) appreciates the comments the National Center for Airspace Surveillance and Protection (CENAVI) submitted on August 29, 2024 (Email: 0117_OF. CENAVI 7067_SPACEX ENG), regarding the SpaceX Draft Tiered Environmental Assessment (EA) for SpaceX's proposal to increase the number of launches and landings of its Starship/Super Heavy Vehicle at the Boca Chica Launch Site. CENAVI's comments and FAA's response are provided below.

CENAVI Comment – Emissions and Space Debris

Each launch generates significant emissions of greenhouse gases and other pollutants, in addition to the possibility of producing space debris that could fall into the Gulf of Mexico or Mexican territory. If this waste is not managed properly, it could affect marine and terrestrial ecosystems, including protected areas and natural reserves in the border region, as well as in urban areas of Mexico.

FAA's Response

The FAA considered effects to Mexico as part of its review of SpaceX's new or modified license for this cadence increase. Under 14 CFR Part 450, vehicle operators such as SpaceX are required to perform robust risk analyses, including trajectory simulations and failure probabilities, to ensure risks to the general public remain within acceptable limits. These analyses account for potential cross-border impacts, particularly in areas near the operational site.

The FAA has analyzed greenhouse gas (GHG) emissions and determined that while each launch contributes emissions, they remain below significance thresholds established under the National Environmental Policy Act (NEPA). Additionally, SpaceX is required to comply with U.S. environmental regulations, including air quality standards.

The FAA has analyzed debris impacts to land and the marine environment. Debris would be inert and non-hazardous and comprised mainly of stainless steel. Debris is expected to sink. Debris that does not immediately sink would float until becoming water-logged and eventually sink. Because the material is inert and non-hazardous, no impact to the water or air chemistry is expected. Therefore, impacts are expected to be negligible.

The FAA encourages Mexican authorities to engage in dialogue through established diplomatic channels

to align efforts in safety and environmental management. In accordance with FAA Order 1050.1F, FAA analyzed environmental impacts in Mexico in the EA, including noise, biological, and cultural resource impacts.

CENAVI Comment – Cumulative Effects

The increase in the frequency of operations also implies an accumulation of environmental impacts over time. This includes coastal erosion due to controlled blasts, air and water pollution, and noise, which could affect wildlife in cross-border areas. Mexico, specifically the Secretariat of Environment and Natural Resources (SEMARNAT) must ensure that detailed environmental impact studies are carried out that consider these cumulative effects and not only the immediate impacts on the national territory, in coordination with the FAA.

FAA's Response

As described in Final Tiered EA Section 3.3, the cumulative effects analysis considers future SpaceX projects, including the Starfactory construction at SpaceX's production and manufacturing area, housing developments in Boca Chica Village and at Rio East and West (located near State Highway 4 and Richardson Avenue), vehicle engineering testing at SpaceX's property known as Massey's, and construction of a water and other utility lines from Brownsville to the Boca Chica along State Highway 4. The Final Tiered EA concludes that the proposed action, when considered along with these other reasonably foreseeable activities in the area, will not significantly affect the environment.

CENAVI Comment – Recommendations to increase Mexico-U.S. Collaboration

To ensure that Mexico can adequately protect its territory and its population, Mexican authorities must request detailed information on:

- Risk assessments of each launch and landing, with trajectory simulations and analysis of possible failures.
- Contingency plans in case of emergencies that may affect Mexican territory, including communication and coordination procedures between agencies of both countries.
- Updated environmental impact studies, with a focus on the cross-border and cumulative effects of space operations.

FAA's Response

Under 14 CFR Part 450, vehicle operators, such as SpaceX, are required to perform robust risk analyses, including trajectory simulations and failure probabilities, to ensure risks to the general public and the environment remain within acceptable limits. These analyses account for potential cross-border impacts, particularly in areas near the operational site. The FAA encourages Mexican authorities to engage in dialogue through established diplomatic channels to align efforts in safety and environmental management. Per the mandate in FAA Order 1050.1F, FAA analyzed transboundary environmental impacts in Mexico in the EA, including noise, biological, and cultural resource impacts.

CENAVI Comment – Establishment of Joint Procedures

It is essential that Mexico and the United States develop and agree on joint procedures for the management of environmental emergencies related to the SpaceX operations. These could include:

- Joint training for safety and civil protection organizations of both countries in handling space incidents.
- Constant monitoring of SpaceX activities, with participation of the Mexican authorities in the evaluation processes.

- Activation of restricted airspace and maritime areas during launches and landings, ensuring that areas at risk are unoccupied and monitored.

FAA's Response

The FAA understands that the Government of Mexico is in support of and is in direct coordination with SpaceX regarding their proposed operations. This direct coordination between SpaceX and the Government of Mexico began after the receipt of this comment. The FAA encourages Mexican authorities to engage in dialogue through establish diplomatic channels on any other questions that may arise.

CENAVI Comment – General

The expansion of SpaceX operations in Boca Chica presents both opportunities for various US agencies, as well as binational risks in the border region between Mexico and the US, which must be managed in a coordinated manner. It is imperative that Mexican authorities collaborate with the FAA and SpaceX, ensuring that safety and environmental protection measures are sufficient to mitigate any risk that may impact Mexico. Through a joint and coordinated effort, both countries will be able to establish mechanisms to preserve the environment and the safety of the population during the execution of these activities. To carry out the above, it is essential to establish communication channels between the Mexican and US authorities, with the purpose of exchanging information in a timely manner to prevent effects on the national territory, ecosystems, and population, as well as adopting the necessary measures to protect them in the event of a contingency.

FAA's Response

NEPA does not require an analysis of failures or worst-case scenarios that are not reasonably foreseeable. The EA considers the reasonably foreseeable effects of SpaceX's activities. NEPA is not a vehicle for establishing international procedures for handling environmental emergencies. All launch operations must also meet the Commercial Space Launch Act's demanding safety requirements.

If you have questions or concerns regarding FAA's responses, please contact Norma V. Campos, FAA Senior Representative (Attach) at U.S. Embassy Mexico City at Norma.V.Campos@faa.gov or +1-202-856-1626 or +52-56-4170-6400.

Sincerely,

STACEY MOLINICH ZEE

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Date: 2025.04.11 16:32:19 -04'00'

Stacey M. Zee
Manager
Operations Support Branch

REGION 6
DALLAS, TX 75270

August 29, 2024

VIA Online Submission

Ms. Stacey Zee
Federal Aviation Administration
SpaceX PEA c/0 ICF
9300 Lee Highway
Fairfax, Virginia 22031
spacexbocachica@icf.com

Re: Federal Aviation Administration Draft Tiered Environmental Assessment for SpaceX Starship/Super Heavy Vehicle Increased Cadence at the SpaceX Boca Chica Launch Site in Cameron County, Texas

Dear Ms. Zee:

The Environmental Protection Agency (EPA) has reviewed the Federal Aviation Administration (FAA) Draft Tiered Environmental Assessment (EA) for SpaceX Starship/Super Heavy Vehicle Increased Cadence at the SpaceX Boca Chica Launch Site in Cameron County, Texas. The EA was prepared pursuant to Section 102(2)(C) of the National Environmental Policy Act of 1969 (NEPA), as amended; the Council on Environmental Quality (CEQ) NEPA Implementing Regulations (40 CFR Parts 1500 to 1508); Section 4(f) of the Department of Transportation Act (DOT)(49 U.S.C. § 303); Section 106 of the National Historic Preservation Act (16 U.S.C. § 470); Executive Order 11988, Floodplain Management; Department of Transportation (DOT) Order 5650.2, Floodplain Management and Protection; and FAA Order 1050.1F, Environmental Impacts: Policies and Procedures.

The FAA is evaluating SpaceX's proposal to increase the cadence of the Starship/Super Heavy launch program at the Boca Chica vertical launch area (VLA) in Cameron County, Texas. SpaceX must obtain new license or modification of their existing vehicle operator license from the FAA to operate Starship/Super Heavy. Issuing a permit or license is considered a major federal action subject to environmental review under NEPA.

The EA evaluates the potential environmental impacts of activities associated with the federal action of modifying SpaceX's vehicle operator license. The completion of the environmental review process does not guarantee that the FAA will issue a license modification to SpaceX for the Proposed Action. SpaceX's license application must also meet FAA safety, risk, and financial responsibility requirements per 14 CFR Chapter III. The FAA's Federal Action also includes the FAA's issuance of temporary airspace closures.

As part of our environmental review process, the EPA offers the following comments for FAA's consideration in finalizing the NEPA document:

Cultural Resources

The FAA stated that the Proposed Action is not expected to result in any additional impacts to cultural resources, beyond those contemplated in the 2022 EA, and those discussed and subjected to avoidance, minimization, and mitigation stipulations by the 2022 EA. The data and analyses presented in these documents remain substantially valid. The conditions and requirements of established in 2022 have been met, and would continue to be met, in the current action.

Environmental Justice (EJ)

The FAA stated that the Proposed Action would result in no significant impacts to socioeconomics, EJ, and children's environmental health and safety risks are anticipated. On August 12, 2024, the day before the first scheduled public meeting for the proposed Project, the FAA postponed all its scheduled public meetings without providing a comment period deadline.

EPA recommends the FAA comply with the applicable requirements under NEPA and conduct meaningful outreach and engagement to the public and EJ communities with concerns before the completion of the NEPA process. Once completed, FAA should continue EJ outreach to the affect communities as necessary.

Stratospheric Ozone Depletion

Global rocket emissions cause ozone depletion and deposit particulates into the stratosphere. The latest scientific assessment of ozone depletion considers future scenarios of space industry emissions, including the potential for a significant increase in launch rates.[1] Some studies suggest that with a weekly launch frequency, which will be exceeded at Vandenberg Space Force Base alone, rockets could be responsible for stratospheric ozone loss to an extent that researchers have identified as being of concern.[2] We note that the solid fuel propellent used for missile launches has a much larger impact on stratospheric ozone than rockets used in commercial space launches.[3]

[1] The "Scientific Assessment of Ozone Depletion: 2022" is a series of assessments prepared by the world's leading experts in the atmospheric sciences and under the guidance of the Montreal Protocol on Substances that Deplete the Ozone Layer in coordination with the World Meteorological Organization and the United Nations Environment Programme. The latest assessment notes that many of the impacts of rocket activity involve chemistry and radiative interactions that are poorly understood, so periodic assessments and critical knowledge gap identification are important to increasing understanding of present and future impacts of space industry emissions on stratospheric ozone. The assessment is available at: https://ozone.unep.org/system/files/documents/Scientific-Assessment-of-Ozone-Depletion-2022.pdf

[2] Dallas, et al. May 10, 2020. "The environmental impact of emissions from space launches: A comprehensive review". Journal of Cleaner Production. See: https://www.sciencedirect.com/science/article/pii/S0959652620302560
Ryan et al. 2022: "Impact of Rocket Launch and Space Debris Air Pollutant Emissions on Stratospheric Ozone and Global Climate". See: https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2021EF002612

[3] "The limited studies of emissions from rocket engines using liquid propellent reveal that while they do result in stratospheric ozone loss, solid rocket motors are responsible for orders of magnitude greater loss." See "The Environmental Impact of Emissions from Space Launches: A Comprehensive Review" at: https://www.sciencedirect.com/science/article/pii/S0959652620302560

While a limited number of flight tests are evaluated in individual impact assessments, it is important to try to capture the collective impacts from the flight tests being planned, including those occurring at other launch facilities, since this is a global impact. EPA recommends the Final EA and Findings of No Significant Impact (FONSI) discuss stratospheric ozone depletion effects of the proposed action in the cumulative context, utilizing the guidance provided in 40 CFR 1502.21 for incomplete or unavailable information. Consider using a heading, such as "impacts to the stratospheric ozone layer," that distinguishes it from the discussion of ground-level air quality impacts. When possible, please address this concern in the final document.

Clean Water Act (CWA) Permitting

The CWA Section 402 National Pollutant Discharge Elimination System (NPDES) permitting regulations require the discharge of stormwater from large and small construction activities in areas upland from a waterbody and not considered a jurisdictional wetland area, regardless of the land's designation as federal, state, Indian country or private.

The CWA Section 402, 40 CFR § 122.26(b)(14)(x) and 40 CFR § 122.26(b)(15)(i) National Pollutant Discharge Elimination System (NPDES) permitting regulations authorize discharge of stormwater from large and small construction activities, all entities associated with a construction project who: 1) meet the NPDES permitting authority's definition of "operator," 2) cause an earth disturbance of 1 acre or greater, or less than one acre if part of a larger common plan of development or sale that ultimately disturbs 1 acre or greater, and 3) discharge stormwater from their construction activities (including any on- and off-site construction support activities), are required to obtain NPDES permit coverage via the Construction General Permit (CGP) or individual NPDES permit from the NPDES permitting authority prior to beginning construction activities and/or construction support activities.

EPA's 2022 CGP definition of construction activities refer to "earth-disturbing activities, such as the clearing, grading, and excavation of land, and other construction-related activities (e.g., grubbing; stockpiling of fill material; placement of raw materials at the site) that could lead to the generation of pollutants. Some of the types of pollutants that are typically found at construction sites are: sediment; nutrients; heavy metals; pesticides and herbicides; oil and grease; bacteria and viruses; trash, debris, and solids; treatment polymers; and any other toxic chemicals." Therefore, demolition, building additions, renovations and new construction on existing pavement that results in earth disturbance and/or construction support activities (e.g., equipment staging yards, materials storage areas, excavated material disposal areas, etc.) that involve earth disturbance or pollutant-generating activities of its own, are considered construction-related activities that require NPDES permit coverage.

Additionally, because it appears that the overall earth disturbance of this project will be greater than 1 acre, the larger common plan of development or sale will be triggered, therefore stormwater discharges from all construction activities and all -site or off-site construction support activities (i.e., borrow pits, staging areas, material storage areas, temporary batch plants, laydown areas, etc.) will be required to obtain NPDES permit coverage via the CGP or individual NPDES permit (except any portion of the project's construction activities that is covered by a CWA 404 permit or waived from permit

coverage) regardless of if the smaller project's earth disturbance in areas upland from the waterbody and not considered a jurisdictional wetland area is less than 1 acre.

The EA explains the site is in Cameron County, Texas, near the cities of Brownsville and South Padre Island in a sparsely populated coastal area adjacent to the Gulf of Mexico, characterized by marsh and barrier island plant communities, shallow open water, algal flats, and unvegetated tidal flats. The EA identifies a variety of SpaceX projects including: the Starfactory construction at SpaceX's production and manufacturing area, housing developments in Boca Chica Village and at Rio East and West (located near State Highway 4 and Richardson Avenue), vehicle engineering testing at SpaceX's property known as Massey's, and construction of a water and other utility lines from Brownsville to the Boca Chica along State Highway 4. Additionally, the build out of the Starfactory would require water resources during the construction phase, however the factory would subsume existing structures at SpaceX's production and manufacturing areas, and the existing, baseline activities would continue to operate. Massey's site has been used as a commercial site, and conversion to a SpaceX testing facility would not result in a significant change of land use.

In Section 3.2.7, the Draft EA indicates that a Texas Pollutant Discharge Elimination System (TPDES) Construction and Industrial Storm Water Pollution Prevention Plan (SWPPP) are maintained. However, NPDES stormwater coverage under the Multi-Sector General Permit (MSGP) and Construction General Permit (CGP) are two separate NPDES permits. As noted above, CGP coverage authorizes the discharge of stormwater from large and small construction activities. MSGP coverage authorizes the discharge of stormwater from eligible industrial operations. Because the CGP's required site-specific SWPPP contents are completely different than the MSGP's required site-specific SWPPP contents, one TPDES Construction and Industrial SWPPP is not authorized. A separate site-specific SWPPP compliant with all requirements of the CGP is required.

We realize construction-related activities included in the Draft EA have and will continue to occur at different times. Therefore, it is important to clarify that stormwater discharges from earth disturbances related to construction activities for buildings, launch pads, waterlines, roads, parking, housing, utilities, and other traditional construction activities regardless of change in land use fall under Section 402 of the CWA and NPDES permitting program. Additionally, it's important to clarify that submittal of a modified CGP Notice of Intent (NOI) for changes to earth disturbances, etc. and approval from the NPDES permitting authority are required prior to conducting construction activities and discharging stormwater from area not previously included in the NOI submittal for CGP coverage.

In Texas, the Texas Commission on Environmental Quality (TCEQ) is the NPDES permitting authority, except on Indian Country. The FAA should coordinate with TCEQ on this and all other permitting issue as appropriate.

CWA Section 404

Section 2.2 and 3.7 of the Draft EA states that a CWA section 404 permit will be sought because of filling jurisdictional wetlands. The final EA should quantify the number of wetlands to be lost. Also Figure 1 appears to show future wetland losses because of adding an air separation unit. Identify any other facilities that may result in wetlands losses in relation to increased cadence operations along with the proposed method of compensatory mitigation.

Section 3.3.1.7 Cumulative Impacts

Please include reasonably foreseeable expansions and anticipated wetlands losses not covered in this Draft EA. Also include and explain whether these will occur in a phased approach, and if so, in what sequence. Please address this concern in the final document.

Thank you for the opportunity to comment on the proposed action. EPA looks forward to the receipt of the Final NEPA decision document and the responses to comments made on the Draft EA. If you have any questions, please contact Michael Jansky of my staff at (214) 655-7451 or by e-mail at jansky.michael@epa.gov for assistance.

Sincerely,

ROBERT HOUSTON

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Date: 2024.08.29 10:50:36 -05'00'

Robert Houston
Acting Deputy Director
Environmental Justice, Community Engagement and Environmental Review Division

U.S. Department of Transportation
Federal Aviation Administration

Office of Commercial Space Transportation

800 Independence Ave., SW.
Washington, DC 20591

April 11, 2025

Michael Jansky
Superintendent
Environmental Protection Agency
Region 6
600 E. Harrison Street Room 1006
Dallas, TX 75270
Submitted to: jansky.michael@epa.gov

Dear Michael Jansky,

The Federal Aviation Administration (FAA) appreciates the comments the Environmental Protection Agency (EPA) submitted on August 29, 2024 (FDMS Letter 0115_SpaceX Draft Tiered EA - EPA Region 6 Response 082924), and January 14, 2025 (Email: SPACE X REVISED DRAFT TIERED ENVIROMENTAL ASSESSMENT FONSI CADENCE DOCUMENT [082224] 2), regarding the SpaceX Draft Tiered Environmental Assessment (EA) for SpaceX's proposal to increase the number of launches and landings of its Starship/Super Heavy Vehicle at the Boca Chica Launch Site. EPA's comments and FAA's response are provided below.

EPA Comment – Cultural Resources

EPA notes that the FAA stated that the Proposed Action is not expected to result in any additional impacts to cultural resources, beyond those contemplated in the 2022 EA, and those discussed and subject to avoidance, minimization, and mitigation stipulations by the 2022 EA. The data and analyses presented in these documents remain substantially valid. The conditions and requirements established in 2022 have been met, and would continue to be met, in the current action.

FAA's Response

The FAA appreciates EPA's input on Proposed Action impacts to this resource.

EPA Comment – Socioeconomics and Environmental Justice (EJ)

EPA notes that the FAA stated that the Proposed Action would result in no significant impacts to socioeconomics, EJ, and children's environmental health and safety. EPA also notes that on August 12, 2024, the day before the first scheduled public meeting for the proposed Project, the FAA postponed all its scheduled public meetings without providing a comment period deadline.

EPA recommends the FAA comply with applicable NEPA requirements and conduct meaningful outreach and engagement to the public and EJ communities with concerns before the completion of the NEPA process. Once completed, the FAA should continue EJ outreach to the affect communities as necessary.

FAA's Response

The FAA prepared a Revised Draft EA and re-initiated the public comment period on November 12, 2024. Additional public meetings were held in person on January 7, 2025, in Brownsville, Texas, and virtually on January 13, 2025. Public meetings included attendance by FAA staff and offered Spanish-translated materials and interpreters. The comment period was extended to 45 days to provide sufficient opportunity to comment. In accordance with 40 CFR Part 15019(d), the FAA provided the Revised Draft EA at least 15 days in advance of the public meetings. The FAA also provided an opportunity to submit comments during these meetings and encouraged all interested members of the public and stakeholders to submit comments on the EA.

EPA Comment – Stratospheric Ozone Depletion

EPA states that global rocket emissions cause ozone depletion and deposit particulates into the stratosphere. The latest scientific assessment of ozone depletion considers future scenarios of space industry emissions, including the potential for a significant increase in launch rates. Some studies suggest that with a weekly launch frequency, rockets could cause stratospheric ozone loss to an extent that researchers have identified as being of concern. EPA notes that the solid fuel propellent used for missile launches has a much larger impact on stratospheric ozone than rockets used in commercial space launches. EPA states the importance of evaluating the collective impacts from launches globally because this is a potential global impact. EPA recommends the Final EA and Findings of No Significant Impact (FONSI) discuss stratospheric ozone depletion effects of the proposed action in the cumulative context, utilizing the guidance provided in 40 CFR 1502.21 for incomplete or unavailable information.

EPA also explains that the "Scientific Assessment of Ozone Depletion: 2022" is a series of assessments, the latest of which notes that the impacts of rocket activity involve chemistry and radiative interactions that are poorly understood, so periodic assessments and critical knowledge gap identification are important to increasing understanding of present and future impacts of space industry emissions on stratospheric ozone. The assessment is available at: https://ozone.unep.org/system/files/documents/Scientific-Assessment-of-Ozone-Depletion-2022.pdf

FAA's Response

EPA Comments recommend that the Draft EA "[d]iscuss stratospheric ozone depletion effects of the proposed action in the cumulative content, utilizing the guidance provided in 40 CFR 1502.21 for incomplete or unavailable information." Although EPA's comments point to some literature, EPA provides no concrete suggestions for how this theoretical information might be applied to analyze the proposed action.

NEPA does not require the FAA to engage in analysis of speculative stratospheric ozone impacts when information necessary to determine if there are foreseeable effects is unavailable and cannot be obtained at this time. Under NEPA, agencies' consideration of environmental effects are subject to a "rule of reason." NEPA does not require agencies to provide in-depth analysis of effects where only limited information is available

The articles cited by EPA on this issue consistently reference the lack of studies and data related to black carbon-related upper atmosphere impacts, in particular the lack of observational data and in-situ measurements as they relate to rockets such as the Falcon 9, which use kerosene and liquid oxygen as rocket propellants. For instance, one of the studies cited by EPA in its comments explains that "[t]he literature on [black carbon] and alumina emissions is sparse and experimental procedures are not well described; comprehensive in situ stratospheric sampling of rocket particles is almost entirely lacking."

Ross, M.N. and Sheaffer, P.M., Radiative forcing caused by rocket engine emissions, Earth's Future, 2: 177-196 (2014). Another more recent study emphasizes the lack of scientific understanding of potential effects, stating:

"Many of the impacts of rocket activity involve chemistry and radiative interactions that are poorly understood and, in some cases, not yet studied … The uncertainties in these processes and in any potential new emission sources limit the confidence level of predictions of present and future impacts of space industry emissions on stratospheric ozone."

World Meteorological Organization, Scientific Assessment of Ozone Depletion, GAW Report No.278, at 49 (2022).

In September 2022, the United States Government Accountability Office ("GAO") released a Technology Assessment that includes discussion of the black carbon emissions. See U.S. GAO, GAO-22-105166, Technology Assessment, Large Constellations of Satellites, Mitigating Environmental and Other Effects (Sept. 2022) ("GAO Technical Assessment"). The GAO relied on extensive scientific outreach to compile its report. GAO Technical Assessment at 2 ("To conduct this technology assessment, GAO reviewed technical studies, agency documents, and other key reports; interviewed government officials, industry representatives, and researchers; and convened a 2-day meeting of 15 experts from government, industry, academia, and a federally funded research and development center."). The GAO Technical Assessment relies on older studies to note the potential harm from black carbon emissions but cautions the studies cited "…had to make assumptions about the amount and physical processes of black carbon emissions released from rockets", and states that "scientific understanding of atmospheric effects is nascent." Id. at 14 and 10. The report repeatedly notes the science is poorly understood, illustrating the lack of data that would be necessary to draw conclusions about the emissions and the effect of those emissions from rockets. For example:

- "Rocket launches and satellite reentries produce particles and gases that can affect atmospheric temperatures and deplete the ozone layer ... However, the size and significance of these effects are poorly understood due to a lack of observational data, and it is not yet clear if mitigation is warranted." Id. at 6;
- "[T]he size of the potential effect from particle emissions [e.g. black carbon] is unknown because the observational data needed to validate modeling studies for rocket emissions are few, with most of the data collected in only the lower stratosphere." Id. at 13;
- "[T]here are currently no observational data for black carbon emissions from rockets, and as a result, both studies had to make assumptions about the amount and physical processes of black carbon emissions released from rockets." Id. at 14; and
- "Current knowledge is not sufficient to determine the extent to which some effects need to be mitigated. For example, researchers do not yet know the types and magnitude of rocket emissions that are likely to result from planned satellite launches. These data are necessary to accurately predict the potential environmental effects from rocket emissions through computer modeling." Id. at 53

Put simply there is neither a generally accepted method for analyzing these impacts because the necessary data and tools do not exist to accurately estimate emissions of black carbon from rockets and any associated radiative forcing effects nor a way to identify potential mitigation measures to address such emissions if effects were foreseeable.

Thus, while the FAA does not object to including a concise high-level summary of climate or ozone-related effects noted in the comments, a detailed analysis or effort to quantify the atmospheric effects of this project is not feasible. Any quantification would be based on speculative assumptions and hypotheses rather than actual data. NEPA does not require such speculation. Finally, in response to EPA's suggestion that 40 C.F.R. § 1502.21 be applied to acknowledge incomplete or unavailable information, the FAA notes that FAA Order 1050.1F references 40 C.F.R. § 1502.21[1] which applies when an agency "is evaluating reasonably foreseeable significant effects on the human environment in an environmental impact statement[.]" (emphasis added). The FAA is preparing an EA here. Further, as evidenced by the state of the science and summarized above, the effects identified by EPA are neither "reasonably foreseeable" nor can they be characterized at this point as "significant."

EPA Comment – Clean Water Act (CWA) Permitting

"The CWA Section 402 National Pollutant Discharge Elimination System (NPDES) permitting regulations require the discharge of stormwater from large and small construction activities in areas upland from a waterbody and not considered a jurisdictional wetland area, regardless of the land's designation as federal, state, Indian country or private.

The CWA Section 402, 40 CFR § 122.26(b)(14)(x) and 40 CFR § 122.26(b)(15)(i) National Pollutant Discharge Elimination System (NPDES) permitting regulations authorize discharge of stormwater from large and small construction activities, all entities associated with a construction project who: 1) meet the NPDES permitting authority's definition of "operator," 2) cause an earth disturbance of 1 acre or greater, or less than one acre if part of a larger common plan of development or sale that ultimately disturbs 1 acre or greater, and 3) discharge stormwater from their construction activities (including any on- and off-site construction support activities), are required to obtain NPDES permit coverage via the Construction General Permit (CGP) or individual NPDES permit from the NPDES permitting authority prior to beginning construction activities and/or construction support activities.

EPA's 2022 CGP definition of construction activities refer to "earth-disturbing activities, such as the clearing, grading, and excavation of land, and other construction-related activities (e.g., grubbing; stockpiling of fill material; placement of raw materials at the site) that could lead to the generation of pollutants. Some of the types of pollutants that are typically found at construction sites are: sediment; nutrients; heavy metals; pesticides and herbicides; oil and grease; bacteria and viruses; trash, debris, and solids; treatment polymers; and any other toxic chemicals." Therefore, demolition, building additions, renovations and new construction on existing pavement that results in earth disturbance and/or construction support activities (e.g., equipment staging yards, materials storage areas, excavated material disposal areas, etc.) that involve earth disturbance or pollutant-generating activities of its own, are considered construction-related activities that require NPDES permit coverage.

Additionally, because it appears that the overall earth disturbance of this project will be greater than 1 acre, the larger common plan of development or sale will be triggered, therefore stormwater discharges from all construction activities and all -site or off-site construction support activities (i.e., borrow pits, staging areas, material storage areas, temporary batch plants, laydown areas, etc.) will be required to obtain NPDES permit coverage via the CGP or individual NPDES permit (except any portion of the project's construction activities that is covered by a CWA 404 permit or waived from permit coverage)

[1] On January 20, 2025, President Trump issued Executive Order (EO) No. 14154, *Unleashing American Energy*, which revoked EO 11991, *Relating to Protection and Enhancement of Environmental Quality* (May 24, 1977), and instructed the Chair of the CEQ to rescind its NEPA-implementing regulations.

regardless of if the smaller project's earth disturbance in areas upland from the waterbody and not considered a jurisdictional wetland area is less than 1 acre.

The EA explains the site is in Cameron County, Texas, near the cities of Brownsville and South Padre Island in a sparsely populated coastal area adjacent to the Gulf of Mexico, characterized by marsh and barrier island plant communities, shallow open water, algal flats, and unvegetated tidal flats. The EA identifies a variety of SpaceX projects including: the Starfactory construction at SpaceX's production and manufacturing area, housing developments in Boca Chica Village and at Rio East and West (located near State Highway 4 and Richardson Avenue), vehicle engineering testing at SpaceX's property known as Massey's, and construction of a water and other utility lines from Brownsville to the Boca Chica along State Highway 4. Additionally, the build out of the Starfactory would require water resources during the construction phase, however the factory would subsume existing structures at SpaceX's production and manufacturing areas, and the existing, baseline activities would continue to operate. Massey's site has been used as a commercial site, and conversion to a SpaceX testing facility would not result in a significant change of land use.

In Section 3.2.7, the Draft EA indicates that a Texas Pollutant Discharge Elimination System (TPDES) Construction and Industrial Storm Water Pollution Prevention Plan (SWPPP) are maintained. However, NPDES stormwater coverage under the Multi-Sector General Permit (MSGP) and Construction General Permit (CGP) are two separate NPDES permits. As noted above, CGP coverage authorizes the discharge of stormwater from large and small construction activities. MSGP coverage authorizes the discharge of stormwater from eligible industrial operations. Because the CGP's required site-specific SWPPP contents are completely different than the MSGP's required site-specific SWPPP contents, one TPDES Construction and Industrial SWPPP is not authorized. A separate site-specific SWPPP compliant with all requirements of the CGP is required.

We realize construction-related activities included in the Draft EA have and will continue to occur at different times. Therefore, it is important to clarify that stormwater discharges from earth disturbances related to construction activities for buildings, launch pads, waterlines, roads, parking, housing, utilities, and other traditional construction activities regardless of change in land use fall under Section 402 of the CWA and NPDES permitting program. Additionally, it's important to clarify that submitting a modified CGP Notice of Intent (NOI) for changes to earth disturbances, etc. and approval from the NPDES permitting authority are required prior to conducting construction activities and discharging stormwater from area not previously included in the NOI submittal for CGP coverage.

In Texas, the Texas Commission on Environmental Quality (TCEQ) is the NPDES permitting authority, except on Indian Country. The FAA should coordinate with TCEQ on this and all other permitting issues as appropriate."

FAA's Response

FAA acknowledges the difference between NPDES stormwater coverage under the Multi-Sector General Permit (MSGP) and Construction General Permit (CGP). The EA does not propose any construction-related activities. The FAA's jurisdiction is limited to licensed launch and reentry operations, which includes discharge from industrial activities, the TPDES industrial wastewater would be applicable and is described in the EA. Any non-licensed activities, including construction or industrial development, remain subject to Clean Water Act (CWA) Section 402 requirements. SpaceX would be required to comply with applicable permits, such as a Construction General Permit (CGP) if necessary, but these permits fall outside the scope of this EA and are not analyzed here.

EPA Comment – CWA Section 404 and Cumulative Impacts

Section 2.2 and 3.7 of the Draft EA states that a CWA section 404 permit will be sought because of filling jurisdictional wetlands. The final EA should quantify the number of wetlands to be lost. Also Figure 1 appears to show future wetland losses because of adding an air separation unit. Identify any other facilities that may result in wetlands losses in relation to increased cadence operations along with the proposed method of compensatory mitigation.

Please include reasonably foreseeable expansions and anticipated wetlands losses not covered in this Draft EA. Also include and explain whether these will occur in a phased approach, and if so, in what sequence. Please address this concern in the final document.

FAA's Response
As disclosed in Section 3.2.7 of the EA, operational changes would not alter existing wetlands or floodplains beyond what was analyzed in the 2022 PEA. Therefore, no additional wetland loss would occur as a result of this proposed action, and no change was made in the Final EA.

EPA Comment – Revised Draft
EPA Region 6 provided detailed comments on the Draft Tiered EA on August 29, 2024. We have no additional comments on the Revised Document.

FAA's Response
FAA appreciates EPA's input.

If you have questions or concerns regarding FAA's responses, please contact Amy Hanson at (847) 243-7609 or via email at Amy.Hanson@faa.gov.

Sincerely,

STACEY MOLINICH ZEE
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Date: 2025.04.11 16:35:02 -04'00'

Stacey M. Zee
Manager
Operations Support Branch

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STATE OF HAWAIʻI | KA MOKUʻĀINA ʻO HAWAIʻI
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA ʻOIHANA KUMUWAIWAI ʻĀINA
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1151 PUNCHBOWL STREET, ROOM 330
HONOLULU, HAWAII 96813

January 17, 2025

Stacy M. Zee
Manager, Operations Support Branch
Federal Aviation Administration

Re: FAA-2024-2006-0114, Revised Draft Tiered Environmental Assessment (EA) for SpaceX Starship/Super Heavy Vehicle Increased Cadence at the SpaceX Boca Chica Launch Site in Cameron County, Texas

Dear Ms. Zee,

The Hawaii Department of Land and Natural Resources' Division of Aquatic Resources (DAR) appreciates the opportunity to comment on the Federal Aviation Administration's Revised Draft Tiered Environmental Assessment (EA) for SpaceX Starship/Super Heavy Vehicle Increased Cadence at the SpaceX Boca Chica Launch Site in Cameron County, Texas (FAA-2024-2006). DAR is concerned with the potential effects of landings near the main Hawaiian Islands and the northwest Hawaiian Islands.

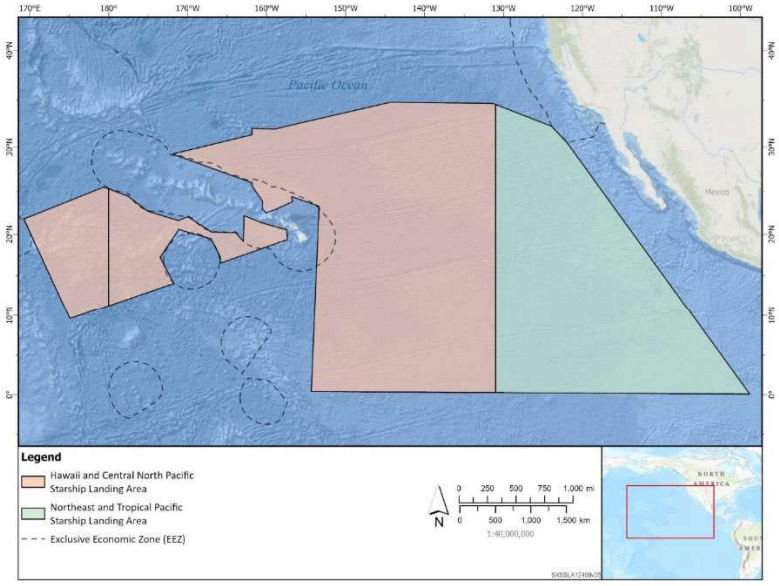

Fig. 1: North Pacific Starship landing area (Hawaii and central north Pacific landing area and northeast and tropical Pacific Ocean landing area). Illustration from the EA, page 11.

According to the EA, the proposed action increases SpaceX flights to up to 25 “Super Heavy” landings and up to 25 “Starship” landings annually. Some of these vehicles may not be reused and up to 20 may instead experience:

1. A hard-water landing at terminal velocity and break up on impact, resulting in an explosive event at the surface of the water;
2. A soft water landing and tip over and sink or explode on impact at the surface of the water; or
3. An in-flight breakup during reentry resulting in debris falling into the ocean.

DAR is concerned with the potential effects of landings (e.g., noise, disruption of fishing activity) to state commercial fishers, especially those who fish in federal waters within and beyond the Hawai‘i Exclusive Economic Zone (EEZ), and commercial or recreational fishers fishing south of Kaua’i, O‘ahu, Lāna‘i, and Maui, or north of Kaua‘i within the EEZ (Fig. 1). DAR is also concerned about the potential effects of landing (e.g., noise, marine debris, and pollution created by space vehicles exploding on impact or reentry) on state aquatic wildlife resources, especially pelagic species. DAR notes that the EA did not analyze the effects of landings on four federally and state-listed pelagic species: sperm whales, main Hawaiian Islands insular false killer whales, oceanic white tip sharks, and giant (oceanic) mantas, all of whom utilize the habitat within the Hawaii and central north Pacific landing area (Fig. 1). The EA also did not analyze the effects of landings on the highly endangered (federally and state-listed) Hawaiian monk seal.

DAR would like to be included in the discussions about this project as part of the FFA’s engagement with the State of Hawai‘i as the project moves forward. DAR hopes that the FAA will be able to conduct a more thorough analysis of the effects of the project on commercial and recreational fishing in and near Hawai‘i, especially within the Hawaii EEZ, and aquatic wildlife resources, especially marine pelagic species.

Thank you for the opportunity to comment.

Sincerely,

Brian Neilson, Administrator
Hawaii Department of Land and Natural Resources
Division of Aquatic Resources

U.S. Department
of Transportation
**Federal Aviation
Administration**

Office of Commercial Space Transportation

800 Independence Ave., SW.
Washington, DC 20591

April 11, 2025

Brian Neilson, Administrator
Hawaii Department of Land and Natural Resources
Division of Aquatic Resources
1151 Punchbowl Street, Room 330
Honolulu, Hawaii 96813
Submitted to: brian.j.neilson@hawaii.gov

Dear Brian Neilson,

The Federal Aviation Administration (FAA) appreciates the comments the Hawaii Department of Land and Natural Resources' Division of Aquatic Resources (DAR) submitted on January 17, 2025 (FDMS Letter FAA-2024-2006-10093), regarding the SpaceX Draft Tiered Environmental Assessment for SpaceX's proposal to increase the number of launches and landings of its Starship/Super Heavy Vehicle at the Boca Chica Launch Site. DAR's comment and FAA's response are provided below.

DAR Comment – Cultural Resources

DAR is concerned with the potential effects of landings near the main Hawaiian Islands and the northwest Hawaiian Islands. According to the EA, the proposed action increases SpaceX flights to up to 25 "Super Heavy" landings and up to 25 "Starship" landings annually. Some of these vehicles may not be reused and up to 20 may instead experience:

1. A hard-water landing at terminal velocity and break up on impact, resulting in an explosive event at the surface of the water;
2. A soft water landing and tip over and sink or explode on impact at the surface of the water; or
3. An in-flight breakup during reentry resulting in debris falling into the ocean.

DAR is concerned with the potential effects of landings (e.g., noise, disruption of fishing activity) to state commercial fishers, especially those who fish in federal waters within and beyond the Hawai'i Exclusive Economic Zone (EEZ), and commercial or recreational fishers fishing south of Kaua'i, O'ahu, Lāna'i, and Maui, or north of Kaua'i within the EEZ (Fig. 1). DAR is also concerned about the potential effects of landing (e.g., noise, marine debris, and pollution created by space vehicles exploding on impact or reentry) on state aquatic wildlife resources, especially pelagic species. DAR notes that the EA did not analyze the effects of landings on four federally and state-listed pelagic species: sperm whales, main Hawaiian Islands insular false killer whales, oceanic white tip sharks, and giant (oceanic) mantas, all of whom utilize the habitat within the Hawaii and central north Pacific landing

area (Fig. 1). The EA also did not analyze the effects of landings on the highly endangered (federally and state-listed) Hawaiian monk seal.

DAR would like to be included in the discussions about this project as part of the FFA's engagement with the State of Hawai'i as the project moves forward. DAR hopes that the FAA will be able to conduct a more thorough analysis of the effects of the project on commercial and recreational fishing in and near Hawai'i, especially within the Hawaii EEZ, and aquatic wildlife resources, especially marine pelagic species.

FAA's Response

In response to concerns raised by DAR and other commenters, the FAA revised the EA to remove the Pacific action area from the U.S EEZ and establish a 50 nautical mile buffer zone around the Papahānaumokuākea Marine National Monument. These changes will further reduce potential environmental impacts and ensure there will be no significant effects by:

- Protecting Sensitive Ecosystems: The removal of the Pacific action area from the Hawaiian EEZ ensures that operations avoid areas of unique biodiversity and cultural significance, thereby minimizing risks to marine life and ecosystems associated with the monument.
- Avoiding Overlap with Protected Areas: The establishment of a buffer zone around the monument ensures that activities remain at a safe distance from the boundary, reducing the likelihood of any adverse impacts on the marine environment.
- Mitigating Potential Cross-Boundary Impacts: By revising the action area, the likelihood of debris dispersion affecting the Hawaiian Islands and surrounding waters is significantly decreased and expected to be negligible.

If you have questions or concerns regarding FAA's responses, please contact Amy Hanson at (847) 243-7609 or via email at Amy.Hanson@faa.gov.

Sincerely,

STACEY MOLINICH ZEE

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Stacey M. Zee
Manager
Operations Support Branch

PUBLIC SUBMISSION

As of: January 21, 2025
Received: August 29, 2024
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Posted: August 30, 2024
Category: Guidelines / Policy
Tracking No. m0g-3qf2-yuyz
Submission Type: Web

Docket: FAA-2024-2006
Tiered Environmental Assessment for the SpaceX Starship/Super Heavy Vehicle Increased Cadence at the Boca Chica Launch Site in Cameron County, Texas

Comment On: FAA-2024-2006-0001
U.S. DOT/FAA - Draft Tiered Environmental Assessment

Document: FAA-2024-2006-0110
Comment from NOAA

Submitter Information

Email: alexandria.barkman@noaa.gov
Government Agency Type: Federal
Government Agency: NOAA

General Comment

Aloha Ms. Amy Hanson,

The National Marine Fisheries Service (NMFS), Pacific Islands Regional Office (PIRO) received a notice about the release of the SpaceX Draft Tiered Environmental Assessment (Draft EA) for SpaceX's proposal to increase the number of launches and landings of its Starship/Super Heavy Vehicle at the Boca Chica Launch Site from the Federal Aviation Administration. We would like to provide the below comments on the proposed activities that may have adverse impacts to EFH in the Pacific Islands Region.

This technical assistance does not fulfill any federal responsibilities and does not constitute an essential fish habitat (EFH) consultation. NMFS PIRO Habitat Conservation Division is the federal regulatory agency responsible for implementing the Magnuson-Stevens Fishery Conservation and Management Act (MSA), including the EFH provisions described by Federal regulations (50 CFR 600.920). For all questions related to consultations with us in the future, please contact us through the email address EFHESAconsult@noaa.gov.

Proposed Project Changes
The proposed action includes SpaceX Starship-Super Heavy Reentry and Recovery Operations in wates 62 nautical miles (NM) north of Kauai, Hawaii. An EFH consultations was conducted on the previous plan of 5 maximum launches per year. The revised plan proposes up to 25 annual launches of the Starship and 25 annual launches of the Super Heavy.

MSA Mandate
The EFH provision of the MSA (Section 305(b)) and the consultation process is described by 50 CFR 600.805-600.930. An EFH consultation is required for any action that "may adversely affect" designated EFH, defined as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity" (e.g., water column and/or substrate). An adverse effect is any impact that reduces the quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species, and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions. Adverse effects can be on a continuum from temporary to short-term to long-term or permanent.

In the Hawaiian Islands, EFH has been designated in the marine water column from the surface to a depth of 3,281 feet (ft) (1000 meters (m)), from the shoreline to the outer boundary of the Exclusive Economic Zone (200 NM), and the seafloor from the shoreline out to a depth of 2,297 ft (700 m). These waters and submerged lands are designated as EFH because they support various life stages for the management unit species (MUS) identified under the Western Pacific Fishery Management Council's Pelagic and Hawai'i Archipelago Fishery Ecosystem Plan (Hawai'i FEP). The MUS and life stages found in these waters include: eggs, larvae, juveniles, and adults of Bottomfish MUS; eggs, larvae, juveniles, and adults of Crustacean MUS; and eggs, larvae, juveniles, and adults of Pelagic MUS. Specific types of habitat considered as EFH include coral reefs, patch reefs, hard substrate, seagrass beds, soft substrate, artificial or man-made structures, lagoon, estuarine, surge zone, deep-slope terraces and pelagic/open ocean. Due to the large area considered EFH, most in-water activities in the EEZ have the potential to adversely affect EFH and therefore require a consultation.

NMFS Concerns
The Starship and Super Heavy landings could have adverse effects on EFH from physical damage to the benthos, including coral reef ecosystems <2,297 ft (700 m) deep in the Hawaii EEZ from sinking debris. Chemical contamination of the water column up to 3,281 ft (1000 m) and benthos <2,297 ft (700 m) may result from unburned solid propellant residue, batteries, and petroleum from recovery vessels. Although an EFH consultation has been conducted for part of this action in the past, the proposed changes to the action require the re-initiation of an EFH consultation.

Conclusion
NMFS agrees with the FAA determination that there may be adverse effects to EFH from the proposed action. The FAA should re-initiate an EFH consultation with NMFS.

We greatly appreciate the opportunity to provide comments on the Environmental Assessment, and will be looking for the opportunity to consult on the planned activities in the future. For all additional questions related to this, please contact us through the email address: efhesaconsult@noaa.gov

Respectfully,
Alexandria Barkman

U.S. Department of Transportation
Federal Aviation Administration

Office of Commercial Space Transportation

800 Independence Ave., SW.
Washington, DC 20591

April 11, 2025

Alexandria Barkman
National Oceanic and Atmospheric Administration
National Marine Fisheries Service, Pacific Islands Regional Office
1845 Wasp Boulevard, Building 176
Honolulu, Hawaii 96818
Submitted to: efhesaconsult@noaa.gov

Dear Alexandria Barkman,

The Federal Aviation Administration (FAA) appreciates the comments the National Oceanic and Atmospheric Administration (NOAA) submitted on August 29, 2024 (FDMS Letter FAA-2024-2006-0110), regarding the SpaceX Draft Tiered Environmental Assessment (EA) for SpaceX's proposal to increase the number of launches and landings of its Starship/Super Heavy Vehicle at the Boca Chica Launch Site. NOAA's comments and FAA's responses are provided below.

NOAA Comment – Essential Fish Habitat

This technical assistance does not fulfill any federal responsibilities and does not constitute an essential fish habitat (EFH) consultation. National Marine Fisheries Service (NMFS) Pacific Islands Regional Office Habitat Conservation Division is the federal regulatory agency responsible for implementing the Magnuson-Stevens Fishery Conservation and Management Act (MSA), including the EFH provisions described by Federal regulations (50 CFR 600.920). For all questions related to consultations with us in the future, please contact us through the email address EFHESAconsult@noaa.gov.

The EFH provision of the MSA (Section 305(b)) and the consultation process is described by 50 CFR600.805-600.930. An EFH consultation is required for any action that "may adversely affect" designated EFH, defined as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity" (e.g., water column and/or substrate). An adverse effect is any impact that reduces the quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species, and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions. Adverse effects can be on a continuum from temporary to short-term to long-term or permanent. In the Hawaiian Islands, EFH has been designated in the marine water column from the surface to a depth of 3,281 feet (ft) (1000 meters (m)), from the shoreline to the outer boundary of the U.S. Exclusive Economic Zone (EEZ)

(200 NM), and the seafloor from the shoreline out to a depth of 2,297 ft (700 m). These waters and submerged lands are designated as EFH because they support various life stages for the management unit species (MUS) identified under the Western Pacific Fishery Management Council's Pelagic and Hawai'i Archipelago Fishery Ecosystem Plan (Hawai'i FEP). The MUS and life stages found in these waters include: eggs, larvae, juveniles, and adults of Bottomfish MUS; eggs, larvae, juveniles, and adults of Crustacean MUS; and eggs, larvae, juveniles, and adults of Pelagic MUS. Specific types of habitat considered as EFH include coral reefs, patch reefs, hard substrate, seagrass beds, soft substrate, artificial or man-made structures, lagoon, estuarine, surge zone, deep-slope terraces and pelagic/open ocean. Due to the large area considered EFH, most in-water activities in the EEZ have the potential to adversely affect EFH and therefore require a consultation. Starship and Super Heavy landings could have adverse effects on EFH from physical damage to the benthos, including coral reef ecosystems <2,297 ft (700 m) deep in the Hawaii EEZ from sinking debris. Chemical contamination of the water column up to 3,281 ft (1000 m) and benthos <2,297 ft (700 m) may result from unburned solid propellant residue, batteries, and petroleum from recovery vessels. Although an EFH consultation has been conducted for part of this action in the past, the proposed changes to the action require the re-initiation of an EFH consultation. NMFS agrees with the FAA determination that there may be adverse effects to EFH from the proposed action. The FAA should re-initiate an EFH consultation with NMFS.

FAA's Response

The FAA determined there may be temporary, limited adverse effects to EFH, particularly in the event of launch failure involving the spread of debris. The FAA consulted NMFS regarding potential adverse effects to EFH around Hawaii. The FAA has revised the EA to remove the Pacific action area from the U.S. EEZ. While EFH can be mapped outside of the EEZ, there are no consultation requirements outside of the EEZ. However, SpaceX would still implement the NMFS conservation recommendations from the previous consultation. NMFS provided conservation recommendations pursuant to 50 CFR § 600.920, which SpaceX and the FAA have agreed to implement as stated in the 2022 PEA and mitigated FONSI/ROD.

The new Proposed Action would increase the number of Starship/Super Heavy vehicle launches, but as the number of launches increases, the reliability of the vehicle would increase, and the risk of an anomaly would remain the same as or decrease compared to what was described in the 2022 PEA. The probability of an expended vehicle impacting EFH would remain negligible. SpaceX expects fuel onboard the launch vehicle to be consumed during vehicle breakup, as well as all residual propellant, which would combust. Any remaining structural debris would be made of inert materials and are not anticipated to affect water quality and EFH. SpaceX would also continue to either sink or recover any large floating debris, as necessary, and implement previous NMFS Conservation Recommendations.

If you have questions or concerns regarding FAA's response, please contact Amy Hanson at (847) 243-7609 or via email at Amy.Hanson@faa.gov.

Sincerely,

STACEY MOLINICH ZEE
Digitally signed by STACEY MOLINICH ZEE
Date: 2025.04.11 16:36:24 -04'00'

Stacey M. Zee
Manager
Operations Support Branch

Zaccagnino, Jimmy

From: SpaceXBocaChica
Sent: Tuesday, January 21, 2025 12:00 PM
To: Zaccagnino, Jimmy
Subject: Fw: Draft Tiered EA for SpaceX Starship Super Heavy Vehicle Increased Cadence at the SpaceX Boca Chica Launch Site in Cameron County Texas

Follow Up Flag: Follow up
Flag Status: Flagged

From: Wilamena Harback - NOAA Federal <wilamena.harback@noaa.gov>
Sent: Wednesday, January 15, 2025 4:46 PM
To: SpaceXBocaChica <SpaceXBocaChica@icf.com>
Cc: Jay Nunenkamp - NOAA Federal <jay.nunenkamp@noaa.gov>; Rachel Morris - NOAA Federal <rachel.morris@noaa.gov>
Subject: Draft Tiered EA for SpaceX Starship Super Heavy Vehicle Increased Cadence at the SpaceX Boca Chica Launch Site in Cameron County Texas

Good morning Ms. Amy Hanson,

I am the Environmental Compliance Coordinator (ECC) for NOAA's Office of National Marine Sanctuaries (ONMS), and you were the person that was listed as the POC for the project. We are reaching out to you for assistance with both an extension to the comment period and a request (going forward) to be a cooperative agency for this action.

Yesterday, myself and my colleagues were reading through the NOAA communications and we noticed the following article:

https://www.civilbeat.org/2025/01/public-should-weigh-in-on-spacexs-plans-to-splash-down-near-hawai%CA%BBi/

Unfortunately, this was the first time that I (or any of our staff on site at the Papahānaumokuākea Marine National Monument and new Papahānaumokuākea National Marine Sanctuary) had heard about this new draft tiered Environmental Assessment (EA). Our staff are worried about the proximity to and now within the monument and newly sanctuary designation that is finalized (as of this week with the signing of the ROD, and with an effective date forthcoming). As comments are due on the 17th (Friday) and we never received this for coordination and comment, we are wondering if you would have any information on this specifically as the landing zones around Hawaii are significantly larger than was originally communicated to the Monument in 2021? The original landing zones were outside of the monument and new sanctuary, and our staff were coordinated with to make sure there were mitigation measures in place to prevent parts from migrating into the monument. Unfortunately none of this was completed this go-around.

This EA is listed here: https://www.faa.gov/media/87646 and they are tiering off of another action. However, this would now have an impact on the sanctuary resources (as both their landing zone

has significantly increased and now within the monument and sanctuary) as we describe above. We are requesting an extension to the comment period and to be added as a cooperative agency going forward due to the impacts and lack of any BMPs/mitigation measures?

I apologize for the rapid questions, but we would need to act quickly due to the current comment period expiring on Friday and the need to work with the lead agency (FAA's) timelines.

Please advise ASAP as we do not have a lot of time and the site, regional and HQ staff at NOAA's ONMS are concerned.

Thank you in advance.

Wilamena G Harback
Environmental Compliance Coordinator
Protected Area Policy Division
Office of National Marine Sanctuaries (ONMS)
National Oceanic and Atmospheric Administration (NOAA)
wilamena.harback@noaa.gov
240-653-9171 (work phone)
Wilamena.Harback@NOAA.gov

U.S. Department of Transportation
Federal Aviation Administration

Office of Commercial Space Transportation

800 Independence Ave., SW.
Washington, DC 20591

April 11, 2025

Wilamena Harback
Environmental Compliance Coordinator
National Oceanic and Atmospheric Administration
Office of National Marine Sanctuaries
1305 East-West Highway
Silver Spring, Maryland 20910
Submitted to: wilamena.harback@noaa.gov

Dear Wilamena Harback,

The Federal Aviation Administration (FAA) appreciates the comments the National Oceanic and Atmospheric Administration (NOAA) submitted on January 15, 2025 (Email: Draft Tiered EA for SpaceX Starship Super Heavy Vehicle Increased Cadence at the SpaceX Boca Chica), and January 17, 2025 (FDMS Letter FAA-2024-2006-10831), regarding the SpaceX Draft Tiered Environmental Assessment for SpaceX's proposal to increase the number of launches and landings of its Starship/Super Heavy Vehicle at the Boca Chica Launch Site. NOAA's comments and FAA's response are provided below.

NOAA Comment – Office of National Marine Sanctuaries Consultation

I am the Environmental Compliance Coordinator (ECC) for NOAA's Office of National Marine Sanctuaries (ONMS), and you were the person that was listed as the POC for the project. We are reaching out to you for assistance with both an extension to the comment period and a request (going forward) to be a cooperative agency for this action. Yesterday, myself and my colleagues were reading through the NOAA communications and we noticed the following article: https://www.civilbeat.org/2025/01/public-should-weigh-in-on-spacexs-plans-to-splash-down-nearhawai%CA%BBi/

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Unfortunately, this was the first time that I (or any of our staff on site at the Papahānaumokuākea Marine National Monument and new Papahānaumokuākea National Marine Sanctuary) had heard about this new draft tiered Environmental Assessment (EA). We are requesting an extension to the comment period and to be added as a cooperative agency going forward due to the impacts and lack of any BMPs/mitigation measures? I apologize for the rapid questions, but we would need to act quickly due to the current comment period expiring on Friday and the need to work with the lead agency (FAA's) timelines. Please advise ASAP as we do not have a lot of time and the site, regional and HQ staff at NOAA's ONMS are concerned.

FAA's Response

Based on public comments received on the draft EA, the FAA has modified its proposal and is no longer proposing to land in the U.S. Exclusive Economic Zone (EEZ) and has established a buffer zone of 50 nautical miles around the Papahānaumokuākea Marine National Monument. The EA was revised to reflect these modifications. These changes further reduce potential environmental impacts and ensure that no significant effects will occur by:

- Protecting Sensitive Ecosystems: The removal of the Pacific action area from the Hawaiian EEZ ensures that operations avoid areas of unique biodiversity and cultural significance, thereby minimizing risks to marine life and ecosystems associated with the monument.
- Avoiding Overlap with Protected Areas: The establishment of a buffer zone around the monument ensures that activities remain at a safe distance from the boundary, reducing the likelihood of any adverse impacts on the marine environment.
- Mitigating Potential Cross-Boundary Impacts: By revising the action area, the likelihood of debris dispersion affecting the Hawaiian Islands and surrounding waters is significantly decreased and expected to be negligible.

Landings would not occur in the Flower Garden Banks National Marine Sanctuary. Flight hazard areas for launch and landing, as defined in 14 CFR 450.133, contain the areas debris is statistically most likely to land in during an anomaly do not overlap with the Flower Garden Banks National Marine Sanctuary. Therefore, no adverse impacts to this resource are expected.

NOAA Comment – North Pacific Office Landing Operations

The landing operations in the North Pacific Ocean, discussed in the Draft EA, may occur within or near the Papahānaumokuākea Marine National Monument (which is also within the recently designated Papahānaumokuākea National Marine Sanctuary), and the Hawaiian Islands Humpback Whale National Marine Sanctuary (Figure 4, Draft EA). Additionally, the landing area in the Gulf of Mexico could affect the Flower Garden Banks National Marine Sanctuary. Therefore, ONMS requests to be a cooperating agency with the FAA on the proposed licensing to SpaceX for increased landing operations in marine areas so that we can help SpaceX meet its objectives while minimizing impacts to critical natural and cultural areas of the ocean.

We look forward to working with the FAA's Office of Commercial Space Transportation to support the activities of SpaceX in a manner that will protect our treasured national marine sanctuaries. Please confirm you are the point of contact for this project.

FAA's Response
See FAA's response above to NOAA Comment – Office of National Marine Sanctuaries Consultation.

If you have questions or concerns regarding FAA's response, please contact Amy Hanson at (847) 243-7609 or via email at Amy.Hanson@faa.gov.

Sincerely,

STACEY MOLINICH ZEE

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Date: 2025.04.11 16:47:57 -04'00'

Stacey M. Zee
Manager
Operations Support Branch

TEXAS GENERAL LAND OFFICE
COMMISSIONER DAWN BUCKINGHAM, M.D.

January 17, 2025

FILED ELECTRONICALLY AND VIA CERTIFIED MAIL, R.R.R

Ms. Amy Hanson
FAA Environmental Specialist
SpaceX EA, c/o ICF
1902 Reston Metro Plaza
Reston, VA 20190

RE: Docket No. FAA-2024-2006: ***Revised Draft Tiered Environmental Assessment for SpaceX Starship/Super Heavy Launch Vehicle Program Increased Cadence at the Boca Chica Launch Site***

Dear Ms. Hanson:

As someone who grew up on the Texas coast and as Commissioner of the Texas General Land Office (GLO), which safeguards and manages more than 3,400 miles of Texas coastline, I care deeply about the stewardship of our coastal and public lands and ensuring the public's right of access to Texas' beaches.

However, I also recognize the significance of space exploration for Texas and the United States and SpaceX is working to ensure the United States remains the world's leader in space. SpaceX is quite literally reaching for the stars and in doing so, inspiring generations of Texans, especially our youth, to do the same – exploring, learning, and seeking new possibilities. As such, I continue to support SpaceX's operations at the Boca Chica Launch Facility in Cameron County, Texas and its commitment to be good stewards of the environment.

Sincerely,

D. Buckingham

DAWN BUCKINGHAM, M.D.
Commissioner, Texas General Land Office

1700 North Congress Avenue, Austin, Texas 78701-1495
P.O. Box 12873, Austin, Texas 78711-2873
512-463-5001 glo.texas.gov

U.S. Department of Transportation
Federal Aviation Administration

Office of Commercial Space Transportation

800 Independence Ave., SW.
Washington, DC 20591

April 11, 2025

Dawn Buckingham, Commissioner
Texas General Land Office
1700 North Congress Avenue
Austin, Texas 78711-2873
Submitted to: david.land@glo.texas.gov

Dear Dawn Buckingham,

The Federal Aviation Administration (FAA) appreciates the comments the Texas General Land Office (GLO) submitted on January 17, 2025 (FDMS Letter FAA-2024-2006-10959), regarding the SpaceX Draft Tiered Environmental Assessment for SpaceX's proposal to increase the number of launches and landings of its Starship/Super Heavy Vehicle at the Boca Chica Launch Site. GLO's comment and FAA's response are provided below.

GLO Comment – General Support

As someone who grew up on the Texas coast and as Commissioner of the Texas General Land Office (GLO), which safeguards and manages more than 3,400 miles of Texas coastline, I care deeply about the stewardship of our coastal and public lands and ensuring the public's right of access to Texas' beaches. However, I also recognize the significance of space exploration for Texas and the United States and SpaceX is working to ensure the United States remains the world's leader in space. SpaceX is quite literally reaching for the stars and in doing so, inspiring generations of Texans, especially our youth, to do the same - exploring, learning, and seeking new possibilities. As such, I continue to support SpaceX's operations at the Boca Chica Launch Facility in Cameron County, Texas and its commitment to be good stewards of the environment.

FAA's Response

Thank you for the comment.

If you have questions or concerns regarding FAA's responses, please contact Amy Hanson at (847) 243-7609 or via email at Amy.Hanson@faa.gov.

Sincerely,

STACEY MOLINICH ZEE

Digitally signed by STACEY MOLINICH ZEE
Date: 2025.04.11 16:38:42 -04'00'

Stacey M. Zee
Manager
Operations Support Branch