5. Individual Letter Responses

January 17, 2025

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

Submitted electronically to www.regulations.gov, Docket No. FAA-2024-2006

Re: Revised 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. Hanson,

Defenders of Wildlife and Audubon Texas provide the following comments in response to the Revised Draft Tiered Environmental Assessment for SpaceX Starship/Super Heavy Vehicle Increased Cadence at the SpaceX Boca Chica Launch Site in Cameron County, Texas (November 2024). Founded in 1947, Defenders of Wildlife is a national non-profit conservation organization focused on wildlife and habitat conservation across the country. The organization represents more than 2.1 million members and supporters in the United States and around the world, including approximately 105,000 in Texas. Defenders works for the protection and recovery of flora and fauna in the Lower Rio Grande Valley, including rare and endangered species in the South Texas Coastal Corridor. Audubon Texas is the state office of the National Audubon Society. The National Audubon Society is a nonprofit conservation organization with over 1.7 million members that protects birds and the places they need, today and tomorrow, throughout the Americas using science, advocacy, education, and on-the-ground conservation. Audubon Texas has a network of 21 local chapters and over 90,000 members in Texas.

Defenders of Wildlife and Audubon Texas appreciate the opportunity to comment on the Draft Tiered Environmental Assessment for SpaceX Starship/Super Heavy Launch Vehicle Program Increased Cadence (Draft EA). The Draft EA is intended to tier from the 2022

Programmatic Environmental Assessment (PEA) for the launch program at the SpaceX facility in Boca Chica, Texas. The Proposed Action is a ramping up of the frequency of rocket launches and landings at Boca Chica. The Draft EA claims that the environmental impacts of the Proposed Action would be "comparable" to those evaluated in the PEA, stating that that "the modification of SpaceX's existing vehicle operator license . . . conforms to the prior environmental documentation" and that there are "no significant environmental changes."[1] It notes that the Finding of No Significant Impact (FONSI) that followed the PEA determined that the original launch program would not significantly affect the environment because its impacts would be reduced below a significant level by required mitigation measures. With assurances that SpaceX would continue to adhere to the measures included in the PEA and FONSI, the Draft EA concludes that the Proposed Action also would not result in significant impacts. We believe the Draft EA does not support this conclusion, and that National Environmental Policy Act (NEPA) therefore requires an Environmental Impact Statement (EIS).

1. Requirements of NEPA

Agencies, including the Federal Aviation Administration (FAA), must comply with NEPA during the planning stages of federal agency actions. The statute requires that an EIS be prepared for any actions that would have a "reasonably foreseeable significant effect on the quality of the human environment."[2] It allows a less rigorous and detailed EA only for actions that would "not have a reasonably foreseeable significant effect . . . or if the significance of such effect is unknown."[3] The order that directs FAA's implementation of NEPA clarifies that "an EIS is required when any of the impacts of the proposed action, after incorporating any mitigation commitments, remain significant to the human environment."[4]

Citing the Council on Environmental Quality (CEQ) NEPA regulations,[5] the FAA order states that determining the significance of effects "requires consideration of both context and intensity."[6] Depending on the proposed action, the appropriate context may be "nationwide, an affected region, affected interests, or a locality" but "for a site-specific action, significance would usually depend upon local impacts."[7] The FAA order clarifies

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[1] Draft EA at 68
[2] NEPA § 106(a)(1).
[3] NEPA § 106(a)(2).
[4] FAA, *Order 1050.1F: Environmental Impacts: Policies and Procedures*, 4-3 (July 16, 2015). The order directs that "All FAA Lines of Business and Staff Offices (LOB/Sos) must comply with the CEQ Regulations as further implemented and supplemented by this Order." *Id.* at sec. 1-7, p. 1-2.
[5] Because the Order was last updated in 2015, it implicitly references the CEQ regulations current as of that date. 40 C.F.R. Parts 1500–1508 1978).
[6] *Supra* n.4.
[7] *Id*.

that "intensity refers to the severity of the impacts and includes, but is not limited to, consideration of "unique characteristics of the geographic area (e.g., proximity to historic or cultural resources, parks, prime farmlands, wetlands, wild and scenic rivers, ecologically critical areas)", "adverse impacts on endangered or threatened species or critical habitat", and "whether an action threatens a violation of Federal, state, or local law or requirements imposed for the protection of the environment."[8]

With respect to mitigation, the FAA order states that

> mitigation includes avoiding the impact; minimizing the impact; rectifying the impact by repairing, rehabilitating, or restoring the environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and compensating for the impact by replacing or providing substitute resources.[9]

2. *Like the PEA before it, the Draft EA grossly understates the impacts of rocket launches at Boca Chica*

Our organizations' separate comments on the Draft PEA highlighted the many environmental impacts of SpaceX operations at Boca Chica, a biologically diverse and sensitive area. We incorporate those comments by reference and attach them to this letter. The site is surrounded by conservation properties including state parks and Lower Rio Grande Valley National Wildlife Refuge. Numerous species of birds flock to tidal flats within a few hundred feet of the launch tower, including piping plover and red knot, which are listed as threatened under the Endangered Species Act (ESA). The nearby beach is a nesting ground for ESA-listed sea turtles. These and other resources are vulnerable to the noise, vibration, light, heat, and emissions produced by every launch of the Super Heavy, the largest rocket ever built. In April 2023, a Super Heavy exploded during a failed launch attempt, raining boulder-sized chunks of concrete and flaming debris onto the wildlife refuge. Even a relatively uneventful launch in June 2024 propelled a high-velocity gravel plume that destroyed bird nests.

The magnitude of potential impacts is self-evident, which is why our comments on the Draft PEA insisted that FAA must undertake an EIS to comply with NEPA. The current Draft EA compounds the error of the PEA by claiming that the Proposed Action would not represent a significant increase in impacts relative to the current baseline. This assertion is not credible because the Draft EA fundamentally misjudges the similarity of the Proposed Action to the previously permitted operations, and repeatedly compares its impacts to

[8] *Id*.
[9] *Id*. at 4-14

dubious thresholds of significance. Undercutting its own claims about the sufficiency of the previously-prescribed mitigation measures, the Draft EA also suggests a series of new measures, none of which would provide effective mitigation as currently designed. For these reasons, the Draft EA's determination that the Proposed Action would not result in significant impacts is unsupported. If it cannot be demonstrated that the impacts of the Proposed Action would be insignificant, an EIS must be produced rather than an EA.

3. The Draft EA focuses on the qualitative similarity of the impacts to those described in the PEA while downplaying their substantial quantitative increase

The repeated statements that the impacts of the Proposed Action would be comparable to those covered by the PEA seem to be based on the fact that both would stem from launches and landings of similar rockets at the same site. This glosses over key differences. Most obviously, the Proposed Action represents a multi-fold increase in the frequency of launches. In addition, the rockets that would be used for the Proposed Action are not in fact the same as the rockets previously analyzed. The upgraded Starship would produce 2.4 times the thrust of the previous version, while the thrust of the upgraded Super Heavy would be almost 40 percent greater. For these reasons, while the impacts of the Proposed Action may be qualitatively similar to those analyzed in the 2022 PEA, they would be quantitatively much greater. The following are just some examples of the Draft EA's pervasive downplaying of impacts.

a) Area of noise impacts

The Draft EA repeatedly states that "while the number of orbital launches and landings . . . would change, the spatial extent of impacts from each orbital launch/landing would generally be the same as in the 2022 PEA."[10] However, as a consequence of the increased thrust, noise impacts would extend one mile farther from the launch site.[11] This linear increase means that the area subject to those impacts would expand by 30 percent. The Draft EA acknowledges this expansion only by saying that "the geographic extent of modeled noise contours [would] slightly increase under the Proposed Action."[12] It is not reasonable to characterize a difference of 30 percent as either "generally the same as", or a "slight" increase over, the impacts evaluated in the PEA.

b) Increased launch frequency

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[10] Draft EA at 19.

[11] See Draft EA at 26: "the 2022 PEA found that the higher L_{Amax} contours (100–140 dBA) extended up to approximately 7 miles from the launch site. . . . Updated noise modeling for the Proposed Action, which includes vehicle thrust increase, indicates that the higher LAmax contours (100–140 dBA) would extend up to approximately 8 miles from the launch site."

[12] *Id*. at 19.

The Draft EA is similarly dismissive of the increase in launch frequency, stating that "although the frequency of . . . impacts is higher than what was presented in the 2022 PEA, an increase from 10 launch events to 25 launches would still be considered intermittent, temporary, and infrequent."[13] Each of these terms is relative and subjective. They are only useful if tied to frequency-dependent impact thresholds, something the Draft EA makes no attempt to do. In the case of wildlife, the increase in launch frequency means that individual animals are more than twice as likely to experience a direct impact (including injury or death) over the course of a year. In addition, recurring events have cumulative impacts. It is possible that some wildlife species or other sensitive resources can tolerate 10 launches a year but would be pushed past a tipping point by 25 launches.

Frequency must also be judged relative to the magnitude of the event in question. For example, 20 thunderstorms over the course of a year may not be considered frequent, but 20 hurricanes would be. As the most powerful rocket ever developed (with a track record of causing some of the largest non-nuclear explosions in history), each launch of the Super Heavy is clearly the equivalent of a hurricane.

c) Increased emissions

The Draft EA states that "air quality impacts, taking into account the new information related to the Proposed Action, would be comparable to those discussed in the 2022 PEA and would not be significant."[14] This is contradicted on the next page, where Table 3 shows that the overall air quality impacts of the Proposed Action would be approximately three times that of existing operations. The emissions of rocket launches and landings alone would be five times greater. The discrepancy is apparently due to the shift of most static test fires from Boca Chica to the Massey's site four miles away. While they may have been removed from the Proposed Action, the test fires will still clearly contribute to cumulative air quality impacts in the area. In any event, neither a five-fold nor a three-fold increase in emissions can reasonably be deemed "comparable" to the baseline.

d) Biological impacts

The Draft EA mischaracterizes the biological impacts of the Proposed Action in a variety of ways. It states that "biological impacts . . . would be comparable to those discussed in the 2022 PEA."[15] However, it also acknowledges that "during launch activities, noise would cause wildlife to be temporarily displaced or disturbed."[16] Given the substantial increase in

[13] *Id*. at 26.
[14] *Id*. at 28.
[15] *Id*. at 42.
[16] *Id*. at 43.

launch frequency, the impacts may be qualitatively similar but are certainly not quantitatively comparable.

The Draft EA also downplays the potential severity of impacts. It states that "wildlife would be expected to resume normal behavior shortly after a launch operation is complete."[17] That conclusion is not supported. Studies have shown that harassment in the form of repeated noise and other forms of disturbance can permanently alter the behavior of wildlife.[18] The likelihood of crossing such a threshold would be greater under the Proposed Action due to the increased launch frequency. Regarding sonic booms, the Draft EA states that "direct physical injury or death of wildlife . . . are not anticipated."[19] This reasoning, present throughout the document's analysis of biological impacts, is based on an unfounded assumption that death or injury are the only relevant forms of impact on wildlife. Studies have also shown that repeated stressful events like rocket launches and sonic booms can cause physiological harm in addition to altering behavior.[20]

With respect to the rocket heat plume, the Draft EA posits that impacts to wildlife would be mitigated because "noise associated with the pre-launch operations and the engines is expected to drive individuals to disperse from the area prior to exposure" and "some pre-launch activities, such as the use of drones . . . could trigger the startle response of birds and other animals, allowing additional dispersal time."[21] Repeatedly startling animals and driving them from their home ranges is itself an impact. It is not appropriate to treat it as a form of mitigation. For example, causing birds to flush from their nests exposes eggs and nestlings to dangers including heat and predation and increases the risk of nest abandonment. The startle response therefore increases rather than minimizes impacts to nesting birds. The Draft EA undermines its own argument in the next paragraph, stating that "the species that frequent the area have likely experienced . . . [the] disturbance" of Proposed Action activities. Wildlife that are accustomed to disturbance are less likely to disperse when it occurs, and thus more likely to be impacted by the heat plume and other hazards.

Furthermore, the proposed increased landing cadence will cause additional impacts at the areas surrounding the ocean landing platforms. As stated in the Draft EA, "for landings at sea, both Starship and Super Heavy could have: (1) a hard landing at terminal velocity and

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[17] *Id*.
[18] Graeme Shannon et al., *A synthesis of two decades of research documenting the effects of noise on wildlife, Biological Reviews* (November 2015).
[19] Draft EA at 43.
[20] Clinton D. Francis and Jesse R. Barber, *A framework for understanding noise impacts on wildlife: an urgent conservation priority*, Frontiers in Ecology and the Environment (August 2013).
[21] Draft EA at 49.

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 and (3) breakup during reentry resulting in debris falling into the ocean." All three of these landing scenarios will result in ocean impacts by creating floating and sinking marine debris, noise and heat disturbance, and anywhere from 74 to 101 MT of residual propellent[22] entering the ocean per launch. Additionally, the action areas described in the Draft EA appear to cover a significantly larger area[23] in the Pacific Ocean than was previously identified in the 2022 PEA[24]. The expanded action areas in the Pacific Ocean overlap critical habitat for numerous protected species as identified in the 2022 PEA. The environmental impact of increased landing frequency of ocean landings at what appears to be an expanded Action Area in the Pacific Ocean is lacking from the Draft EA. Most critical is a review of the areas directly adjacent to the Pacific Remote Islands Marine National Monument at Johnston Atoll and Wake Atoll and areas directly adjacent to and in some cases overlapping the Papahānaumokuākea Marine National Monument. An EIS is needed to evaluate the impact of the expanded action areas.

e) Purported improvement in launch reliability

One of the Draft EA's rationales for why the impacts of the Proposed Action would not be significantly greater than those of current operations is that the rockets will become more reliable over time, reducing the odds of "anomalies" like the April 2023 explosion. The document states that "the Proposed Action . . . is not expected to increase the probability of an anomaly occurring due to the increase in reliability and capability of the vehicle that occurs with each successful launch."[25] This is echoed in its description of the purpose and need of the Proposed Action, which notes that "frequent launches and landings in the early phase of the program are critical in developing Starship/Super Heavy's rapid launch capability because it allows for iterative testing of the core design."[26] However, these two ideas are in conflict with each other. If iterative testing is the purpose of the action, there will necessarily be a period of frequent launches before the hoped-for improvement in reliability may be realized. How many launches will occur during that period of elevated risk? Will launch frequency be scaled back after the testing phase is complete? If not, will the improvement in reliability really compensate for the increased number of launches?

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[22] *Id*. at 15
[23] *Id*. at 14, figure 4.
[24] Final Programmatic Environmental Assessment (Final PEA) and Mitigated Finding of No Significant Impact/Record of Decision (Mitigated FONSI/ROD) for the SpaceX Starship/Super Heavy Launch Vehicle Program at the SpaceX Boca Chica Launch Site in Cameron County, Texas (PEA). Appendix D, page 25, figure 5.
[25] *Id*. at 52.
[26] *Id*. at 20.

The Draft EA makes no attempt to answer these questions. It must do so, given the catastrophic nature of anomalies.

4. The Draft EA does not adequately assess the potential impacts of the Proposed Action on species listed under the Endangered Species Act

One of the most important requirements of NEPA is an analysis of potential impacts to species listed under the ESA and to their designated critical habitat, and, in the case of an EA, a justification for why those impacts would not be significant. By falling back on the flawed assumption that the impacts of the Proposed Action would be effectively the same as those covered by the previous analysis, the Draft EA fails to meet that requirement. It also fails to provide the documentation necessary to evaluate its conclusions. Several times the Draft EA asks readers to refer to a Biological Assessment (BA) in Appendix A for additional analysis of impacts, but no such document is included in the appendix. Another document that is referenced but not included is the October 11, 2024, concurrence from the U.S. Fish and Wildlife Service (FWS), which supposedly determined that "expansion of the action area . . . is not likely to adversely affect ESA-listed species and designated habitat beyond those effects already evaluated."[27] Without that source, we are left to speculate as to why FWS provided concurrence for the expanded area of impacts but not for other aspects of the Proposed Action, like increased launch frequency.

The Draft EA acknowledges that "the FAA determined the Proposed Action may affect and is likely to adversely affect ESA-listed species" and "is conducting additional formal consultation with [FWS and NOAA Fisheries]."[28] It says the results of that consultation, a Biological Conference Opinion (BCO), will be provided with the Final EA. Without the BA and BCO, reviewers of the Draft EA are denied a key tool for assessing the validity of its claims about impacts to listed species and critical habitat. Regardless of the conclusions of the BCO, however, impacts to listed species and critical habitat must be fully disclosed and discussed in the NEPA document itself, not deferred to an ESA consultation document. This is particularly true because "significance" of impacts under NEPA is not co-extensive with "jeopardy" to species or "destruction or adverse modification" of critical habitat under the ESA. Impacts may rise to the level of significance, requiring analysis in a full EIS, even if they do not rise to the level of jeopardy or destruction/adverse modification.

One example that illustrates the Draft EA's incomplete analysis of impacts to listed species is the case of the endangered Rice's whale. On page 12, a map of the Super Heavy landing zone in the Gulf of Mexico depicts an avoidance area for this species. The existence of an avoidance area clearly indicates concern about impacts to Rice's whale from ocean

[27] *Id*. at 45.
[28] *Id*. at 6.

landings. However—confoundingly—the species is not mentioned anywhere else in the Draft EA. There is no discussion of why an avoidance area was deemed necessary or why it is expected to provide effective mitigation. There is also no information about whether FAA has complied with its ESA section 7(a)(2) obligations with respect to Rice's whale, including by initiating consultation with NOAA Fisheries, the agency charged with implementing the ESA for this species.

5. ***The Draft EA does not adequately address the impacts to migratory birds protected by the Migratory Bird Treaty Act***

The Migratory Bird Treaty Act (MBTA) prohibits "take" of a protected migratory bird "unless and except as permitted" by FWS. The MBTA makes it "unlawful at any time, by means or in any manner to" "kill" or "take" "any migratory bird, nest" or "egg of any such bird." During past launches of the Super Heavy Booster, direct impacts to migratory bird eggs were documented,[29] which is in violation of the MBTA. In the Draft EA, SpaceX proposes to increase the number of Super Heavy launches from five to 25, therefore, the impacts to migratory birds and bird eggs are expected to increase. The minimization and mitigation measures included in the Draft EA are insufficient and fail to include all of the mitigation measures recommended by USFWS[30] to avoid impacts to migratory birds and destruction of their eggs. The measure to "develop field experiments to determine the extent of the gravel plume impact area due to Starship/Super Heavy launches", if conducted during breeding season, will lead to additional impacts to migratory birds. The Draft EA does not adequately address the increased likelihood of bird impacts, the increased likelihood of repeated violations of the MBTA, or how to mitigate impacts to nesting birds and their eggs.

6. ***Mitigation measures included in the Draft EA would not provide effective mitigation as designed***

As mentioned above, the launch on June 6, 2024, produced a gravel plume that destroyed multiple active bird nests.[31] The Draft EA notes that a gravel plume was not previously analyzed in the 2022 PEA. In a tacit acknowledgement that the impacts of this aspect of the Proposed Action may not be kept below a significant level through adherence to the PEA and FONSI, the Draft EA includes several new "minimization and mitigation measures" to

[29] Coastal Bend Bays & Estuaries Program, Shorebird nest fates at Boca Chica after rocket test launch (June 6, 2024).
[30] USFWS, *U.S. Fish and Wildlife Southwest Region Migratory Birds Program Recommendation for Minimization and Mitigation of Impacts to Migratory Birds at Starbase Texas* (July 2024).
[31] Coastal Bend Bays & Estuaries Program, *Shorebird nest fates at Boca Chica after rocket test launch* (June 6, 2024).

address it. Unfortunately, none of these measures would either minimize or mitigate impacts.

One of the new measures states that "SpaceX will . . . develop field experiments to determine the extent of the gravel plume impact area due to Starship/Super Heavy launches . . . [to] help inform the mitigation strategies."[32] Another says that "SpaceX will work with USFWS to investigate field techniques to protect identified nests during launch events."[33] Both are, at best, precursors to mitigation measures, not mitigation itself. There is certainly value in better understanding the nature of the impacts. The results of the first measure's experiments could inform development of the field techniques referenced in the second measure. However, to be effective, those techniques would need to be proven and ready for implementation prior to the start of the Proposed Action. The measures make no such commitment.

Another new measure states that "SpaceX will monitor for impacts to nesting [birds]" and "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."[34] While it is important to document impacts as they occur, monitoring and reporting are not mitigation. The appropriate role of monitoring is to trigger changes to, or even cessation of, the Proposed Action if a predefined level of impact is observed. This measure does not even hint at the possibility that the Proposed Action could be altered in response to monitoring data, nor does any other part of the Draft EA. Therefore, there is no reason to expect it to play any role in mitigating impacts.

Finaly, the Draft EA includes a measure in which SpaceX promises to "make an annual contribution of $5,000 to the Animal Health Department at the Gladys Porter Zoo."[35] While it may be laudable, such a donation is irrelevant. It would plainly neither minimize nor mitigate the impacts of the Proposed Action. If it is intended to compensate for impacts in some way, particularly to wildlife species, the Draft EA makes no attempt to explain how it would do so.

Another area in which the measures of the PEA and FONSI are insufficient, per the October 11, 2024, FWS concurrence, is the updated sonic boom estimates. The Draft EA includes several new measures intended to address sonic boom impacts, all of which suffer from the same flaws as those described above. One says that "SpaceX will conduct a review of the existing literature on impulsive noise effects . . ." without explaining how this review

[32] Draft EA at 44.
[33] *Id*. at 45.
[34] *Id*.
[35] *Id*.

would contribute to the development of mitigation techniques.[36] Another says that "SpaceX will . . . identify and prioritize a list of research studies that would help address data gaps regarding the effects of SpaceX launch activity on ESA-listed wildlife" and commit to "initiating this measure prior to Flight 6 and delivering a completed research priority list to [FWS]. . . as soon as possible."[37] This measure makes clear that the list of studies would not be produced until after the Proposed Action is already underway, let alone the results of those studies. There is also a promise to monitor sonic boom levels during a Super Heavy booster landing and "provide the monitoring data to the FAA within 15 days of the launch" with no mention of how the data would be acted upon.[38] Most egregiously, a measure commits SpaceX to "provid[ing] funds for a necropsy . . . of any piping plover or red knot found dead within the 15 psf sonic boom overpressure contour . . . to determine if the bird exhibits indicators of hearing damage."[39] First—if it is anticipated that sonic booms may injure or kill ESA-listed piping plovers or red knots, this impact must be analyzed in the NEPA document and also covered by an incidental take statement in the forthcoming BCO. Second—at the point of a necropsy, any opportunity to mitigate impacts to the bird in question has clearly passed. As with all these measures, there is no discussion of how necropsy results would lead to the Proposed Action being modified to avoid such outcomes going forward.

7. The Draft EA offers a misleadingly narrow view of the public interest

Just as the Draft EA underestimates the environmental impacts of the Proposed Action, it also overestimates public support for it. After noting that the Proposed Action would benefit the interests of government agencies that have contracts with SpaceX, it states that "public interests largely intersect with the government interests identified, including . . . advancing reliable and affordable access to space which in turn advances the scientific and national security benefits of the U.S. space program as a whole."[40] While advancement of space travel may benefit some elements of the public interest, this statement paints an incomplete picture. What about the interest of local communities in being free of the noise and other impacts of rocket launches that degrade their quality of life? Or their interest in having unimpeded access to Boca Chica beach and other public lands in the area? Or the interest of Americans nationwide in defending the integrity of national wildlife refuges and protecting ESA-listed species? The Draft EA is silent on these interests.

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[36] *Id*.
[37] *Id*. at 46.
[38] *Id*. at 45.
[39] *Id*. at 46.
[40] *Id*. at 5.

Conclusion

NEPA requires that federal agencies take a "hard look" at the environmental consequences of their proposed actions.[41] With its unexamined assumptions and offhanded dismissal of impacts, the Draft EA cannot be said to meet that standard. Given the potential intensity of impacts to sensitive resources including ESA-listed species and nesting birds, and the context of the wildlife refuges and other protected lands inside the action area, FAA must comply with its NEPA obligations by undertaking an EIS.

Sincerely,

Dr. Sharon Wilcox
Senior Texas Representative
Defenders of Wildlife

Lisa Gonzalez
Vice President & Executive Director
Audubon Texas

[41] *See, e.g.*, *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 350 (1989).

Attachment A

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November 1, 2021
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Re: Draft Programmatic Environmental Assessment (PEA) for the SpaceX Starship/Super Heavy Launch Vehicle Program at the SpaceX Boca Chica Launch Site in Cameron County, Texas

Audubon Texas is the state field office of the National Audubon Society. The organization has been working along the Texas coast since 1923, focusing on birds and the places they need to survive and flourish. Audubon Texas is the leaseholder of more than 170 islands along the Texas coast, which we maintain, often with dedicated partners, for the benefit of resident and migratory birds. Additionally, Audubon owns the 557-acre Sabal Palm Sanctuary in Brownsville, Texas. This sanctuary is operated in partnership with the Gorgas Science Foundation for purposes of providing education around conservation and ecological stewardship, for making the sanctuary available to the public as community asset, and for conserving some of the last remaining intact Sabal Palm forest in North America. The sanctuary sits approximately 17.5 miles from the SpaceX Boca Chica staging area, and fewer than 20 miles from the vertical launch area (VLA).

Audubon Texas appreciates the opportunity to provide comment on this draft PEA. As stated in earlier comments, we continue to monitor the activities of SpaceX and the Federal Aviation Administration (FAA), chiefly because of the location of the launch site, situated among state-owned lands at Boca Chica State Park and federally protected lands at the Lower Rio Grande Valley National Wildlife Refuge, which includes the Las Palomas Wildlife Management Area and the Laguna Atascosa National Wildlife Refuge, as well as the relatively novel and ill-understood long-term impacts of such infrastructure in this sensitive setting.

The FAA, as the lead federal agency for this project, consistent with other agencies, has its own implementing procedures for adherence to the National Environmental Policy Act (NEPA).[1] There have been eight (8) written re-evaluations since the 2014 final environmental impact statement (FEIS) for the SpaceX launch site. We understand that business plans change, particularly in a field as novel, complex, and uncertain as private space exploration. We are also mindful of the underlying goals of the laws which apply to these studies and activities. We believe continued amendments, changes in scope, changes in the types of rockets and material used, new plans for on-site infrastructure, (e.g., natural gas-powered generation, saltwater desalination, etc.) represent connected and cumulative actions which must be carefully considered against FAA Order 1050.1F, Paragraph 2-8.b.(1-2)[2], which states, in part:

> b. Scope of Proposed Action. To determine the scope of an EA or EIS, the responsible FAA official must consider:
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> (1) Connected actions. Connected actions are closely related actions that: (a) automatically trigger other actions; (b) cannot or will not proceed unless other actions are taken previously or simultaneously; or (c) are interdependent parts of a larger action and depend on the larger action for their justification (see 40 CFR § 1508.25(a)(1), CEQ Regulations). Connected actions and other proposed actions or parts of proposed actions that are related to each other closely enough to be, in effect, a single course of action must be evaluated in the same EA or EIS (see 40 CFR §§ 1502.4(a) and 1508.25(a)(1), CEQ Regulations). A proposed action cannot be segmented by breaking it down into small component parts to attempt to reduce impacts (see 40 CFR § 1508.27(b)(7), CEQ Regulations).
>
> (2) Cumulative actions. Cumulative actions, when viewed with other proposed actions, have cumulatively significant impacts. Cumulative actions should be discussed in the same EIS (see 40 CFR § 1508.25(a)(2), CEQ Regulations). (See Paragraph 4-2.d(3) for a discussion of cumulative impacts).

Today's SpaceX activities and project scope go well beyond the plan considered under the original record of decision (ROD). Considering the interconnectedness and interdependency of

[1] Council on Environmental Quality, 2020. Federal Agency NEPA Implementing Procedures. Available online: https://ceq.doe.gov/docs/laws-regulations/federal-agency-nepa-implementing-procedures-2020-06-04.pdf.
[2] US Department of Transportation, Federal Aviation Administration, 2015. Environmental Impacts: Policies and Procedures. Available online: https://www.faa.gov/documentlibrary/media/order/faa_order_1050_1f.pdf.

actions on-site, and the cumulative impacts of activities past and contemplated including under this draft PEA, fresh consideration under a new environmental impact statement (EIS) would be appropriate. In this fashion, the FAA should consider the entire proposed complex including the full range of proposed activities and previous amendments to the project, and the potential cumulative environmental impacts and alternatives of these activities.

Audubon is sensitive to SpaceX's desire for moving this project forward quickly. We are aware that concerns over the preparation of a new EIS could delay the project. Audubon's goal is to gain understanding, not create delay. It should be possible to reconcile the need for a comprehensive analysis while also respecting the broader stakes involved. Given the sheer scope of the project and the extent to which multiple parties are committed to the project, including SpaceX, NASA, and other elements of the federal government, the resources needed to better understand cumulative impacts should be gathered in order to ensure a more comprehensive impacts and alternatives analysis can be undertaken, in a reasonable time period. A new EIS is warranted.

Audubon is impressed with the scope and the seriousness of the paradigm-altering work that is being performed at SpaceX. We appreciate and understand that the endeavor seeks to alter the course of human civilization, and that no less a species-altering opportunity to populate Mars is at stake. Further, we believe that solving many of the pressing challenges of our times (climate change, for example, which is the greatest existential threat to humans and North American birds today)[3] requires significant investment in technology transfer—the kind of field-altering work in which SpaceX is currently engaged.

And yet, we simultaneously know that as humankind develops new technologies and gains extraordinary proficiencies, we must do so with a sophisticated understanding of how our activities impact our natural world, and the communities that rely on ecological biodiversity, ecological function, ecosystem services provided to society, and species' ability to survive and thrive. SpaceX has selectively chosen to defy rules and norms when it deems them obtrusive. Accordingly, the FAA has notified the company on multiple occasions that construction and

[3] Wilsey, C, B Bateman, L Taylor, JX Wu, G LeBaron, R Shepherd, C Koseff, S Friedman, R Stone. Survival by Degrees: 389 Bird Species on the Brink. National Audubon Society: New York. Available online: https://nas-national-prod.s3.amazonaws.com/climatereport-2019-english-lowres.pdf.

launches are being conducted without proper permits.[4,5] SpaceX activities occur on private property surrounded by some of the most critical habitat and protected areas in the state of Texas. While SpaceX's rights begin at their fence line, their obligations and the potential risks and impacts of their work do not.

We recognize and value that SpaceX has demonstrated a desire to be more integrated in and responsive to the community, whether by protecting sea turtles and supporting research during the February freeze, or by engaging in opportunities around education. SpaceX is a company, with economic means, charismatic leadership, and incredible government support, that has chosen to work in a pristine ecoregion with a rich history of environmental protection. Reasonable operational solutions and mitigation opportunities should be brought forth to lessen environmental impacts, to the greatest degree possible. We are optimistic that the same caution and level of undertaking by the SpaceX team to seek new worlds can be applied to reducing their own environmental impacts on the fragile ecosystems of coastal South Texas and on our planet.

With respect to the current draft PEA[6], we have listed some additional comments, ranked in no particular order.

[4] Shepardson, D. "U.S. warns SpaceX its new Texas launch site tower not yet approved", Reuters. Available online: https://www.reuters.com/business/aerospace-defense/faa-warns-spacex-it-has-not-approved-new-texas-launch-site-tower-2021-07-14/

[5] Roulette, J., 2021. "SpaceX ignored last-minute warnings from the FAA Before December Starship launch", The Verge. Available online: https://www.theverge.com/2021/6/15/22352366/elon-musk-spacex-faa-warnings-starship-sn8-launch-violation-texas

[6] US Department of Transportation, Federal Aviation Administration, 2021. Draft programmatic environmental assessment for the SpaceX starship/super heavy launch vehicle program at the SpaceX Boca Chica launch site in Cameron County, Texas. Available online: www.faa.gov/space/stakeholder_engagement/spacex_starship/media/Draft_PEA_for_SpaceX_Starship_Super_Heavy_at_Boca_Chica.pdf

Species impacts since 2014 Record of Decision

- According to the draft PEA, the existing conditions for biological resources in the study area were described in the 2014 EIS (FAA 2014a) and have not substantially changed[7], so the draft PEA incorporates the 2014 EIS information by reference. The draft PEA goes on to state that monitoring of avian impacts has been done from the period 2016-2020, and no significant impacts have been registered, as stated here:

> Overall, these previous construction and operations activities have not shown a significant impact on the piping plover, red knot, and snowy plover (aplomado falcon was never observed during any monitoring event), as the mean number of individuals compared year to year (to test for a temporal trend) showed a slight negative trend but likely not significant (UTRGV 2020). [8]

The evidence outlined immediately above is based on a minimal period of five years of monitoring data. This is not an ample time period on which to base a temporal population abundance trend, nor does the draft PEA provide any statistical measures to substantiate the claim of, "a slight negative trend but likely not significant". Additional monitoring data and peer review is required, as a more rigorous analysis could find that significant impacts are occurring. The UTRGV 2020 data referenced above may not currently be available because it is tied to a previous EA. Credible scholarship from researchers at the Coastal Bend Bays and Estuaries Program (CBBEP) expressly challenges, even rejects, the conclusions cited above, citing a significant, (more than 50%) decline in the wintering Piping Plover population in Critical Habitat Unit TX-1 since mid-2018. This wintering population represents a critical portion of the Northern Great Plains population. These are precisely the kinds of potential impacts that must be

[7] US Department of Transportation, Federal Aviation Administration, 2021. Draft programmatic environmental assessment for the SpaceX starship/super heavy launch vehicle program at the SpaceX Boca Chica launch site in Cameron County, Texas. Available online: www.faa.gov/space/stakeholder_engagement/spacex_starship/media/Draft_PEA_for_SpaceX_Starship_Super_Heavy_at_Boca_Chica.pdf, p. 102.

[8] US Department of Transportation, Federal Aviation Administration, 2021. Draft programmatic environmental assessment for the SpaceX starship/super heavy launch vehicle program at the SpaceX Boca Chica launch site in Cameron County, Texas. Available online: www.faa.gov/space/stakeholder_engagement/spacex_starship/media/Draft_PEA_for_SpaceX_Starship_Super_Heavy_at_Boca_Chica.pdf, p. 111.

more fully understood, and that could be ascertained through an EIS that assesses the project as it is today—not as it was initially scoped in 2014, prior to changes in the rocket design, plans for on-site gas power generation and desalination, disturbance caused by increased numbers of test launches, facility footprint expansion, etc.

- According to the draft PEA:

> A noise-induced startle response could occur from launches and/or sonic booms from landings at a critical time in the reproductive cycle of any animal. A startle response from nesting birds can result in broken eggs or cause immature young that are not flight-capable to flee the nest. Repeated nest failures could eventually trigger desertion of a nesting area. There are no mitigation measures currently available to reduce the chances of noise-induced startle responses but monitoring of select species could determine if noise was responsible for reduced reproductive success. [9]

As elsewhere in the document, there is a discussion of what could be done and insufficient mention of what will be done. Such representations have far more force if an explanation of study and mitigation is explicit and transparent, and further, would engender more goodwill, community engagement, trust, and superior outcomes.

Mitigating for Extreme (Weather) Events

- Clarity around what constitutes event readiness is lacking in the draft PEA. No information has been included to detail what has been done to prepare the VLA and propellant storage facilities for hurricane damage, detailing ongoing maintenance, and security. We understand that as part of the Spill Prevention, Control, and

[9] US Department of Transportation, Federal Aviation Administration, 2021. Draft programmatic environmental assessment for the SpaceX starship/super heavy launch vehicle program at the SpaceX Boca Chica launch site in Cameron County, Texas. Available online: www.faa.gov/space/stakeholder_engagement/spacex_starship/media/Draft_PEA_for_SpaceX_Starship_Super_Heavy_at_Boca_Chica.pdf, p. 113.

Countermeasures Plan (SPCCP) that these measures may be called out and in place, but they are difficult to ascertain. The hurricane plan called out in the 2014 EIS references a 25-year, 24-hour storm event (7.1 inches)[10]:

> SpaceX would implement a Hurricane Plan and SPCCP to prevent the accidental release of fuels. Measures could include: a. Design of elevated and reinforced facilities to withstand wind and waves to mitigate damage and release of fuels b. Containment areas around fuel tanks would be sized to contain the volume of the largest tank plus sufficient freeboard for a 25-year, 24-hour storm event (7.6 inches).

It should be noted that the National Oceanic and Atmospheric Administration (NOAA) updated its precipitation frequency estimates under the Atlas 14 program. According to NOAA's Atlas 14 projections, a 25-year, 24-hour storm event is now defined as 9.06-inch rainfall event (with a 90% confidence interval of 6.82-11.9 inches of precipitation)[11]. Under the draft PEA, design criteria for containment areas based on 7.6 inches of rainfall may not meet NOAA's Atlas 14 precipitation frequency estimates. As a result, fuel containment areas may be under-designed for precipitation events that occur along the South Texas coast, making the surrounding landscape vulnerable to fuel contamination during flood events.

The only mention of hurricane-related preparation deals with precipitation. Elements of the SPCCP do not address wind and storm surge. The VLA is located within Zone AE (a one percent annual chance flood event, sometimes referred to as the 100-yr flood plain) and Zone VE [12], and the remainder of the SpaceX

[10] US Department of Transportation, Federal Aviation Administration, 2014. Final Environmental Impact Statement SpaceX Texas Launch Site. Available online: www.faa.gov/space/environmental/nepa_docs/spacex_texas_eis/media/FEIS_SpaceX_Texas_Launch_Site_Vol_I.pdf, ES-33, Table ES.8-1.

[11] US National Oceanic and Atmospheric Administration, 2017. NOAA Atlas 14 point precipitation frequency estimates: TX. Available online: https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html.

[12] US Department of Transportation, Federal Aviation Administration, 2014. Final Environmental Impact Statement SpaceX Texas Launch Site. Available online:

facility is located within Zone AE[13],[14]. Zone AE is considered a high-risk area. Given the progression of our understanding of hurricane activity, including the potential for increased severity and damage in the coming decades[15], it is appropriate to update plans and analyses to reflect the emerging science linking greater hurricane damage risk and the need for adaptation and mitigation. The language suggests what might be done, but it is unclear whether explicit measures have been assessed and identified that define what will be done, and why. To the extent possible, these measures should be updated and published to reflect: 1) the risk associated with the entirety of the project as assessed at today's existing and planned scope, not that of seven years ago; and 2) the risk based on the best available science describing the effects of climate change on the severity, frequency and damage of hurricanes and severe storms affecting the Texas Gulf Coast. An updated EIS would address this.

- In a related note, page 16 of the draft PEA[16] references a possible methane spill. No information is included to describe how SpaceX prepares to respond to the social costs of these sorts of events in real terms. One estimate of the current social cost of methane (SC-CH4; a measure of the social/economic loss caused by emitting one ton of methane into the atmosphere) for example, is $670-$4,000 per

www.faa.gov/space/stakeholder_engagement/spacex_starship/media/Draft_PEA_for_SpaceX_Starship_Super_Heavy_at_Boca_Chica.pdf, p. 92.

[13] US Federal Emergency Management Agency, 2020. Glossary. Available online: https://www.fema.gov/about/glossary.

[14] US Federal Emergency Management Agency, 2020. Glossary: Zone VE and V1-30. "Areas subject to inundation by the 1-percent-annual-chance flood event with additional hazards due to storm-induced velocity wave action". Available online: https://www.fema.gov/glossary/zone-ve-and-v1-30.

[15] Bruyère, C. L., et al., 2017. Impact of Climate Change on Gulf of Mexico Hurricanes. NCAR Technical Note NCAR/TN-535+STR, 165 pp. Available online: https://opensky.ucar.edu/islandora/object/technotes:552.

[16] US Department of Transportation, Federal Aviation Administration, 2021. Draft programmatic environmental assessment for the SpaceX starship/super heavy launch vehicle program at the SpaceX Boca Chica launch site in Cameron County, Texas. Available online: www.faa.gov/space/stakeholder_engagement/spacex_starship/media/Draft_PEA_for_SpaceX_Starship_Super_Heavy_at_Boca_Chica.pdf, p. 16.

short ton, depending on the discount rate applied.[17] It is mentioned throughout the draft PEA that SpaceX principally works with liquid methane, not gaseous methane, but in the event of an anomalous event, it is unclear whether gaseous emissions are likely, or possible. There is discussion of the volatilization of liquids during these events, and it is implied that no significant gaseous methane events are likely or even possible, however, this remains unclear.

- Starship explosions have occurred, powered by three or six Raptor engines, and a "debris retrieval" strategy has been identified. What comprises the strategy should be more explicit. If such protocols were expressly written, and made public where possible, it would advance the conversation around safety and risk mitigation, in addition to environmental mitigation and anomaly abatement in the very sensitive, surrounding ecosystem. We also make note of our belief that SpaceX has learned from previous explosion events and is learning how to more sensibly and sensitively retrieve debris from these immensely delicate refuge lands. We understand that state and federal partners are engaged beyond the fence line. At the same time, this habitat is so sensitive that even the mildest disturbance can have lasting and sometimes irreversible impacts. The proposed vertical launch and control center areas are located within designated Piping Plover critical habitat Unit TX-1. The critical habitat description within Unit TX-1 specifically states that it does not include densely vegetated habitat within those boundaries. The majority of the region of influence, first characterized in the 2014 EIS) is densely vegetated, and therefore not considered critical habitat for the Piping Plover. However, unvegetated flats and depressional wetlands that occur within the Unit are considered critical habitat and should be given extra care during debris removal to mitigate impacts.
- Previous explosions have involved Starship prototypes. The record does not describe the potential for Superheavy anomalies, which based on engine power alone (up to 33 Raptor engines at full operational capacity) seemingly have the potential to create a much larger

[17] Interagency Working Group on Social Cost of Greenhouse Gases, United States Government, 2021. Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990. Available online: https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf?source=email, p. 6.

range of impacts. What could an anomaly look like if it were on the ground before launch? More information is needed to describe likely debris field radii, the expected increase in magnitude of an explosion, and the increased possibility of injury to the refuge and other protected lands and human communities, e.g., South Padre Island, and how potential impacts would be mitigated.

Lighting

- The SPCCP calls for up to 20% of annual engine ignitions to occur between 7:00 pm and 7:00 am.[18] A plan should include steps to mitigate lighting impacts on the seasonal migration of birds and wildlife. According to the draft PEA, "SpaceX will coordinate with the USFWS, NPS, TPWD, and THC on updating its Facility Design and Lighting Management Plan." Additional information is needed. The draft PEA states,

> "The FAA has not established a significance threshold for light emissions or visual resources/visual character. Factors to consider when assessing the significance of potential visual effects include the degree to which the action would have the potential to:
>
> - Create annoyance or interfere with normal activities from light emissions;
> - Affect the visual character of the area due to the light emissions, including the importance, uniqueness, and aesthetic value of the affected visual resources.
> - Affect the nature of the visual character of the area, including the importance, uniqueness, and aesthetic value of the affected visual resources;
> - Contrast with the visual resources and/or visual character in the study area; and
> - Block or obstruct the views of visual resources."[19]

[18] US Department of Transportation, Federal Aviation Administration, 2021. Draft programmatic environmental assessment for the SpaceX starship/super heavy launch vehicle program at the SpaceX Boca Chica launch site in Cameron County, Texas. Available online: www.faa.gov/space/stakeholder_engagement/spacex_starship/media/Draft_PEA_for_SpaceX_Starship_Super_Heavy_at_Boca_Chica.pdf, p. 14.

[19] US Department of Transportation, Federal Aviation Administration, 2021. Draft programmatic environmental assessment for the SpaceX starship/super heavy launch vehicle program at the SpaceX Boca Chica launch site in Cameron County, Texas. Available online:

Creating or pursuing defined thresholds for these considerations is required to advance understanding and help all stakeholders achieve common purpose.

Additional Infrastructure

- The current record including, the 2014 EIS and Draft PEA do not define mid- to long-term plans for natural gas supply. This should be addressed in the land use section, but details are lacking. We understand that SpaceX may own inactive historical wells within its property envelope; any plans to rework these for gas production should be included. If natural gas must be brought to the site, the plans for pipelines, siting, surface impacts, etc. should also be included.

Quantitative Benchmarks

- Some challenges and uncertainties stem from the fact that the FAA has not established significance thresholds for multiple factors being reviewed in the draft PEA, including climate/GHG emissions (p. 46), light emissions (p. 62) cultural resources (p. 71), unlisted species impacts (p. 110), coastal resources (p. 119), land use (p. 121), hazardous materials, solid waste, and pollution (p. 124), natural resources and energy supply (p. 129), and socioeconomics, environmental justice, or children's environmental health and safety risks (p. 136). By any measure, it is difficult to assess for significant impacts if there is not a standard against which to measure.

Public Equity/Public Access

- The FAA offered two public comment events: on October 18, 2021 and again, on October 20, 2021. According to the US Centers for Disease Control Social Vulnerability Index (SVI), Cameron County, Texas scores 0.9758 on a scale of 0.0 (lowest social vulnerability) to 1.0 (highest social vulnerability). Using the same numeric SVI scale, Cameron County scores 0.9981for SVI Theme 3 ("Minority Status & Language").[20]

www.faa.gov/space/stakeholder_engagement/spacex_starship/media/Draft_PEA_for_SpaceX_Starship_Super_Heavy_at_Boca_Chica.pdf, p. 72.

[20] US Centers for Disease Control, 2018. Social Vulnerability Index. Available online: https://svi.cdc.gov/map.html.

- Given the above information, the decision to present the written elements of the FAA public comment program in English-only, and without Spanish translation, made little sense in a community where only 28.6% households speak English and the vast majority of residents (71.4%) speak other languages, predominantly Spanish.[21] The program's spoken elements were provided in both English and Spanish, though some participants raised concerns over the quality of the Spanish translation. It is troubling the FAA did not carefully choose community-conscious personnel (the proctor appeared to be a third-party contractor who was not from the community and who did not speak fluent Spanish). This creates a lack of focus on accessibility of the program, is poorly conceived, and compounds and underscores the frustration and concerns that local access and transparency are not being respected in this process.
- We believe that such missed opportunities to communicate with the local community compound and exacerbate other public equity issues that the SpaceX complex has posed. This includes escalating proposed public access/road closure hours on State Highway 4, which began in 2014 at 180 hours per year, and now stands at 500 annual closure hours in the draft PEA. In addition, there are possibly 300 additional hours for anomalies, or explosions or other unforeseen deviances from planned operations. The central point: the number of closure hours continues to climb (it should be noted that there are local reports that methods to officially tally the closure hours vary broadly from SpaceX to the local community, depending on the entity providing the accounting). These road closures impact the local community and curtail its access to local beachfront and outdoor recreation. Ultimately, the road closures amount to limiting access to public trust resources, those resources owned by the State of Texas, managed in trust for the use of all Texans and visitors to the state.

Final Comments

One phrase in the prepared draft PEA perhaps best captures the insufficiency of the arguments being made in support of continuing to blanket today's scope of work under the 2014 EIS: "During preparation of the 2014 EIS, the TGLO did not raise any

[21] US Census Bureau, 2019. State and County QuickFacts: Cameron County, Texas. Available online: https://www.census.gov/quickfacts/cameroncountytexas.

objections to SpaceX's Falcon proposal. Therefore, the Proposed Action is not expected to result in significant impacts to coastal resources."[22]

This statement speaks to the heart of the cumulative impacts concern. The Falcon proposal in 2014 was a proposal of a very different scope, with lesser orders of magnitude. The project as proposed in 2014 was very different from the project as imagined today. Possible expansions contemplated and put into practice at present time are not fully described in the draft PEA. One cannot conclude that no significant impacts, coastal or otherwise, may be expected in a proposed 2021 action because impacts of a much smaller project were deemed acceptable seven years ago; such an argument simply makes no sense. Based on our understanding of circumstances, and with utmost respect to all parties involved, we believe that a new, comprehensive EIS is merited in this case.

Again, Audubon Texas appreciates this opportunity to provide public comment on the Draft PEA.

Respectfully,

Lisa A. Gonzalez

Vice President and Executive Director

Audubon Texas, National Audubon Society

Scott Moorhead

Policy Director

Audubon Texas, National Audubon Society

[22] US Department of Transportation, Federal Aviation Administration, 2021. Draft programmatic environmental assessment for the SpaceX starship/super heavy launch vehicle program at the SpaceX Boca Chica launch site in Cameron County, Texas. Available online: www.faa.gov/space/stakeholder_engagement/spacex_starship/media/Draft_PEA_for_SpaceX_Starship_Super_Heavy_at_Boca_Chica.pdf, p. 120.

Attachment B

National Headquarters
1130 17th Street, N.W. | Washington, D.C. 20036-4604 | tel 202.682.9400 | fax 202.682.1331
www.defenders.org

November 1, 2021

Ms. Stacey Zee
SpaceX PEA, c/o ICF
9300 Lee Highway
Fairfax, VA 22031

Transmitted via electronic mail to SpaceXBocaChica@icf.com

RE: Comments on SPACEX Draft Programmatic Environmental Assessment for Starship/Super Heavy Program

Dear Ms. Zee,

On behalf of the 2,146,000 million members and supporters of Defenders of Wildlife ("Defenders"), including 124,600 members and supporters in the State of Texas, we submit these comments on the Draft Programmatic Environmental Assessment for the SpaceX Starship/Super Heavy Launch Vehicle Program at the SpaceX Boca Chica Launch Site in Cameron County, Texas ("DPEA").[1] The National Environmental Policy Act ("NEPA") is a procedural statute intended to ensure that "unquantified environmental amenities and values may be given appropriate consideration in [federal] decision-making."[2] The statute is invoked during the planning stages for a federal agency action. Pursuant to NEPA, a federal agency must take a "hard look" at the environmental impacts of its proposed action.[3] NEPA is not designed merely to provide the government with information about the environmental effects of plans. Instead, it is intended to make that information available to the public, as well. We have no opposition to space exploration more generally, but it must be conducted in an environmentally responsible manner and in compliance with existing laws. We therefore have serious concerns about the environmental impacts of SpaceX's current operations, and these adverse impacts will only be intensified by the addition SpaceX Starship/Super Heavy Launch Vehicle Program ("Proposed Project" or "Project"). Indeed, the Proposed Project will have significant impacts on the affected area, on listed species, on critical habitat, and on other wildlife. It will also result in the violation of multiple laws. These significant impacts necessitate the preparation of an Environmental Impact Statement ("EIS"). We moreover have serious concerns about the adequacy of the DPEA, itself, which failed to account for scores of environmental impacts and did not consider any alternatives other than a "no action" alternative and the Proposed Project. Thus, it would be indefensible for the Federal Aviation Administration ("FAA") to conclude its NEPA analysis with a Finding of No Significant Impact ("FONSI"), and the FAA must instead develop an EIS to meaningfully evaluate the Proposed Project's significant impacts.

[1] Federal Aviation Administration, *Draft Programmatic Environmental Assessment for the SpaceX Starship/Super Heavy Launch Vehicle Program at the SpaceX Boca Chica Launch Site in Cameron County, Texas* (Sept. 2021) ("DPEA").
[2] 42 U.S.C. § 4332(B).
[3] *Nat'l Audubon Soc'y v. Dep't of the Navy*, 422 F.3d 174, 184 (4th Cir. 2005).

I. Factual Background

The SpaceX launch site in Boca Chica is adjacent to and surrounded by national wildlife refuge land, state park land, tidal flats that host many wading bird species, and beaches used by nesting sea turtles. During the facility's initial planning stages in 2013 and 2014, it was understood that the site ("Vertical Launch Area" or "VLA") would host launch activities. Since that time, however, the company has expanded to engaging in testing activities, which are inherently more dangerous and have caused numerous explosions that have destroyed sensitive habitat. SpaceX now intends to expand its operations with its SpaceX Starship/Super Heavy Launch Vehicle Program, with even larger equipment and even more testing.

A. Project Location

The SpaceX site is situated near the Lower Rio Grande Valley National Wildlife Refuge ("LRGV NWR"), Boca Chica State Park, Boca Chica Beach, the South Bay Coastal Preserve, Brazos Island State Park, Isla Blanca Park, Las Palomas Wildlife Management Area, and Palmito Ranch Battlefield National Historic Landmark.[4] This is an ecologically diverse area with a remarkable community of wildlife unlike any other place in the United States. The site is located in a hemispheric meeting place of tropical and subtropical species on a unique matrix of terrestrial, coastal, and marine environments, representing one of the greatest diversity of plants and animals found in one place in North America. This area is a unique flyway for western hemisphere avian species, and more than 250 different bird species have been identified in Boca Chica Village and Boca Chica Beach in recent years. The ecological sensitivity and vulnerability of this area cannot be overstated, and activities in this area must be carefully managed to reduce, avoid, and mitigate impacts to resident and migrant wildlife.

LRGV NWR, which abuts the VLA, "is considered one of the most biologically diverse regions in North America."[5] According to the refuge's Comprehensive Conservation Plan, the number one goal of the Lower Rio Grande Valley National Wildlife Refuge Complex is to "restore, enhance and protect the natural diversity of the Lower Rio Grande Valley including threatened and endangered species on and off refuge lands."[6] The Refuge's Boca Chica branch is comprised of "saline flats, mangrove marshes, shallow bays and unique dunes of wind-blown clay known as 'lomas.'"[7] Birders are drawn to the area, where they can observe species such as reddish egrets, American oystercatchers, peregrine falcons, mangrove warblers, piping plovers, and brown pelicans.[8] Other public lands in the area also are of immense ecological value. Laguna Atascosa NWR, too, is a "premier bird-watching destination."[9] Remarkably, more bird species have been recorded in Laguna Atascosa NWR than in any other refuge in the National Wildlife Refuge System.[10] The refuge is also

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[4] DPEA at 76–78, 121.
[5] *Lower Rio Grande Valley*, *About the Refuge*, U.S. Fish & Wildlife Serv., https://www.fws.gov/refuge/Lower_Rio_Grande_Valley/about.html (last visited Nov. 1, 2021).
[6] U.S. Fish & Wildlife Serv., *Final Lower Rio Grande Valley and Santa Ana National Wildlife Refuges: Comprehensive Conservation Plan* at 6 (Sept. 1997) (Attachment A).
[7] *Lower Rio Grande Valley*, *Boca Chica Beach*, U.S. Fish & Wildlife Serv., https://www.fws.gov/refuge/Lower_Rio_Grande_Valley/visit/boca_chica_beach.html (last visited Nov. 1, 2021).
[8] *Id.*
[9] *Laguna Atascosa*, *About the Refuge*, U.S. Fish & Wildlife Serv., https://www.fws.gov/refuge/Laguna_Atascosa/about.html (last visited Nov. 1, 2021).
[10] *Id.*

"the center for conservation and recovery efforts" for the endangered ocelot and hosts the only population of the species in the entire United States.[11] Established in 1984 and managed by the Texas Parks and Wildlife Department, the South Bay Coastal Preserve offers habitat that serves as "an integral part of the organic production and fertility of South Bay."[12] Indeed, "South Bay and its wind-tidal flats, shallow depths, associated vegetation, and unique location provides excellent feeding, resting and wintering habitat for numerous types of migratory bird species, such as the White Pelican, Brown Pelican, cormorants, Gadwall, Green-winged Teal, and Redhead."[13]

The VLA is also located within both the Rio Grande Valley Wildlife Corridor and South Texas Coastal Corridor. The Rio Grande Valley Wildlife Corridor was created as a part of "a long-standing program aimed at preserving, restoring, and managing habitat for wildlife, including threatened and endangered species."[14] This corridor is a joint initiative that began in the 1970s and over the years has been supported by the U.S. Fish and Wildlife Service ("Service"), the Texas Parks and Wildlife Department ("TPWD"), Valley Land Fund, The Nature Conservancy, Conservation Fund, and Audubon, among other organizations.[15] According to TPWD, the Boca Chica tract of the Rio Grande Valley Wildlife Corridor is a large anchor tract of the corridor and is "managed to conserve biological material to safeguard gene pools and replenish wildlife populations throughout the corridor."[16] The South Texas Coastal Corridor has similar aims. The Service has made habitat connectivity for wildlife in the region a priority, investing over $90 million over the past 40 years to acquire lands that create a wildlife corridor throughout the refuge complex. The collection of protected wildlife lands in the South Texas Coastal Corridor aims to preserve what small amount of native habitat remains in the area and to create a travel corridor for a variety of species, including the endangered ocelot. The ultimate goal of the acquisition of properties and easements within this corridor is to eventually connect the main Laguna Atascosa NWR tracts, the Bahia Grande Unit of the Laguna Atascosa NWR, Lower Rio Grande Valley NWR units, and Boca Chica State Park.

Areas that are—and will continue to be—impacted by SpaceX's activities in South Texas include habitat that supports at least twelve listed species. Indeed, the FAA identified in an analysis separate from the NEPA analysis at issue that twelve listed species may be affected by the project: the northern aplomado falcon (endangered), the piping plover (threatened) and its critical habitat, the red knot (threatened), the eastern black rail (threatened), the West Indian manatee (threatened), the Gulf Coast jaguarundi (endangered), the ocelot (endangered), the Kemp's ridley sea turtle (endangered), the loggerhead sea turtle (threatened), the green sea turtle (threatened), the hawksbill sea turtle (endangered), and the leatherback sea turtle (endangered) sea turtles.[17] Proposed red knot critical habitat also appears in the vicinity.[18]

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[11] *Id.*
[12] *Texas GEMS – South Bay Coastal Preserve*, Texas Parks & Wildlife, https://tpwd.texas.gov/landwater/water/conservation/txgems/southbay/index.phtml (last visited Nov. 1, 2021).
[13] *Id.*
[14] Texas Parks & Wildlife, Scoping Comments for Draft Environmental Assessment at 4 (Jan. 27, 2021) (Attachment B) ("TPWD Scoping Comments").
[15] *Id.* at 4.
[16] *Id.* (internal citation omitted).
[17] DPEA at 116.
[18] Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for Rufa Red Knot (Calidris canutus rufa), 86 Fed. Reg. 37,410, 37,493–94 (July 15, 2021).

B. Existing SpaceX Activities

SpaceX currently engages in testing and launches of its Falcon launch vehicles at its Boca Chica site, along with continual experimentation related to the Starship/Super Heavy proposal. These operations are accompanied by construction, noise, light, increases in traffic, and area-wide closures. They have also been marked by repeated anomalies, i.e., explosions, which have resulted in habitat destruction due to falling debris, debris retrieval efforts, and wildfires. Problematically, although SpaceX's activities at its Boca Chica site have expanded since the FAA and the Service engaged in environmental analyses of its initial operations, these expansions have never been accompanied by a supplemental or new EIS. Moreover, SpaceX has failed to engage in actions to lessen its environmental impacts, such as ignoring the mitigation efforts it once committed to and rescinding its offer of financial support for new positions at LRGV NWR that are necessary to address challenges that SpaceX has imposed on the refuge.

SpaceX has also caused an increased amount of noise, lighting, and traffic in the area. The company is already supported by existing construction, such as a solar farm, a production and manufacturing area, and a separate processing, production, and manufacturing area. According to Service personnel, "[m]any days of construction and testing have occurred at night."[19] The Service has also remarked on ongoing "extensive construction" and "the appearance of significantly increased highway traffic 24 hours per day all week."[20]

SpaceX operations, such as tests and launches, have also spurred forced closures of the surrounding area, which have been poorly implemented and are at times chaotic. In 2019, Service staff "conservatively quantified more than 1,000 closure hours and noted a significant disparity in accounting between SpaceX's reported total of 158 hours" for that year.[21] According to recent TPWD scoping comments, "[c]losure notifications continue to be provided either the same day or as little as one to four days prior to closures, and notification of closure extensions have occurred after the extension period has begun. Also, revocation of closures occur well into the authorized closure window after landowners and the general public may have abandoned their plans for the day."[22] At other times, dangerous operations have proceeded without adequate notice of closures, putting the public at risk.

SpaceX's activities have also resulted in recurring explosions, which agencies at times refer to as "failures" or "anomalies." Note that "testing, rather than launches, [are] inherently more inclined to result in a failure."[23] Since 2019, SpaceX operations have caused repeated explosions, including on:

- April 21–22, 2019,
- July 25, 2019,
- August 2019,
- November 18, 2019,
- February 28, 2020,

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[19] Letter from Charles Ardizzone, Field Supervisor, U.S. Fish and Wildlife Service to Stacey M. Zee, Office of Commercial Space Transportation, Federal Aviation Administration at 3 (Mar. 4, 2020) (Attachment C).

[20] Letter from Manuel "Sonny" Perez III, South Texas Refuge Complex Manager, U.S. Fish & Wildlife Serv. to James R. Repchek, Federal Aviation Administration at 2 (Aug. 23, 2021) (Attachment D) ("August 2021 Service Letter").

[21] *Id.*

[22] TPWD Scoping Comments at 11 (Attachment B).

[23] Email from Bryan Winton (Nov. 29, 2019, 09:32 CST) (Attachment E).

- April 2, 2020,
- May 29, 2020,
- June 23, 2020,
- December 9, 2020, and
- March 30, 2021.[24]

These explosions have resulted in environmental destruction from fallen debris, debris retrieval operations, and wildfires. A Service employee has interpreted the likelihood of debris exploding into LRGV NWR to be a "regular reoccurring risk of their activity."[25] When explosions occur, the debris field can span for miles, which has happened as recently as this year.[26] Exploded rocket debris, along with its removal operations involving heavy machinery such as high-capacity tow trucks and construction dump trucks, have been known to damage sensitive habitat in the area.[27] SpaceX's explosions have also caused wildfires, such as two 2019 incidents that "resulted in wildfires of 130-acres and 10-acres respectively burned through coastal prairie and dune habitats on refuge managed land."[28] The harms to these areas are compounded by area-wide closures and other barriers to access. For example, the night of a July 25, 2019 SpaceX fire, the "Brownsville Fire Dept. showed up but did not pursue putting out the fire due to its location and lack of access."[29] Moreover, because Service personnel are barred from the refuge following explosions, they have been unable to assess the full extent to which refuge wildlife are harmed.[30]

Of grave concern is the fact that SpaceX's ongoing activities have never been appropriately addressed in a NEPA analysis or though consultation pursuant to Section 7 of the Endangered Species Act ("ESA"). When SpaceX first proposed operating in the region, it was widely understood—at least by regulators—that its activities would only include launches, rather than testing, which is inherently more dangerous and increases the likelihood of explosions. Accordingly, federal agencies almost exclusively analyzed the impacts of launch activities when they prepared NEPA and ESA analyses for SpaceX.

Although the FAA has asserted that it revisited the 2014 EIS on multiple occasions and confirmed that SpaceX's activities continued to fall within the scope of the actions covered by the newest licenses, it is abundantly clear that they do not. The 2014 EIS "addressed only 12 launches per year, not continual experimentation related to the Starship/Super Heavy proposal as is currently being

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[24] Email from Mary Orms (Jan. 21, 2021, 13:07 CST) (Attachment F); Email from Bryan Winton (Jan. 21, 2021, 10:33 CST) (Attachment F); Email from Bryan Winton (Mar. 30, 2021, 21:25 CST) (Attachment G); Tariq Malik, *Boom! SpaceX Pops Huge Starship SN7 Test Tank on Purpose in Pressure Test (videos)*, Space.com (June 23, 2020), https://www.space.com/spacex-starship-sn7-test-tank-destroyed-videos.html.

[25] Email from Bryan Winton (Apr. 24, 2020, 12:55 CST) (Attachment H).

[26] Email from Bryan Winton (Mar. 30, 2021, 21:25 CST) (Estimating that a March 2021 explosion resulted in a 2–3-mile debris field) (Attachment G).

[27] *See, e.g.,* Email from Randy Reese (Nov. 23, 2019, 17:09 CST) (Attachment E); *see also* Email from Bryan Winton (Jan 21, 2021, 10:33 CST) ("April 21,22 -2019 - Space X employee(s) get stuck with 2 vehicles and a forklift in tidal flats. Causes significant damage to tidal flats.") (Attachment F).

[28] Letter from Manuel "Sonny" Perez III, Complex Refuge Manager, South Texas Refuges Complex, U.S. Fish & Wildlife Serv. & Charles Ardizzone, Project Leader, Texas Coastal Ecological Service Office, U.S. Fish & Wildlife Serv. to Daniel P. Murray, Manager, Safety Division, Federal Aviation Administration at 2 (Jan. 22, 2021) (Attachment I).

[29] Email from Mary Orms, Ecological Services Field Office, U.S. Fish and Wildlife Service (July 26, 2019 15:43 CST) (Attachment J).

[30] Email from Bryan Winton (Jan 21, 2021, 10:33 CST) (Attachment F).

carried out."[31] According to the Service, "[c]urrent activities, such as large explosions and falling debris from SpaceX flight test activities, the appearance of significantly increased highway traffic 24 hours per day all week, and extensive construction, have not been adequately analyzed nor addressed."[32] In the words of one Service employee, "[a]lthough the experimental aspects of their program were 'causally' mentioned in the 2014 EIS, that document addressed the impacts of launches, not continual experimentation and construction going on out there."[33]

Similarly, SpaceX's ongoing activities exceed the scope of the Section 7 analyses conducted by the Service pursuant to the ESA. Service documents have remarked that the FAA and SpaceX are violating Section 7 of the ESA and that SpaceX is violating Section 9 of the ESA. The Service issued a biological opinion and Incidental Take Statement ("ITS") covering original SpaceX operations in 2013 and reinitiated consultation after the red knot was listed in 2015. Service records have stated that SpaceX's current operations exceed the scope of the original consultations and ITS. In one record an employee noted:

> I need to say one more time that neither SpaceX nor FAA have take authorization under the Endangered Species Act for the testing activities they are engaging in, whether there is an anomaly or not. It is good to do the best we all can for listed species and SpaceX/FAA needs either a new/amended biological opinion asap or to stop and get an HCP before we find a carcass or get sued by a third party.[34]

SpaceX has also failed to act on several promises that would have decreased the severity of environmental impacts. According to TPWD:

> [t]o date, several of the avoidance and minimization measures associated with the 2014 Final EIS and Rod have not been fully implemented, including: mitigating noise impacts by scheduling construction activities to occur between 8 a.m. and 5 p.m.; avoiding lateral light spread and uplighting per the Lighting Management Plan; maintaining cleared shoulders along SH 4; and observing speed limits not to exceed 25 miles per hour between the Control Center Area (CCA) and VLA. Also, to our knowledge, construction of vehicle barriers along SH 4 and monitoring of vegetation changes in piping plover critical habitat has not occurred.[35]

Finally, according to LRGV NWR management, SpaceX committed to make funding available to hire additional refuge staff members to support the increased need for refuge personnel caused by SpaceX.[36] These employees were needed to "maintain integrity of the refuge."[37] Although disputed

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[31] January 2021 Service Letter at 2 (Attachment I).
[32] August 2021 Service Letter at 2 (Attachment D).
[33] Email from Chris Perez, (Jan. 6, 2021 08:53 CST) (Attachment K).
[34] Email from Dawn Gardiner (Dec. 17, 2020, 13:59 CST) (Attachment L); *see also* Email from Dawn Gardiner (Dec. 10, 2020, 16:23 CST) ("Also I'm having Mary draft a dear SpaceX letter with a copy to you reminding them about section 9 and piping plovers and that they don't [sic] have coverage for the activities right now that could look like harm and harass.") (Attachment M).
[35] TPWD Scoping Comments at 2 (Attachment B).
[36] Email from Bryan Winton (Apr. 4, 2019, 13:45pm CST) (Attachment N).
[37] *Id.*

by SpaceX, according to refuge staff "there has been no commitment [from SpaceX] to follow through with arrangements made/agreements made." [38]

C. Proposed Project Background

According to the DPEA, SpaceX intends to obtain an experimental permit and/or a vehicle operator license to begin operating new equipment, its Starship/Super Heavy launch vehicles.[39] The project will consist of testing and launches and will almost certainly be accompanied by a number of environmental stressors, including construction, excess noise, unnatural lighting, explosions, and wildfires.

1. Construction

SpaceX's proposal would require a significant amount of construction in addition to the already-existing construction at its sites. According to the DPEA, expected future construction includes a redundant launch pad, a redundant landing pad, trenching and pull-offs along SH 4, support buildings, a payload processing center, parking lots, a power plant, a liquid natural gas pretreatment system, a liquefier, a cooling tower, a desalination plant, injection wells, tank structural test stands, an expanded solar farm, and two integration towers.[40] The VLA, is expected to be roughly 40 acres in size,[41] the power plant is expected to be 5.4 acres in size,[42] and the solar farm is expected to expand from 2 acres in size to 7 acres.[43] Although the DPEA notes that "all construction related noise impacts would be of short duration,"[44] there are no foreseeable limits on the extent to which construction will occur. Use of the site has continued to expand since the original EIS and the DPEA is programmatic in nature, specifically because future, not-yet-planned activities are nonetheless expected to occur. Although, according to the DPEA, SpaceX intends to engage in most construction during the day, the company is not precluding construction at night.[45]

2. Noise

Noise will result from SpaceX's proposed Project. Indeed, it will cause an "[i]ncreased frequency of noise from general operations, launches, landings, and static fire tests."[46] Sonic booms will be generated during landings.[47] The use of heavy equipment during the construction and modification processes will also generate noise,[48] as will traffic to, from and between the sites.[49] Moreover, SpaceX flies drones over the refuge to determine whether any humans are present during testing and launches.[50] Additionally, operations would include the use of a sonic pulse every 15 minutes to

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[38] *Id.*
[39] DPEA at 8.
[40] DPEA at 26, 131; Federal Aviation Administration, *Biological Assessment*, *SpaceX Starship/Super Heavy Launch Vehicle Program at the SpaceX Boca Chica Launce Site* at 19 (June 2021) ("BA").
[41] DPEA at 26.
[42] *Id.* at 32.
[43] *Id.* at 33.
[44] *Id.* at 50.
[45] *Id.* at 50.
[46] *Id.*at 113.
[47] *Id.*
[48] *Id.* at 50.
[49] *Id.* at 49.
[50] Email from Bryan Winton (Oct. 16, 2019 16:43 CST) (Attachment O).

collect weather data.[51] Noises generated by SpaceX will not be limited to daytime hours. Starship suborbital launches, Super Heavy launches, Starship land landings, and Super Heavy land landings are expected to occur during the day or at night.[52] Although the FAA provides that this is a conservative estimate, the DPEA assumes that "20 percent of annual operations involving engine ignition (i.e., static fire engine tests, suborbital launches, and orbital launches) would occur at night."[53] Some construction, which generates noise, would also be conducted during nighttime hours.[54]Anomalies would also be accompanied by increased noise levels. For instance, noise would result from explosions, wildfires, and debris plummeting to the ground. Debris reconnaissance, which at times involves the use of all-terrain vehicles ("ATV") and other times involves SpaceX employees walking through sensitive public lands, would also contribute to noise in the area. Finally, debris removal, which can involve heavy machinery or helicopters, would also generate noise.

3. Lights

The Project is also expected to increase the amount of unnatural lighting in the area, much of which would be at night. Launches are accompanied by bright, fiery heat plumes and will also require bright spotlighting for days to illuminate the launch vehicle on the launch pad.[55] "In addition to nighttime launch activity, SpaceX would need to perform ground support operations 24 hours a day, 7 days a week, throughout the year," which would involve the use of white lighting.[56] The power plant, too, is expected to operate all day, every day and expected to emit light at night.[57] Moreover, construction occurring at nighttime hours would also lighting.[58] Finally, because more employees are expected to travel to, from, and between SpaceX's two sites throughout the night, the project will be accompanied by additional lighting emitted by the headlights of cars.

4. Anomalies

The Project will also result in anomalies. The area surrounding the site has already suffered from repeated explosions. Now, even more testing, such as experimental launches, tank tests, and static fire engine tests, is likely to occur than under current operations. Testing is inherently more likely to result in failure than executing more polished launch operations.[59] In fact, SpaceX intends to conduct approximately 10 tank tests per month and estimates that 10 percent of those tests may result in an explosion and the spread of debris, which could include to areas outside of SpaceX property.[60] In other words, SpaceX estimates there will be one explosion per month resulting from tank testing, alone. Even SpaceX has acknowledged that "[d]ebris from anomalies could impact

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[51] DPEA at 14.
[52] *Id.*
[53] *Id.*
[54] *Id.* at 50.
[55] *Id.* at 14.
[56] *Id.*
[57] *Id.* at 32. Note that the DPEA states that lighting at the plant would be "minimal," it provides no explanation as to why.
[58] *Id.* at 112.
[59] For example, a Service employee cautioned that "[n]ow that the site is for testing . . . it is now apparent that given the changes to Space-X project/activity and constructed infrastructure, there is a likelihood we will have a fire, and maybe more to come, given Space X plans for more engines, bigger rockets, higher hops, etc." Email from Bryan Winton, Manager, Lower Rio Grande Valley National Wildlife Refuge (July 31, 2020, 15:13 CST) (Attachment P)
[60] DPEA at 15–16.

habitat in the vicinity of the VLA. Debris may cause ruts in the unvegetated salt flats or depressional wetlands upon impact or during recovery."[61]

5. Closures

SpaceX now anticipates even more closures than prior estimates. The surrounding area, including neighboring state and federal lands, would purportedly be closed for 500 hours per year during testing and launches and purportedly up to another 300 hours per year for debris cleanup in the event of certain explosions.[62]

II. The FAA Must Prepare an EIS Because the Project's Impacts Will Be Significant

Because the Project's impacts will be significant, the FAA must prepare an EIS to analyze its environmental impacts. NEPA is intended to ensure that "unquantified environmental amenities and values may be given appropriate consideration in [federal] decision making."[63] The statute is crucial because, when properly executed, it allows federal agencies and members of the public to weigh the environmental consequences of proposed federal actions before agencies reach a final decision regarding the best path forward. Under NEPA, an agency must prepare a detailed statement, referred to as an EIS, if it plans to undergo a "major Federal action[] significantly affecting the quality of the human environment."[64] NEPA regulations include guidance for determining the significance of a projects' impacts, requiring agencies to consider "the potentially affected environment and degree of the effects of the action."[65] The potentially affected environment includes "the affected area (national, regional, or local) and its resources, such as listed species and designated critical habitat under the Endangered Species Act."[66] When analyzing the degree of an action's effect, agencies must consider, among other factors, adverse effects and effects that would violate other laws.[67]

Agencies must also consider connected actions,[68] such as actions that "[c]annot or will not proceed unless other actions are taken previously or simultaneously" or "[a]re interdependent parts of a larger action and depend on the larger action for their justification."[69] SpaceX's prior and existing operations at the Project sites are connected actions to the Proposed Project. This is because the Project will rely on previous actions taken at the site. For instance, the Starship/Superheavy project would utilize infrastructure that has already been developed by SpaceX at the site.[70] The Program also relies on testing at the site that is ongoing. SpaceX's prior operations and the proposed Project are also interdependent parts of SpaceX's larger action at the site to further commercial space exploration.

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[61] *Id.* at 113.
[62] *Id.* at 9.
[63] 42 U.S.C. § 4332(B).
[64] *Id.* § 4332(C).
[65] 40 C.F.R. § 1501.3(b).
[66] *Id.* § 1501.3(b)(1).
[67] *Id.* § 1501.3(b)(2), (b)(2)(ii), (b)(2)(iv).
[68] *Id.* § 1501.3(b).
[69] 40 C.F.R. § 1501.9(e)(1)(ii)–(iii).
[70] *See, e.g.*, DPEA at 34 ("Starship/Super Heavy test and launch operations conducted during the program development and operational phases must be able to use, to the maximum extent practicable, existing infrastructure at one of SpaceX's launch sites.")

Among other harms, SpaceX's activities are likely to adversely affect the surrounding area, at least ten listed species, designated critical habitat, and other wildlife. Moreover, the Project's effects will result in multiple legal violations. Thus, the SpaceX Project is likely to have significant environmental impacts, and the FAA must prepare an EIS before moving forward with any approvals.

A. Significant Impacts to the Area

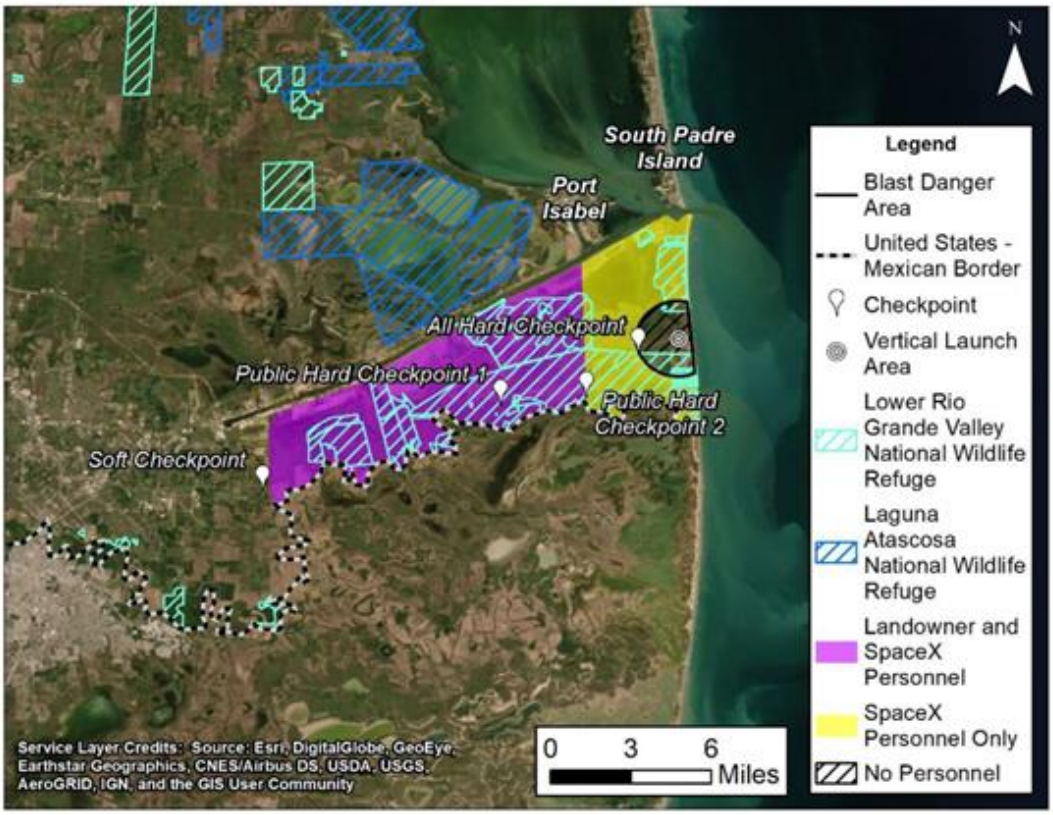
1. Impacts to LRGV NWR

The Project will have significant environmental impacts because it will have numerous adverse impacts on the affected area, including LRGV NWR. The FAA must consider impacts to LRGV NWR because, when determining a project's significance, NEPA regulations require agencies to consider the affected regional and local area.[71] The Project will cause routine, major shutdowns of the refuge, precluding refuge staff and visitor access for more than a month every year. Moreover, recurring explosions resulting from SpaceX's testing activities will likely result in harmful debris pummeling the refuge, causing wildfires and spurring removal operations that will further damage refuge habitat. Finally, the project is likely to cause an increased amount of sound, light, and traffic in the refuge.

LRGV NWR has been repeatedly forced to shut down operations during SpaceX's testing and launch activities, which prevents the Service from adequately managing the refuge and precludes visitors from enjoying these public lands. The newest proposal assessed in the DPEA anticipates 800 hours of annual closures—500 for testing and 300 for debris retrieval. During closure times, LRGV NWR staff are not allowed to access the refuge, but SpaceX personnel would be. Below is a map that was included in the Biological Assessment, which shows the launch site and closure areas:

[71] 40 C.F.R. § 1501.3(b)(1).

Figure 5-4. Road Closures and Checkpoints in Relation to National Wildlife Refuges



[72]

This map depicts what areas of LRGV NWR (represented by turquoise hashes) will be closed to refuge staff but open to SpaceX staff (represented by yellow). The Service, rightfully, anticipates that SpaceX will exceed its number of requested closure hours, given that in 2019 the closure hours resulting from SpaceX's activities were more than six times as large as the number of hours reported by SpaceX for that year.[73]

These closures are harmful because they prevent the Service from managing the refuge and they prevent visitors from enjoying it. In fact, the Service has explicitly stated that its

> ability to maintain the biological integrity, diversity and environmental health of Refuge resources, as well as our ability to ensure the viability of the six wildlife-dependent recreational uses, has been significantly diminished at the Boca Chica tract [of LRGV NWR]. This occurs by preventing or constraining public access year-round, hampering biological and monitoring studies including sea turtle patrols, sea turtle cold-stunning responses, [and] hampering refuge management and law enforcement patrol . . . .[74]

[72] BA at 56.
[73] August 2021 Service Letter at 2 (Attachment D).
[74] January 2021 Service Letter at 2 (Attachment I).

In the past, closures have impeded other day-to-day activities at the refuge, such as the collection of milkweed and yucca seed.[75] It would be irrational to assume that future closures will not have similar impacts on refuge management activities.

These closures, moreover, will prevent members of the public from exercising their right to enjoy the refuge and its wildlife, a fact that is of deep concern to the Service. According to the Service, "[t]he protected activities of the Refuge that are being substantially impaired include fishing, wildlife observation, photography, environmental education, and interpretation."[76] The Service attempted to quantify the number of recreational hours that were lost from a "mere" 158 hours of refuge closures by accounting for the number of individuals who would have otherwise visited during that time.[77] The agency determined that 158 closure hours resulted in a loss of 9,900,000 recreational hours.[78] Accordingly, refuge staff have concluded that "the purposes of the refuge are substantially impaired even with the estimation of only one hour of visitation."[79] This also invokes environmental justice concerns. Indeed, most of the refuge's visitors are from the surrounding area, and the surrounding area is occupied by a higher rate of individuals who are below the poverty line and a higher rate of individuals who are Hispanic compared to the national average.[80]

LRGV NWR has also been harmed by repeated explosions during testing, which have caused wildfires and resulted in debris removal operations that have damaged habitat. As can be seen in the above map, portions of the refuge appear in the "Blast Danger Area." According to the Service:

> Two SpaceX incidents on July 25, 2019 and again in August 2019 resulted in wildfires of 130-acres and 10-acres respectively burned through coastal prairie and dune habitats on refuge managed land. Anomalies resulting in explosions on November 20, 2019, February 28, 2020, and December 9, 2020 resulted in debris scattered onto refuge managed lands.[81]

There has also been at least one explosion in 2021 that scattered debris on the Refuge.[82] According to the Service, "debris that has fallen onto the Refuge has damaged sensitive wind tidal flats."[83] Operations to retrieve the debris have further damaged the refuge. SpaceX employees use ATVs, or otherwise walk through LRGV NWR to locate debris that has been scattered throughout the area.[84] In the past, SpaceX has used high-capacity tow trucks and a construction dump truck to drag the

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[75] Email from Bryan Winton, Wildlife Refuge Manager, Lower Rio Grande Valley National Wildlife Refuge, U.S. Fish & Wildlife Serv. (Mar. 25, 2019, 12:17 CST) (Attachment Q).
[76] August 2021 Service Letter at 2 (Attachment D).
[77] January 2021 Service Letter at 3 (Attachment I).
[78] *Id.*
[79] Email from Sonny Perez, Acting Complex Refuge Manager, South Texas Refuges Complex (Dec. 3, 2020, 11:22 CST) (Attachment K).
[80] August 2021 Service Letter at 1–2 (Attachment D).
[81] January 2021 Service Letter at 2 (Attachment I).
[82] *See* Email from Bryan Winton, Refuge Manager, Lower Rio Grande Valley National Wildlife Refuge, U.S. Fish & Wildlife Serv. (Mar. 30, 2021, 21:22 CST) (Attachment G); *see also* Email from Stacey Zee, FAA (Mar. 3, 2021) (debris found and collected from LRGV, which was within the "ground hazard area") (Attachment R).
[83] August 2021 Service Letter at 2 (Attachment D).
[84] Email from Randy Rees, Environmental Health and Safety Manager, Chief of Emergency Operations, Space Exploration Technologies (SpaceX) (Feb. 29, 2020, 22:10 CST) (Attachment S).

debris through what we understand to be parts of the refuge.[85] Below are photographs of impacts that debris retrieval has had on habitat, which were included in a Service FOIA response:


[86]

Unsurprisingly, "[t]he vehicles or machinery used to retrieve debris have created rutting and damage that interrupts tidal water sheet flow across [the refuge's sensitive wind tidal] flats."[87] Service personnel have also noted that botched retrieval efforts have further damaged the refuge.[88] For example, a Service employee noted that in April 2019 "SpaceX employee(s) [got] stuck with 2 vehicles and a forklift in tidal flats. [This] [c]ause[d] significant damage to tidal flats."[89] Retrieval methods have also damaged refuge cable fencing installed to protect the area from disturbance.[90] In August 2021, the Service asserted that "none of the damage to the sensitive tidal flats from debris pickup and motorized equipment and human access has been adequately addressed."[91] These harmful impacts are likely to continue when SpaceX implements its newest Project. Although the

[85] Email from Randy Rees, Environmental Health and Safety Manager, Chief of Emergency Operations, Space Exploration Technologies (SpaceX) (Nov. 23, 2019, 17:09 CST) (Attachment E).
[86] *Id.*
[87] August 2021 Service Letter at 2 (Attachment D).
[88] Email from Bryan Winton (Jan 21, 2021, 10:33 CST) (Attachment F).
[89] *Id.*
[90] January 2021 Service Letter at 2 (Attachment I).
[91] August 2021 Service Letter at 3 (Attachment D).

DPEA asserts that areas can be restored by regrading,[92] it fails to account for the loss of important habitat values in the meantime, it fails to provide any evidence demonstrating that regrading can actually restore habitat, and it fails to demonstrate why and how SpaceX would now follow through with its commitment to restore the area in light of the companies' ongoing, chronic failures to comply with environmental measures that it previously promised.

The refuge is also vulnerable to explosion-induced wildfires. Wildfires resulting from SpaceX activities have already scorched at least 140 acres of refuge-managed land. The DPEA underplays the severity that a future wildfire may have, noting that "[v]egetative land cover in [susceptible nearby areas] is classified as barren or grasslands, both of which would recover quickly post-fire."[93] However, as noted by a Service employee, "[m]y concern is that this sensitive area does not normally burn (lighting strikes), and by starting to burn an area that usually does not have fire can change the vegetation or cause more damage than good especially with the types of sand and salty soils which will lose protection once vegetation is removed, and change the ecology of the area."[94] Similar harms are likely to persist if SpaceX implements the Proposed Project.

LRGV NWR has been—and will continue to be—harmed by the impacts of noise, light, traffic, and human presence generated by SpaceX. LRGV NWR is described in the DPEA as being a "noise sensitive area", which is "an area where noise interferes with normal activities associated with its use."[95] Debris retrieval and removal operations are also harmful to LRGV NWR because they can disturb refuge wildlife, such as nesting birds,[96] in light of the loud noises and human presence resulting from these efforts. Moreover, SpaceX flies drones over the refuge to determine whether any humans are present during testing and launches.[97] The Service has "biological concerns" regarding the use of drones because birds can be reactive to these during nesting season.[98] There also have been "increased observations of road mortality of wildlife at all hours of daytime and nighttime."[99] Furthermore, according to the LRGV NWR Refuge Manager, LRGV NWR is "being negatively impacted" because trash discarded by SpaceX employees "is being blown into the refuge due to high winds, and negligence."[100] He further noted that "[t]he refuge has never experienced this level of trash visible from the road ever. It is readily apparent that the trash is related to Space-X and the motorists driving to-from the site daily."[101] LRGV NWR would likely face similar or more severe environmental impacts if the Proposed Project is implemented.

Finally, it is our understanding that Service staff, which include law enforcement personnel and biologists, are needed to address at least some of SpaceX's impacts to the refuge.[102] In 2019, the Refuge Manager has stated that three new employees "are needed to oversee the refuge during

[92] DPEA at 113.
[93] *Id.* at 112.
[94] Email from Ernesto Reyes, Alamo Ecological Service Sub-Office, U.S. Fish & Wildlife Service (Aug. 20, 2019, 08:01 CST) (Attachment T).
[95] DPEA at 49.
[96] Email from Bryan Winton (Mar. 9, 2020, 14:16 CST) (Attachment U).
[97] Email from Bryan Winton (Oct. 16, 2019, 16:43 CST) (Attachment O).
[98] *Id.*
[99] January 2021 Service Letter at 2–3 (Attachment I).
[100] Email from Bryan Winton (Mar. 9, 2020, 14:16 CST) (Attachment U).
[101] *Id.*
[102] Email from Bryan Winton (Apr. 4, 2019, 13:45pm CST) (Attachment O).

Space-X closures, so we can maintain integrity of the refuge when everyone else is closed out of the place except SpaceX."[103]

Overall, based on what we already know about SpaceX's existing impacts, the Project and other connected actions will have significant, adverse impacts on LRGV NWR.

2. Impacts to Other Nearby Habitat

The Project, both independently and in combination with connected actions, is also likely to have significant, adverse impacts on nearby habitat other than LRGV NWR. First, habitat in the area will be destroyed to accommodate new construction. The project is expected to be accompanied by filling jurisdictional waters, including 10.94 acres of salt flats, 0.28 acres of depressional areas, and 5.94 acres of high marsh areas for 17.16 acres of wetland impact.[104] Because they will be converted to uplands, they "would not retain any of the previous wetland functions or values."[105] 14.5 acres of uplands are also expected to be destroyed.[106]

According to the Environmental Protection Agency, ("EPA") SpaceX's operations have caused "substantial and unacceptable adverse impacts to aquatic resources of national important (ARNI)," due to the impacts to mudflats, estuarine and non-tidal wetlands, which "support benthic invertebrate communities which make them essential foraging habitats for wintering and migrating shorebirds, including the threatened piping plover and red knot."[107] The wetland complex at issue "was designated by the Western Hemisphere Shorebird Network as a Site of International Importance," and is "critical to the survival of many species of shorebirds and waterfowl."[108] The EPA has concerns over the "direct, secondary, and cumulative impacts associated with destruction of the rare and valuable aquatic habitats within the project area," and questioned "whether adequate compensatory mitigation will be provided for project impacts."[109]

Areas outside of LRGV NWR that are near the Proposed Project location are similarly vulnerable to the harmful impacts associated with explosions. Debris can cause rutting in nearby salt flats and wetlands,[110] a problem worsened by the fact that the debris field can span for miles.[111] In fact, some of the rocket pieces from at least one explosion were lodged in wetlands near the Project location.[112] Following a different explosion that was onset by engine failure, debris was observed 500-1000 meters into state lands and included small, medium, and large pieces of debris.[113] According to TPWD, at least one explosion has scattered debris onto the Boca Chica Wildlife Management Area.[114] In addition to LRGV NWR, other areas are susceptible to explosion-induced wildfires. The

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[103] *Id.*
[104] DPEA at 95.
[105] *Id.*
[106] *Id.* at 111.
[107] Letter from Maria L. Martinez, EPA, to Joe McMahan, U.S. Army Corps (April 7, 2021).
[108] *Id.*
[109] *Id.*
[110] DPEA at 113.
[111] Email from Bryan Winton (Mar. 30, 2021, 21:25 CST) (estimating that a March 2021 explosion resulted in a 2–3-mile debris field) (Attachment G).
[112] Letter from Charles Ardizzone, Field Supervisor, U.S. Fish and Wildlife Service to Stacey M. Zee, Office of Commercial Space Transportation, Federal Aviation Administration at 1 (Mar. 4, 2020) (Attachment C).
[113] Email form Sonny Perez (Mar. 30, 2021, 10:47 CST) (Attachment V).
[114] Email from Eric Schroeder (Mar. 12, 2021, 11:38am CST) (Attachment W).

DPEA characterizes areas that may receive wildfires as being small,[115] yet 140 acres of TPWD property were burned in July and August 2019 as a result of SpaceX test launches.[116] More than 100 acres from only two fires can hardly be considered small. Moreover, "[n]ighttime activities also hinder efforts to extinguish fires, evacuate people, remove trespassers, and delays debris removals."[117] Again, although the DPEA downplays the severity of impacts resulting from explosions, stating that rutting can be regraded and vegetative land cover can "recover quickly post-fire," it fails to demonstrate the viability of restoration, fails to demonstrate that it would follow through on promised mitigation, and fails to account for any lost habitat values in the meantime. For instance, listed species—the threatened piping plover and the threatened red knot—use tidal flats in the area for foraging.[118]

Finally, many of the areas near the launch site that will be impacted by the Proposed Project have been categorized by the FAA as "noise sensitive areas," including Boca Chica State Park, Brazos Island State Park, and Boca Chica Beach.[119] These areas, therefore, will be adversely impacted by noises resulting from construction, daily operations, traffic, testing, and launches at the SpaceX site.

B. Significant Impacts to Listed Species and Critical Habitat

The Project will have significant impacts to at least ten listed species, including the piping plover, the red knot, the northern aplomado falcon, the Gulf Coast jaguarundi, the ocelot, and the Kemp's ridley, hawksbill, leatherback, loggerhead sea turtle, and green sea turtle.

1. Impacts to Piping Plovers

As admitted by the FAA in its Biological Assessment ("BA"), this project is likely to adversely affect piping plovers (*Charadrius melodus*), a threatened species of shorebird, along with their critical habitat, which is located on the project site and in surrounding areas. The Service first added piping plovers to the endangered and threatened species lists in 1985, in large part due to the disturbance and destruction of their habitat.[120] Piping plovers can be sensitive to human disturbances.[121] They spend more time alert and less time foraging in areas that are disturbed.[122] This can lead to reduced time spent feeding and increased stress levels, resulting in lower body mass in members of the species.[123] Disturbances to piping plovers from human presence can reduce the overall value of piping plover critical habitat.[124]

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[115] DPEA at 112.
[116] Texas Parks and Wildlife Scoping Letter at 12 (Attachment B).
[117] Letter from Charles Ardizzone, Field Supervisor, U.S. Fish and Wildlife Service to Stacey M. Zee, Office of Commercial Space Transportation, Federal Aviation Administration at 4 (Mar. 4, 2020) (Attachment C).
[118] January 2021 Service Letter at 3 (Attachment I).
[119] DPEA at 49.
[120] Endangered and Threatened Wildlife and Plants; Determination of Endangered and Threatened Status for the Piping Plover, 50 Fed. Reg. 50,726 (Dec. 11, 1985).
[121] U.S. Fish & Wildlife Serv., *Piping Plover (Charadrius melodus): 5-Year Review: Summary and Evaluation* 17 (Mar. 2020), https://ecos.fws.gov/docs/five_year_review/doc6378.pdf.
[122] *Id.* at 16.
[123] *Id.*
[124] 66 Fed. Reg. 36,079 Endangered and Threatened Wildlife and Plants; Final Determination of Critical Habitat for Wintering Piping Plovers, 66 Fed. Reg. 36,038, 36,069 (July 10, 2001).

Piping plovers have already felt serious impacts resulting from the SpaceX project, which are likely to continue or intensify. As previously stated, the Service concluded that SpaceX was likely causing such a blatant take of this threatened species that the company was vulnerable to a lawsuit under the ESA.[125] Moreover, research has shown that the piping plover population at Boca Chica has experienced a rapid and significant population decline.[126] The timing of the decline became severe in 2019,[127] right when SpaceX's operations in the area began to ramp up. Indeed, the area is functioning as a population sink due to the piping plover's historic reliance on the area,[128] coupled with the increased harm from SpaceX activities.

Even the FAA has acknowledged some—although not all—of the harms that SpaceX can cause to piping plovers. For instance, the FAA admitted in its BA that piping plovers can be displaced due to noises generated by SpaceX.[129] As previously discussed, some of the noises resulting from SpaceX operations include those resulting from construction, daily operations, traffic, testing, launches, sonic booms, explosions, and increased human activity. SpaceX is expected to generate both noise and light all day, every day. Given the piping plover's sensitivity to disturbances, the Project is likely to cause piping plovers in the area to spend less time foraging, experience increased stress levels, and suffer from reduced body mass. The BA also states piping plovers could be killed if they appeared within the heat plume created by engine ignition during testing and launches, which can run as hot as 212 degrees Fahrenheit within a .3 mile radius of the launch area. The FAA has failed to offer any valid explanation regarding how these impacts could or would be mitigated.

Inevitable explosions, along with resulting debris and wildfires, are also likely to harm piping plover critical habitat. According to the Service, there is "documented evidence that the debris and its removal has impacted and scarred various habitats in the area, including tidal flats which are foraging habitat for the threatened piping plover."[130] Finally, according to the BA, the facility expansion would fill 11.03 acres of piping plover critical habitat.[131]

Thus, the Proposed Project will seriously harm piping plovers and their designated critical habitat, resulting in significant environmental impacts.

2. Impacts to Red Knots

The Proposed Project is also likely to adversely affect threatened red knots (*Calidris canutus rufa*), as admitted by the FAA in its BA, along with proposed red knot critical habitat. The Boca Chica area "contains a high concentration of rufa red knots during the spring and fall migration periods, serving as an important northbound and southbound stopover site on the northern Gulf coast."[132] The Service listed the red knot as threatened under the ESA in 2015.[133] Red knot populations were

[125] Email from Dawn Gardiner (Dec. 17, 2020, 13:59 CST) (Attachment L); *see also* Email Dawn Gardiner (Dec. 10, 2020, 16:23 CST) (Attachment M).
[126] D. Newstead and B. Hill, *Piping Plover Population Abundance, Trend and Survival at Boca Chica 2018-2021: Report by Coastal Bend Bays & Estuaries Program* (Oct. 22, 2021) (Attachment X).
[127] *Id.*
[128] *Id.*
[129] BA at 65.
[130] Service January 2021 Letter (Attachment I).
[131] BA at 64.
[132] Red knot CH proposal at 37,493.
[133] Endangered and Threatened Wildlife and Plants; Threatened Species Status for the Rufa Red Knot, 79 Fed. Reg. 73,706 (Dec. 11, 2014).

decimated in the late 1800s and early 1900s by commercial hunting for sport and food.[134] More recently the species' population has declined from threats to its habitat and prey species.

As acknowledged by the FAA in its BA, red knots can be disturbed, displaced, or killed by SpaceX's operations. Red knots can be sensitive to disturbances. Disturbances during the peak migration months of May and August can drive red knots to reject foraging habitats that would have otherwise been preferred.[135] Research shows that human disturbances can cause a decline in shorebirds' food intake and the amount of time spent foraging.[136] Disturbances "negatively affect the birds' energy balances."[137] As summarized by the Service in its red knot "Threats Assessment," which it developed during the species' listing process, one study "found that disturbed shorebird flocks often did not return to the same place or even general location along the beach once they were disturbed, with return rates at one site of only 8 percent for monospecific red knot flocks. Even when flocks returned, not all shorebirds did so, with half or less of the birds returning after a disturbance."[138] Moreover, according to the Threats Assessment, lighting on tall structures is known to cause avian collisions and "birds can become disoriented and entrapped in areas of artificially lighted airspace."[139] In addition to human presence, red knots can also be disturbed by aircraft.[140] Moreover, red knots could be killed if they are located within the heat plume created by engine ignition during testing and launches. Finally, according to the BA, the number of red knots in the area has declined over the years.[141]

The Project will also harm red knot habitat in the area, which will likely soon be designated as critical habitat. In its proposal to designate critical habitat for red knots, including in Boca Chica, the Service stated that one of the identified threats to the species was "habitat modification resulting from space exploration development."[142] Although the BA did not address the Proposed Project's impacts to red knot critical habitat, it did state that the facility expansion would fill 11.03 acres of piping plover critical habitat. It is likely that this same area that will be filled will soon be designated as red knot critical habitat, as well. Moreover, red knots use mud and salt flats surrounding the Project area, [143] portions of which have been destroyed by debris and debris retrieval efforts following rocket explosions.

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[134] Endangered and Threatened Wildlife and Plants; Proposed Threatened Status for the Rufa Red Knot, 78 Fed. Reg. 60,024, 60,028 (Sept. 30, 2013).
[135] 78 Fed. Reg. 60,076–77.
[136] 78 Fed. Reg. 60,078
[137] U.S. Fish and Wildlife Service, *Rufa Red Knot Background Information and Threats Assessment: Supplement to Endangered and Threatened Wildlife and Plants; Final Threatened Status for the Rufa Red Knot (Calidris Canatus Rufa): Docket No. FWS-R5-ES-2013-0097; RIN* AY17, at 266 (Nov. 2014) (Attachment Y) ("Threats Assessment")
[138] *Id.* at 269-270 (internal citations omitted).
[139] U.S. Fish and Wildlife Service, *Rufa Red Knot Background Information and Threats Assessment: Supplement to Endangered and Threatened Wildlife and Plants; Final Threatened Status for the Rufa Red Knot (Calidris Canatus Rufa): Docket No. FWS-R5-ES-2013-0097; RIN* AY17, at 297 (Nov. 2014) (citing Kuvlesky, W.P., Jr., L.A. Brennan, M.L. Morrison, K.K. Boydston, B.M. Ballard, and F.C. Bryant. 2007. Wind energy development and wildlife conservation: Challenges and opportunities. Journal of Wildlife Management 71(8):2487-2498.).
[140] U.S. Fish and Wildlife Service, *Rufa Red Knot Background Information and Threats Assessment: Supplement to Endangered and Threatened Wildlife and Plants; Final Threatened Status for the Rufa Red Knot (Calidris Canatus Rufa): Docket No. FWS-R5-ES-2013-0097; RIN* AY17, at 266 (Nov. 2014).
[141] Although the BA makes the conclusory assertion that this decline is "not significant," it fails to provide evidence in support of this assertion.
[142] Red Knot CH proposal at 37,493-94.
[143] Texas Scoping Letter at 5 (internal citation omitted).

Thus, the Project will harm red knots and their proposed critical habitat.

3. Impacts to Northern Aplomado Falcons

The FAA also admitted in its BA that endangered northern aplomado falcons (*Falco femoralis septentrionalis*) are likely to be adversely affected by the project. Northern aplomado falcons have been observed foraging and nesting in the action area.[144] Habitat loss and degradation of breeding and wintering grounds of migratory birds, including those in the action area, negatively impacts important avian prey species for aplomado falcons. They also could be attracted to nest and perch on proposed infrastructure, such as towers. As with red knots and piping plovers, northern aplomado falcons could be startled and displaced due to noise impacts from SpaceX's operations. If northern aplomado falcons flush off their nests during disturbances, it would expose their eggs or small young to inclement weather and predators. This can result in the destruction of their eggs and the death of their chicks. Moreover, even the FAA admits in its BA that disturbances may also reduce foraging efficiency and feeding time for the species. Finally, northern aplomado falcons and their eggs could be killed by heat plumes during engine testing and launches. Thus, the Project will likely cause serious adverse effects to endangered northern aplomado falcons.

4. Impacts to Ocelots and Gulf Coast Jaguarundis

Endangered ocelots (*Leopardus pardalis*) and endangered Gulf Coast jaguarundis (*Herpailurus yagouaroundi cacomitli*) are also likely to be adversely affected by the project. Laguna Atascosa NWR and adjacent lands support the only known U.S. breeding population of the ocelot.[145] While this refuge is not as close to the danger site as LRGV NWR, portions of it are within the action area. Furthermore, areas of the LRGV NWR within the action area contain lomas covered in Taumalipan thornscrub, ideal habitat for ocelots. An ocelot was observed and trapped traveling along SH 4 in the LRGV NWR within the action area in 1998 and there have been additional reports of ocelot sightings in this portion of the refuge in the past 25 years.[146] The jaguarundi is an endangered cat with a recent documented history in South Texas and an active recovery plan with site-specific management actions in Texas. The last known record of a jaguarundi in the United States was a roadkill along SH 4, the road leading into and through the action area.[147]

The area near the launch site is within a broader corridor of lands encompassing Laguna Atascosa NWR, and LRGV NWR as well as the habitat between them. This coastal corridor on the eastern boundary of the Rio Grande delta supports a matrix of Taumalipan thornscrub (ideal habitat for ocelots and jaguarundis) as well as native rangeland wetlands and upland communities that may be suitable for movement of both cat species.[148] SpaceX employees traveling through the area could expose ocelots and jaguarundis to the increased potential for vehicle collisions. Vehicular collisions are the leading known cause of mortality for ocelots in Texas, and the 2013 Jaguarundi Recovery Plan similarly identified mortality from vehicle collisions as a threat to this species.[149] According to SpaceX there will be an extra 505 vehicles per day through potential travel corridors for the Gulf

[144] BA at 37.
[145] BA at 42.
[146] *Id.*
[147] *Id.* at 41.
[148] *Id.* at 42.
[149] *Id.* at 41.

Coast jaguarundi and the ocelot: 55 construction vehicles and 450 SpaceX staff vehicles. Moreover, according to TPWD:

> several hundred employees and contractors travel to the Boca Chica Launch Site and between the CCA and VLA throughout the day and night, resulting in an increase in traffic along SH 4 TPWD continues to be concerned that the increase in traffic has resulted and will continue to result in an increase in wildlife-vehicle collisions. Roadkill observations have been documented along SH 4 and include state-listed and SGCN species including Texas tortoise, Texas indigo snake, snowy plover, and Harris' hawk.[150]

There have been numerous incidents stemming from SpaceX involving traffic safety. Dump trucks importing dirt to the SpaceX site have been known to violate speed limits in the area, and at least one such truck even crashed in 2016.[151] Although the driver involved in that incident was fired, vehicle crashes involving SpaceX agents and employees have persisted in the area. Unfortunately, a family's vehicle crashed with an eighteen-wheeler commercial trailer that was delivering products to and from the SpaceX facility in the middle of the night, killing one of the family members.[152] According to the victim's family, the eighteen-wheeler had backed up unsafely and stopped in the middle of the dark road.[153] Service staff have expressed concern regarding SpaceX traffic's impacts to "public safety, wildlife mortality increasing due to high speed trucks, and damage to [refuge] property (vegetation and fence) from accidents."[154] Protecting additional north-south travel corridors is essential to offset the impacts of the proposed increase in vehicle traffic, yet SpaceX does not appear to have taken any steps to provide for adequate protections.

Gulf Coast jaguarundis and ocelots may also be impacted by the Proposed Project because it could cause them to avoid lit areas and seek other north-south travel corridors, expending additional energy, pushing them into unfamiliar territory, and increasing the potential for vehicular mortality. Moreover, the rocket heat plume may injure or kill individual cats exposed to the plume. More likely, accidental explosions could start a wildfire and, in the words or the BA, burn "many acres of suitable cat habitat."[155] This could result in the loss of individual cats or directly impact their movement on the landscape and potentially affect species migration corridors.

Moreover, it is our understanding that SpaceX agreed to fund ocelot monitoring in the area and subsequently rescinded its offer. SpaceX's refusal to honor this agreement for funding for ocelot monitoring is particularly impactful at a time when Laguna Atascosa NWR's budget shortages have compelled refuge management to significantly reduce ocelot monitoring on and near the refuge, specifically citing that they were no longer receiving funding for ocelots. Ocelot monitoring in other areas near the refuge is shifting to a third party and the population residing on federal lands is no longer being monitored by remote camera and live trap and release as they have been over the past decade. This raises concerns regarding the Service's knowledge in near-real time of the health of a

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[150] TPWD Scoping Comments at 9 (Attachment B).
[151] Email from Ernesto Reyes (Feb. 25, 2016 07:39 CST) (Attachment Z).[151]
[152] Aristos Georgiou, *Family Sues SpaceX for Negligence After Texas Crash Kills Man, Seeking $20M,* Newsweek, (Apr. 30, 2021), https://www.newsweek.com/family-sue-spacex-negligence-texas-crash-1587758
[153] *Id.*
[154] Email from Ernesto Reyes (Feb. 25, 2016 07:39 CST) (Attachment Z).[154]
[155] BA at 67.

population numbering at only 15 known individuals. This lack of monitoring activity impedes the survival and recovery of the species.

Finally, according to the Service, limiting launch activities to hours between dawn and dusk would minimize impacts to ocelots and jaguarundis,[156] but this recommendation has gone ignored. Thus, by increasing the likelihood of traffic mortalities, likely impeding their movement along migratory corridors, creating a serious risk of habitat destruction from wildfires, and establishing the possibility that cats can die in rockets' heat plumes, the Project will have serious, adverse impacts on endangered ocelots and jaguarundis.

5. Impacts to Sea Turtles

Kemp's ridley (*Lepidochelys kempii*), loggerhead (*Caretta caretta*), green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*), and leatherback (*Dermochelys coriacea*) sea turtles have all been identified nesting in the area of the SpaceX launch site, and Kemp's ridley sea turtles nest there with regularity. Noise and vibrations generated by rocket testing, launches, and landings could cause turtles to abandon their nesting attempts by frightening them.[157] However, there are no mitigation measures currently available to reduce the chances of noise-induced startle responses.[158] Vibrations from rocket launches could also damage incubating eggs not collected by Sea Turtle Inc., either because they were overlooked during patrols or because they were laid during times when public access is prohibited.[159] As previously discussed, in 2019 SpaceX caused more than 1,000 closure hours and 800 closure hours are now being proposed. Indeed, the Service has expressed concerns with closure activities "hampering biological and monitoring studies including sea turtle patrols [and] sea turtle cold-stunning responses."[160]

Moreover, lighting could be visible from the beach, which could cause females to false crawl and could disorient emerging hatchlings.[161] Hatchlings are known to crawl toward artificial light sources, "following the same instinctive response that leads them seaward."[162] Construction is expected to occur both at day and night and the DPEA assumes that 20% of launches will occur at night. According to the Service, limiting launch activities to hours between dawn and dusk would minimize impacts to sea turtles,[163] but this recommendation has gone ignored. Bright spotlights are expected to illuminate the launch pad, at times for multiple days.[164] Although the BA notes that low pressure sodium lights could be used, "to the extent practicable," during sea turtle nesting season, it qualifies this by saying that brighter, white lights would be necessary "for ground support operations performed 24/7 throughout the year," negating the efficacy of its proposed mitigation measure. Finally, sea turtles and hatchlings present near the site at the time of engine ignition could be injured or killed by the rocket heat plume, and their eggs could be destroyed. Kemp's ridley sea turtles at

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156 Letter from Charles Ardizzone, Field Supervisor, U.S. Fish and Wildlife Service to Stacey M. Zee, Office of Commercial Space Transportation, Federal Aviation Administration at 1 (Mar. 4, 2020) (Attachment C).
157 BA at 68.
158 DPEA at 113-114.
159 BA at 68.
160 January 2021 Service Letter at 2 (Attachment I)
161 BA at 69.
162 DPEA at 112.
163 Letter from Charles Ardizzone, Field Supervisor, U.S. Fish and Wildlife Service to Stacey M. Zoo, Office of Commercial Space Transportation, Federal Aviation Administration at 1 (Mar. 4, 2020) (Attachment C).
164 *Id.*

times nest as part of mass aggregation events, or "arribadas," in which a mass of turtles suddenly appears. If an arribada occurs shortly before launch events and the eggs are not removed, or the aggregating turtles are caught in the heat plume, the result could be catastrophic.

Overall, this project is likely to cause significant, adverse effects to five different species of listed turtles, threatening disrupt and kill turtles and destroy their eggs. Despite these alarming consequences, no adequate mitigation measures, such as appropriately managing noise and lighting, have been proposed.

The Proposed Project is likely to adversely affect at least 10 listed species, yet includes little to no meaningful mitigation measures to address these effects. It is abundantly clear that the Project will have significant impacts, and the FAA must prepare an EIS.

C. Significant Impacts to Other Resources in the Affected Area

Finally, the Project will adversely affect other wildlife, another resource in the Proposed Project area.[165] According to TPWD,

> Areas surrounding the project area are managed or preserved as high-quality wildlife habitat that provide foraging, loafing, and nesting sites for birds. Additionally, the project area occurs in the middle of the Central Flyway Migration Corridor through which millions of birds pass during spring and fall migration. More than 250 bird species have been documented within the Boca Chica Village and Boca Chica Beach areas in recent years. The mud and salt flats surrounding the proposed construction areas are used by numerous shorebirds."[166]

Indeed, some of the birds that use the area include reddish egrets, American oystercatchers, peregrine falcons, red knots, mangrove warblers, piping plovers, and brown pelicans.[167] In fact, 58 of the 88 species of birds that have been identified as Species of Greatest Conservation Need in Texas's Gulf Coast Marshes and Prairie Ecoregion have been documented in the vicinity of the Project site.[168] Snowy plovers have been documented nesting directly adjacent to the Proposed Project site:

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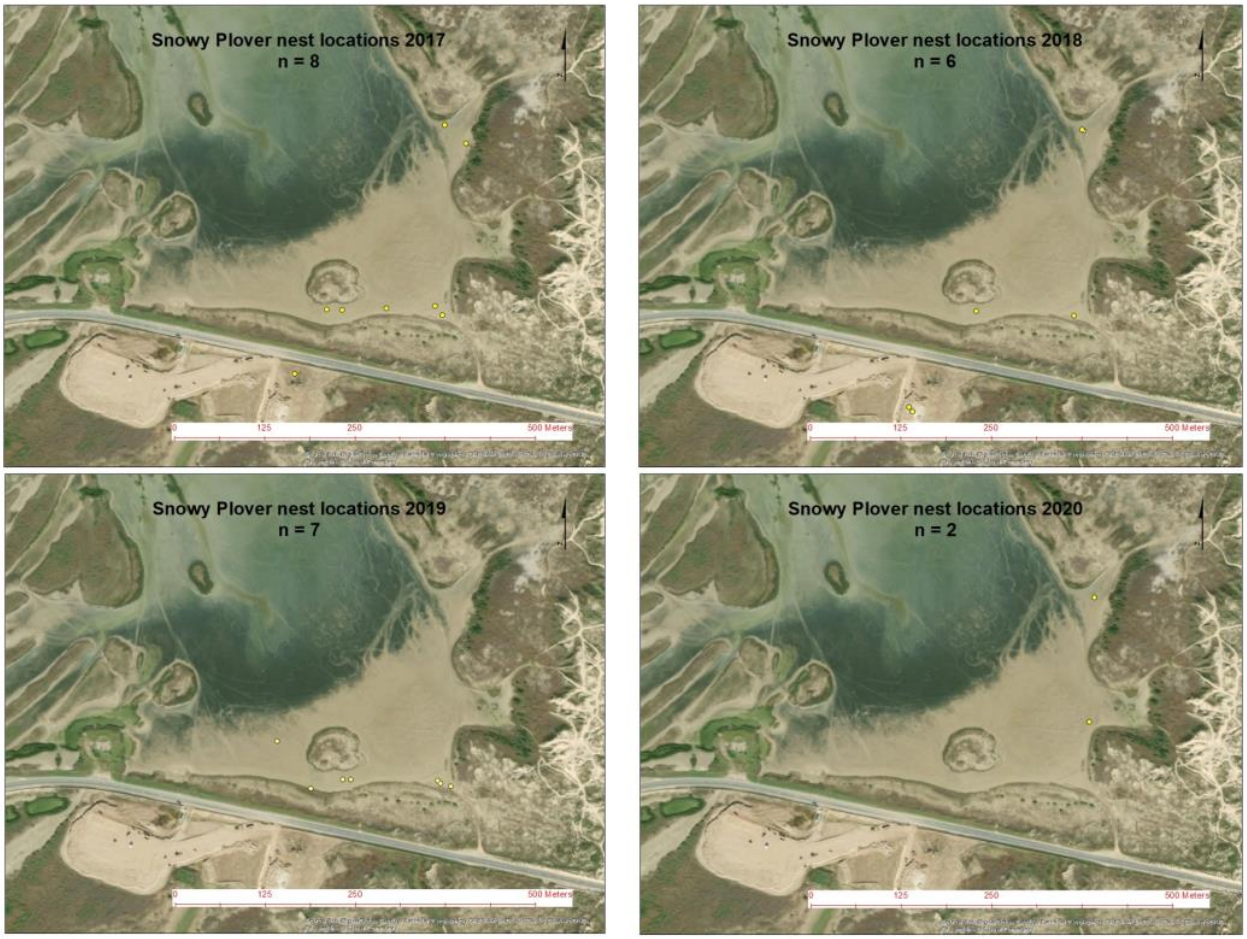
[165] *See id.* § 1501.3(b)(1) (significance should be assessed based on the effects of the action to the affected area and its resources).

[166] Texas Scoping Letter at 5. (internal citation omitted).

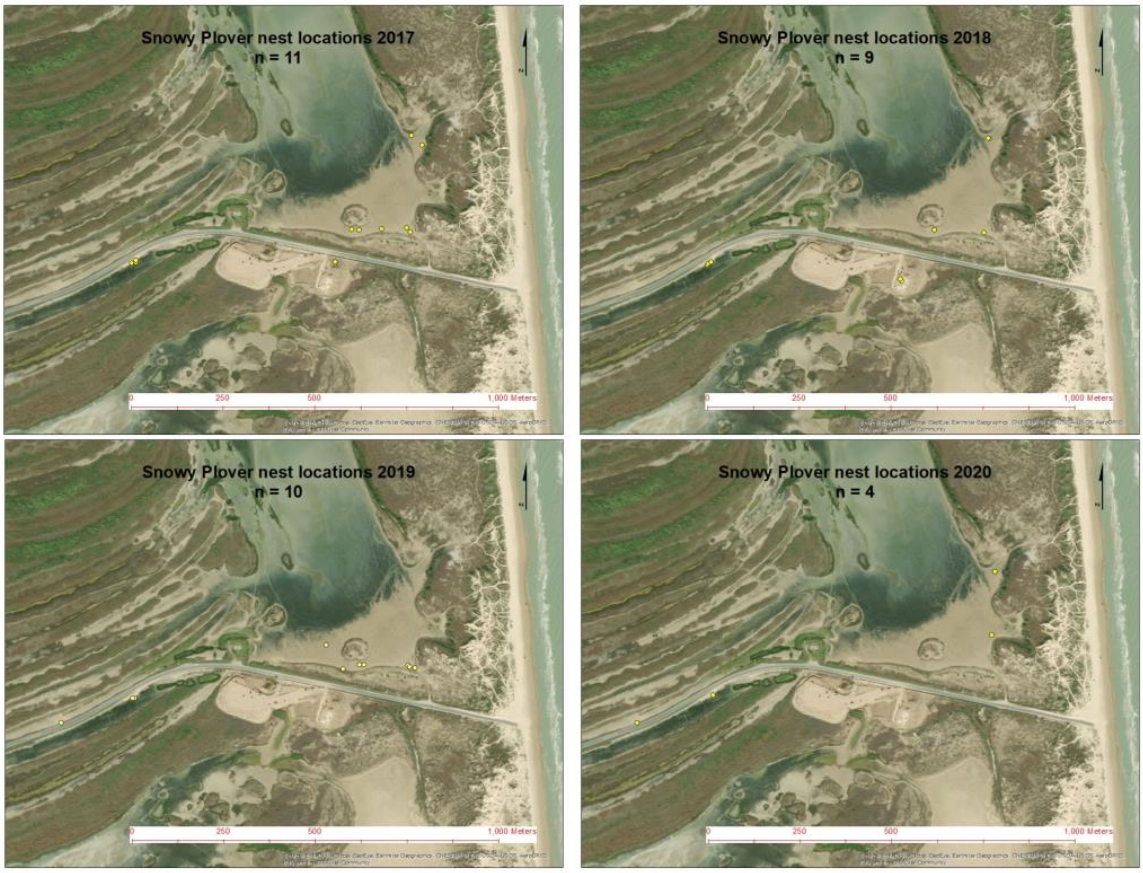
[167] https://www.fws.gov/refuge/Lower_Rio_Grande_Valley/visit/boca_chica_beach.html

[168] Letter from Clayton Wolf, Chief Operating Officer, Texas Parks & Wildlife to Stacy M. Zee, Office of Commercial Space Transportation, Federal Aviation Administration at 7 (Jan 27, 2021) (Attachment X – Texas Parks and Wildlife Scoping Letter)

Nest locations of Snowy Plovers in vicinity of SpaceX launch site – Boca Chica, Cameron County, Texas



Nest locations of Snowy Plovers in vicinity of SpaceX launch site – Boca Chica, Cameron County, Texas



[169]

As previously discussed, SpaceX will cause serious disturbances to the area resulting from human presence, construction, traffic, lighting, sonic booms, the use of ATVs, and the use of drones. "Disturbance of shorebirds can cause behavioral changes resulting in less time roosting or foraging, shifts in feeding times, decreased food intake, and more time and energy spent in alert postures or fleeing from disturbances."[170] As the Service has noted:

> At two sites on the Atlantic coast of New Jersey, [researchers] found that disturbed shorebird flocks often did not return to the same place or even general location along the beach once they were disturbed, with return rates at one site of only 8 percent for monospecific red knot flocks. Even when flocks returned, not all shorebirds did so, with half or less of the birds returning after a disturbance. [171]

Moreover, according to the Service, researchers:

> found the abundance of shorebirds declined with increased [off road vehicle ("ORV")] frequency, as did the number and size of roosts. [One study] found that disturbance from ORVs decreased shorebird abundance and altered shorebird habitat use. In

[169] Email from David Newstead, (Jan. 8, 2021 11:13 CST) (Attachment AA).
[170] Threats Assessment at 270 (internal citations omitted).
[171] *Id.* at 269-270 (internal citations omitted).

> experimental plots, shorebirds decreased their use of the wet sand microhabitat and increased their use of the swash zone in response to vehicle disturbance."[172]

Disturbances, such as those caused by SpaceX, also impede birds' ability to successfully reproduce. When disturbed, nesting birds can flush off of their nests, exposing their chicks and eggs. This can result in predators eating the vulnerable chicks and eggs or them overheating in the sun. Startle responses can also "result in broken eggs or cause immature young that are not flight-capable to flee the nest."[173] Inappropriate light can also cause nesting and roosting birds to abandon areas, as can repeated nest failures.[174]

The Project's threats to area wildlife are not limited to disturbances. According to the Service, traffic from SpaceX has resulted in the death of migratory birds.[175] As the agency has pointed out, traffic near the site was already killing birds even before it began to "exponentially increase."[176] Moreover, as the FAA admits, "[t]he presence of newly constructed structures, such as the integration towers and natural gas pretreatment system, could pose a potential collision impact to birds."[177] Artificial lighting is also dangerous to bird species in the area. Artificial night lighting is a cause of mortality among migratory birds,"[178] lighting on tall structures is known to cause avian collisions, and "birds can become disoriented and entrapped in areas of artificially lighted airspace."[179] SpaceX's excessive and unpredictable area-wide closures have also interfered with wildlife monitoring efforts that can be used to support species conservation. For example, the closures have placed undue burdens on scientists from the Coastal Bend Bays & Estuaries Program, who are charged with conducting critical surveys of birds in the area, including piping plovers, along with nesting snowy and Wilson's plovers.[180]

Anomalies also threaten birds in the project area. According to the Service, videos of rocket launch failures "show evidence of different species of birds being impacted by the blast."[181] Snowy plovers have been documented as nesting near areas where exploded rocket debris landed.[182] Moreover, TPWD has remarked that sand flats are "essential to shorebirds in general and critical to species with relatively short legs and bills, like plovers, that are physically limited to shallow water habitats."[183] However, debris and debris retrieval operations have been known to damage tidal flats

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[172] *Id.* at 270 (internal citations omitted).
[173] DPEA at 113.
[174] *Id.* at 112-13.
[175] Email from Bryan Winton (Sept. 17, 2020 22:13 CST) (Attachment BB). *See also* Email from Bryan Winton (Sept. 28, 2020 15:32 CST) (Attachment CC) ("We know for sure there is a direct loss of wildlife due to increased traffic serving Space-X.")
[176] *Id.*
[177] DPEA at 111.
[178] TPWD Scoping Comments at 4 (internal citation omitted) (Attachment B).
[179] U.S. Fish and Wildlife Service, *Rufa Red Knot Background Information and Threats Assessment: Supplement to Endangered and Threatened Wildlife and Plants; Final Threatened Status for the Rufa Red Knot (Calidris Canatus Rufa): Docket No. FWS-R5-ES-2013-0097; RIN* AY17, at 297 (Nov. 2014) (citing Kuvlesky, W.P., Jr., L.A. Brennan, M.L. Morrison, K.K. Boydston, B.M. Ballard, and F.C. Bryant. 2007. Wind energy development and wildlife conservation: Challenges and opportunities. Journal of Wildlife Management 71(8):2487-2498.).
[180] Pers. comms. David Newstead (Oct. 31, 2021). Although the Coastal Bend Bays & Estuaries Program monitoring was successfully accomplished, the closures nevertheless placed a strain on scientists' time and resources.
[181] January 2021 Service Letter (Attachment I).
[182] Letter from Charles Ardizzone, Field Supervisor, U.S. Fish and Wildlife Service to Stacey M. Zoo, Office of Commercial Space Transportation, Federal Aviation Administration at 2 (Mar. 4, 2020) (Attachment C).
[183] TPWD Scoping Comments at 7 (Attachment B).

and will almost certainly continue to do so. Wildfires can also kill and displace birds and destroy nests and eggs. When commenting on a recent wildfire, a Service employee noted that it "could have as easily been devastating to nesting shorebird and resident species during their reproductive period."[184]

Thus, the Proposed Project will adversely affect wildlife, a resource in the Project Area, causing the Proposed Project to have significant environmental impacts.

D. Resulting Legal Violations

When analyzing the degree of an action's significance, agencies must consider effects that would violate other laws.[185] Among other legal violations, the Project will absolutely result in violations of the National Wildlife Refuge System Improvement Act of 1997 ("Refuge Improvement Act") and will likely result in violations of the Migratory Bird Treaty Act ("MBTA"), as well.

1. Violations of the Refuge Improvement Act

The National Wildlife Refuge System is managed pursuant to the Refuge Improvement Act, which Congress passed to "help protect species large and small, beautiful and not-so-beautiful, endangered and common alike."[186] The primary mission of the National Wildlife Refuge System is:

> to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.[187]

The Refuge Improvement Act was intended "to establish clearly the conservation mission of the System."[188] However, SpaceX's actions are resulting—and will continue to result—in violations of the Refuge Improvement Act, including from (1) SpaceX using the refuge without the Service engaging in a compatibility determination, (2) SpaceX engaging in incompatible uses of the refuge, (3) SpaceX failing to obtain a special use permit for engaging in commercial activities in the refuge, (4) SpaceX's operations interfering with the Service's mandate to promote the biological integrity, diversity, and environmental health of the refuge system, (5) SpaceX's operations interfering with the Service's mandate to provide for wildlife conservation in the refuge, and (6) SpaceX's operations interfering with the Service's mandate ensure that the refuge's purposes are carried out.

a. Failure to Engage in a Compatibility Determination

It is our understanding that the Service has never engaged in a compatibility determination of all of SpaceX's activities in the refuge and has no future plans to do so. To ensure that refuges carry out the System's mission and their respective purposes, the law creates a presumption against public use

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[184] Email from Bryan Winton (Aug. 19, 2019 22:51 CST) (Attachment T)
[185] *Id.* § 1501.3(b)(2), (b)(2)(ii), (b)(2)(iv).
[186] 143 Cong. Rec. H7646-02, H7647, 1997 WL 586267, 4.
[187] 16 U.S.C. § 668dd(a)(2).
[188] H.R. REP. NO. 105-106, at 3 (1997), reprinted in 1997 U.S.C.C.A.N. 1798-5.

and access of national wildlife refuges.[189] With extraordinarily limited exceptions, the Refuge Improvement Act provides authorization only to the Secretary of the U.S. Department of the Interior and the Service to administer and authorize uses of refuges.[190] The Service may "permit the use of any area within the System for any purpose . . . whenever [it] determines that such uses are compatible with the major purposes for which such areas were established."[191] Thus, it must engage in a compatibility determination whenever it "initiate[s] or permit[s] a new use of a refuge or expand[s], renew[s], or extend[s] an existing use of a refuge."[192]

SpaceX has repeatedly used LRGV NWR when engaging in operations and will continue to do so for the Proposed Project. For example, the refuge has been and will continue to be used as a sacrificial debris field, where explosion debris has landed on multiple occasions and wildfires resulting from explosions have occurred. LRGV NWR would be included in the Project's "Blast Danger Area"[193] and be subject to further FAA-approval as a part of the hazard area where debris may land,[194] which has occurred in the past. The refuge is and would continue to be subject to SpaceX's use during debris reconnaissance and removal operations. Based on the information available to us, it is our understanding that these and other uses of the refuge by SpaceX have never been the subject of compatibility determinations and will not be the subject of any compatibility determinations in the future.

b. Incompatible Use of a Refuge for SpaceX's Overall Operations

SpaceX is also violating and will continue to violate the Refuge Improvement Act by engaging in an incompatible use of a refuge. Refuges can only be used if "such uses are compatible with the purposes for which these areas are established."[195] For a use to be "compatible" it must be "a wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the [Service], will not materially interfere with or detract from the fulfillment of the mission of the System or the purposes of the refuge."[196]

SpaceX's current and proposed activities are plainly incompatible with the purposes of LRGV NWR. The purpose of the refuge is in part to "develop[], advance[], manage[], conserve[e], and protect[]… fish and wildlife resources."[197] As discussed, SpaceX's activities cause a multitude of harms to fish and wildlife resources, such as from explosions, wildfires, disturbances, and adverse modification of habitat resulting from debris. Even according to the Service, SpaceX's operations cause "both '*adverse'* and '*severe'* impacts to Refuge public use, management, wildlife, and habitat."[198]

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[189] 50 C.F.R. § 25.21(a) (Except for refuges in Alaska, "all areas included in the [System] are closed to public access until and unless we open the area for a use . . . in accordance with the [Refuge Act]. . . ."); *see also United States v. Sams*, 45 F. Supp. 3d 524, 525 (E.D.N.C. 2014) (the Refuge Act "closes national wildlife refuges in all states except Alaska to all uses until opened.").
[190] *See, e.g.* 16 U.S.C. § 668dd(a)(1) (refuges "shall be administered by the Secretary through the United States Fish and Wildlife Service"), (d)(1)(A) ("the Secretary is authorized…. to permit the use of" refuges).
[191] 16 U.S.C. § 668dd(d)(1)(A).
[192] *Id.* § 668dd(d)(3)(A)(i); *see also* 50 C.F.R. § 26.41(a).
[193] BA at 56.
[194] DPEA at 24-25.
[195] 16 U.S.C. § 668dd(d)(1)(B).
[196] *Id.* § 668ee(1).
[197] LRGV NWR CCP at 42 (citing 16 U.S.C. § 742f(a)(4)) (Attachment A).
[198] August 2021 Service Letter at 2 (emphasis in original) (Attachment D).

Thus, the Project will violate the Refuge Improvement Act's prohibition on incompatible uses of a refuge.

c. Unlawful Use of a Refuge for Economic Purposes

It is also our understanding that SpaceX has never obtained a special use permit to use the refuge for economic activities, which is required by Refuge Improvement Act regulations.[199] However, even if SpaceX does obtain a special use permit, economic uses of a refuge can only be permitted where the Service "determine[s] that the use *contributes to the achievement* of the national wildlife refuge purposes or the National Wildlife Refuge System mission."[200] SpaceX's use of the refuge clearly does not. Thus, the Project will result in an unlawful economic use of LRGV NWR.

d. Preventing the Service from Achieving its Affirmative Management Prescriptions

As is now also the case, the Project will impede the Service's ability to achieve several affirmative management prescriptions delineated in the Refuge Improvement Act. The Refuge Improvement Act requires the Service to administer the System to "ensure that the biological integrity, diversity, and environmental health of the System are maintained for the benefit of present and future generations of Americans."[201] However, the Service has explicitly stated: "Due to operations by SpaceX, the FWS's ability to maintain the biological integrity, diversity and environmental health of Refuge resources… has been significantly diminished at the Boca Chica tract."[202] Thus, SpaceX is interfering with the Service's ability to comply with the Refuge Improvement Act's biological integrity, diversity, and environmental health mandate. The Refuge Improvement Act also requires the Service to "provide for the conservation of fish, wildlife, and plants, and their habitats within the System,"[203] however SpaceX's activities directly counter such efforts and will continue to do so during the Proposed Project. Finally, the SpaceX project impedes the Service's ability to "ensure that… the purposes of each refuge are carried out."[204] As discussed, the purpose of LRGV NWR is in part to "develop[], advance[], manage[], conserve[e], and protect[]… fish and wildlife resources,"[205] and SpaceX is impeding such efforts.

Because SpaceX's impacts would result in violations of numerous provisions of the Refuge Improvement Act, its impacts will be significant and the FAA must prepare an EIS to address the project.

2. The Project Will Likely Result in Violations of the Migratory Bird Treaty Act

SpaceX's Project will also likely result in violations of the MBTA by causing a take of migratory birds, their chicks, their nests, and/or their eggs. In 1918, Congress enacted the MBTA to implement a treaty for "the protection of migratory birds" between Great Britain (on behalf of

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[199] *Id.* § 27.97.
[200] 50 C.F.R. § 29.1.
[201] 16 U.S.C. § 668dd(a)(4)(B).
[202] January 2021 Service Letter at 2-3 (Attachment I).
[203] 16 U.S.C. § 668dd(a)(4)(A).
[204] *Id.* § 668dd(a)(4)(D)
[205] LRGV NWR CCP at 42 (citing 16 U.S.C. § 742f(a)(4)) (Attachment A).

Canada) and the United States.[206] The objective of the treaty was to create a "uniform system of protection" to "insur[e] the preservation of such migratory birds" because "a lack of adequate protection" for many migratory birds traveling through the United States left them vulnerable to extinction.[207] Over the years, Congress broadened the scope of the MBTA to implement similar treaties with Mexico in 1936, Japan in 1972, and the former Soviet Union in 1976.[208] The MBTA was a breakthrough in U.S. conservation law. Once on the path to extinction, the MBTA helped restore countless populations of birds, such as sandhill cranes, snowy egrets, and wood ducks.[209] In fact, the Supreme Court has described the purpose of the MBTA as a "national interest of very nearly the first magnitude."[210]

As a "conservation statute[] designed to prevent the destruction of certain species of birds,"[211] the MBTA protects more than 1,000 species of birds found in the United States.[212] Under this law:

> [u]nless and except as permitted by regulations . . . it shall be unlawful at any time, by any means or in any manner, to pursue, hunt, take, capture, [or] kill . . . any migratory bird [or] any part, nest, or egg of any such bird . . . included in the terms of the conventions . . .."[213]

This provision applies to "any person, association, partnership, or corporation who shall violate any provisions of [the Act]."[214] The MBTA applies to both targeted and incidental takes, and the foreseeable incidental take of migratory birds cannot proceed without formal authorization from the Service. [215]

The Project is likely to create impacts that result in a take of migratory birds, their chicks, their eggs and/or their nests. As discussed, many migratory birds use the area, including red knots, piping plovers, snowy plovers, Wilson's plovers, reddish egrets, American oystercatchers, peregrine falcons, and brown pelicans. Migratory birds and their eggs could be killed or destroyed if they appear in the rocket's heat plume during launches. Moreover, migratory birds, such as snowy plovers, nest near the Project site. Disturbances can cause birds to flush off of their nests, leaving chicks vulnerable to death from overheating, predators, and fleeing the nest when they are not yet flight-capable. Flushing can also lead to the destruction of eggs, onset by predators and overheating. Lighting on tall structures, moreover, can kill migratory birds by causing avian collisions. Finally, explosion-onset wildfires can kill birds and destroy nests and eggs.

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[206] *Act of July 3, 1918, ch.* 128, 40 Stat. 755.
[207] Convention for the Protection of Migratory Birds, 39 Stat. 1702 (Aug. 16, 1916).
[208] Convention between the United States of America and Mexico for the Protection of Migratory Birds and Game Mammals, 50 Stat. 1311 (Feb. 7, 1936) (Mexico Convention); Convention for the Protection of Migratory Birds and Birds in Danger of Extinction, and Their Environment, art. VI, 25 U.S.T. 3329 (Mar. 4, 1972) (Japan Convention); Convention Concerning the Conservation of Migratory Birds and Their Environment, art. IV, 29 U.S.T. 4647 (Nov. 19, 1976) (Russia Convention).
[209] Nat'l Audubon Soc'y, *The Migratory Bird Treaty Act, Explained*, (Jan. 26, 2018), https://www.audubon.org/news/the-migratory-bird-treaty-act-explained.
[210] *Missouri v. Holland*, 252 U.S. 416, 435 (1920).
[211] *Andrus v. Allard*, 444 U.S. 51, 52 (1979).
[212] *See* 50 C.F.R. § 10.13.
[213] 16 U.S.C. § 703(a).
[214] *Id.* § 707(a).
[215] *See* 86 Fed. Reg. 54643 (Oct. 4, 2021).

E. Conclusion

At bottom, it would be arbitrary and capricious for the FAA to proceed without preparing an EIS. Indeed, the FAA recognized it was appropriate to prepare an EIS for SpaceX's originally planned activities in the area in 2014, so it would make no sense for the agency to now deem an EIS unnecessary for a connected action with even larger rockets and more infrastructure. The Project will cause significant impacts because it will likely adversely affect nearby public lands, at least ten species listed under the Endangered Species Act, and other wildlife in the area. It moreover will result in numerous violations of the Refuge Improvement Act and is also likely to result in violations of the MBTA. The FAA has also failed to demonstrate that nearly any meaningful mitigation measures will be implemented to counter these significant impacts. As put by one Service employee, "I must state this emphatically here that our response MUST be very clear that an EA is inappropriate to comply with the spirit and intent of NEPA, because we can see no path towards a FONSI!"[216] We agree. To comply with NEPA, the FAA must prepare an EIS.

III. The DPEA is Inadequate

If the FAA incorrectly decides against preparing an EIS, this decision would also be unlawful because it would have been made based on the woefully inadequate DPEA, which fails to comply with NEPA and its regulations. If it is unknown whether an action will be "significant," then an agency may prepare an EA. An EA must provide "sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact."[217] In doing so, the EA must discuss the environmental impacts of and alternatives to the proposed action[218] and must account for connected actions.[219] The DPEA, however, fails to comply with these requirements. Indeed, it fails to adequately consider the environmental impacts of the project and it fails to adequately consider alternatives to the proposed action. Accordingly, the DPEA does not provide sufficient evidence and analysis to support a finding of no significant impact.

A. The DPEA Fails to Adequately Consider Environmental Impacts

Under NEPA, a federal agency must take a "hard look" at the environmental impacts of its proposed action, yet the DPEA fails to do so for a number of reasons. First, it does not appear to consistently evaluate the environmental impacts of SpaceX's prior and current operations at the site, despite the fact that they are connected actions with respect to the Proposed Project. Second, the DPEA at times places artificial limitations on when actions can be considered significant. Third, the DPEA fails to adequately discuss the Project's impacts to listed species. Finally, it glosses over critical details involving the Project that are either definitely or otherwise likely to result in significant impacts.

The DPEA must account for connected actions, yet it has failed to do so. NEPA regulations require agencies to consider connected actions,[220] such as actions that "[c]annot or will not proceed unless

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[216] Email from Chris Perez (Jan 6, 2021 08:53 CST) (Attachment K).
[217] 40 C.F.R. § 1501.5(c)(1).
[218] *Id.* § 1501.5(c)(2).
[219] *Id.* § 1501.3(b).
[220] *Id.* § 1501.3(b)

other actions are taken previously or simultaneously" or "[a]re interdependent parts of a larger action and depend on the larger action for their justification."[221] The Proposed Project will rely on previous actions taken at the site, such as SpaceX's construction of existing infrastructure that, according to the DPEA, "SpaceX must be able to use."[222] The Project will also rely on information obtained from prior and ongoing testing at the site.[223] Moreover, SpaceX's prior actions, current operations, and the Proposed Project are also interdependent parts of SpaceX's larger action at the site to further commercial space exploration, making them connected actions. As stated by a Service employee, "[a]ll SpaceX development is a connected action."[224] Although impacts resulting from the Proposed Project, alone, are significant enough to warrant an EIS, the DPEA is inherently defective for failing to also consistently consider connected actions.

Even though prior and current operations at the site are connected actions, they at times were ignored in DPEA's analysis of what can be considered significant. For example, in the DPEA's analysis of noise impacts, current SpaceX operations were accounted for as existing conditions at the site.[225] According to the DPEA, construction noise impacts would only be significant if they increase the noise by DNL 1.5 dB.[226] However, the Project and current operations are connected actions. The FAA, therefore, cannot judge significance by an increase in the sound level above existing conditions and instead should consider the increased noise level resulting from the connected actions rather than the noise level of the increase.

The DPEA also places several artificial limitations on when an action can be considered significant. First, the assessment makes the concerning assertion that, "[a] significant impact on biological resources would occur if the USFWS or NMFS determines that the action would be likely to jeopardize the continued existence of a federally listed threatened or endangered species, or would result in the destruction or adverse modification of federally designated critical habitat."[227] This is incorrect for a number of reasons. First, CEQ regulations do no provide that only listed species and critical habitat should be considered when determining whether an action will have significant impacts to biological resources. According to the regulations, when assessing the significance of an action, agencies should consider "the affected area… and its resources, *such as* listed species and designated critical habitat under the Endangered Species Act."[228] CEQ regulations' reference to listed species and critical habitat serves only as an *example* of affected resources is not intended to limit listed species and critical habitat to being the only two metrics for determining the significance of impacts to biological resources.

Moreover, the DPEA's stated threshold for significance inappropriately uses the same standards as ESA Section 7's prohibition against jeopardizing a species' continued existence or adversely modifying its critical habitat.[229] A federal agency's legal obligations under NEPA and the ESA are entirely separate; compliance with the ESA Section 7 prohibition against jeopardizing a species'

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[221] *Id.* § 1501.9 (e)(1)(ii)-(iii)
[222] *See, e.g.*, DPEA at 34 ("Starship/Super Heavy test and launch operations conducted during the program development and operational phases must be able to use, to the maximum extent practicable, existing infrastructure at one of SpaceX's launch sites.")
[223] BA at 8.
[224] Email from Chris Perez (Sept. 10, 2020 08:46 CST) (Attachment DD)
[225] DPEA at 49.
[226] *Id.* at 50.
[227] DPEA at 110.
[228] 40 CFR § 1501.3(b)(1) (emphasis added).
[229] *See* 16 U.S.C. § 1536(a)(2).

continued existence does not simultaneously satisfy NEPA's requirements to analyze significant impacts short of the threat of extinction.[230] As one court stated, "[c]learly, there can be a significant impact on a species even if its existence is not jeopardized."[231]

Another example of an arbitrary limitation on significance is the DPEA's assertion that "[n]oise from the Proposed Action would not be expected to cause a significant impact because the noise events are infrequent and short-term and would not result in impacts at the population level."[232] First, significance should not be limited to population-level impacts, especially because CEQ's regulations for determining significance state that significance can in part be examined based on impacts to resources in a local area.[233] Significance, therefore, should not be limited to population-level impacts. Moreover, setting aside the incorrect substance of the FAA's misguided conclusion that noise events would be infrequent and short-term, noise events that are infrequent and short term can nevertheless have significant impacts. As previously mentioned, research suggests that disturbed shorebird flocks often do not return to the same location after being disturbed, or otherwise return with a diminished flock size.[234]

The DPEA also fails to adequately address impacts to listed species and critical habitat. First, although the BA's (albeit, still inadequate) analysis contains more information about listed species than the DPEA, the FAA cannot rely on the consultation process to satisfy its obligations under NEPA. According to the DPEA, "[t]he FAA's BA includes the full impact analysis on ESA-listed species."[235] However, an agency cannot substitute compliance with NEPA for compliance with the ESA.[236] The FAA also avers that it is engaged in Section 7 consultation under the ESA "to address the potential effects to ESA-listed species."[237] But, a mitigation plan developed to satisfy the ESA does not inherently satisfy NEPA.[238]

Regardless, both the BA and the DPEA fail to adequately assess the impacts of the project on listed species and critical habitat, largely relying on generalized assertions without supporting information or otherwise entirely ignoring certain issues. "[G]eneral statements about possible effects and some risk do not constitute a hard look absent a justification regarding why more definitive information could not be provided."[239] For example, neither document appropriately accounts for the impacts that lighting will have on listed species, as evidenced by the fact that the site design is incomplete and the number of lights that will be used is yet to be finalized.[240] As another example, the DPEA notes that lighting at the power plant would be minimized, but it does not explain what that would mean, such as which species might be impacted and just how bright the power plant would remain. The analyses also do not accurately account for disturbances. At times, the BA is dismissive of them,

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[230] *See Greater Yellowstone Coalition v. Flowers*, 359 F.3d 1257, 1275–76 (10th Cir. 2004) (recognizing FWS conclusion that action not likely to cause jeopardy does not necessarily mean impacts are insignificant).
[231] *Makua v. Rumsfeld*, 163 F. Supp. 2d 1202, 1218 (D. Haw. 2001) ("A FONSI . . . must be based on a review of the potential for significant impact, including impact short of extinction.).
[232] DPEA at 114.
[233] 40 CFR § 1501.3(b)(1).
[234] Threats Assessment at 269-270 (internal citations omitted) (Attachment Y).
[235] DPEA at 116.
[236] *See Portland Audubon Society v. Lujan,* 795 F. Supp. 1489, 1509 (D. Or. 1992) (rejecting agency's request for the court to "accept that its consultation with [FWS under the ESA] constitutes a substitute for compliance with NEPA.")
[237] DPEA at 116.
[238] *National Wildlife Federation v. Babbitt*, 128 F. Supp. 2d 1274, 1302 (E.D. Cal. 2000) (requiring EIS under NEPA even though mitigation plan satisfied ESA).
[239] *Blue Mountains Biodiversity Project v. Blackwood*, 161 F.3d 1208, 1213 (9th Cir. 1998).
[240] BA at 9.

implying that disturbances caused by the massive SpaceX project are comparable to disturbances resulting from recreational beach-goers.[241] Moreover, even in places where the documents note that disturbances can cause displacement, they do not elaborate on what the effects of displacement would be. For instance, roughly how many members of the species might be displaced? Where would these species go? Is there sufficient foraging, nesting, and roosting habitat available to them if they do relocate? The BA and DPEA also do not fully consider how site closures will impact listed species. For instance, a Service employee raised the question of whether "closures prevent sea turtle personnel from being able to provide quick assistance for stranded turtles."[242] In late 2020, for example, more than 20 green sea turtles in the area died, likely in large part from gill nets.[243]

Finally, the DPEA failed to adequately consider the impacts of certain foreseeable, major events. For instance, it barely discusses the impacts of anomalies. More than 10 anomalies have occurred, and the DPEA even briefly notes the possibility of monthly explosions, accompanied by debris, resulting from tank tests. The DPEA notes that anomaly-induced rutting can be regraded, but does not explain what the impact of rutting would be in the meantime, given that flats in the area serve as important foraging habitat to shorebirds. It also does not explain whether regrading habitat would sufficiently restore habitat in the area. The DPEA also makes brief mention of the fact that wildfires can result from explosion, stating that they would occur in "small areas adjacent to the launch mount and landing pad."[244] History has shown, however, that SpaceX's wildfires can be anything but "small," such as when 130 acres of refuge-managed land burned following an explosion in July 2019. Moreover, it is foreseeable that wildfires will not be limited to areas adjacent to the launch mount. Earlier this year, for instance, the debris field resulting from an explosion spanned for miles. While it is possible that some of these events and resulting impacts may be addressed in external documents and response plans, they are not addressed in the DPEA, and the FAA is therefore in violation NEPA.

Finally, the DPEA glosses over, or otherwise entirely overlooks, major Project components or elements that are parts of connected actions. For instance, it only briefly referenced the construction of an entire power plant, failing to specify information such as the timing and extent of noise, how much additional traffic would accompany the construction, and what species and habitats would be impacted. It also failed to address work by Mountain Valley Electric Cooperative to realign and upgrade a powerline from East Brownsville to the Boca Chica Beach area, intended to serve SpaceX.[245] Powerlines increase the likelihood of bird strikes, and there will be added noise and lighting spurred by construction of the line. Moreover, it is our understanding that the Project will require the installation of a pipeline though LRGV NWR, but this is not addressed in the DPEA. Thus, the DPEA failed to adequately consider environmental impacts and cannot be relied upon to support a FONSI.

B. The DPEA Fails to Adequately Analyze Alternatives

Finally, the FAA failed to consider an adequate range of alternatives, instead limiting its analysis to an evaluation of the Project and of a "no action" alternative. CEQ regulations require that

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[241] *Id.* at 66.
[242] Email from Chris Perez (Jan. 4, 2021) (Attachment EE).
[243] Email from Mariana Devlin (Dec. 29, 2020 09:38 CST) (Attachment EE).
[244] EA at 112.
[245] https://www.fws.gov/nwrs/threecolumn.aspx?id=6442470706

environmental assessments include alternatives to a proposed action.[246] SpaceX entirely dictated the terms of the alternatives analysis, or in this case, lack thereof. Specifically, it noted that in order to meet the purpose and need for the federal action, it must be able to use existing infrastructure at its own facilities.[247] It then dismissed consideration of its existing launch facilities other than at Boca Chica for reasons that generally boil down to convenience, such as scheduling flexibility, ready access to propellants, and proximity to Starship/Super Heavy manufacturing and production facilities.[248]

"[T]he evaluation of 'alternatives' mandated by NEPA is to be an evaluation of alternative means to accomplish the *general* goal of an action; it is not an evaluation of the alternative means by which a particular applicant can reach his goals."[249] As the Seventh Circuit has asserted:

> We have held that blindly adopting the applicant's goals is "a losing proposition" because it does not allow for the full consideration of alternatives required by NEPA. NEPA requires an agency to "exercise a degree of skepticism in dealing with self-serving statements from a prime beneficiary of the project" and to look at the general goal of the project rather than only those alternatives by which a particular applicant can reach its own specific goals.[250]

The FAA cannot and should not winnow down the scope of its alternatives analysis simply to accommodate what is most convenient for SpaceX. This is especially important because when SpaceX began operations at the Boca Chica site, it conveyed to regulators that it would only engage in launch activities, rather than more dangerous testing activities. As previously discussed, the Boca Chica launch site is in an extraordinarily ecologically sensitive area, and even Service personnel have suggested that "now that the area is a test site rather than a strategic launch location, their project should be moved to a far less environmentally sensitive area."[251] The FAA should consider an alternative site location, regardless of what SpaceX demands.

Moreover, even if Boca Chica were the only viable site for the Project, that would not explain why the FAA only considered two alternatives, instead of considering various project configurations at the Boca Chica site that would decrease the significance of SpaceX's environmental impacts. For instance, the FAA could have analyzed options that contemplated fewer launches per year, utilized less imposing construction, or caused fewer disturbances. Instead, the FAA chose to evaluate only two options, calling into question the legitimacy of the DPEA's analysis.

Because the DPEA failed to adequately analyze the Project's environmental impacts and an appropriate range of alternatives, the DPEA does not meet the requirement that it provide sufficient evidence and analysis for a FONSI. Thus, if the FAA chooses not to prepare an EIS despite the significance of the Project's environmental impacts, the agency must at a minimum revise the DPEA to adequately address the Proposed Project's environmental impacts and evaluate an appropriate range of alternatives.

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[246] 40 C.F.R. § 1501.5(c)(2).
[247] DPEA at 34.
[248] *Id.* at 35.
[249] *Van Abbema v. Fornell*, 807 F.2d 633, 638 (7th Cir. 1986).
[250] *Environmental Law & Policy Center v. U.S. Nuclear Regulatory Commission*, 470 F.3d 676, 683 (7th Cir. 2006)
[251] Email from Bryan Winton (Aug. 19, 2019 22:51 CST) (Attachment X – Fire Impacts)

IV. Conclusion

The FAA must prepare an EIS to evaluate the environmental impacts of SpaceX's Proposed Project. The action will have significant impacts because it will have adverse effects on the surrounding area, on listed species, on critical habitat, and on other wildlife in the area. Even if the FAA decides that an EIS is not warranted, which would be an arbitrary and capricious decision, the FAA at a minimum must revise the DPEA because it fails to provide sufficient evidence and analysis for a FONSI. Thank you for your time, and we sincerely appreciate this opportunity to submit comments on the Proposed Project.

Sincerely,

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AA. FAA-2024-2006-10521-A1

Comment Response

Biological Resource Impacts

The Final Tiered EA explicitly acknowledges that the increased launch cadence may result in increased harassment of ESA-listed species, including piping plovers, red knots, and additional listed bird species not previously analyzed in the 2022 Programmatic Environmental Assessment (PEA). FAA reinitiated consultation with USFWS under Section 7 of the Endangered Species Act (ESA) to ensure that the most current data and potential mitigation measures are incorporated into the analysis. The ESA consultation documents (Final Biological Assessment and Final Biological Opinion) are included in the Final Tiered EA and posted to the project website. At the time the Draft EA was issued to the public these documents were not available because consultation was ongoing. Though the Draft EA explicitly stated in the Biological Resources section the consultation is ongoing and the draft BA is not provided, the Draft EA mistakenly stated in one location (page 5) that the BA was attached in Appendix A.

The Final Tiered EA addresses the potential for direct harm and harassment, including potential mortality and behavioral disturbance (harassment) of species. The FAA acknowledges that increased launch cadence may result in more frequent disturbances and addressed this through Section 7 consultation with USFWS to refine mitigation measures. Frequent disturbances do not necessarily indicate significant effects under NEPA. All effects remain short-lived and intermittent, and according to data collected to date, there is no evidence of permanent harm to any species; therefore, the effects are not considered significant.

The Final Tiered EA recognizes that the expansion of the rocket plume footprint due to increased thrust may alter the extent of heat exposure compared to what was previously analyzed in the 2022 PEA. However, based on gathered temperature data during previous launch events at the Boca Chica Launch Site, the extent of the heat plume is much less than what was estimated in the 2022 PEA and the analysis, even with greater thrust in future launches, is a conservative estimate. The potential for direct mortality from the rocket plume has been evaluated during previous launch events at the Boca Chica Launch Site, and no evidence was found that species present in the area are within the direct impact zone at the time of launch. The heat and force from the rocket plume are concentrated in a confined area near the launch site, where species are unlikely to be present because they would flush. No injured or dead birds have been found in any post-launch monitoring. The increased launch cadence means that such disturbances will occur more frequently, and additional mitigation measures are being coordinated with USFWS to minimize impacts. But because all effects remain intermittent, and according to data collected to date, there is no evidence of permanent harm to any species, the effects are not considered significant under NEPA.

To mitigate risks such as egg breakage from sand displacement (commentor refers to gravel plume), the Final Tiered EA incorporates pre- and post-launch monitoring, which is conducted in collaboration with regulatory agencies such as USFWS and TPWD. Key mitigation measures include:

- Pre-launch surveys to identify active nests in sensitive areas.
- Coordination with USFWS and TPWD to implement strategies for nest protection.
- Monitoring and adaptive management to assess impacts and adjust mitigation measures accordingly.

The comment suggests that the absence of observed mortality does not mean that deaths have not occurred due to scavenger activity or delayed access to the site for post-launch monitoring. But the absence of observed mortality is not evidence of a significant effect, and monitoring data collected to date does support a finding that birds flush before launch events and have not suffered any mortality or injuries from launch events. In fact, the monitoring methods used account for this limitation the possibility of scavenger activity or delayed access by conducting pre- and post-launch species surveys to assess population changes, coordinating with USFWS to refine survey timing to improve detection of potential wildlife impacts, and evaluating indirect evidence of species presence and disturbance indicators, such as tracks, nesting activity, and habitat conditions. The FAA does not ignore the potential for cumulative harassment due to the increased launch cadence. Rather, the Final Tiered EA considers these effects, including: the potential for repeated displacement of species from designated critical habitat areas, the potential effects of cumulative stress on species and their ability to use essential habitat resources. As the Final Tiered EA explains, none of these effects are considered significant.

The heat plume's primary impact zone is localized to the immediate launch pad area, where vegetation and nesting habitat are already minimal due to previous disturbances. The FAA does not treat wildlife dispersal from those disturbances as a mitigation measure but rather as an expected behavioral response that informs impact analysis and risk assessments.

The FAA has followed proper NEPA procedures by assessing the effects of increased launch cadence and determining that mitigation measures can reduce potential adverse effects, conducting Section 7 consultation to ensure compliance with ESA requirements and implementing species-specific mitigation strategies, and evaluating cumulative effects in Section 3.3 of the EA, including construction and testing noise, within the broader environmental review.

Refer to the FAA's Biological Assessment (BA) and the USFWS's BO for more information about potential effects to ESA-listed species and critical habitat.

The Final Tiered EA considers the reasonably foreseeable impacts of the Proposed Action, including potential effects on wildlife. The Final Tiered EA explicitly cites the Migratory Bird Treaty Act (MBTA) in the list of minimization and mitigation measures in Final Tiered EA section 3.2.8.1. The FAA's role under NEPA is to assess and disclose environmental effects, while enforcement of the MBTA falls under the jurisdiction of the U.S. Fish and Wildlife Service (FWS). SpaceX remains responsible for ensuring its activities comply with the MBTA. The MBTA is a strict liability statute that prohibits the take of migratory birds, including harm, disturbance, or destruction of nests and eggs, without explicit authorization. Unlike the Endangered Species Act (ESA), the MBTA does not provide an incidental take permit mechanism, meaning there is no formal authorization process for unintentional take. However, the U.S. Fish and Wildlife Service (USFWS) has issued guidance under Director's Order No. 225, Section 5, outlining the USFWS's policy regarding enforcement and implementation of measures to reduce the risk of enforcement actions. The FAA has assessed the potential impacts to migratory birds along with the minimization and mitigation measures in the Environmental Assessment (EA) and BA that avoid and minimize these impacts, and has determined that the measures align with USFWS's guidance and policy on MBTA compliance. The assertion that the FAA has not previously analyzed potential debris impacts to bird nests is not accurate. The 2022 PEA acknowledged the potential for debris to affect wildlife in the event of an anomaly but determined that the likelihood of direct wildlife strikes was very low. Further, the FAA has outlined in the Final Tiered EA that additional mitigation measures are under consideration, including monitoring and experimental protective techniques for nesting birds.

The FAA and SpaceX are implementing measures to prevent and mitigate potential impacts of migratory birds. The commitment to working with USFWS to investigate protective field techniques and nest shielding strategies is part of ensuring compliance with federal protections for migratory birds and ensuring no significant effects. Monitoring and reporting data on nest impacts will inform adaptive mitigation efforts.

The FAA remains committed to collaborating with USFWS, to ensure these measures are effective.

FAA reinitiated ESA Section 7 consultation with the National Marine Fisheries Service (NMFS) to ensure that potential impacts to federally listed species under NMFS jurisdiction, including those from overpressure events, are properly assessed. The reinitiation with NMFS included adding broader areas in the Pacific and Indian Ocean compared to the 2022 PEA.NMFS issued a Final Biological Conference Opinion included in Appendix A of the Final Tiered EA. The Final Tiered EA describes the consultation history, including referenced documents, which contain details on species and habitats under NMFS jurisdiction. In addition, the consultation documents are included in the Final Tiered EA and posted to the project website. The Final Tiered EA acknowledges that NMFS has determined that overpressure events are likely to adversely affect protected species in the Gulf of Mexico and Atlantic. The FAA's determination that the risk of fallen objects or hazardous materials affecting listed species is discountable is based on the large dispersal area and low probability of marine species being in the impact zone at the time of an event, rapid dilution and breakdown of residual propellant in the marine environment, reducing exposure risks. SpaceX's debris monitoring and recovery protocols, which minimize the likelihood of long-term impacts to the marine environment, further reduce potential effects. Additionally, no materials currently found in the Starship debris are classified as hazardous or require special disposal per United States hazardous waste regulations. The FAA remains committed to collaborating with NMFS to ensure these measures are effective.

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 made revisions to the Final Tiered EA to address these issues. To mitigate potential effects on marine ecosystems and cultural resources, the FAA has revised the Final Tiered EA to remove the U.S. Exclusive Economic Zone (EEZ) from the Pacific action area from the EEZ (EEZ) and establish a buffer zone of 50 miles around the Papahānaumokuākea Marine National Monument. These changes significantly reduce potential environmental impacts by: Protecting Sensitive Ecosystems: The removal of the EEZ from the Pacific action area from the 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 shifting the action area, the likelihood of debris dispersion affecting the Hawaiian Islands and surrounding waters is significantly decreased and expected to be negligible. These revisions and consultations with relevant agencies and stakeholders ensure that environmental and cultural considerations are appropriately addressed.

Application of ESA

The Final Tiered EA fully acknowledges the importance of analyzing potential impacts on ESA-listed species and their designated critical habitat. The FAA has conducted and continues to conduct formal ESA consultations in compliance with Section 7 of the ESA to evaluate potential impacts and ensure that the Proposed Action does not result in jeopardy or destruction of critical habitat.

The BAs referenced in the Final Tiered EA is part of the formal consultation process and is included in the administrative record and will be included with the Final Tiered EA once formal consultation is complete. The ESA Section 7 consultation process is separate from the NEPA significance determination, and while "jeopardy" under the ESA is a different threshold than "significant impact" under NEPA, the Final Tiered EA evaluates impacts in both regulatory contexts. See explanation below in Noise on FAA's significance determination under NEPA in the context of ESA Section 7. The Final Tiered EA builds upon prior ESA analyses and integrates new impact assessments where applicable. The FAA has committed to incorporating the results of the additional formal consultations into the Final EA, including the Biological Conference Opinions (BCOs), which documents the finalized impact determinations. This approach ensures that all relevant data and agency determinations are incorporated into the final environmental review.

Noise

The Final Tiered EA acknowledges the proposed launch cadence increase will result in more frequent exposure to noise. To address that increase, the FAA conducted updated noise modeling to assess the impacts of the Proposed Action, including the anticipated increases in thrust and geographic extent of noise. Data collected from previous launches indicated that the noise modeling conducted for the 2022 PEA was within the predicted results. The EA's modeling uses updated parameters to reflect the capabilities of the newer rocket versions and ensures that the analysis is consistent with current conditions and activities. The modeling appropriately differentiates between land and water surfaces, accounting for differences in acoustic impedance. The selected ground impedance values were based on established environmental noise modeling practices and reflect a combination of coastal wetlands, estuarine environments, and open water conditions. While variability exists in how sound interacts with mixed-terrain landscapes, the EA's approach aligns with past FAA, NASA, and U.S. Air Force environmental reviews for rocket noise assessments. The Final Tiered EA includes detailed descriptions of the modeling methodology, including references to the noise propagation model (RNOISE), data sources, and assumptions regarding atmospheric conditions. FAA-approved models, such as RNOISE, incorporate standardized input parameters that have been refined through decades of validation with real-world data. These models are routinely used in environmental impact assessments for spaceports and launch facilities.

The FAA recognizes that an increase in annual launches will increase noise exposure events. However, the Final Tiered EA accounts for all noise sources, including launch events (primary high-intensity noise source), engine testing and static fires (evaluated for localized and temporary noise exposure), and construction activities (assessed separately in the cumulative impacts analysis). While noise events will occur more frequently, the FAA's assessment relies on established acoustic modeling. This analysis supports the conclusion that noise remains an intermittent, rather than continuous, disturbance, particularly because launch noise is of short duration and does not create persistent ambient noise

increases. Testing and construction generate lower noise levels than launch events and have been considered in the cumulative effects assessment.

The Final Tiered EA does not dismiss or ignore noise-related harassment; rather, it evaluates the expected behavioral responses of species based on best available science and ESA Section 7 consultation with USFWS. The claim that an Environmental Impact Statement (EIS) is required due to noise-related harassment is not supported by NEPA regulations. Per FAA's 1050.1F Desk Reference, which outlines the requirements under the FAA's NEPA implementing procedures, a significant impact (under NEPA) to species and critical habitat protected under ESA would occur when: The U.S. Fish and Wildlife Service or the National Marine Fisheries Service determines that the action would be likely to jeopardize the continued existence of a Federally listed threatened or endangered species, or would result in the destruction or adverse modification of federally-designated critical habitat. The USFWS (or NMFS) did not reach this conclusion for the Proposed Action. The FAA has followed proper NEPA procedures in Section 3.2.8 in the Final Tiered EA by assessing the effects of increased noise frequency and determining that mitigation measures can reduce potential adverse effects below the level of significance, conducting Section 7 consultation to ensure compliance with ESA requirements and implementing species-specific mitigation strategies, and evaluating cumulative effects, including construction and testing noise, within the broader environmental review.

Anomalies

SpaceX has successfully landed and recovered its Super Heavy booster. SpaceX has had no landing anomalies during the booster landings at the VLA. These advancements demonstrate SpaceX's commitment to (and success in) improving the safety and reliability of its launch and landing operations. The successful landings and recoveries indicate a reduced risk of anomalies during these critical phases, addressing concerns about potential hazards associated with increased launch and landing activities at the Boca Chica launch site. As SpaceX continues to refine its technology and procedures, the FAA expects the risk of anomalies will continue to decrease. The recent successes in controlled landings and booster recoveries are promising indicators of progress toward these goals.

The purpose of the action includes iterative testing and operational launches to support NASA, DoD, and commercial missions. While the initial phase of the program involves testing to improve reliability, the launch cadence is expected to increase over time as vehicle performance and safety improve rather than decrease. The Final Tiered EA evaluates the potential environmental impacts of up to 25 annual launches, recognizing that early test flights may carry a higher risk of anomalies. As reliability improves, the probability of anomalies decreases, reducing the associated environmental and safety risks over time. the long-term goal is sustained operational capability rather than a reduction in launch frequency. However, improved vehicle reliability and operational efficiency will result in fewer anomalies and reduced environmental risks per launch over time. The increase in reliability is expected to offset the potential risks associated with a higher launch cadence, aligning with NASA's and DoD's needs for a high-frequency, reliable launch system.

The Final Tiered EA and USFWS BA evaluate both the likelihood and potential consequences of anomalies, including debris dispersal, fire, and recovery operations. The Final Tiered EA acknowledges that anomalies may still occur but also considers that as the launch program progresses, the probability of anomalies decreases due to design improvements and operational experience. The FAA has reviewed the environmental effects of the April 20, 2023 anomaly, including debris dispersal, habitat impacts, and fire

occurrence, and incorporated lessons learned into updated mitigation measures. The implementation of a deluge water system and launch pad reinforcements are expected to reduce the likelihood and severity of pad-related anomalies. The FAA recognizes that debris from anomalies may enter sensitive habitats, and recovery efforts must be conducted carefully to minimize additional disturbance. SpaceX has implemented enhanced debris containment and recovery protocols in coordination with USFWS and other agencies. Post-launch environmental monitoring is conducted to assess potential habitat damage and recovery needs.

Mitigation Measures

SpaceX must continue to monitor impulsive noise effects to ensure that future mitigation measures are effective and effects are not significant.

The FAA does not anticipate significant injury or mortality to piping plovers or red knots from sonic booms. The commitment to fund necropsies is intended to verify that hearing damage is not occurring. If impacts are observed, the FAA, in coordination with USFWS, would consider additional mitigation or operational adjustments. The FAA's adaptive management approach ensures that mitigation measures are continuously evaluated and refined based on real-world data. The Final Tiered EA includes additional details on how monitoring results will inform decision-making. The USFWS Biological Conference Opinion (BCO) addresses ESA-listed species impacts and ensure compliance with the ESA. The FAA and USFWS will continue collaboration to refine mitigation strategies as new information becomes available.

Air Quality

The EA's conclusion that air quality impacts are not significant is based on regulatory significance thresholds rather than a direct numerical comparison of emissions alone. Table 3 presents updated emissions estimates that account for the proposed increased launch cadence and operational adjustments. While some emission categories have increased, such as those related to launches and landings, the overall impact remains within acceptable regulatory thresholds as determined by the Clean Air Act (CAA) and relevant state and federal air quality standards.

The relocation of static fire tests to Massey's site means that these emissions are no longer part of the Proposed Action, but they are still accounted for in cumulative impact assessments. The E Final Tiered A evaluates cumulative impacts from all sources in the region, including operations at both Boca Chica and Massey's, to provide a comprehensive analysis of air quality impacts. The FAA and SpaceX comply with Texas Commission on Environmental Quality (TCEQ) permitting and National Ambient Air Quality Standards (NAAQS) to ensure that emissions remain below regulatory thresholds and do not contribute to violations of air quality standards. The determination that air quality impacts remain "not significant" follows NEPA and EPA criteria, which consider significance based on whether emissions would: exceed NAAQS or state air quality standards, trigger additional regulatory permitting requirements, or cause measurable health or environmental harm at a level exceeding established regulatory thresholds. While emissions are expected to increase, the Final Tiered EA analysis shows that air quality impacts remain within allowable regulatory limits and do not reach the threshold for significance under NEPA.

SpaceX operations remain in compliance with the Clean Air Act, and all emissions are accounted for in TCEQ air quality permitting processes. The FAA and SpaceX will continue to monitor air quality impacts and adjust operations if necessary to maintain compliance with regulatory standards.

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January 17, 2025

To: Ms. Amy Hanson, FAA Environmental Specialist
Office of Commercial Space Transportation
Federal Aviation Administration
800 Independence Ave SW
Washington D.C. 20591

RE: Additional Comments to the Revised Draft Tiered Environmental Assessment for SpaceX Starship/Super Heavy Vehicle Increased Cadence at the SpaceX Boca Chica Launch Site in Cameron County, Texas.

[Docket Number FAA-2024-2006]

The Air Line Pilots Association, International (ALPA), representing more than 79,000 pilots at 42 United States (U.S.) and Canadian airlines, is submitting additional comments to the *"Revised Draft Tiered Environmental Assessment for SpaceX Starship/Super Heavy Vehicle Increased Cadence at the SpaceX Boca Chica Launch Site"* in Cameron County, TX due to the January 16, 2025 catastrophic breakup of the Starship/Super Heavy vehicle in oceanic airspace. The launch activities are licensed by the Federal Aviation Administration (FAA).

The January 16, 2025, SpaceX Starship rocket launch from the Starbase Boca Chica, TX facility, and ensuing breakup raises additional concerns about whether the FAA is providing adequate separation of space operations from airline flights. While there is a lot of additional data that needs to be collected and evaluated, the ability of the FAA Air Traffic Control to respond in a timely fashion to an unanticipated rocket anomaly needs to be further evaluated.

In addition to the concerns and recommendations that ALPA provided in the initial comment document submitted on January 16, 2025 (also included at the end of this submission as an appendix), ALPA strongly urges the FAA to provide flight crews the locations of rocket launch Aircraft Hazard Areas (AHA's) and Debris Response Areas (DRAs) prior to the launch. Neither of these products is available to flight crews prior to launch, and DRA's are not disclosed to the flight crews until after the rocket suffers a catastrophic event. By that time, it's much too late for crews who are flying in the vicinity of the rocket operation, to be able to make a decision for the safe outcome of the flight. Advance notice of AHA and DRA would allow flight crews to exercise their Pilot In Command Authority (PIC) to make an informed and timely decision about their need to potentially reject flight plans that route their aircraft underneath space vehicle trajectories or DRAs.

ALPA notes the discussion in Section 2.4 of the revised DRAFT EA:

- "The FAA Air Traffic Organization (ATO) Space Operations Office completed a generic National Aerospace System (NAS) impact analysis in accordance with the FAA "Notice of Updated Factors for Optimizing Use of the National Aerospace System," dated April 13, 2023."

The FAA now has real-world data to complete a thorough analysis utilizing data from the January 16 event, instead of relying on a theoretical assessment, to formulate proper procedures to allow space operators airspace access without jeopardizing lives onboard airline aircraft. As space operations increase the FAA's Acceptable Level of Risk (ALR) may now be inadequate to ensure the safety of the flying public. Therefore, a review of the ALR risk mitigation strategy is warranted. ALPA further recommends the FAA suspend SpaceX flight testing of their Starship launch vehicle until the root cause of the January 16 event is fully investigated and corrected to the satisfaction of the FAA.

As stated in the initial comments, ALPA has specific concerns for the increased safety risk that the conceptual development of the starship/super heavy vehicle may pose to the flying public as SpaceX continues to develop the capability to perform a return-to-launch site landing of Super Heavy and Starship. As stated in the EA document on page 11 Section 2.3, Landings:

- "Some vehicles may not be reused and are instead expended in the ocean in the following three conditions depending on the stage of development of the program".

    1. Hard water landing at terminal velocity and break up on impact resulting in an explosive event at the surface of the water
    2. Soft water landing and tip over and sink or explode on impact at the surface of the water
    3. Or, In-flight breakup – Breakup during reentry resulting in debris falling into the ocean (up to 25 times per year of each vehicle stage)

ALPA's specific concerns are:

1. Currently, the FAA does not have adequate tools necessary to provide "real-time" tracking and alerting to the airborne flight crews when falling debris may be a flight hazard. Although the FAA has "near real-time" capabilities to manage nominal (normal) reentry operations of Super Heavy and Starship reusable portions, "near real-time" capabilities may not be sufficient for air traffic control to clear aircraft away from falling vehicles / falling debris during an off-nominal (unplanned or uncontrolled) trajectory at terminal velocity speeds. ALPA urges the FAA to develop the automation tools required

to provide real-time surveillance of space operations to immediately alert the flight crew of falling debris, especially when an off-nominal event occurs.

2. Soft water landings are not clearly defined in the revised draft EA. ALPA recommends that the FAA clarify what a soft landing is comprised of, and the anticipated speeds of the vehicle from 60,000 feet to impact on the ocean surface.

Since 2018, FAA space EAs have not adequately evaluated NAS impacts. Airspace impacts during previous EAs have been unduly vague and have ignored fundamental airspace safety and operational issues essential to a safe and efficient NAS.

Instead of merely conducting an EA and carrying out the minimal amount of necessary review and process as established by law and policy, the FAA should be conducting a comprehensive environmental assessment that ensures the success of the rocket operation while maintaining the safety of the traveling public. The FAA should consider revising current airspace evaluation requirements for EAs to include:

- Environmental and safety impacts to traditional NAS stakeholders from the earth's surface up to 60,000 feet.
- Additional information needed to more thoroughly review and comment on the intended operation, including the flight profiles, and the speeds at the altitudes where a commercial space vehicle will encounter commercial aviation traffic.
- The amount of time involved in the operation from take-off, reentry, and landing.
- The performance envelope of the space vehicle when operating in airspace shared with commercial aircraft.
- Airspace impacts on surrounding/adjacent airports, based on vehicle trajectories.
- Operational impacts for airspace closures such as longer flight routes, additional fuel burn/carbon emissions, longer flight duration, and delays to access airports.

As with any new entrant or technology introduced into the NAS, the safety of existing aircraft operations must maintain the highest levels of safety and the operational impacts must be known and documented. ALPA supports the safe operation of commercial space activities in the NAS when and where possible and welcomes the opportunity to work with the FAA and stakeholders to ensure that the operations are compatible with existing aircraft operations without major disruptions or decreased levels of safety.

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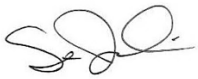
ALPA appreciates the opportunity to provide comments during the EA scoping process. If you would like to discuss ALPA concerns, please do not hesitate to contact Engineering and Air Safety at eas@alpa.org or (800 424-2470).



Capt. Steve Jangelis
Aviation Safety Chair
Air Line Pilots Association, Int

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January 16, 2025

To: Ms. Amy Hanson, FAA Environmental Specialist
Office of Commercial Space Transportation
Federal Aviation Administration
800 Independence Ave SW
Washington D.C. 20591

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

[Docket Number FAA-2024-2006]

The Air Line Pilots Association, International (ALPA), representing more than 79,000 pilots at 42 United States (U.S.) and Canadian airlines, appreciates the opportunity to provide comments during the public comment period to the *"Revised Draft Tiered Environmental Assessment for SpaceX Starship/Super Heavy Vehicle Increased Cadence at the SpaceX Boca Chica Launch Site"* in Cameron County, TX.

ALPA supports a National Airspace System (NAS) that is safe and efficient for all stakeholders. However, gaps in previous commercial space Environmental Assessments (EAs) require careful review and revision to the EA process. ALPA has identified several issues that need to be addressed by the FAA during the Scoping and EA process.

ALPA has specific concerns for the increased safety risk the conceptual development of the starship/super heavy vehicle may have to the flying public as SpaceX continues to develop the capability to perform a return to launch site landing of Super Heavy and Starship. As stated in the EA document on page 11 Section 2.3, Landings:

- "Some vehicles may not be reused and are instead expended in the ocean in the following three conditions depending on the stage of development of the program".

1. Hard water landing at terminal velocity and break up on impact resulting in an explosive event at the surface of the water
2. Soft water landing and tip over and sink or explode on impact at the surface of the water
3. Or, In-flight breakup – Breakup during reentry resulting in debris falling into the ocean (up to 25 times per year of each vehicle stage)

ALPA's specific concerns are:

3. Currently, the FAA does not have adequate tools necessary to provide "real time" tracking and alerting flight crews when falling debris may be a flight hazard. Although the FAA has "near real time" capabilities to manage nominal (normal) reentry operations of Super Heavy and Starship reusable portions, "near real-time" capabilities may not be sufficient for air traffic control to clear aircraft away from falling vehicles / falling debris during an off-nominal (unplanned or uncontrolled) trajectory at terminal velocity speeds.
4. Soft water landings are not clearly defined in the revised draft EA. ALPA recommends that the FAA clarify what a soft landing is comprised of, and the anticipated speeds of the vehicle from 60,000 feet to impact on the ocean surface.
5. As stated in 1 above, the FAA does not have adequate tools necessary to provide "real time" tracking and alerting flight crews when falling debris may be a flight hazard. ALPA urges the FAA to develop the automation tools required to provide real-time surveillance of space operations to immediately alert flight crew of falling debris, especially when an off-nominal event occurs.

Since 2018, EAs have not adequately evaluated NAS impacts. Airspace impacts during previous EAs have been unduly vague, have ignored fundamental airspace safety and operational issues essential to a safe and efficient NAS.

Instead of merely conducting an EA and carrying out the minimal amount of necessary review and process as established by law and policy, the FAA should be conducting a comprehensive environmental assessment. The FAA should consider revising current airspace evaluation requirements for EAs to include:

- Environmental and safety impacts to traditional NAS stakeholders from the earth's surface up to 60,000 feet.
- Additional information needed to more thoroughly review and comment on the intended operation, including the flight profiles, the speeds at the altitudes where a commercial space vehicle will encounter commercial aviation traffic.
- The amount of time involved in the operation from take-off, reentry, and landing.
- The performance envelope of the space vehicle when operating in airspace shared with commercial aircraft.
- Airspace impacts on surrounding/adjacent airports, based on vehicle trajectories.
- Operational impacts for airspace closures such as longer flight routes, additional fuel burn/carbon emissions, longer flight duration, and delays to access airports.

As with any new entrant or technology introduced into the NAS, the safety of existing aircraft operations must maintain the highest levels of safety, and the operational impacts must be known and documented. ALPA supports the safe operation of commercial space activities in the NAS when and where possible and welcomes the opportunity to work with the FAA and stakeholders to ensure that the operations are compatible with existing aircraft operations without major disruptions or decreased levels of safety.

ALPA appreciates the opportunity to provide comments during the EA scoping process. If you would like to discuss ALPA concerns, please do not hesitate to contact Engineering and Air Safety at eas@alpa.org or (800 424-2470).

Capt. Steve Jangelis
Aviation Safety Chair
Air Line Pilots Association, Int

BB. FAA-2024-2006-10632-A1

Comment Response

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. Air Line Pilots Association, International (ALPA)'s recommendation to enhance real-time tracking and alerting tools for falling debris is noted. While the FAA currently uses near real-time capabilities, further technological advancements and operational measures may be explored to improve situational awareness and communication during off-nominal events.

As required by 14 CFR Part 450, SpaceX must develop comprehensive Flight Safety Analysis and Hazard Analysis to evaluate potential impacts on the NAS, including debris risks and contingency plans. These analyses are reviewed by the FAA during the licensing process to ensure that public and airspace safety is maintained. Although NEPA was designed to alert governmental actors to the effect of their proposed actions on the physical environment, not to assess general safety and hazard issues, the Final Tiered EA incorporates these analyses and evaluates cumulative airspace impacts from increased operations. The FAA continuously evaluates these plans and processes to ensure alignment with regulatory requirements and safety goals. ALPA's recommendation to further improve tracking and communication capabilities will be considered as part of the FAA's ongoing efforts to enhance NAS safety.

The Final Tiered EA discusses potential impacts on airspace and aviation safety, including coordination with the appropriate authorities to ensure that flight safety measures align with established protocols. The FAA collaborates with the FAA's Air Traffic Organization, the U.S. Department of Defense, and other agencies to issue Notices to Air Missions (NOTAMs) and coordinate temporary airspace closures related to space launch operations. ATO assesses the potential impacts of space operations on NAS efficiency and works closely with industry stakeholders, including commercial aviation representatives, to develop risk mitigation strategies.

Regarding the dissemination of Aircraft Hazard Areas (AHA's) and Debris Response Areas (DRAs) the FAA will continue to evaluate communication procedures to enhance safety for flight crews. While DRAs are determined based on real-time telemetry and event-specific data following a launch anomaly, the FAA recognizes the importance of timely and transparent information sharing for aviation safety. The agency will review existing processes and determine whether additional measures can be taken to improve situational awareness for flight crews prior to launch.

The FAA acknowledges ALPA's concerns regarding the Acceptable Level of Risk (ALR) and the need for a comprehensive review of airspace safety following the January 16, 2025 event. Under 14 CFR Part 450, the FAA evaluates and enforces safety requirements for commercial space launch operations, including risk assessments and mitigation strategies to ensure public safety and airspace integration. That evaluation has not identified any significant environmental effects from the January 16 event.

With regard to ALPA's recommendation to suspend SpaceX Starship flight testing, the FAA follows a structured investigative and regulatory process when evaluating commercial spaceflight incidents. The agency is currently reviewing the January 16 event and will determine any necessary corrective actions before granting further launch authorizations. The FAA remains committed to ensuring that commercial space operations meet stringent safety standards while maintaining the integrity of the NAS.

January 16, 2025

Submitted via Regulation.gov

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

Re: Comments on the FAA's Revised Draft Tiered Environmental Assessment for the Proposed Increased Launch Cadence for the SpaceX Starship/Superheavy Vehicle Launch Program at Boca Chica, Texas

Thank you for the opportunity to comment on the Draft Tiered Environmental Assessment (DTEA) for the proposal to increase the cadence of the SpaceX Starship/Super Heavy Launch Vehicle Program at Boca Chica, TX. These comments are submitted on behalf of the Center for Biological Diversity, Surfrider Foundation, American Bird Conservancy, Save RGV, and the Carrizo/Comecrudo Nation of Texas ("Commenters").

Commenters remain concerned about the significant environmental and community impacts of SpaceX's activities at the Boca Chica site, particularly given the sensitive ecosystems and imperiled species that have been, and continue to be, adversely affected. The impacts of the Launch Program will be greatly exacerbated by the increase to 25 launches per year. The Federal Aviation Administration (FAA) has a duty to ensure that SpaceX's activities do not come at the expense and undue sacrifice of the people and wildlife that rely on the Boca Chica area; yet, the FAA has once again failed to take the requisite hard look at the environmental and social impacts of SpaceX's proposed activities, and has failed to require SpaceX to implement reasonable measures to mitigate those impacts.

As set forth below, the FAA's failure to ensure that the SpaceX-authored EA objectively analyzes the full range of impacts associated with the proposed increase in launch cadence renders the DTEA inadequate, arbitrary and capricious. Moreover, due to the clearly significant environmental impacts associated with the proposed increased cadence, an EIS is required.

A. The FAA Must Prepare an EIS

The National Environmental Policy Act (NEPA) requires agencies to prepare an environmental impact statement (EIS) for all "major Federal actions significantly affecting the quality of the human environment."[1] To determine whether a proposed action significantly affects the

[1] 42 U.S.C. § 4332(2)(C).

environment and thus requires an EIS, the lead federal agency may first prepare an environmental assessment (EA).[2] An environmental assessment must provide sufficient evidence and analysis to determine whether to prepare an EIS.[3] The lead agency must take a "hard look" at the relevant environmental concerns and alternatives to the proposed action.[4] If an environmental assessment concludes that there are no potentially significant impacts to the environment, the federal agency must provide a detailed statement of reasons why the project's impacts are insignificant and issue a finding of no significant impact (FONSI).[5] However, if an agency action may have significant impacts on the environment, then an EIS must be prepared.[6]

Here, there can be no doubt that an EIS was required before the FAA could approve the Starship/Superheavy Lauch Program itself, and that an EIS is required for the proposal to increase the launch cadence to 25 launches per year, which is essentially a new launch program with considerably more impacts than what the FAA analyzed in the 2020 Programmatic Environmental Assessment for the Starship/Superheavy Launch Program (2020 "PEA"), let alone the proposed but then cancelled Falcon launch program at Boca Chica, for which an EIS was prepared in 2014.[7]

As set forth in the Commenters' Motion for Partial Summary Judgment filed in ongoing litigation over the need for an EIS for the Starship/Superheavy Launch Program (attached as Ex. A, and incorporated by reference), the administrative record for the 2020 PEA shows that the noise and lighting associated with construction, testing, and rocket launches had already harmed the wildlife that depend on Boca Chica and that these impacts would only intensify with the new launch program, causing additional harm to ecologically critical habitat and protected species.[8]

Likewise, the FAA knew of the long history of explosions (i.e., "anomalies") from testing and launching rockets, which are likely to continue for the new launch program with devastating impacts from debris and brush/forest fires.

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[2] 40 C.F.R. § 1508.9.

[3] *Id*.

[4] *Id*. *See also Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 350 (1989).

[5] 40 C.F.R. § 1508.13.

[6] *Id*. § 1501.4.

[7] *See Sierra Club v. Peterson*, 717 F.2d 1409, 1415 (D.C. Cir. 1983) ("If *any* 'significant' environmental impacts might result from the proposed agency action, then an [EIS] must be prepared *before* the action is taken.").

[8] *See Friends of the Earth, Inc. v. United States Army Corps of Eng'rs*, 109 F. Supp. 2d 30, 43 (D.D.C. 2000) (impacts to an ecologically critical area "impels the preparation of an EIS"); *Sierra Club v. United States Army Corps of Eng'rs*, 803 F.3d 31, 46 (D.C. Cir. 2015) (Allowing an activity that would take (i.e., harm) endangered species, even on the condition that the permittee take mitigating measures, "amount[s] to *significant* federal action" under NEPA).

The FAA also knew that the frequent closures of the Boca Chica area to accommodate SpaceX would continue to hinder the management of wildlife refuge lands, prevent the Carrizo/Comecrudo Tribe from accessing sacred areas to undertake ceremonies, and block regular use of an important beach to community residents.

As set forth in Exhibit A, these significant environmental impacts were emphasized to the FAA by the public and expert agencies, including the U.S. Fish and Wildlife Service (FWS), the Environmental Protection Agency (EPA), and the Texas Parks and Wildlife Department (TPWD). The FAA also knew that the proposed mitigation could not possibly reduce the environmental impacts of the Launch Program such that they would not be "significant," and thus an EIS was certainly required.[9]

Now, the FAA proposes to allow SpaceX to drastically increase the launch cadence, which will exacerbate the impacts of the Launch Program to wildlife and the community. And it is doing so without the benefit of the full analysis that NEPA requires, even though there will certainly be significant environmental impacts from 25 launches per year. Further, the mitigation measures set forth in the 2020 PEA and those alluded to in the DTEA—such as possibly shielding birds' eggs in their nests from the effects of launches, relying on increased traffic to reduce wildlife strikes on roads, and doing *future* studies of various effects—are insufficient. Therefore, the DTEA "fails to sufficiently demonstrate that the mitigation measures adequately address and remediate the adverse impacts so that they will not significantly affect the environment," and "because the feasibility of the mitigation measures is not self-evident, the EA does not provide a rational basis for determining that the [FAA] has adequately complied with NEPA."[10] The failure to once again produce an EIS for SpaceX's proposed activities is a glaring violation of the law.

Furthermore, Commenters take issue with the approach that FAA has allowed SpaceX to take with regards to NEPA review. As discussed in Exhibit A, it is readily apparent that the FAA unlawfully delegated the determination as to what level of NEPA review was required to SpaceX, which unsurprisingly decided to push for the faster, cheaper option of a mitigated FONSI. As discussed, that was clearly arbitrary and capricious given the significant environmental impacts

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[9] It also remains unclear whether SpaceX has implemented all of the proposed mitigation measures. On page 20 of the DTEA, it states that SpaceX "maintains ongoing compliance will all mitigation measures," but then follows that with the statement that it is in compliance with "90% of the mitigation measures." This begs the questions of what mitigation measures have not been complied with or implemented, and what are the impacts of that oversight. Nor has the FAA provided monitoring information to the public or explained why it is not doing so. Should the FAA wrongfully attempt to execute another mitigated Finding of No Significant Impact based on this tiered EA, it must prepare a monitoring and compliance plan that includes a plan for public release of monitoring data or an explanation of why release of some or all of the information is not appropriate, as well as an explanation of the FAA's authority to enforce each mitigation measure. *See* 40 C.F.R. §§ 1501.6(d), 1505.3(3).

[10] *O'Reilly v. U.S. Army Corps of Engineers*, 477 F. 3d 225, 234 (5th Cir. 2007).

of the proposal to launch 5-10 rockets per year from the Boca Chica launch facility. Now, the FAA has compounded the impacts of that egregiously unlawful determination by proposing to allow SpaceX to drastically increase the impacts of its activities without a full analysis in an EIS, by tiering off of the woefully inadequate 2020 PEA.[11]

That is the same bait and switch approach that the FAA allowed to take place for the prior SpaceX launch program at Boca Chica. In 2014, an EIS was produced by the FAA for a Falcon launch program, but SpaceX subsequently altered and increased its use of the facility step-by-step over time, which resulted in a series of Written Reevaluations to determine whether supplemental NEPA review was required. Using that process, SpaceX and the FAA were able to avoid the need to fully analyze all of SpaceX's activities in the 2014 EIS, and to spread them out over several reviews, akin to unlawful segmentation of the NEPA analysis.[12]

That is exactly what the FAA has continued to allow here. There can be no doubt that SpaceX *always* intended to launch more than 5-10 Starship/Superheavy rockets per year from the Boca Chica facility. Indeed, that is clear from the DTEA itself, which states that Starship/Superheavy is designed for a "rapid flight rate (meaning minimal time between launches)," and that "frequent launches and landing *in the early phase of the program* are critical" to developing rapid launch capability.[13] This makes it perfectly clear that SpaceX always intended to launch more than 5-10 rockets per year from the outset, and yet attempted to game the system by only seeking approval for fewer launches—making it easier to argue the impacts would be "infrequent" or "temporary," and otherwise capable of being mitigated such that an EIS was not required—and then pushing for many more launches per year and tiering off the PEA rather than doing what should have been done from the beginning: an EIS that covers all of the activities that SpaceX actually intended, to analyze the full range/extent of the impacts associated with those activities. By allowing SpaceX to manipulate the NEPA process, the FAA has failed to ensure that it fully analyzes the actual impacts of SpaceX's operations and activities in an EIS as the law requires.

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[11] The FAA has styled this as a "tiered" EA; however, while an agency may tier off of a prior programmatic NEPA review for subsequent actions, that is not what occurred here, and the use of a "tiered" EA to review the proposed increase in launch cadence is arbitrary and capricious. A tiered analysis is used when subsequent site- or project-specific actions are taken that were contemplated under a programmatic analysis, such as issuing individual launch licenses. But that is not what is occurring here. Rather, since increasing the cadence is not a subsequent action contemplated by the PEA, this should be a new NEPA analysis – specifically, an EIS – that could, if done correctly, incorporate the PEA by reference.

[12] *See* FAA Order 1050.1F at 2-8 ("A proposed action cannot be segmented by breaking it down into small component parts to attempt to reduce impacts (see 40 CFR § 1508.27(b)(7), CEQ Regulations).").

[13] DTEA at 2.

That needs to stop now. It was clear that even at 5-10 launches per year, the Starship/Superheavy Launch Program would have significant environmental impact and that the proposed mitigation was insufficient to support a mitigated FONSI. Now, with a proposed increase to 25 launches, those impacts will be greatly exacerbated, and no additional mitigation has been proposed that could possibly support the FAA's failure to produce an EIS for what is clearly a major federal action with significant environmental impacts. Indeed, a mitigated FONSI is only warranted where "probability [of harm] is so low as to be remote and speculative, or if the combination of probability and harm is sufficiently minimal."[14] The FAA has failed to show that the impacts of launching 25 of the largest rockets in world would be minimal, remote, or speculative even with the proposed mitigation. Rather, significant unmitigated impacts have *already* occurred and are ongoing, and they will only be intensified by increasing the launch program as SpaceX intends. Thus, there can be no doubt that an EIS is required here, and the FAA's continued failure to produce an EIS is a glaring violation of NEPA.[15]

B. The FAA has not provided sufficient opportunity for public participation

NEPA serves to protect the public interest by ensuring clarity and transparency for federal agency decisions affecting the environment. NEPA requires an agency to inform the public and to allow the public to play a role in the decision-making process though comments on draft NEPA documents. Enlisting the public serves to develop high quality information on the issues that are truly significant to the action in question, so as to guide agencies to "take actions that protect, restore, and enhance the environment."[16] Public participation cannot serve these purposes unless relevant and accessible information is available to the public for comment.

Here, the DTEA is inadequate for public comment because it relies directly on documents that are not included (e.g., a supposed Biological Assessment that the DTEA says is included in

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[14] *New York v. NRC*, 681 F.3d 471, 477-79 (D.C. Cir. 2012); *see also Town of Cave Creek v. FAA*, 325 F.3d 320, 327 (D.C. Cir. 2003) (an EIS is only unnecessary where "'changes or safeguards in the project sufficiently reduce the impact to a minimum'") (quoting *Sierra Club v. DOT*, 753 F.2d at 127).

[15] It is notable that for every other launch program for SpaceX, an EIS has been required/produced. The DTEA even notes, with regards to alternatives, that existing and new launch facilities require an EIS, just as with the prior launch program at Boca Chica, which set a precedent for the need for an EIS for the Starship/Superheavy launch program. *See* Ex. A. And for other SpaceX Launch programs, a new EIS has been produced when the launch program was significantly altered. For example, in December of 2024 the FAA published a notice of intent to produce an EIS for "changes to the Falcon Launch Program" in California, the purpose of which is to "increase the space launch mission capability . . . and to enhance resilience and capacity of the nation's space launch infrastructure . . . ." *See* https://www.govinfo.gov/content/pkg/FR-2024-12-13/pdf/2024-29446.pdf. Again, this sets a precedent for the need for an EIS for the Starship/Superheavy Launch Program as well as for the proposed increase in launch cadence.

[16] 40 C.F.R. §§ 1500.1, 1506.6 (public involvement), 1502.1 (purpose of impact statements).

Appendix A, but which is not actually provided, as discussed further below), and incorporates other documents by reference without complying with applicable regulations. Indeed, the DTEA incorporates by reference 11 documents from the FAA, NASA, NMFS, and FWS, covering hundreds of pages of information and analysis, some of which are not readily accessible to the public.

Not only should this incorporation by reference have compelled a longer review and comment period so that the public has time to fully consider these documents and how the FAA is relying on them, but the FAA has violated the CEQ regulations at 40 C.F.R. § 1501.12, which states that incorporated materials must be reasonably available for review (i.e., by providing hyperlinks or indicating how the public can access the materials, which the DTEA fails to do), and that the agency should describe the contents of those documents and their relevance.[17]

The DTEA, however, provides only the titles of these documents, and fails entirely to describe the contents of these documents or provide any explanation of the relevance of these documents, leaving the public with no information as to how the FAA is relying on them to consider the impacts of the proposed increased launch cadence. This leaves the public without the information necessary to provide meaningful comments on the DTEA, in violation of the purpose of the NEPA comment period.

The DTEA (at 6) also refers to reinitiated consultations with NMFS and FWS over the proposed increased launch cadence, and states that the final tiered EA will include the results of those consultations. But by not including those documents for review with the draft EA—even though the agency is apparently relying on the consultations to meet its NEPA obligations—the FAA has precluded an opportunity for public comment on important aspects of the impacts of the proposal. That is inconsistent with the CEQ regulations, which state that to the fullest extent possible, agencies should prepare NEPA documents "concurrent and integrated with" related studies required by other federal laws, such as the ESA.[18] Thus, the results of the reinitiated consultations should have been provided here for public comment. At the very least, the FAA should have provided the biological assessments or other documents that the FAA authored as part of the consultation process for review and comment.

In sum, the FAA's failure to provide necessary information on the documents it has incorporated by reference, as well as its failure to include vital information from the ESA consultation process, renders the DTEA incomplete and inadequate for public comment, in violation of NEPA and applicable regulations.

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[17] 40 C.F.R. § 1501.12 ("Agencies shall cite the incorporated material in the document, briefly describe its content, and briefly explain the relevance of the incorporated material to the environmental document.").

[18] 40 C.F.R. § 1502.24

C. Impacts to Biological Resources from the Proposed Activities

- **Noise and Lighting**

Noise and lighting associated with SpaceX's activities already have significant environmental impacts, which will be exacerbated by the proposed increase in launch cadence. The DTEA fails to take a "hard look" at the impacts of noise and lighting from 25 launches per year, which must be fully analyzed in an EIS.

As discussed in detail in Exhibit A, the noise and lighting associated with SpaceX's activities certainly has significant impacts on the wildlife that rely on the area, including birds protected under the ESA and the MBTA, as well as critically imperiled sea turtles that lay their eggs on Boca Chica beach. The administrative record for the 2020 PEA already establishes that the expert wildlife agencies (i.e., FWS and TPWD) made the FAA well-aware that noise and lighting have caused—and would continue to cause (even at 5-10 launches per year)—significant harm, and it is clear from the record that this harm was not being adequately mitigated. *See* Ex. A. Thus, an EIS was required when the FAA reviewed the initial proposal for the Starship/Superheavy launch program, and an EIS is now required for the proposal to drastically increase the launch cadence, which will intensify the significant impacts of noise and lighting on wildlife.

The FAA's attempt to downplay and side-step the impacts of noise and lighting in the DTEA is arbitrary and capricious. For example, the FAA's attempt to now argue that lighting does not lead to false crawls of nesting sea turtles is inconsistent with statements made in the 2020 PEA, as well as statements in the record from the expert wildlife agencies, which confirm that lighting does indeed lead to false crawls. The DTEA ignores studies confirming that artificial lighting disrupts sea turtle hatchling orientation from the nest to the sea, including a 2023 study that found artificial lights disturb sea turtle's ability to search for the ocean and decreases their chances of survival.[19] In fact, this assertion is belied by the discussion that follows in the DTEA (at 47), which *confirms* that there has been an increased detection of false crawls, resulting in three times the amount of anticipated take.

The need for increased take authorization for protected sea turtles further confirms that the existing mitigation measures for lighting impacts were not successful. Yet, the FAA states that with the implementation of the Light Monitoring Plan, no significant impacts are anticipated from the increased launch cadence. But that is not supported and is illogical. The same mitigation plan was in place for the prior launches, and yet unanticipated harm did indeed occur. Increasing the cadence will exacerbate the impacts of lighting, especially since the FAA still has not imposed any seasonal restrictions to avoid turtle nesting times. The FAA's determination in the DTEA is therefore entirely inconsistent with reality, and the determination that lighting is not

[19] *See* Ex. B and Ex. C.

causing harm – and will not cause further harm in the future from the increased cadence – is arbitrary and capricious.

In reality, the proposal to increase the launch cadence to 25 launches per year (with louder noise levels that were not properly modeled)[20] will drastically increase the impacts of noise and lighting – not only the overall amount of noise and number of hours that detrimental lighting will be employed, but the frequency of the impacts given that launches would now come more than twice per month – 2.5 times more often than what was previously analyzed. And while the DTEA acknowledges, as it must, that there will be more lighting effects,[21] the FAA then takes the unreasonable position that the impacts would not be any different from what was proposed and analyzed for the 2020 PEA (continuing to suggest that the impacts are infrequent and temporary, which is certainly not the case), and that noise and lighting still would not result in significant impacts, even though no additional mitigation has been proposed to address the impacts.

This is the very definition of an arbitrary and capricious NEPA analysis. There can be no serious argument that the launch program will not have significant impacts from noise and lighting – especially the cumulative effects from increasing the number of launches to 25 per year – yet the FAA determined that the impacts have been sufficiently mitigated when they either cannot be (as in the case of noise) or simply have not been (as with lighting, where the FAA has continued to allow SpaceX to use detrimental metal halide lighting and has provided no serious restrictions on the use of lighting to mitigate the impacts to wildlife). *See* Ex. A.

As discussed in Exhibit A, the argument that noise and lighting impacts are only temporary or intermittent was egregiously wrong when the FAA made it in the PEA given statements from the expert agencies that such impacts were continuous and ongoing. It is even more so now with this proposal, which could logically result in launches every other week and will require even more consistent use of harmful spotlighting and even more disturbance from noise associated with preparing for and undertaking launches.[22]

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[20] The DTEA (at 26) acknowledges that the geographic extent of the modeled noise increased from what was discussed in the PEA because the newer rockets will have increased thrust, but it does not use any real-world measurements from the prior launches to discuss how accurate the modelling was. While it states that data collected from launches showed the modeling was within predicted results, no data is provided to verify that statement, which is inconsistent with independent monitoring results, as discussed below. Furthermore, the modeling is clearly inadequate, and thus the impacts from noise will be much greater than what the FAA and SpaceX have considered. *See infra* at __.

[21] DTEA at 47 ("nighttime activity may result in more lighting effects").

[22] Increasing the launch cadence will require the use of Launch Pad B, and the DTEA states that since the publication of the PEA, the location of Launch Pad B has been changed. DTEA at 8. The DTEA, however, fails to analyze whether the new location of launch pad B would result in even more noise and lighting impacts than what was previously considered. The failure to

There is simply no legitimate argument that the impacts from the noise and lighting associated with 25 launches per year will not be significant. Not only will the impacts be greater and more frequent with cumulative effects on species, but SpaceX now proposes to conduct 3 night-launches per year, without any seasonal restrictions to protect nesting birds and hatching turtles. These night launches require additional lighting that the expert wildlife agencies have stated cause adverse effects on wildlife, and for that reason they argued (when it was only 5-10 launches per year being considered) that such night-time activities should be avoided: yet the FAA has done the opposite here and proposes to *increase* the impacts of Space's activities by allowing even more night-time launches. And the proposed "3 nighttime" launches does not even tell the full story, since the FAA has defined night-launches as anything after 7 pm, thereby suggesting that a launch at 5:30-7:00 pm would be a "daytime" launch, even though for much of the year the sun sets around 5:30 at Boca Chica, and thus increased lighting (akin to what would be needed for a "nighttime" launch) would be necessary for an untold number of "daytime" launches that occur at or after sunset, causing similar increased harm.

In sum, the record for the 2020 PEA shows that the significant environmental impacts of noise and lighting have not been mitigated such that they will be "minimal," and increasing the launch cadence will exacerbate those impacts – including to protected wildlife on ecologically critical habitat. The FAA has violated NEPA by failing to take the requisite "hard look" at the significant impacts of the noise and lighting associated with the proposed activities, which must be set forth in an EIS as NEPA requires.

- **Deluge Water**

The FAA has failed to fully analyze the impacts of the deluge water system on the surrounding habitat and the wildlife that relies on it. The DTEA (at 40) summarily dismisses any adverse impacts from deluge water, suggesting it is no more than the amount of moisture that would come from a rainstorm, and suggests that there is no concern regarding metals or chemicals in the runoff from the deluge water system, based on minimal sampling from the first few launches. However, initial sampling is likely not capturing the potential for contamination from ablation of the steel plate, which will increase as more launches take place, making it more likely that the runoff will contain metals. Moreover, the determination that runoff from the deluge water system will not alter the surrounding habitat is belied by comments made by TPWD.

On October 17, 2024, TPWD submitted a letter to the Texas Commission on Environmental Quality (TCEQ) regarding TCEQ's issuance of a TPDES permit for the deluge water system. *See* Exhibit D. In that letter, TPWD states that not only did TCEQ fail to even discuss the impacts of the deluge water system runoff with TPWD—even though TPWD has primary responsibility for protecting the state's fish and wildlife resources and is charged with providing information on

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address the impacts associated with the new location for Launch Pad B renders the DTEA inadequate and incomplete.

such resources to other agencies when decisions are being made that affect those resources—but that TPWD had concerns over raising the number of launches to 25 per year because of the potential impacts on the surrounding habitat.

In the letter, TPWD notes that the deluge water runoff, which could contain oil and grease, copper, mercury, thallium, and zinc, would be discharged onto mudflats that are not only public lands owned by TPWD (for which SpaceX has no easement), but would then flow through the Lower Rio Grande National Wildlife Refuge to the Rio Grande River. The letter notes that "in essence, the draft permit appears to allow land application of effluent with no pollution controls onto public land not owned or controlled by the applicant." And it further notes that the affected area is unique habitat relied upon by many species, including designated/proposed critical habitat for the ESA-listed piping plover and red knot, as well as nesting habitat for snowy plover, Wilson's plover, and least tern, which are protected under the MBTA. It also notes that the affected algal mats and tidal flats are designated aquatic resources of national importance (ARNI), as they are ecologically critical habitat areas.

TPWD found that the discharge of deluge water "has the potential to damage or permanently change the nature of the tidal flats," since the addition of freshwater could alter the salinity regime and create channels that interrupt sheet flow. These "changes in salinity and hydrology could alter the existing algal and vegetation communities that are part of the designated critical habitat of the piping plover and important habitat for other shorebirds." And TPWD expressed concerns over the constituents of the discharge, noting that as much as 190 lbs of steel can be ablated per launch, and the resulting discharge of copper, hexavalent chromium, mercury, and zinc have the potential to adhere to sediments and bioaccumulate in fish and birds.[23]

None of these issues are discussed in detail in the DTEA. To the extent they are even mentioned, the FAA discounts them and concludes that no contamination will occur, and no significant impacts to the habitat are expected. But as TPWD's letter makes clear, that conclusion is without merit. The DTEA never even addresses such issues as the channelization of the runoff, and summarily dismisses the impacts of alterations in salinity, with no actual analysis of the concerns that TPWD sets forth in its letter.

The letter from TPWD leaves no doubt that this issue necessitates further analysis, since the proposal to increase the launch cadence to 25 launches per year will drastically increase the amount and frequency of deluge runoff, and none of these impacts were discussed in detail in the 2020 PEA (making it impossible for the FAA to actually "tier" off of the PEA for these issues). Moreover, since the TWPD letter clearly shows that deluge water runoff is likely to have significant environmental impacts, the FAA must fully analyze such impacts in an EIS.

[23] The DTEA itself notes that "The increased mission profile would increase the cumulative amount of metal that may be ablated and subsequently deposited outside the VLA." DTEA at 58.

- **Traffic and Trucks**

Traffic associated with SpaceX's activities already has a significant environmental impact, which will be exacerbated by the proposed increase in launch cadence. The DTEA fails to take a "hard look" at the impacts of traffic on biological resources, which must be fully analyzed in an EIS.

The record for the 2020 PEA shows that this is a significant issue. In fact, the record contains a roadkill list from 2020 showing the potential harm from traffic, which clearly has not been mitigated below the level of "significant" given the number of kills. And this may only be the tip of the iceberg, as predators/scavengers likely removed carcasses before they could be counted. The record also shows that the Coastal Bend Bays & Estuaries Program (CBBEP) found dead animals that include Species of Special Concern (USFWS) and Texas Species of Greatest Conservation Need (SGCN) that were hit by vehicles along Highway 4 between the checkpoint and the beach. These opportunistic observations from 2020 include 47 individuals representing 22 species of birds, mammals, and reptiles.

Vehicle traffic associated with SpaceX's activities undoubtedly increases the risk of collisions with wildlife. The DTEA, however, fails to adequately address the potential for impacts to wildlife from vehicle traffic, dismissing the issue by relying on posted speed-limit signs and the availability of a shuttle that SpaceX encourages employees to use – the same mitigation set forth in the 2020 PEA. Amazingly, the DTEA fails to provide any information on whether SpaceX employees have actually been using that shuttle service and fails to acknowledge that the record for the PEA shows that SpaceX employees regularly fail to follow the posted speed limit.[24] The FAA's reliance on the installation of wildlife crossings also appears to be unfounded, as it does not appear that any such crossings have actually been installed, and the DTEA (as with the PEA) provides no analysis regarding where the crossings could/would be placed and how the FAA/SpaceX would ensure their effectiveness.

And while the DTEA acknowledges that the proposed increase in launch cadence would result in a drastic increase in truck traffic for water and fuel deliveries—from 6,000 trucks per year to now 23,771 trucks per year—it fails to discuss how many more *other* vehicle trips will be associated with the increased cadence from SpaceX employees and other construction-related

[24] The PEA record shows that the FAA was aware that SpaceX employees were not adhering to the 25-mph speed limit, and thus the FAA had no basis for relying on that as a mitigation measure. ABC submitted a letter noting that partners who work on site have frequently seen dump trucks and other vehicles traveling at high speeds on Highway 4 in and out of the SpaceX facility. And FWS reiterated in an email to FAA in October of 2021 that "[p]ersonnel levels at this time do not maintain speed limits [which] increases roadkill." Thus, the FAA's reliance on the posted speed limit to find that the impacts of vehicle traffic would not be significant and does not require further analysis is clearly arbitrary and capricious.

activities (i.e., contractors). The FAA's failure to provide this basic information to support their analysis renders the DTEA completely inadequate.[25]

Moreover, the DTEA fails to provide *any actual analysis* of the impacts of the drastic increase in truck and other traffic on wildlife.[26] Rather, the DTEA states that the reader should "refer to the Biological Assessment in Appendix A for additional analysis of the increase in trucks due to the Proposed Action."[27] But there *is no Biological assessment* included in Appendix A, so that referral is meaningless and the public has not been afforded with the information necessary to provide meaningful comments on the actual impacts that the FAA has apparently considered. Regardless, any suggestion that the impacts will not be compounded by having 2.5 times more launches per year is unfounded, arbitrary, and capricious given the significant increase in the potential for collisions.

In sum: The DTEA provides almost no analysis of how the increased truck traffic will impact wildlife, rendering it completely inadequate. As discussed, the record already shows that traffic on SH4 results in harm to wildlife, and this will be greatly exacerbated by more traffic associated with the proposed increase in cadence. And the mitigating measures set forth in the PEA and DTEA have not been shown to reduce the impacts below the level of significance. Therefore, the FAA has failed to take the requisite hard look at the impacts of truck traffic in the DTEA, and this issue must be fully analyzed in an EIS.

- **<u>Harm from the June 6 launch and compliance with the MBTA</u>**

In June of 2024, SpaceX undertook the fourth launch of the Starship/Superheavy rocket. A report issued by the Coastal Bend Bays & Estuaries Program on June 6, 2024—immediately following the fourth launch—documents extensive damage to active migratory bird nests at Boca Chica State Park.[28] The June 6 report states that "[a]ll 9 shorebird nests monitored following the rocket launch were either missing eggs, had damaged eggs, or both" as a result of debris caused by the launch. According to the report, the "combination of fast flying debris associated with the launch, lack of any predator signs in-person or on-camera, and presence of cracked and/or missing eggs in every nest checked within 5 hours of the rocket test launch indicates that most, and likely all, of the 9 nests were likely damaged directly by debris that had been projected outwards during the test launch." The birds harmed—Snowy Plover, Wilson's Plover, and Least Tern—are legally protected by the MBTA and international treaties that the MBTA implements.

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[25] The DTEA also fails to discuss SpaceX's use of hovercraft as one of their responses to traffic jams, as discussed *infra* at __.

[26] This is a particularly important issue for ocelots, which are incredibly susceptible to traffic mortality. In fact, according to FWS "[c]ollisions with vehicles represents the largest known cause of mortality (35%) in south Texas" for the ocelot.

[27] DTEA at 11.

[28] *See Shorebird nest fates at Boca Chica after rocket test launch* (Ex. E).

On information and belief, the documented nest destruction is very likely to constitute a small fraction of the harmful impacts to protected migratory birds caused by the launch, since only a small fraction of nests in the area were studied.

The June 6, 2024, report therefore documents significant environmental impacts—including violations of federal environmental law—that were not analyzed in FAA's 2020 PEA, and continue to be ignored in the DTEA, in clear violation of NEPA.

FWS' investigation into the June 6 launch and its impacts to MBTA-protected bird nests and eggs confirms that SpaceX's activities not only have significant impacts, but that such impacts will be amplified and exacerbated by the proposed increased launch cadence. In a July 2024 report from FWS's Southwest Region Migratory Bird Program—which provided recommendations for minimizing and mitigating the impacts to migratory birds from SpaceX's activities at Boca Chica (Ex. F)—FWS confirmed that the damage to eggs of three of the primary migratory bird species nesting and rearing young near SpaceX launch pad (Snowy Plover, Wilson's Plover, and Least Tern) occurred from the June 6 launch. The FWS further acknowledged that this demonstrates "SpaceX's non-compliance [with the] MBTA" due to the "damage and loss of migratory bird eggs during breeding season."[29]

Importantly, FWS stated that the best way to avoid such impacts to migratory birds that rely on Boca Chica is to "avoid rocket launches and other activities from March through mid-August every year," which is the breeding season for these protected animals. Yet, the DTEA never discusses that recommendation, and fails to include it as a potential alternative for mitigation in the NEPA analysis.

Regardless, FWS stated that with the proposed increase to 25 launches per year (with some of those occurring at night), and with the plan to land many of those rockets at the VLA, "it is likely that additional impacts to breeding migratory birds similar to the egg destruction documented in June 2024 will occur." This should leave no doubt that the proposed action at issue here will result in significant impacts, and an EIS is therefore required.

The FAA's total failure to address the impacts of the June 6 launch to MBTA-protected wildlife is a stunning failure to comply with NEPA's "hard look" mandate. While the DTEA acknowledges that pea-size gravel was ejected from that launch event, it merely mentions that a camera lens was damaged by the concrete debris.[30] But as FWS determined, the concrete debris *did* in fact also result in damage to the eggs and nests of MBTA-protected species. Yet, the DTEA not only fails to analyze these impacts – since it never discussed the damage done to

[29] Ex. F at 2.

[30] DTEA at 44.

active migratory bird nests at Boca Chica[31] – it fails to even mention the MBTA as one of the laws that the FAA and SpaceX must comply with.

But it is readily apparent that the FAA and SpaceX *must* comply with the MBTA and are failing to do so here. Relevant caselaw and recent agency rulemaking establish that foreseeable harm inflicted on migratory birds (and active nests) by industrial activity may be covered by the MBTA's prohibitions, even when that is not the specific purpose of the activity. Indeed, a recent ruling that exhaustively analyzed the statute's language, history, and precedents determined that companies may not kill protected migratory birds with impunity just because their actions are an incidental, albeit entirely foreseeable, result of their activities.[32]

Moreover, FWS issued a rule in 2021 that discusses the applicability of the MBTA to the impacts at issue here. In the Service's 2021 rule implementing the MBTA, FWS found that the MBTA *is* applicable to foreseeable incidental take, based on the plain language of the statute, embracing the court's analysis set forth in the *NRDC* case.[33] Thus, the expert agency's own determination and analysis of the MBTA's plain language and applicable case law shows that the FAA must fully consider the impacts to birds protected under the MBTA from the SpaceX activities it regulates.

The DTEA, however, fails entirely to discuss this issue, even though there is now direct evidence of a violation of the MBTA from SpaceX's activities, which is likely to occur again and more frequently if the launch cadence is increased to 25/year. The FAA admits that a gravel plume such as this was *not* previously analyzed in the PEA, yet it fails to do so again here. Indeed, the PEA *never* discusses the potential for bird eggs (protected by the MBTA, the ESA, or otherwise) to be harmed by debris from a rocket launch event, particularly from a non-anomaly event like the Fourth launch that resulted in the harm shown in the June 6 report. Even for an anomaly event, the PEA asserts that a "direct wildlife strike [from debris] would be very unlikely." Thus, the FAA has never addressed the potential for harm to nests and eggs from a debris strike, and how such debris strikes may affect wildlife, including protected birds.[34]

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[31] *See* Ex. E (noting that "[a]ll 9 shorebird nests monitored following the rocket launch on June 6 were either missing eggs, had damaged eggs, or both.").

[32] *See Natural Res. Def. Council v. U.S. Dep't of the Interior*, 478 F. Supp. 3d 469 (S.D.N.Y. 2020).

[33] *See* 86 Fed. Reg. 54642, 54644 (Oct. 4, 2021).

[34] While the DTEA, at page 44, states that this issue was "considered in detail in the Biological Assessment," no such document has been included for review and comment here, and no Biological Assessment was included in the list of documents incorporated by reference into the DTEA. Therefore, the DTEA admittedly fails to provide the FAA's analysis of this important issue, and the failure to include the Biological Assessment is an additional reason that the DTEA is inadequate for the important purpose of public review.

And while the DTEA does discuss the need for further monitoring and that SpaceX would experiment with techniques to protect nests, such as installation of sheltering objects, DTEA at 45, it provides no discussion of whether similar mitigation measures are being taken in other contexts and the results of such actions or the impacts from the measure itself in terms of disturbances from the installation and removal of "shields," which could cause harassment of birds as well as harm to fragile algal mats from foot traffic to install and remove them. Indeed, the entire discussion of such "Minimization and Mitigation Measures" indicates that there is insufficient information available at this time to determine the likelihood of success of these measures. Rather, the actions mentioned are primarily research studies, field experiments, monitoring and investigations that need to be done to *develop* adequate mitigation measures. The FAA, however, has an obligation to ensure this information is developed before relying on such proposals.[35] Importantly, this discussion in the DTEA underscores the fact that sufficient mitigation is not in place to address harm to MBTA-protected birds/nests, which means a significant impact remains unaddressed, requiring a full analysis in an EIS.

In sum, the SpaceX launches have caused significant environmental impacts that have never been analyzed in the PEA or the DTEA. The nest destruction documented in the June 6, 2024, report confirms that the measures relied on by FAA are not working to "avoid, minimize, or mitigate any taking of migratory birds" and that SpaceX cannot be relied on to ensure MBTA compliance. Accordingly, prior to authorizing any additional launches or an increased launch cadence, the FAA is required to take a hard look at such impacts and the available means of monitoring for and avoiding them. Because the known harm to protected birds is certainly a significant impact,[36] that analysis must be set forth in an EIS.

- **Impacts to Listed Species**

While the DTEA (at 48) states that the impacts to listed species from the increased cadence will be "similar" to what was described in the PEA, that is simply not accurate. As discussed above, the increased noise and lighting from 2.5 times more launches per year will certainly cause additional harm by harming/harassing ESA-listed birds and sea turtles, including piping plovers and red knots in their designated critical habitat. But even beyond those increased impacts from what was considered in the PEA, the FAA now admits that an additional six species of listed birds will be impacted that were not evaluated in the PEA due to the expansion of the proposed action. And the FAA has not provided a Biological Assessment that analyzes these impacts, even though the DTEA states that the agency has reinitiated Section 7 consultation and acknowledges

[35] 40 C.F.R. §1502.21.

[36] Pursuant to FAA Order 1050.1F Part 4-3, in determining whether the action is significant for purposes of NEPA, and thus an EIS is required, the FAA must consider such things as "[a]dverse impacts on endangered or threatened species or critical habitat" and "[w]hether an action threatens a violation of Federal, state, or local law or requirements imposed for the protection of the environment."

that the proposed activities are "likely to adversely affect" those species. And the discussion in the DTEA regarding these new impacts is limited to just an acknowledgment that harassment will occur, without any real analysis of the impacts if such harassment. Regardless, the fact that so many more endangered species will be affected by SpaceX's activities shows that the impacts are certainly *not* the same as what was previously considered in the PEA, and due to the extensive nature of the impacts to protected wildlife, the FAA must produce an EIS.[37]

Since the FAA has failed to provide a Biological Assessment for review—even though the agency is supposed to undertake the ESA analysis concurrent and integrated with NEPA review, 40 C.F.R. § 1502.24—the only discussion of the impacts to listed species from the proposed increase in cadence is a Table that merely summarizes the impacts, but does not provide any actual analysis.[38] Regardless, Table 7 of the DTEA *does* acknowledge that significant impacts are likely to occur to listed species, which as set forth in Exhibit A requires a full analysis in an EIS. And even though it attempts to dismiss or downplay many of those impacts—continuing to argue that they will be infrequent, though the new launch cadence drastically increases the frequency—the FAA does not include any additional mitigation measures to address them. Thus, the impacts to listed species remain significant, and the FAA has once again failed to comply with NEPA. *See* Ex. A.

For example, with regards to noise impacts, the DTEA acknowledges that noise from SpaceX's activities can cause harassment of protected wildlife, but it states that noise will still be "intermittent" even though the number of noise events will increase drastically per year under the new proposal. The DTEA also ignores that launches are not the only noise events, and the failure to consider not only testing but construction activities in the discussion of noise impacts on listed species renders the DTEA incomplete. Further, the suggestion that noise impacts are "intermittent" is not supported by the record, which shows that noise impacts are actually ongoing and continuous. *See* Ex. A. And it is simply not credible to refer to noise from 25 launches per year as intermittent, as that would cause frequent disturbance and harassment, which could result in significant harm to listed species. Yet the DTEA provides no actual analysis of the harm that such harassment could cause with the increased frequency. Indeed, the DTEA's conclusions are not supported by any actual data or analysis, and the FAA therefore failed to take a hard look at the significant impacts of noise on listed species from 25 launches per year, which must be set forth in an EIS.

The FAA similarly failed to take a hard look at the impacts on listed species from the heat from the rocket plume. The DTEA acknowledges that the plume will now extend further from what

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[37] *See Sierra Club v. United States Army Corps of Eng'rs*, 803 F.3d 31, 46 (D.C. Cir. 2015) (allowing an activity that would take (i.e., harm) endangered species, even on the condition that the permittee take mitigating measures, "amount[s] to significant federal action" under NEPA).

[38] DTEA at 48-53.

was analyzed in the PEA, since the rockets now have more thrust. But the discussion of impacts to listed species merely says that even though the plume could kill animals, they are likely to flee the area due to the noise of the rockets, so are not likely to be harmed.[39] But this ignores that having to flee the area causes stress and is a form of "take" through harassment. The DTEA fails entirely to analyze how the increased cadence, which will cause more frequent harassment, could harm listed species, including their ability to rely on designated critical habitat. The FAA's failure to address the potential for direct harm as well as the impacts of harassment from the heat plume violates NEPA's hard look mandate.

The DTEA also fails to take a hard look at the impacts of night lighting on listed species. Table 7 states that launches would be primarily during "daylight hours (7:00 a.m. and 7:00 p.m.)," which ignores the fact that for much of the year, sunset is well before 7:00 p.m., and thus many launches may occur during darker times when more lighting is required. And while Table 7 acknowledges that bright spotlighting will continue to be used (and says nothing about avoiding the use of metal halide lights and does not institute any seasonal restrictions, as the expert wildlife agencies suggested – *see* Ex. A) and that such lighting may lead to abandonment of roosting areas, it concludes that this is not significant because the lighting is intermittent. But as set forth in Exhibit A, the expert agencies have stated that lighting is certainly not intermittent, and is already harming listed species, which will only be exacerbated by the increased launch cadence. And again, the DTEA's failure to address how ongoing and frequent harassment from lighting may affect the listed species that rely on the area violates NEPA's hard look mandate. The FAA's attempt to sidestep the significant impacts of lighting on listed species renders the DTEA inadequate, and the agency must fully address these impacts in an EIS.

The same is true for ground vibrations from launches and landings. The DTEA acknowledges that these vibrations can disturb nesting turtles and birds, causing them to abandon nests (though it does not address the potential for vibrations to cause eggs to crack), but says the harm will not be significant because the vibrations are "infrequent." But launches occurring twice per month (or more) is certainly not "infrequent," and the FAA's continuing attempt to frame the impacts of 25 launches per year as infrequent is arbitrary and capricious.

By ignoring the continuous and regular nature of the impacts from 25 launches per year, the DTEA fails to analyze the actual harm from disturbance, displacement, and harassment of wildlife. There is good reason why harassment is considered unlawful "take" under the ESA. Indeed, in April of 2024, FWS issued a memorandum (Ex. G) confirming that harassment – whether intentional or not – is considered "take" where the effects of activities "might disturb the

[39] Even though there might be no evidence of direct harm to listed species from the rocket plume as the DTEA asserts, that does not mean no harm has occurred, since any dead animals could have been dragged off by scavengers or otherwise removed from the area before any monitoring took place – especially since FWS personnel have routinely been kept out of the area for extended periods of time following launches.

birds and make it difficult for them to hatch or raise their young." Thus, the FAA's failure to address the actual impacts of disturbance and harassment of listed species from 25 launches per year—in the context of vibrations, noise, heat, lighting, traffic, human presence etc.—shows that the agency has failed to take a hard look at the significant impacts of SpaceX's proposed activities.[40]

Regarding impacts from traffic on listed species, the DTEA illogically states that the increase in traffic will somehow *reduce* the potential for wildlife strikes by causing wildlife to avoid the area, which is utter nonsense – akin to arguing that the more cars on the road, the less chance of a traffic accident. And this position is directly undermined by the need for wildlife crossings, which SpaceX has apparently not yet constructed. Rather, the increase in traffic exacerbates the potential for harm to wildlife, in particular ocelots, which are highly susceptible to collisions. *See* Ex. A. The increased cadence – with many more truck and car trips required to support SpaceX's activities – will therefore exacerbate what is already a source of significant harm, and the FAA's reliance on encouraging the use of shuttles and compliance with the 25-mph speed limit has not been shown to reduce the risk. Indeed, the DTEA provides no information on whether SpaceX employees are actually using the shuttle and continues to ignore record evidence that employees are not abiding by the speed limit. The FAA's analysis of traffic impacts on listed species is therefore arbitrary and capricious.

As for the impacts of anomalies on listed species, the DTEA (at 52) erroneously claims that fires are unlikely, even though several have occurred from the first few Starship/Superheavy launches – including in designated critical habitat – and that further harm to surrounding habitat from debris is unlikely because the chances of an anomaly decrease with each successful launch. As discussed further herein, that argument lacks credibility, and the FAA's failure to address the harm that has *already* occurred from SpaceX anomalies is arbitrary and capricious, in violation of NEPA.

Finally, the DTEA's discussion of the potential impacts to protected marine species is inadequate. The FAA states that the potential for fallen objects or hazardous material from ocean landings to affect listed species is "discountable," even though it acknowledges that the frequency of landings would increase, and therefore the potential for such interaction to occur would be greater if the FAA allows 25 launches per year. Regardless, the DTEA fails to analyze what the *actual* impacts would be *if* fallen objects or hazardous materials occur in the vicinity of protected marine species, including the potential for direct and indirect harm from residual propellant. There is simply no actual analysis provided to support the DTEA's determination, and no examination of impacts as NEPA requires. And while the DTEA states that the FAA is consulting with NMFS regarding the impacts of overpressure events on listed marine species (noting that

[40] *See Alliance for the Wild Rockies v. Bradford*, 720 F. Supp. 2d 1193, 1212-13 (D. Mont, 2010) (discussing harassment and displacement of wildlife as a significant impact).

the agency found that they were likely to adversely affect protected species), nothing from that consultation has been provided for review and public comment, rendering the DTEA incomplete.

In sum, the Starship/Superheavy Launch Program has had, and will continue to have, significant impacts on listed species, and these impacts would be exacerbated by increasing the launch cadence as proposed. The FAA has failed to take a hard look at the impacts to listed species from 25 launches per year, has failed to make information on those impacts available for public review and comment, and has failed to comply with NEPA by once again attempting to unlawfully avoid the need for an EIS.

- **Harm from increased visitation for launches**

One of the significant environmental impacts from SpaceX's launches that has become increasingly apparent since the Starship/Superheavy Launch Program began is that many people come to view the launches, and this has led to increased foot traffic in the area, causing disturbances and harm to wildlife and the habitat they rely on.

Both the PEA and the DTEA fail to address the environmental harm—including to designated critical habitat in the adjacent wildlife refuge—from the many visitors that show up to witness launches of the Starship/Superheavy rockets or search for debris after a launch. The administrative record for the PEA shows that TPWD brought to FAA's attention the "potential [for] looting/damage by the public seeking debris," and "[d]amages (e.g. looting) from members of the public who may be attracted to the park due to SpaceX operations (e.g. to obtain debris)." FWS has likewise stated that people in Refuge lands result in "substantial impairment to sensitive tidal mudflats and native vegetation," which "unduly disturb[s] wildlife, especially birds, from normal breeding, feeding and sheltering activities for periods of up to 15 hours" for each launch. Furthermore, beach closures "push the public from the public beaches into Refuge dunes, interdunal, mudflat, and loma areas (i.e., into sensitive areas on the Refuge where SpaceX has no legal jurisdiction to remove the public)," which makes staff "unavailable to protect Refuge visitors and resources." And the record shows that "[i]ncreased vehicle and foot traffic stemming from SpaceX activities and increasing public interest" poses a threat to cultural resources. Indeed, "[i]nvasive activities including the unauthorized retrieval of SpaceX debris may result in the inadvertent disturbance of . . . cultural materials."

However, the PEA failed to address this undoubtedly important issue, which would be exacerbated by the proposed increased launch cadence, with more visitors coming to the area to witness launches. The total failure to address this issue in the DTEA shows that the FAA has failed to meet NEPA's "hard look" mandate.

- **Hovercraft Impacts**

There have been several reports about hovercraft being used to transport SpaceX personnel to the launch site, and that these hovercraft activities are having adverse impacts on the area, including

ecologically critical habitat. Yet, the DTEA fails entirely to mention this connected action, and therefore ignores a potential source of ongoing significant environmental harm associated with SpaceX's activities, which would be exacerbated if the launch cadence is increased.

According to the FWS (*see* Ex. H), the South Bay and the tidal flats that may be affected by the use of hovercraft by SpaceX are a globally important shorebird area and designated as a Texas Coastal Preserve that provide feeding, resting, and wintering habitat for numerous types of migratory bird species as well as threatened and endangered species. According to FWS, SpaceX's hovercraft operations—which are directly connected to the activities that the FAA has permitted at the Boca Chica facility as the hovercraft is only necessary to get SpaceX personnel to the launch site for such activities—may be resulting in "take" of protected wildlife. FWS referenced videos showing shorebirds and other waterbirds that were flushed within close range of the hovercraft in motion and noted that if that is happening 8 times a day, 5 days a week, as FWS assumes, this could be considered take in the form of harassment of listed species. *Id.* According to FWS, the FAA has not sought ESA Section 7 take coverage for the hovercraft operations, and SpaceX has not pursued an ESA Section 10 permit with a Habitat Conservation Plan - thus the impacts of the hovercraft operations have not been fully analyzed even in the ESA context.

The FAA must address the impacts of the hovercraft operations on protected wildlife, including not only the ESA-listed species discussed in the FWS letter, but other migratory birds protected under the MBTA that rely on the tidal flats adjacent to the launch facility. Depending on where the hovercraft is travelling and landing, the impacts could be significant, including through the harassment described in the FWS letter, as well as through direct harm to tidal flat habitat where the hovercraft comes ashore and drops people, which can disturb wildlife and cause rutting or trampling of algal mats or other habitat areas. And these impacts could certainly be exacerbated by the proposed increase in launch cadence if the hovercraft will be used even more to support the increased operations.

Since the hovercraft operations are clearly a connected action,[41] the FAA must include an analysis of not only the direct and indirect impacts of the hovercrafts on wildlife and habitat, but also include those impacts in its analysis of the cumulative impacts of the launch program. The

[41] Pursuant to FAA Order 1050.1F, the scope of the proposed action – and therefore what the EA or EIS must cover – includes connected actions, which are closely related actions that cannot or will not proceed unless other actions are taken previously or simultaneously; or are interdependent parts of a larger action and depend on the larger action for their justification. The hovercraft is clearly an action by SpaceX that would not proceed without the construction and launch activities authorized by the FAA and is thus an interdependent part of the larger action (i.e., the launch program itself). The hovercraft operations therefore must be considered by the FAA in its NEPA analysis.

2020 PEA's and the DTEA's total failure to even mention the hovercraft operations renders the FAA's NEPA analysis arbitrary and capricious.

- **Anomalies**

One of the most significant concerns with SpaceX's testing and launch activities is the potential harm from anomalies (i.e., explosions) that can cause catastrophic environmental damage. As set forth in Exhibit A, the FAA was well-aware when it approved 5-10 launches per year that anomalies were not only likely to occur for the Starship/Superheavy launch program, but that the history of anomalies showed that such events cause significant harm, which should have been fully analyzed in an EIS. Now, SpaceX proposes a drastic increase in the number of launches per year, statistically increasing the potential for an anomaly to occur. Yet, the FAA once again failed to fully analyze the potential harm from anomalies in the DTEA.

The DTEA states that even though SpaceX proposes increasing the number of launches drastically, there would be no correlated increase in the potential for anomalies – indeed, it suggests that the likelihood actually decreases as the launch program progresses because SpaceX learns from each launch. That is not entirely logical[42] and is not supported with any data from other launch programs. Rather, more launches mean more opportunities for catastrophic failures and significant environmental impacts should something go wrong.

And even if the per-launch chance of an anomaly is reduced as the launch program progresses—as the DTEA assumes without support—that does not mean that the potential for an anomaly has somehow disappeared. Indeed, the DTEA still assumes that 300 hours per year will be required to address anomalies; therefore, it is readily apparent that the potential for significant environmental harm from an anomaly remains. Since the 2020 PEA never provided a full analysis of the potential harm from an anomaly (i.e., did not discuss the potentially catastrophic harm from debris landing in the adjacent wildlife habitat and harm from debris removal efforts, even if the FAA considers the probability low – *see* Ex. A), and the DTEA provides nothing more, the FAA has still failed to take the requisite "hard look" at this important issue.

The FAA's complete reliance on the PEA to address the issue of anomalies for the increased cadence (i.e., no new analysis provided)[43] is also arbitrary and capricious given changes to the

[42] Changes made to the rockets for each launch (i.e., design modifications such as changes to the heat shields or the configuration of the rockets) *may* address concerns raised by prior launches, but also create new opportunities for malfunctions or mistakes. Since this is still the early stages of a multi-year testing program for experimental rockets, any claim that the potential for anomalies is already diminishing lacks credulity and is arbitrary.

[43] DTEA at 8 (stating that the FAA is relying on the PEA Section 2.1.3.7 re Anomalies since the analysis remains "unchanged").

launch program for the new proposal. The PEA did not address the potential for anomalies when *landing* over 20 rockets per year at the VLA, which is a major component of the proposed changes to the launch program. Reports on the first attempt to land the rocket at the VLA show that it was a close call, with a high potential for an anomaly,[44] and the second attempt to land the rocket at the VLA was scrubbed because of safety concerns.[45] Therefore, the proposal to increase the landings at the VLA – which have not been proven safe – increases the potential for an anomaly, which undermines the FAA's assertion that at this point in the launch program the chances of an anomaly occurring are reduced.

Furthermore, the FAA failed to provide any analysis of the environmental impacts of anomalies, even though it now has the opportunity to consider the actual harm from the explosion that occurred during the first launch of the Starship/Superheavy rocket, which should have been used as an example to assess the potential harm from future anomalies to fully analyze the potential for harm from SpaceX's activities. As the FAA is well aware, just minutes into the April 20 launch, the rocket exploded in a fireball, and the launch pad was destroyed by the intense heat generated by the rocket, scattering debris—including dust, chunks of concrete, and metal—over a large area, including adjacent sensitive tidal flats that provide critical habitat for endangered species. The destruction of the launch pad—which had not been discussed or considered in the 2022 PEA—resulted in significant environmental harm: FWS stated that the "[i]mpacts from the launch include numerous large concrete chunks, stainless steel sheets, metal and other objects hurled thousands of feet away along with a plume cloud of pulverized concrete that deposited material up to 6.5 miles northwest of the pad site." The debris field included designated critical habitat for the ESA-protected piping plover as well as the communities of Brownsville and Port Isabel, which were blanketed with fine dust particulate, exposing the communities to inhalation of debris. FWS documented 385 acres of debris on SpaceX's facility and at Boca Chica State Park, which is leased by the Service and managed as a component of the Lower Rio Grande National Wildlife Refuge. FWS further documented, as a consequence of the launch, a 3.5-acre fire that started south of the pad site on Boca Chica State Park land.

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[44] *See* Ex. I (SpaceX's Starship booster was '1 second away' from aborting epic launch-tower catch | Space) and Ex. J (Historic Starship booster capture was a second from a fiery end) (SpaceX staff stating, "I want to be really upfront about the scary sh** that happened and what we're doing about it because I think that's our focus – getting to Flight Six." He then went on to say that, "We were one second away from [a misconfigured spin gas abort] tripping, which would have told the rocket to abort and try to crash into the ground next to the tower instead of attempting to land on the tundra.").

[45] *See* Ex. K SpaceX launch: Donald Trump attends launch with Elon Musk; catch attempt called off - ABC7 Los Angeles

See Ex. L SpaceX launches Starship rocket, but abandons attempt to catch booster at launch site | PBS News

This event should have triggered the FAA to do a supplemental NEPA review, which the agency failed to do before issuing further launch licenses in violation of NEPA and its own implementing regulations.[46] The agency has now compounded that failure by ignoring the impacts of the April 20 explosion when considering the proposal to increase SpaceX's activities at Boca Chica, which they admit still pose a risk of anomalies occurring.

And the reliance on the PEA for this issue is blatantly arbitrary and capricious, since the April 20 explosion occurred after that document was final, and the PEA did not consider the actual impacts of an explosion on the launch pad. Indeed, the 2020 PEA merely mentions the potential for an anomaly to occur on the launch pad ("An anomaly on the launch pad could cause . . . an explosion that spreads debris"), but it provides no analysis of what impacts such an event might have. For example, it fails to fully address the harm from troughs created by ejected debris and the subsequent interruption of tidal flow/hydrology, as well as impacts from efforts to recover debris from an anomaly. *See* Ex. A. The FAA now has the opportunity to stop focusing on the hypothetical and consider the actual, real-world impacts of a rocket anomaly on the launch pad, yet the DTEA fails to provide any analysis of the harm to surrounding habitat from the April 20 explosion or the efforts to recover that debris, even though it acknowledges that much of the debris has been recovered.

As discussed in detail in Exhibit A, the expert wildlife agencies have stated unequivocally that debris from anomalies and debris recovery efforts cause significant harm to the sensitive tidal flats that provide ecologically critical habitat for many species, including birds protected under the ESA and MBTA. Moreover, the record for the PEA shows that such harm cannot be mitigated, since restoration of the tidal flats is uncertain and unproven. Yet, rather than discuss the actual harm from an anomaly and debris recovery efforts, the FAA just assumes that another similar event is not likely to occur. That is arbitrary and capricious.

Even if the new deluge water system reduces the potential for certain anomalies (i.e., from the launch pad exploding from the intense heat from the take-off), that does not mean the same or similar harm would not occur if the rocket itself explodes on or just above the launch pad, during either a launch or landing event. In other words, the implementation of deluge water may reduce

[46] FAA Order 1050.1F, 9-3 (a supplemental EA or EIS must be prepared when: (1) there are substantial changes to the proposed action that are relevant to environmental concerns, or (2) there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts); *Marsh v. Oregon Natural Resources Council*, 490 U.S. 360, 363-70 (1989) (NEPA's duty to supplement applies when "remaining governmental action would be environmentally 'significant,'" the agency retains an "opportunity to weigh the benefits of the project versus the detrimental effects on the environment," and "new information is sufficient to show that the remaining action will 'affect the quality of the human environment' . . . to a significant extent not already considered").

the chances of *some* types of anomalies from occurring, but does not preclude them, which is clear from the fact that SpaceX still assumes that up to 300 hours of closures will be necessary per year to address anomalies. And the chances of an oversight, mistake, or unexpected event occurring only increase with the number launches/landings.

Thus, in order to take the requisite "hard look" at the impacts of an anomaly, the FAA should have discussed in detail the environmental harm that occurred from the April 20 launch, the harm that has occurred from debris recovery efforts, and the ways such harm is being redressed. And since anomalies can clearly cause significant environmental harm, that discussion must be provided in an EIS to fully assess the impacts of the Launch Program and the proposed increased launch cadence.

D. Impacts to the Community from the Proposed Activities

- **The DTEA fails to adequately consider the environmental justice impacts of increased launch operations on the Carrizo/Comecrudo Tribe**

The FAA has, once again, completely failed to address the fact that the Boca Chica area is the sacred ancestral birthplace of the Carrizo/Comecrudo people (the "Tribe"), and that the activities it has authorized are adversely impacting these sacred lands, which would be exacerbated by the proposed increase in launch cadence.

The proposal to increase operations at the Boca Chica VLA is just the latest act in the legacy of displacement in Texas of native peoples, and the FAA's failure to even acknowledge the impacts of SpaceX's activities on the Tribe shows an egregious disregard for their sovereignty, access to land, and land rights that have been denied to virtually all indigenous peoples throughout Texas' history.

The Carrizo/Comecrudo Tribe has ancestral ties to the immediate region of the Lower Rio Grande Valley and recognizes the project area and its surroundings to be an extremely important sacred cultural, ancestral, and historic site. Although the Tribe has not yet been granted federal recognition, that does not invalidate the cultural affiliation with the lands of their ancestors, nor their sacred sites, among which are the area surrounding the mouth of the Rio Grande and the river itself, as well as with the wildlife of the area that are also sacred to the Tribe.[47]

[47] As discussed herein, the proposed increased cadence would exacerbate impacts to the surrounding habitat and the wildlife that rely on the area, though noise, heat, light, anomalies, traffic etc. This includes harm to animals that are sacred to the Tribe, such as ocelots, cranes, herons, plovers, coyotes, and deer. Any harm to the habitat of Boca Chica therefore adversely affects the Tribe's spiritual and religious interests in the area and the wildlife that are sacred to the Tribe. *See* Ex. __ (Mancias Decl.). The DTEA, however, fails entirely to discuss this significant impact of the proposed activities.

There has been no archeological study in the immediate construction site of SpaceX, but patterns of archaic burials in the area show a need for more analysis and protections. It is likely that there are burials, artifacts, or remains of villages in the construction site of SpaceX. Yet, the FAA has done nothing to investigate the potential loss of burial sites or other remains, and has not consulted with the Tribe to discuss issues around access to the area and harm to their cultural traditions.[48] As there are many ancestral village sites near the river and throughout the so called Rio Grande Valley, it is likely that SpaceX's activity has disturbed and damaged sites in the area, which was never addressed in the 2020 PEA, and which could be exacerbated by the proposed increase in launch operations, but which the DTEA once again ignores.[49]

In sum, the FAA and SpaceX have shown a shocking disregard for the native peoples of Texas and the impacts of SpaceX's operations in the Tribe's ancestral sacred lands. The FAA's ongoing failure to discuss, analyze, and consult with the Tribe on the impacts of SpaceX's proposed operations—including to the lands and wildlife that are sacred to the Tribe, and from access restrictions that prevent the Tribe from visiting their ancestral lands—is an egregious violation of NEPA, as well as a disregard for the common decency and respect the Tribe deserves as the original people of Boca Chica. SpaceX should not be permitted to use the Tribe's sacred lands as a sacrifice zone, and the FAA must not continue to ignore the significant adverse impacts that SpaceX's activities have on the Tribe's rights and interests.

- **Impacts of Closures**

The FAA has, once again, failed to fully analyze the significant impacts of closures on the community as well as on surrounding refuge and park lands. *See* Ex. A. The proposal to increase the launch cadence will exacerbate the impacts of closures, and the FAA has violated NEPA by failing to fully address these issues in an EIS.

When the FAA was evaluating the impacts of SpaceX's proposal to launch 5-10 rockets per year from Boca Chica, it assumed that only 500 hours per year would be required for general operations and launches, and 300 hours per year to respond to anomalies. Those assumptions were clearly remiss, given that closures to accommodate SpaceX have regularly exceeded 1,000

[48] Pursuant to the Native American Graves Protection and Registration Action (NAGPRA), the FAA should undertake archeological studies and direct consultation with the Tribe before any more permits are granted. The Tribe would prefer that ancestral human and material remains be undisturbed; however, SpaceX has neither sought nor received consent from the Tribe to use their sacred ancestral lands, and are thus in violation of NAGPRA if they have disturbed human remains and/or objects of cultural patrimony, and/or funerary items and have neglected to inform the Tribe.

[49] *See* "Guide to Working With Non-Federally Recognized Tribes in the Section 106 Process." Advisory Council on Historic Preservation, available at https://www.achp.gov/sites/default/files/whitepapers/2018-06/GuidetoWorkingwithNon-FederallyRecognizedTribesintheSection106Process.pdf

hours per year, even when the company was only doing sporadic testing and limited launches. *See* Ex. A. For example, FWS stated that it "conservatively quantified" more than 1,000 hours of closures in 2019, and in 2020 FWS calculated that there had been "well over 1,000 hours" of closures in just 3 months. Indeed, over the past few years, according to both FWS and TPWD, closures have been well beyond 500 hours each year. Thus, FWS described the estimate of 500 hours for closures as "unrealistic," and a "gross misstatement" of what would actually occur, and TPWD likewise stated that the actual number of closures would likely "far exceed[]" the number of hours authorized by FAA. *See* Ex. A.

SpaceX now intends to drastically increase its activities at Boca Chica with 25 launches and nearly as many rocket landings per year at the VLA. Yet, the FAA has accepted SpaceX's baseless assertion that the number of closure hours would not need to be increased to accommodate this drastic increase in SpaceX's activities. Given the statements in the record from FWS and TPWD, that is blatantly arbitrary. Rather, given the record evidence and the history of closures to accommodate SpaceX, the FAA should assume that closures will certainly exceed 500 hours per year if the cadence is increased. This is so even if SpaceX *has* taken measures to move some of the testing off-site to the Massey's Test Site as the DTEA claims (at 11), since this appears to be irrelevant as the 500 hours was specific to launch events and not testing: the DTEA states that the 2022 PEA "assumed approximately 100 hours of access restrictions for each orbital launch event and 500 hours of access restrictions annually."[50] Thus, moving *testing* to the Massey Test Site would not account for reducing access restrictions from 100 hours per *launch event* to only 20 hours, as the DTEA assumes – a drastic reduction that defies credulity.[51]

Regardless, the assumption that each launch campaign will require less than 20 hours of restrictions is simply not commensurate with reality, particularly given that the recent launches have resulted in significantly more closure hours than what is discussed for the first few launches in the DTEA (at 35-36), which appears to only include the closure hours for the day of the launch itself, and not all closure hours associated with the work leading up to launches. For example, based on the text message alert system, there were over 20 hours of closures in October or 2024, and more than 11 hours associated with the 6th launch in November of 2024. Thus, the downward trend that the DTEA asserts has not been consistent, and there is no reason to assume that as the launch program proceeds, closure times will continue to decrease.

Part of the issue appears to be how the closure hours are calculated. The DTEA ignores the actual impacts of how SpaceX approaches closures. As FWS has explained, while SpaceX is limited to a certain number of hours, they routinely issue a notice covering 3-5 consecutive days for a

[50] DTEA at 35.

[51] Furthermore, nothing in the DTEA would prevent SpaceX from continuing to do such testing at the VLA and the FAA has not included a condition requiring such testing to be done at the Massey's Test Site. Therefore, relying on this change to assume that closures would remain below 500 hours is arbitrary and capricious.

launch event, and so even if they only use (and thus count) part of one of those days, all announced days are lost to the public and researchers, because there is no way for the Refuge staff, the general public, or the Tribe to be able to tell ahead of time which day any SpaceX activity will actually occur – the public just assumes those days are not available for access.[52] The Refuge and researchers are likewise unable to schedule their activities for those days. Therefore, SpaceX's assertions regarding the number of closure hours is inconsistent with the actual impacts of announced closures, which have regularly included 3 or more days. The FAA should include all announced closure days in the calculation of closures, and should not accept SpaceX's attempt to minimize the impacts of closures.

It is also unreasonable for the FAA to claim that the projected closures to address anomalies for 25 launches and 22 landings at the VLA can still be limited to 300 hours – the same number of hours that was assumed for only 5-10 launches in the PEA. This assumption is based on the theory that as the number of launches increases, there is less potential for an anomaly – i.e., the risk would be lower for each launch. As discussed above, this argument is not logical – the more launches that take place, the more opportunities there are for something to go wrong. And the DTEA ignores that here, the launches are not using identical rocket configurations, but rather the whole point of this accelerated launch program is to test new equipment and configurations, and new maneuvers and operational goals.[53] While some of these measures are intended to increase safety, they are still changes being made to an experimental rocket, not "tried and true," and therefore the risk of anomalies does not dissipate. Indeed, the history of anomalies over the past few years at Boca Chica suggests that the risk of an anomaly remains high. The DTEA provides no support for the notion that increasing the number of launches by 2.5X will somehow reduce the potential for anomalies to occur.

Furthermore, SpaceX now intends to not only drastically increase the number of launches, but to attempt to land most of those rockets at the VLA. Landing the rockets at the VLA presents a new risk of an anomaly and is not something that has been proven to be safe. As discussed, reports on

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[52] The most recent launch as of this writing provides a prime example. The initial scheduled launch date was January 13, which then got changed to the 15th, and then to the 16th. Since closures were announced for all of those days, the public experienced the equivalent of three days of closures, even though SpaceX will likely attempt to argue that only one day of closures actually occurred for the launch.

[53] For example, for flight 7 attempted to deploy 10 Starlink simulators to test the ability to deploy satellites in the future, along w/changes in the size and location of the flaps, a redesign of the propulsion system resulting in a 15% increase in propellant volume, and changes in the heat shield. https://www.space.com/space-exploration/launches-spacecraft/spacexs-starship-flight-7-test-flight-will-deploy-simulated-starlink-satellites-for-1st-time; see also https://www.spacex.com/launches/mission/?missionId=starship-flight-7

the first attempt show that it was a close call with a high potential for an anomaly,[54] and the second attempt to land the rocket at the VLA was scrubbed because of safety concerns.[55] Therefore, the potential for an anomaly will drastically increase if the proposal to increase the cadence of landings is approved, and assuming the same 300 hours of closures to address anomalies is arbitrary and capricious.

Regardless, even if closures to accommodate SpaceX *can* somehow be kept to the number of hours set forth in the 2020 PEA—even with the significant increase in launch cadence and the increased potential for an anomaly from landings at the VLA—that would *still* be a significant impact requiring an EIS. As discussed in detail in Exhibit A, the record for the PEA shows that these closures have significant impacts on refuge resources and the community. Indeed, FWS and TPWD made it clear that 500 hours of closures *severely impact*s public use and wildlife resources, and *severely impair*s their ability to manage state and federal lands, including the adjacent wildlife refuge.[56] And these closures prevent the community from accessing Boca Chica Beach for recreation as well as for fishing, which is a significant impact since the area is an important resource for recreation (such as hiking, birdwatching, surfing) and subsistence fishing – particularly since there are many low-income people that rely on the area as a source of food.[57]

Closures also disrupt the ability of the Carrizo/Comecrudo Tribe to hold their traditional cultural ceremonies. As discussed in Exhibit A, Boca Chica beach is sacred to the Tribe, and the frequent closures prohibit Tribal members from accessing an area of vital cultural, social, religious, and spiritual importance. In the declaration provided by Juan Mancias (Ex. M, incorporated by reference), the Chairman of the Tribe, he states that the Tribe has been prevented from accessing Boca Chica beach several times—the sacred origin site of their people—to undertake ceremonies and leave offerings to their ancestors because of the frequent beach closures that have occurred

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[54] SpaceX's Starship booster was '1 second away' from aborting epic launch-tower catch | Space https://newatlas.com/space/starship-tower-capture-landing-near-destruction/ (SpaceX staff stating "I want to be really upfront about the scary sh** that happened and what we're doing about it because I think that's our focus – getting to Flight Six." He then went on to say that, "We were one second away from [a misconfigured spin gas abort] tripping, which would have told the rocket to abort and try to crash into the ground next to the tower instead of attempting to land on the tundra.")

[55] SpaceX launch: Donald Trump attends launch with Elon Musk; catch attempt called off - ABC7 Los Angeles

SpaceX launches Starship rocket, but abandons attempt to catch booster at launch site | PBS News

[56] *See* Ex. A at 30-33.

[57] *Id.* at 33-35.

for purposes of SpaceX activities.[58] This is indisputably a significant impact, and even though Commenters brought this issue to the attention of the FAA in the ongoing litigation, the DTEA still fails to even acknowledge that Boca Chica is sacred to the Tribe, and provides no mechanisms to mitigate the impacts of closures. In fact, neither SpaceX nor the FAA has contacted Tribal Chairman Mancias to even discuss these issues. Therefore, closures have had, and will continue to have, a significant impact on the Tribe, and the FAA's continued failure to fully address this important issue, which will be exacerbated by more frequent closures if the FAA allows for 25 launches per year, is an egregious and shocking violation of its NEPA duties.

These concerns would also be exacerbated by the proposed increased cadence because even *if* the number of closure hours per event is reduced as the program progresses, as SpaceX claims without support, the higher launch cadence will increase the *frequency* of closures. Thus, rather than a closure occurring once or less per month, they would occur twice or more per month, causing even more frequent disruption, and making it more likely that a closure would coincide with an important date for a ceremony for the Tribe, increasing the hindrance of access for refuge management, and reducing access to the area for the community. The FAA fails to acknowledge anywhere in the DTEA that if closures occur every other week, it will cause even more problems for refuge management and community access than what was analyzed in the 2020 PEA. The FAA's failure to address this significant impact is arbitrary and capricious, and the agency must address these issues in an EIS.

A few additional points regarding closures:

- The Cameron County text message system for Boca Chica Beach closures is only in English and should be available in Spanish.
- Cameron County's text message alert system is not accurate, and sometimes the closure dates on the County website do not match the text message system.
- Cameron County and the Texas GLO have excessively closed HWY 4 for SpaceX during hours that should be made available to the public, such as Friday afternoons, Saturdays, and Sundays.
- It is difficult for the public to plan visits to Boca Chica Beach because the Cameron County website has an unclear calendar system for HWY 4 closures; the County will very often post announcements of several closure dates per week with multiple alternative

[58] As discussed in Ex. M, the Tribe regularly holds ceremonial life ways at Boca Chica Beach, which take place during the Quarter days (the equinoxes and solstices), and Cross-Quarter days (the midpoint between each solstice and equinox, such as mid-summer day), and typically involve between 20 and 30 of the Tribe's members, during which the members leave offerings of tobacco and pemican for ancestors at the beach.

closure dates and cancel some of the closures short notice. Thus, it would appear that the beach could be closed up to 5 times a week because of the alternate closure dates.

- **Harm from Increased Traffic**

The increased truck and employee traffic on SH4 associated with the proposed increased launch cadence would have a significant impact on the community, increasing what is already an intolerable situation that makes it difficult for people to visit public lands, causing similar concerns as closures of the area to accommodate SpaceX discussed above. The DTEA fails to note that the current level of traffic for SpaceX is already causing problematic traffic conditions, which will only be exacerbated by the increased launch cadence.

In the DTEA, the FAA asserts that the increase in truck traffic—from 6,000 to over 23,000 trucks per year—is not anticipated to alter the traffic conditions along SH-4. That is patently absurd. SH4 is a two-lane road and provides the only access to the Boca Chica area, and the Texas Department of Transportation (TDOT) has stated that traffic on that road is already an issue due to SpaceX's current operations. When asked if the Department has noticed an increase in traffic on SH-4, a TDOT Spokesperson said: "Oh, yes. It's unreal, the amount of traffic. And it's not just regular vehicular traffic. We've seen an increase in overweight, oversize, large trucks, rocket ships, all sorts of things that are coming into the area."[59]

This "tremendous increase" in traffic will only continue and become much worse with the proposed increase in launch cadence—with not only an additional 18,421 truck trips per year, or approximately 40 trucks every day accessing the site via SH 4, but also an increase in the amount and frequency of the nearly 3,000 staff and contractors that drive to the site (which may be well more, and which the DTEA fails to discuss). This will greatly exacerbate issues regarding traffic and public access to Boca Chica, including for the Tribe and environmental justice communities, children, people seeking recreational opportunities and for subsistence fishing, as well as for Refuge staff. Yet, the DTEA fails to address this important issue, rendering it inadequate.

In sum, the FAA's assertion that it does not anticipate that the increase in traffic would alter traffic conditions along SH4 is arbitrary and capricious, and this significant impact must be fully considered in an EIS.

- **Noise impacts on the community/structures**

The FAA has failed to take the requisite hard look at the impacts of noise from SpaceX's activities on the community, which are significant and must be fully addressed in an EIS. Noise

[59] *See* Ex. N. https://riograndeguardian.com/sh-4-is-the-road-that-leads-to-starbase-a-txdot-official-says-the-amount-traffic-using-it-is-unreal/. TDOT has also stated that the current level of use requires the entire roadway to be reconstructed, which is also not discussed in the DTEA.

from launches and landings has already caused damage and annoyance, which will be exacerbated by increasing the number of launches per year.

First, the noise modeling provided in the Appendix to the DTEA, which the FAA relies on for its conclusions regarding the impacts of noise from the proposed activities, is inadequate and misleading. As set forth in detail in the attached report from the Noise Pollution Clearinghouse (attached as Ex. O and incorporated by reference),[60] the noise modelling (which was done using a noise model that is not approved by AEE or the FAA) is flawed because it is premised on unrealistic and invalid assumptions about ground cover and impedance/noise absorption, with many areas that are water erroneously modeled as land, which resulted in flawed results regarding the noise levels that people in areas such as Port Angeles will be exposed to even more frequently if the proposed increased cadence is approved. The Noise Assessment also failed to provide confidence intervals; failed to consider landing noise and sonic boom noise from landings in the Gulf of Mexico; failed to assess the cumulative effects of the full-range of noise sources from the proposed activities (including the cumulative impacts of launch/landing and sonic boom noise); failed to consider the actual noise from sonic boom events (discussing only the overpressure from those events); relied on a supplemental noise metric (CDNL) and failed to use the applicable primary noise metric (the DNL 65 dB significance threshold); relied on outdated and insufficiently protective noise thresholds; ignored the impacts of low frequency noise from launches/landings and thereby ignored impacts to the community, including health impacts to children; misapplied and misrepresented the OSHA guidelines and ignored more useful guidelines from the EPA and WHO; and failed to adequately assess the impacts of noise from SpaceX's activities on children's health as well as on sleep interference. As a result of the many deficiencies, errors, and misrepresentations made in the Noise Assessment, the analysis of noise health impacts and land use compatibility (including for 4(f) properties), was flawed and inadequate. The DTEA failed to accurately quantify the noise levels and failed to accurately assess the noise impacts; thus, the FAA's conclusions regarding the impacts of noise in the DTEA are arbitrary and capricious. *See* Ex. O.

Regardless of the inadequacies of the modeling, the conclusions in the DTEA and the accompanying Noise Study regarding the potential for annoyance and harm to structures are also inconsistent with a recently published articles and studies on the impact of noise from SpaceX's launches. As discussed in a CHRON article attached at Ex. P,[61] people in the surrounding community have been complaining about the powerful noise from the Starship/Superheavy

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[60] Because the FAA and SpaceX did not make the data underlying the Noise Assessment publicly available, the report attached as Ex. __ is a preliminary assessment based on the information available in the DTEA and appendix. If the FAA does not address the issues set forth in the report and litigation over the arbitrary and capricious noise assessment is required, Commenters would seek to submit a more complete expert report after obtaining the underlying data.

[61] Available at https://www.chron.com/culture/article/spacex-starship-noise-study-19928851.php

launches, which they have compared to an earthquake. In fact, during the FAA's January 13, 2025, virtual public meeting, Rio Grande Valley residents discussed experiencing their houses shaking as far as 25 miles away from the VLA, with windows vibrating and concern about foundations cracking.

The CHRON article discusses a new noise Brigham Young University noise study, attached as Ex. Q, which found that one Starship launch produces the noise equivalent of four to six launches of NASA's Space Launch System or at least 10 Falcon 9 launches. Moreover, the study used noise measurements to determine that the impact of Starship can be felt from miles away, and that homes and businesses in Port Isabel and South Padre Island's south end have a risk of structural damage.

According to the study, the loudest part of the launch occurred during the return of the rocket's first stage booster to the launch site, which reached about 125 decibels in Port Isabel and South Padre Island. Researchers compared that sound to a gunshot recorded at 2 feet or like a firework at 500 feet. The study's author noted that such noise could bring implications such as sleep disruptions, alarms setting off and disruptions to wildlife populations; yet the DTEA fails to discuss this significant impact and how 25 launches per year will exacerbate exposure to annoying and disruptive noise.[62]

And the CHRON article notes that SpaceX and its activities have previously affected Texans' homes. South Texans near Boca Chica's launch site have bemoaned the noise, calling it "terrifying." A family living 10 miles from the facility said a sonic boom shattered a glass door at their home. Thus, noise from SpaceX activities has had, and will continue to have, significant impacts.

Likewise, in a CNN article discussing the same Brigham Young noise study (Ex. R),[63] a co-author of the Brigham Young noise study stated that the earsplitting sonic boom from the launch was "one of the loudest things [he'd] ever heard or experienced," and other experts stated that the sonic booms could cause problems for people in the surrounding community. And the article quotes the author of the Brigham Young noise study as saying that the measured sound levels were like being a few feet away from a gunshot without hearing protection, which risks structural damage as well as hearing loss.[64] The article notes that mitigation for this sonic boom noise is not really possible.

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[62] *See Hausrath v. U.S. Dep't of the Air Force*, 491 F. Sup. 3d 770 (D. Idaho 2020) (EA was arbitrary and capricious because it failed to take a hard look at potential interference with residents' sleep and speech and failed to adequately consider noise impacts on environmental justice communities).

[63] Available at https://www.cnn.com/2024/12/24/science/spacex-starship-sonic-boom/index.html

[64] The article also notes that past research has documented adverse effects from sonic booms on wild animals, citing a FWS document: EFFECTS OF AIRCRAFT NOISE AND SONIC

This is at odds with the FAA's determination in the DTEA that noise from SpaceX's activities is not likely to result in harm to the surrounding community. Rather, the noise is already causing significant impacts, which will only be exacerbated by increasing the launch cadence to 25 launches and nearly as many landings at the VLA per year.

Furthermore, the Brigham Young noise study—which was limited to noise monitoring of just one launch event and did not capture any data for test fires or present a cumulative noise assessment, and therefore did not capture the full impact of noise from SpaceX's activities but nonetheless raises some serious concerns indicating that much more needs to be done to study noise from SpaceX's activities—shows that measured sound levels *exceeded* what was predicted in the 2020 PEA, noting: "While the measured levels around 10 km are only 2 dB greater than the EA prediction, by 20 km this difference has grown to 4–5 dB. Most markedly, Station 8 (north Brownsville) measured a LZ max 9 dB greater than predicted in the EA." In fact, the study noted that the discrepancy between the measured sound levels and what was predicted in the PEA is one of the major results of the study, stating it showed a "shortcoming in the EA model's ability to handle changes in spectrum and level that occur during launch." The study likewise found that for sonic booms, "measured overpressure deviates appreciably from predictions," and concluded that "sonic boom overpressures around 10 km are 1–4 psf greater than modeled, with the possibility of exceeding 10 psf (0.48 kPa) and increasing structural damage claims." This confirms that the modeling that the FAA relied on is inadequate and must be revisited.

Continuing to rely on the same modeling here (without any reference to actual measured noise levels from the prior launches) is arbitrary and capricious. The DTEA fails to discuss the actual noise and overpressure levels that have occurred from Starship/Superheavy launches, and does not account for the discrepancies between the modeled predictions and actual noise levels, as set forth in the Brigham Young noise study. Therefore, the DTEA fails to take the "hard look" that NEPA requires. Rather than continuing to rely on the skewed analysis provided in the noise modeling conducted by SpaceX, the FAA should conduct an actual independent analysis, as part of an EIS, of the significant noise impacts of SpaceX's activities, as NEPA requires.

- **Sonic Boom Impacts on Noise-Sensitive Areas**

Regardless of the flaws with the Noise Assessment and the modeling discussed above—which failed to capture the actual impacts of noise from SpaceX's activities, including to noise-sensitive areas, because the noise analysis used the wrong land cover and failed to assess the cumulative impacts of noise, including the combined impacts of sonic booms, launches, and landings—it is readily apparent that sonic booms from Starship/Superheavy landings at the VLA will have significant impacts on noise-sensitive areas, and therefore an EIS is required to fully analyze the impacts of sonic booms.

BOOMS ON DOMESTIC ANIMALS AND WILDLIFE: A LITERATURE SYNTHESIS, available at https://www.fs.usda.gov/t-d/programs/im/sound_measure/Manci_et_al_1988.pdf.

The DTEA states that the significance threshold for sonic boom noise pursuant to FAA Order 1050.1F is exposure at or above 60 CDNL.[65] But that is not an accurate portrayal of the applicable threshold. Rather, Order 1050.1F states that noise is significant if it would *increase* the day-night average sound level (DNL) by "1.5 dB or more for noise sensitive areas that are exposed to noise at or above the DNL 65 dB noise exposure level, or that will be exposed at or above the DNL 65 dB level due to a DNL 1.5 dB or greater increase, when compared to the no action alternative."[66] The FAA therefore ignores that according to Order 1050.1F, merely drawing a circle around the 60 CDNL or DNL 65 dB (as the DTEA does) does not suffice, since it is the *difference* in additional noise that matters and thus "an increase from DNL 63.5 dB to 65 dB" would also be significant. No assessment is provided in the DTEA as to whether a 1.5 dB increase would occur from sonic booms in surrounding noise sensitive areas based on a DNL of 65 dBA. Thus, by basing its analysis on a circle around the 60 CDNL (or 65 dBA), the FAA fails to provide the analysis of noise impacts that the FAA's own Order requires.

And even *if* the 60 CDNL noise exposure can be represented by the DNL 65 dBA, as the FAA asserts without support, that is not sufficient to ensure that noise-sensitive areas are protected. The PEA, at 57, states that "the DNL 65 dB threshold does not adequately address the impacts of noise on visitors to areas within a national park or national wildlife and waterfowl refuge where other noise is very low and a quiet setting is a generally recognized purpose and attribute," so using the 65 DNL as a proxy for 60 dB CDNL is not sufficient to address noise levels to the types of noise sensitive areas most affected by SpaceX's activities, and the analysis is fundamentally flawed.

Moreover, the DTEA and accompanying noise study show that noise sensitive areas *would* experience noise above the significance threshold. Therefore, sonic boom noise impacts are "significant," and an EIS is required to fully analyze such impacts.

While the DTEA (at 30) asserts that no noise-sensitive areas are within the 60 dB CDNL contour, that is clearly erroneous. The DTEA acknowledges that the 60 dB CDNL "extends approximately 5 miles from the VLA," but then fails to acknowledge that state and federal wildlife refuge and

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[65] *See* DTEA at 29 ("Noise exposure from sonic booms that exceeds the significance threshold of C-weighted day-night average noise level (CDNL) 60 dBC for impulsive noise sources (equivalent to DNL 65 dBA) is a significant impact."). The DTEA, however, fails to provide any support for why the 60 CDNL—which is mentioned nowhere in the FAA Order 1050.1F—is "equivalent" to the DNL 65 dBA that *is* discussed as a significance threshold. The only citation provided to support the use of the 60 CDNL is a 2020 EA for the Falcon rocket program at the Kennedy Space Center, which does not provide any support for the methodology employed by FAA, which is not consistent with Order 1050.1F

[66] Order 1050.1F at 4-8.

park lands *are well-within 5-miles of the VLA*.[67] Therefore, noise sensitive areas *would* experience "significant" noise impacts form sonic booms.[68] Indeed, the 5-mile area around the VLA includes not only state park and National Wildlife Refuge lands, but also designated critical habitat for the piping plover, proposed critical habitat for the red knot, and ecologically critical habitat for other migratory birds protected under the MBTA. Thus, the impacts of sonic booms—which can harm and harass migratory birds that rely on Boca Chica in violation of the ESA and MBTA—are certainly significant.

This is illustrated by the July 2024 prior draft of the tiered EA for increasing the cadence of the Starship/Superheavy Launch Program, which found that noise sensitive areas *would* be impacted by 60 CDNL from sonic booms.[69] The revised DTEA reached the opposite conclusion (i.e., no significant impact from sonic booms); however, the agency has provided no explanation as to how/whether the noise levels have been materially reduced such that the impacts of sonic booms will no longer be significant for purposes of NEPA.

In fact, when you compare the map found at figure 12 of the sonic boom analysis in the July Draft with the revised DTEA, it is clear that the difference in the affected area is minimal, with the 60 dB CDNL area including a similar amount of park and refuge lands.[70] The DTEA provides

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[67] Noise-sensitive areas within 5-miles of the launch pad include portions of the Lower Rio Grande Valley National Wildlife Refuge, the South Bay Coastal Preserve, and Boca Chica State Park.

[68] *See* 2020 PEA at 56 (noting that pursuant to FAA Order 1050.1F, noise sensitive areas include "parks," and "wildlife and waterfowl refuges"); *Id.* at 54 ("Compatible land use analysis considers the effects of noise on special management areas, such as national parks, national wildlife refuges, and other sensitive noise receptors"). An FAA Advisory Circular regarding flight rules near noise-sensitive areas defines such areas as places where "noise interferes with normal activities associated with the area's use," and provides examples including "parks, recreational areas (including areas with wilderness characteristics), wildlife refuges, and cultural and historical sites where a quiet setting is a generally recognized feature or attribute." *See* Ex. S.

[69] *See* Ex. T at 21 ("Noise-sensitive areas are within the 60 dB CDNL contour within the US. Noise sensitive areas within the 60 dB CDNL would experience significant noise impacts under the FAA's current 60 dB CDNL significance threshold.").

[70] As discussed, these park and refuge lands are critical to protected wildlife. According to the CNN article at Ex. R, FWS research has shown that sonic booms *can* adversely affect wildlife, and yet the FWS apparently does not have sonic boom monitoring equipment near the Starship launch site in Texas, even though it does collect data about sonic boom impacts emitted from Falcon rockets in Florida and California. This begs the question of why such monitoring is not taking place in Boca Chica when the VLA is so close to ecologically critical habitat, and also why the data collected in Florida and California is not being used in the DTEA to fully analyze the impacts of sonic booms on wildlife. The failure to include that information renders the DTEA arbitrary and capricious. The article in fact notes that the impacts of sonic booms led local officials in California to move to limit the number of launches that SpaceX carries out, calling

no information that would suggest that this small difference has somehow changed the determination regarding the significance of the impacts of sonic booms. Rather, it appears that the affected area is nearly the same, and that noise-sensitive park and refuge lands are still within the 60 dB CDNL. Thus, the impacts of sonic boom noise are significant, and an EIS is required.

E. The FAA failed to adequately consider SpaceX's contribution to the climate crisis

NEPA requires that federal agencies consider the reasonably foreseeable direct and indirect impacts of their actions, even if the extent of these impacts is not known, which necessitates a consideration of climate impacts.[71] Climate impacts are an indirect result of the proposed SpaceX activities, and therefore must be considered in the NEPA analysis.[72] However, the FAA has failed to adequately analyze the impacts of SpaceX's emissions on the environment, which will be compounded by increasing the number of launches.

The DTEA's analysis of climate impacts is inadequate, as it does not consider all of the sources of emissions associated with the project. While the DTEA discusses methane emissions and increased truck traffic, it fails to provide the full scope of the climate impacts associated with SpaceX's activities, because it never discusses the emissions associated with fracking and processing the natural gas to supply the fuel for the rockets. It also failed to discuss the types of trucks that would be used for the 23,771 truck trips per year, and how far they would be travelling. Vehicle emissions are a significant contributor to climate change, yet the DTEA provides almost no analysis of the actual emissions that would result from the thousands of vehicles associated with SpaceX's activities. And the FAA ignored emissions from anomalies, which could result in significant methane releases. Therefore, even though the FAA has now included a social cost of carbon assessment, that analysis is woefully incomplete because it does not consider all of the contributions to climate change.

The FAA's failure to address where the methane fuel is coming from, how it will be shipped, and the upstream impacts associated with fracking or other methods required to obtain the fuel needed for SpaceX rockets and infrastructure is alarming. Immediate, deep reductions in methane emissions are critical for lowering the rate of global warming in the near-term, preventing the crossing of irreversible planetary tipping points, and avoiding harms to species and ecosystems from methane's intensive near-term heating effects and ground-level ozone

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into question the FAA's decision here to allow even more launches/landings with sonic boom without fully analyzing the impacts in an EIS.

[71] *See* 42 U.S.C. § 4332(2)(C), 40 C.F.R. § 1508.8.

[72] *See Center for Biological Diversity v. Bernhardt*, 982 F.3d 723, 736 (9th Cir. 2020) (holding GHG emissions are a 'reasonably foreseeable' indirect effect).

production.[73] Methane is a super-pollutant 87 times more powerful than CO_2 at warming the atmosphere over a 20-year period,[74] and is second only to CO_2 in driving climate change during the industrial era.[75] Methane also leads to the formation of ground-level ozone, a dangerous air pollutant that harms ecosystems and species by suppressing plant growth and reducing plant productivity and carbon uptake, which the PEA and DTEA failed to consider.[76]

Because methane is so climate-damaging but also comparatively short-lived with an atmospheric lifetime of roughly a decade, cutting methane has a relatively immediate effect in slowing the rate of temperature rise in the near-term. Critically, deep cuts in methane emissions of ~45% by 2030 would avoid 0.3°C of warming by 2040 and are considered necessary to achieve the Paris Agreement's 1.5°C climate limit and prevent the worst damages from the climate crisis.[77] Deep cuts in methane emissions that reduce near-term temperature rise are also critical for avoiding the crossing of planetary tipping points—abrupt and irreversible changes in Earth systems to states wholly outside human experience, resulting in severe physical, ecological and socioeconomic harms.[78] The FAA's failure to fully consider the implications of SpaceX's activities, particularly when those activities will result in significant emissions, is a clear violation of NEPA.

The FAA provides no real analysis in the DTEA as to the impacts the proposed SpaceX activities would have on our climate and how such changes will impact people and the environment, instead claiming that the emissions will not be significant, based only on comparing SpaceX to

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[73] United Nations Environment Programme and Climate and Clean Air Coalition, Global Methane Assessment: Benefits and Costs of Mitigating Methane Emissions, Nairobi: United Nations Environment Programme (2021) [hereinafter Global Methane Assessment], https://www.unep.org/resources/report/global-methane-assessment-benefits-and-costs-mitigating-methane-emissions, at 11.

[74] Myhre, G. et al., Anthropogenic and Natural Radiative Forcing. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F. et al. (eds.)] (2013), *available at* https://www.ipcc.ch/report/ar5/wg1/ at Table 8.7.

[75] Global Methane Assessment at 11.

[76] *Id.* at 11, 69.

[77] *Id.* at 11.

[78] Hoegh-Guldberg, O. et al., Impacts of 1.5°C Global Warming on Natural and Human Systems, In: Global Warming of 1.5°C, An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V. et al. (eds)] (2018), https://www.ipcc.ch/sr15/chapter/chapter-3/, at 262.

the total GHG emissions of the US.[79] However, the emissions from SpaceX are certainly not discountable, and the FAA's approach ignores that every contribution of GHGs to the atmosphere causes cumulative harm. Ignoring the incremental contribution of a project like SpaceX will only lead to death by a thousand small cuts, which the FAA has failed to properly consider.[80]

Moreover, this approach to analyzing climate impacts has been deemed inadequate by the CEQ, which provided interim climate guidance in January of 2023 stating that making comparisons of GHG emissions between a specific project and the U.S. or a State does not provide the hard look that NEPA requires. CEQ warned agencies that:

> NEPA requires more than a statement that emissions from a proposed Federal action or its alternatives represent only a small fraction of global or domestic emissions. Such a statement merely notes the nature of the climate change challenge, and is not a useful basis for deciding whether or to what extent to consider climate change effects under NEPA. Moreover, such comparisons and fractions also are not an appropriate method for characterizing the extent of a proposed action's and its alternatives' contributions to climate change because this approach does not reveal anything beyond the nature of the climate change challenge itself—the fact that diverse individual sources of emissions each make a relatively small addition to global atmospheric GHG concentrations that collectively have a large effect. Therefore, when considering GHG emissions and their significance, agencies should use appropriate tools and methodologies to quantify GHG emissions, compare GHG emission quantities across alternative scenarios (including the no action alternative), and place emissions in relevant context, including how they relate to climate action commitments and goals. This approach allows an agency to present the environmental and public health effects of a proposed action in clear terms and with sufficient information to make a reasoned choice between no action and other alternatives and appropriate mitigation measures. This approach will also ensure the professional and scientific integrity of the NEPA review.[81]

The FAA, however, failed to follow this guidance and summarily dismissed this important issue based on a comparison of SpaceX's emissions with the U.S. and Texas. This is clearly not the "hard look" that NEPA requires.

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[79] DTEA at 22-25.

[80] *See Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Admin.*, 538 F.3d 1172, 1216-17 (9th Cir. 2008) (holding that, under NEPA, agencies must "discuss the *actual* environmental effects resulting from . . . emissions").

[81] CEQ, 88 Fed. Reg. 1196, 1201.

And the amounts of CO2e at issue are not insignificant. Indeed, emissions from the proposed increased in cadence would be well more than double what was previously analyzed, with 97,342 metric tons of CO2e being emitted through launches and venting. According to the EPA's GHG equivalency calculator, that is equal to the GHGs of 22,706 gas-powered vehicles driven for an entire year, or 108,128,944 pounds of coal burned per year.[82] The FAA's analysis simply ignores that every increase in emissions matters given the current climate crisis.

Rather than provide an actual analysis of the contribution of SpaceX's emissions to the climate crisis, the DTEA attempts to use false equivalencies and unsupported and/or irrelevant claims regarding emission reductions to suggest that the proposed activity would not contribute to climate change. For example, regarding the impacts of GHG emissions from truck traffic, the DTEA states that EPA regulations for engines and fuels "will cause vehicle GHG emissions to decline significantly over the next several decades."[83] Not only is that statement vague and unsupported, but it is irrelevant given the proposed action and the associated truck traffic – with 23,771 truck trips per year – is to take place over a 5-year period, rendering any changes over "several decades" meaningless. Rather, the FAA must assess the impacts from truck traffic that will take place now, under existing conditions, which the DTEA fails to do.

The DTEA (at 23) then goes on to make an irrelevant comparison between GHG emissions and the social cost of carbon with supposed offsets from purported benefits that have nothing to do with climate, such as job creation and U.S. competitiveness in the global launch market. But that is not a valid assessment of climate impacts. The FAA is free to weigh benefits and adverse impacts in its decision-making, but it should not color the analytical discussion of effects under NEPA with SpaceX's irrelevant view of the advantages of its presence in the community.

In sum, the FAA's failure to consider the human health and environmental impacts of SpaceX's emissions in the context of the current climate crisis renders the FAA's analysis arbitrary and capricious.

F. Expanded Landing Area for Starship

The DTEA (at 11) states that SpaceX is proposing to expand the potential landing site for Starship in the Pacific Ocean near Hawaii and the northeast and southeast Pacific Ocean. Figures 4 and 5 in the DTEA show significantly expanded areas compared to what was presented in the 2022 PEA (*See* 2020 PEA at 22) and associated 2022 NMFS Biological Opinion (at figure 5).

[82] https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

[83] DTEA at 23.

However, in the FAA's April 2023 Written Reevaluation, is states that Space X proposed to increase the landing area about 155 miles north of the area near Hawaii initially described in the 2022 PEA and also proposed an area southwest of Hawaii for potential Starship debris fields. Yet, in the Final Tiered Environmental Assessment for Space X Starship Super Heavy Landings in the Indian Ocean, it states that "SpaceX considered other potential landing areas in the Atlantic and Pacific Ocean; however, no areas were able to meet all of the combined elements including optimization of launch trajectories, specific vehicle flight testing objectives, mission timelines and planning flexibility." And in fact, to date, all landings have been in the Gulf of Mexico or the Indian Ocean.

Nothing in the current DTEA explains why these expanded landing areas in the Pacific Ocean have now become viable. The DTEA presents no analysis of the effects of Starship landings and debris in these areas. Further, there has there been no identified outreach to the Office of Hawaiian Affairs or, in fact, any State of Hawaii agency or entity, or any specific notice and consultation with the Hawaiians.

The proposed expansion area clearly could have impacts on both the Papahānaumokuākea Marine National Monument (the largest contiguous marine reserve in the U.S.)[84] and the Pacific Islands Heritage Marine National Monument (home to the most undisturbed coral reef within the United States, complete with a greater proportion of apex predators (sharks and jacks) than any other studied coral reef ecosystem in the Pacific),[85] areas of enormous ecological and cultural importance, including hitherto undisturbed seamount communities, numerous endangered species and migratory bird species, and both ancient archaeological sites and areas of vital present importance to Pacific Islanders. But again, there is no evidence of consultation with the Monument managers, and no analysis of these impacts in the DTEA. The complete omission of any effects analysis and consultation regarding this proposed expansion is shocking. A full

[84] The 1,350 mile stretch of coral islands, seamounts, banks and shoals of the Monument supports an incredible diversity of coral, fish, birds, marine mammals and other flora and fauna, many of which are unique to the Hawaiian Island chain. Many of the islands and shallow water environments are important habitats for rare species such as the threatened green turtle and the endangered Hawaiian monk seal, as well as the 14 million seabirds representing 22 species that breed and nest there. Land areas also provide a home for four species of bird found nowhere else in the world, including the world's most endangered duck, the Laysan duck.

[85] Many nationally and internationally threatened, endangered, and depleted species thrive in the Monument, including sea turtles, pearl oysters, giant clams, reef sharks, coconut crabs, fish, and dolphins, as well as providing important seabird and migratory shorebird habitat. Both Palmyra Atoll and Kingman Reef support higher levels of coral diversity (180–190 species) than any other atoll or reef island in the central Pacific. The DTEA failed to address the potential for impacts to these sensitive species.

analysis of the environmental and related cultural, social and economic effects of this expansion of landing areas in the Pacific and near Hawaii must be included in an EIS.

G. Failure to Consider Cumulative Effects

The FAA's failure to fully analyze the significant environmental impacts of the SpaceX Starship/Superheavy Launch Program, and in particular how increasing the cadence to 25 launches per year will exacerbate those impacts as discussed above, also means that the agency has failed to fully analyze the cumulative effects of the proposed action.

As discussed, the noise and lighting from SpaceX's activities cause significant harassment of wildlife, including protected species. And the heat from the rocket plumes and the impacts of deluge water runoff, along with fires and debris from anomalies, harms the habitat that the same wildlife relies on. The FAA, however, has failed to consider the synergistic effects of these impacts—whereby imperiled and protected birds are repeatedly harassed while their habitat is disturbed—including how that might affect the ability of migratory birds to continue to utilize this ecologically critical area. Further, as noted earlier, the DTEA fails to adequately identify and discuss the feasibility and likelihood of success of mitigation measures and thus cannot be relied upon to assume that the significant cumulative adverse impacts will (or even can) be mitigated to levels of insignificance.[86]

Now, SpaceX proposes a drastic increase in those impacts, exacerbating both the intensity (i.e., increased noise and heat from more powerful rockets) and the frequency of impacts from more launches/landings. There can be no doubt that the increased cadence will cause more frequent harassment of wildlife, with less time between launches for recovery. This will stress wildlife, causing them to expend energy by forcing them off the habitat areas they rely on, even as those areas are damaged and diminished.[87] The FAA's failure to consider the cumulative effects of harassment and habitat loss in this ecologically critical area from the proposed increase in launch cadence is arbitrary and capricious.

Furthermore, the DTEA fails to address the cumulative effects of several nearby LNG facilities, such as the Rio Grande LNG and Next Decade LNG and other such facilities that are planned, in

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[86] *See O'Reilly v. U.S. Army Corps of Engineers*, 477 F. 3d 225, 235 (5th Cir. 2007); *Town of Cave Creek v. FAA*, 325 F.3d 320, 327 (D.C. Cir. 2003) (an EIS is only unnecessary where "'changes or safeguards in the project sufficiently reduce the impact to a minimum'").

[87] *See e.g.* DTEA at 46-47 stating that plant cover has already been lost. The DTEA also states that SpaceX plans to eventually expand the VLA and develop the area south of the existing pad boundary, which will lead to further habitat loss and harm from noise and lighting, which also adds to the cumulative effects of SpaceX's activities, but the DTEA fails to take that into account.

construction, or operating – several of which are very close to the Space X facility. These LNG projects have similar impacts on wildlife from construction noise, lighting, habitat loss and the potential for catastrophic harm from an anomaly/spill, and the failure to address how these other projects contribute to cumulative environmental effects is a violation of NEPA.

H. Alternatives Analysis

The FAA appears to have blindly accepted SpaceX's unsupported claim that 25 launches per year at Boca Chica is necessary to support SpaceX's purported purpose and goals, and has thereby ignored obvious alternatives that should have been fully considered, as NEPA requires. While *some* redundancy in launch facilities may be useful as the DTEA claims, that does not mean that 25 launches per year at Boca Chica is the *only* viable alternative, and the FAA's failure to fully analyze any other alternative is a blatant violation of NEPA.[88]

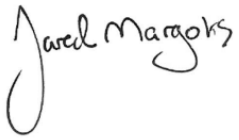
There is simply no compelling reason provided for the sudden need to drastically increase the launch cadence at Boca Chica. There is absolutely nothing provided in the DTEA to show that the Starship/Superheavy launch program could not be spread out amongst the other locations that SpaceX has access to or is currently developing (tellingly, with an EIS in every other instance). There is also nothing to show that the purpose or goal of the program has changed since it was first proposed at 5 Starship/Superheavy launches per year. Merely claiming, without support, that a lower cadence would not allow for the launch capacity needed for the program does not support 25 launches per year, especially given SpaceX proposed only 5 launches per year for the *same program* not so long ago. Thus, the FAA's failure to consider an alternative with fewer launches per year (and with seasonal restrictions to protect wildlife), which would reduce the significant impacts of SpaceX's activities, was arbitrary and capricious.

I. Conclusion

SpaceX's activities at the Boca Chica site continue to have significant adverse impacts on surrounding habitat and the wildlife that relies on those areas, including federally protected species, as well as the community. Those impacts have not been adequately analyzed by FAA or mitigated by SpaceX. An EIS is required before the FAA can permit *any* further activities, including the proposed increased cadence. *See Ocean Advocates v. U.S. Army Corps of Eng'rs*, 402 F.3d 846, 864-65 (9th Cir. 2005) (an EIS must be prepared if there are "substantial questions" regarding whether the proposed action may have significant impacts); *Town of Cave Creek v. FAA*, 325 F.3d 320, 327 (D.C. Cir. 2003) (an EIS is only unnecessary where "'changes or safeguards in the project sufficiently reduce the impact to a minimum'"). Please contact me if you have any questions regarding these comments.

[88] *See* 40 C.F.R. § 1502.14 (The alternatives analysis is the heart of the NEPA process).

Sincerely,



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CC. FAA-2024-2006-2520-A1

Comment Response

Wildlife Protection and ESA Compliance

While SpaceX operations may attract visitors to the region, general public visitation, tourism, and any associated environmental impacts are not regulated by the FAA and are managed under local and state jurisdiction. However, the Final Tiered EA does acknowledge potential habitat disturbances from launch-related activities, and mitigation measures have been established to minimize direct operational impacts. Public access restrictions are enforced during launch and recovery operations, preventing immediate disturbance to habitats and wildlife during critical phases of the mission. Any potential effects from public access would fall under the jurisdiction of land management agencies, including TPWD, USFWS, and local authorities, which regulate public land use, enforce conservation measures, and manage habitat protection efforts.

The ESA consultation documents (Final Biological Assessment and Final Biological Opinion) are included in Appendix A of the Final Tiered EA and posted to the project website. At the time the Draft EA was issued to the public these documents were not available because consultation was ongoing. Though the Draft EA explicitly stated in the Biological Resources section the consultation was ongoing and the draft USFWS BA was not provided, the draft EA mistakenly stated in one location (page 5) that the USFWS BA was attached in Appendix A.

The Final Tiered EA evaluates lighting impacts based on current data and incorporates feedback from expert wildlife agencies, including USFWS and the NMFS. Mitigation measures, such as shielding and minimizing the use of artificial lighting during nesting seasons, have been identified to reduce lighting impacts.

The increase in false crawls and unanticipated take cited in the Final Tiered EA reflects ongoing monitoring efforts and collaboration with expert agencies. The Final Tiered EA incorporates updated information and monitoring data to assess cumulative effects and refine mitigation measures. As described in the EA, the increased cadence would raise the number of possible nighttime launches from two per year to three per year. However, SpaceX will cease nighttime static fire tests. Monitors from Sea Turtle, Inc. actively search for and collect sea turtle eggs on Boca Chica Beach, reducing the potential for on-beach hatching and associated disorientation risks. SpaceX works with Sea Turtle Inc, offering volunteers to assist and support the searches, recoveries, and rescue missions of sea turtles on Boca Chica Beach. Available monitoring data does not indicate that VLA activities have increased false crawls or caused hatchlings to become stranded in the dunes. Recent monitoring data show an increase in detections of green sea turtle false crawls in 2022 and 2023 compared to the estimates in the May 2022 Biological Conference Opinion. This has led to adjustments in the incidental take metric to reflect increased monitoring frequency. As stated in Final Tiered EA Section 3.2.8.1, lighting can adversely affect sea turtles; however, available data does not indicate a direct correlation between beach lighting and false crawls (Byrd 2022). To address potential impacts, SpaceX has committed to mitigating lighting and activity-related risks including shielding lights and ceasing nighttime static fires. The increased cadence will not reduce access to Boca Chica Beach for sea turtle monitoring efforts. While data does not show that additional incidental take is reasonably certain to occur, the FAA has adjusted incidental take metrics to accommodate enhanced monitoring.

The Final Tiered EA explicitly acknowledges that the increased launch cadence may result in increased harassment of species, including piping plovers, red knots, and additional listed bird species not previously analyzed in the 2022 Programmatic Environmental Assessment (PEA). However, the FAA has not simply stated that impacts will be "similar" without further consideration. Instead, FAA reinitiated consultation with USFWS under Section 7 of the Endangered Species Act (ESA) to ensure that the most current data and potential mitigation measures are incorporated into the analysis. The ESA consultation documents (Final Biological Assessment and Final Biological Opinion) are included in Appendix A of the Final Tiered EA and posted to the project website. At the time the Draft EA was issued to the public these documents were not available because consultation was ongoing. Though the Draft EA explicitly stated in the Biological Resources section the consultation was ongoing and the draft USFWS BA was not provided, the draft EA mistakenly stated in one location (page 5) that the USFWS BA was attached in Appendix A. But because all effects remain intermittent, there is no evidence of permanent harm to any species, and the USFWS has determined the Proposed Action would not jeopardize federally listed species or result in destruction or adverse modification of designated critical habitat, the impacts do not meet FAA's significance criteria (see response to comment FAA-2024-2006-10521-A1 under Noise for explanation of FAA's significance criteria).

The Final Tiered EA recognizes that the expansion of the rocket plume footprint due to increased thrust may alter the extent of heat exposure compared to what was previously analyzed in the 2022 PEA. The potential for direct mortality from the rocket plume has been evaluated and there is no evidence that species present in the area are within the direct impact zone at the time of launch. The heat and force from the rocket plume are concentrated in a confined area near the launch site, where species are unlikely to be present. Birds are likely to flush and then quickly return to normal behavior, and no injured or dead birds being found during post-launch surveying. During nesting season, when nests are near the VLA and eggs are present in the nest, sand may be displaced due to the thrust of the rocket and could impact the eggs. Incidental impacts may occur; however, this is expected to be intermittent and rare. SpaceX is actively working with USFWS to determine methods to reduce these impacts through adaptive management. The increased launch cadence means that such disturbances will occur more frequently, and additional mitigation measures are being coordinated with USFWS to minimize impacts. But because all effects remain intermittent, and there is no evidence of permanent harm to any species, the effects are not considered significant under NEPA.

The comment suggests that the absence of observed mortality does not mean that deaths have not occurred due to scavenger activity or delayed access to the site for post-launch monitoring. But the absence of observed mortality is not evidence of a significant effect. In fact, the monitoring methods used account for the possibility of scavenger activity or delayed access by conducting pre- and post-launch species surveys to assess population changes, coordinating with USFWS to refine survey timing to improve detection of potential wildlife impacts, and evaluating indirect evidence of species presence and disturbance indicators, such as tracks, nesting activity, and habitat conditions. The Final Tiered EA does not ignore the potential for cumulative harassment due to the increased launch cadence. Rather, the Final Tiered EA explicitly considers these effects, including: the potential for repeated displacement of species from designated critical habitat areas, the potential effects of cumulative stress on listed species and their ability to use essential habitat resources. As the Final Tiered EA explains, none of these effects are considered significant.

Section 3.2.8 of the Final Tiered EA addresses the potential for direct harm and harassment from the rocket plume, including potential mortality and behavioral disturbance (harassment) of species. The FAA acknowledges that increased launch cadence may result in more frequent disturbances and addressed this through Section 7 consultation with USFWS to refine mitigation measures. Additionally, post-launch monitoring and habitat assessments are incorporated to evaluate cumulative effects.

The Final Tiered EA acknowledges potential lighting impacts on federally listed species and outlines mitigation measures to minimize disturbance. SpaceX has implemented shielded lighting, reduced-intensity lighting, and operational restrictions to mitigate artificial light exposure, particularly for species like sea turtles and migratory birds that are sensitive to nighttime illumination.

The FAA recognizes that an increase in annual launches will increase noise exposure events. However, the Final Tiered EA accounts for all noise sources, including launch events (primary high-intensity noise source), engine testing and static fires (evaluated for localized and temporary noise exposure), and construction activities (assessed separately in the cumulative impacts analysis). While noise events will occur more frequently, the FAA's assessment relies on established acoustic modeling. This analysis supports the conclusion that noise remains an intermittent, rather than continuous, disturbance, particularly because launch noise is of short duration and does not create persistent ambient noise increases. Testing and construction generate lower noise levels than launch events and have been considered in the cumulative effects assessment. The Final Tiered EA does not dismiss or ignore noise-related harassment; rather, it evaluates the expected behavioral responses of species based on best available science and the Section 7 consultation with USFWS. The claim that an Environmental Impact Statement (EIS) is required due to noise-related harassment is not supported. The FAA has followed proper NEPA procedures by assessing the effects of increased noise frequency and determining that mitigation measures can reduce potential adverse effects below the level of significance, conducting Section 7 consultation to ensure compliance with ESA requirements and implementing species-specific mitigation strategies (as described in the Biological Opinion), and evaluating cumulative effects, including construction and testing noise, within the broader environmental review.

The claim that the FAA has failed to integrate its ESA consultation with NEPA review under 40 C.F.R. § 1502.24 mischaracterizes the process. The regulation requires agencies to ensure that scientific and environmental analyses are appropriately incorporated into NEPA documents, but it does not mandate that all consultation documents be completed prior to the issuance of a draft NEPA analysis. The ESA consultation documents (Final Biological Assessment and Final Biological Opinion) are included in Appendix A the Final Tiered EA and posted to the project website. At the time the Draft EA was issued to the public these documents were not available because consultation was ongoing. Though the Draft EA explicitly stated in the Biological Resources section the consultation is ongoing and the draft USFWS BA was not provided, the draft EA mistakenly stated in one location (page 5) that the USFWS BA was attached in Appendix A. The FAA is fully complying with these requirements. Furthermore, the Final Tiered EA does not rely solely on a summary table to assess impacts, as suggested. Rather, it provides a preliminary analysis of the expected effects while acknowledging the need for additional coordination with FWS. FAA reinitiated consultation with USFWS, incorporated updated impact assessments and committed to additional conservation measures to minimize harm. The Final Tiered EA sufficiently addresses reasonably foreseeable impacts under NEPA, and additional findings from the ESA consultation will be integrated into the final decision-making process. Final Tiered EA Table 6 acknowledges that certain species may experience adverse effects, as determined under the ESA Section 7 consultation process. Under NEPA,

significance determinations consider, among other things, whether mitigation measures can effectively reduce adverse effects below significance thresholds. The FAA, in coordination with USFWS have developed additional mitigation strategies which are outlined in the Final Biological Opinion (BO).

The Final Tiered EA appropriately tiers from the 2020 PEA and includes updated analyses of potential environmental impacts, including those to migratory birds. The FAA has also incorporated new data and feedback from USFWS and other stakeholders to ensure a thorough and robust review of potential environmental impacts under the Proposed Action. SpaceX's activities must comply with all applicable environmental laws, including the MBTA, as a condition of its FAA launch license. As described in the EA, 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 prelaunch 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 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).

The Final Tiered EA considers the reasonably foreseeable impacts of the Proposed Action, including potential effects on wildlife. Compliance with all applicable laws, including the MBTA, is a requirement for SpaceX operations. The MBTA is a strict liability statute that prohibits the take of migratory birds, including harm, disturbance, or destruction of nests and eggs, without explicit authorization. Unlike the Endangered Species Act (ESA), the MBTA does not provide an incidental take permit mechanism, meaning there is no formal authorization process for unintentional take. However, the U.S. Fish and Wildlife Service (USFWS) has issued guidance under Director's Order No. 225, Section 5, outlining the USFWS's policy regarding enforcement and implementation of measures to reduce the risk of enforcement actions. The FAA has assessed the potential impacts to migratory birds along with the minimization and mitigation measures in the Final Tiered EA and USFWS BA that avoid and minimize these impacts, and has determined that the measures align with USFWS's guidance and policy on MBTA compliance. SpaceX remains responsible for ensuring its activities comply with the MBTA. The assertion that the FAA has not previously analyzed potential debris impacts to bird nests is not accurate. The 2022 PEA acknowledged the potential for debris to affect wildlife in the event of an anomaly but determined that the likelihood of direct wildlife strikes was very low. The June 6 launch resulted in some observed effects from sand displacement. As described above, during nesting season, when nests are near the VLA and eggs are present in the nest, sand may be displaced due to the thrust of the rocket and could impact the eggs. Incidental impacts may occur; however, this is expected to be intermittent and rare. SpaceX is actively working with USFWS to determine methods to reduce these impacts through adaptive management. Further, the FAA has outlined in the Final Tiered EA that additional mitigation measures are under consideration, including monitoring and experimental protective techniques for nesting birds.

The FAA remains committed to collaborating with USFWS, to ensure these measures are effective.

FAA reinitiated consultation with the NMFS to ensure that potential impacts, including those from overpressure events, are properly assessed. The Final Tiered EA acknowledges overpressure events are likely to adversely affect protected species in the Gulf of Mexico (now Gulf of America) and Atlantic. The FAA's determination that the risk of fallen objects or hazardous materials affecting federally listed species is discountable is supported by NMFS, which concurred with this assessment in its Biological Opinion (BO). NMFS, as the expert agency responsible for marine species protection, agreed that the potential impacts

are not likely to adversely affect ESA-listed species. This conclusion is based on the large dispersal area, the low probability of marine species being in the impact zone at the time of an event, and the rapid dilution and breakdown of residual propellant in the marine environment, reducing exposure risks. Additionally, SpaceX's debris monitoring and recovery protocols further minimize the likelihood of long-term impacts, reinforcing the determination that potential effects remain below significance thresholds (see response to comment FAA-2024-2006-10521-A1 under Noise for explanation of FAA's significance criteria)..

Noise and Sonic Boom Assessment

The Federal Aviation Administration (FAA) has conducted a comprehensive analysis of the noise impacts associated with SpaceX's activities, utilizing the RNOISE model, 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 that certain limitations exist, such as the assumption of uniform ground elevation, which may lead to minor overpredictions of noise levels in areas with significant terrain variations. However, these conservative estimates 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.

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 be occur with an increased launch rate. SpaceX has collected monitoring data on launch and landing noise levels, and the monitoring data was determined to be in alignment with model predictions. The FAA uses both Day-Night Level (DNL) and C-weighted Day-Night Level (CDNL) metrics to ensure a comprehensive assessment of noise impacts. DNL (A-weighted) is the standard metric used to assess long-term community noise exposure, particularly for continuous sources like airport operations. CDNL (C-weighted) is more appropriate for assessing impulsive noise events like rocket launches, as it accounts for low-frequency energy, which is more prominent in launch noise and can cause vibrations and structural responses. Using CDNL in addition to DNL ensures that both general noise exposure and low-frequency noise impacts are accurately assessed, providing a more complete evaluation of potential community impacts.

The Final Tiered EA discusses the probability of structural damage using standard methodologies, including the Fenton and Methold criteria, which assess the likelihood of damage based on overpressure levels. Measured sonic boom overpressures from Starship launches are below the levels typically associated with structural damage. While localized (south of the Port of Brownsville) damage to windows or doors is possible in rare cases, the probability remains low. As described in the EA, the 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. The comment

refers to the data collection efforts of 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 data and BYU's measurements are in family 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 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).

As described in the Final Tiered EA Section 3.2.3.5, FAA Order 1050.1F defines a significant noise impact as a DNL increase of 1.5 dB or more in areas that are already at or exceed DNL 65 dB or would be newly exposed to this threshold. CDNL 60 dB is used for assessing impulsive noise sources such as sonic booms, as it accounts for the low-frequency components of blast noise that are not well represented by the A-weighted DNL metric. CDNL 60 dB is considered functionally equivalent to DNL 65 dB based on previous FAA environmental analyses, including the 2020 Environmental Assessment (EA) for Falcon rocket operations at Kennedy Space Center, and is a conservative threshold for assessing significant noise impacts. The Final Tiered EA evaluates both DNL and CDNL contours to ensure compliance with FAA's NEPA significance criteria and determine whether additional mitigation is required.

South Padre Island is a high-activity tourist area, with fireworks displays, concerts, boat traffic, and aviation noise contributing to existing background levels—particularly in the summer months. The Port of Brownsville and surrounding industrial areas also generate substantial noise, including ship traffic, heavy machinery, and roadway noise from SH-4. The beach itself is naturally loud, with wind, surf, and human activity contributing to an elevated background noise environment that is not reflected in a zero-baseline assumption. The areas experiencing the highest noise exposure during launch events are closed to the public for safety reasons, meaning no one is present to experience the peak noise levels at those locations. Wildlife refuge and park lands within the CDNL 60 dB contour are subject to temporary closures during launches, mitigating direct exposure for visitors.

The FAA acknowledges that noise impacts from the proposed increase in launch cadence will occur more frequently due to the higher number of annual launches. However, noise from individual launches remains temporary and of short duration, consistent with findings from prior analyses, including the 2022 PEA. The Final Tiered EA considers the increased frequency and evaluates the cumulative impacts accordingly. The Final Tiered EA acknowledges the relocation of Launch Pad B since the publication of the 2022 PEA and analyzes the impacts associated with the updated location. The FAA has determined that the noise impacts from operations at Launch Pad B are consistent with those previously analyzed. The assessment considers cumulative impacts from all operations, including those associated with the increased launch cadence. While the impacts may occur more frequently, they remain temporary and intermittent.

The FAA recognizes that an increased launch cadence means more frequent exposure to vibrations. However, the assessment considers the short duration of each event and concludes that vibrations are not continuous or persistent in a way that would lead to sustained habitat degradation. The Final Tiered EA acknowledges potential impacts and evaluates them using available data on wildlife responses to similar activities, ensuring that conclusions are based on scientific evidence and regulatory guidance. . The FAA has reinitiated Section 7 consultation with USFWS to ensure that vibration-related impacts are properly assessed and mitigated, including refining monitoring protocols to assess species responses to launch-related vibrations and considering additional protective measures for sensitive nesting areas.

Deluge Water and Surface Water Impacts

The Final Tiered EA evaluates the potential environmental impacts of the deluge water system, including the volume of water discharged and its chemical composition. The analysis concludes that the deluge water volume is comparable to natural precipitation events in the region and is unlikely to result in significant habitat alteration. The source water uses potable water, does not undergo any industrial processes, and sampling data from initial launches indicate that water runoff did not contain harmful concentrations of metals or chemicals, suggesting that the deluge water system, as currently designed, does not pose a significant risk to surrounding habitats or wildlife. The steel plate of the deluge system is designed to withstand the intense conditions of launch operations, and any potential for material ablation or contamination will continue to be monitored according to the EA. SpaceX has committed to ongoing sampling and analysis of deluge water runoff to assess the potential for metals or other contaminants over time. The FAA has coordinated with the Texas Parks and Wildlife Department (TPWD) and other relevant agencies to evaluate potential impacts of the deluge water system on habitats and wildlife. While TPWD has expressed concerns about potential impacts, ongoing monitoring and mitigation measures are designed to address these concerns. The Final Tiered EA includes measures to ensure runoff is properly managed and does not adversely affect the surrounding environment, including water sampling, sediment control, and habitat monitoring. The FAA has evaluated the potential impacts of the deluge water system based on the best available data and scientific analysis Initial sampling has not identified significant risks.

While the FAA does not administer the Texas Pollutant Discharge Elimination System (TPDES) permit process, the permitting process overseen by TCEQ 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 TPWD raises concerns about pollutants such as copper, mercury, zinc, and hexavalent chromium, the Final Tiered EA notes that sampling water, air, and soil from previous launches has not identified any contamination levels that would exceed state or federal thresholds for water quality, nor has it shown any ablation is occurring. No impacts are anticipated from salinity or hydrology changes either. The Final Tiered EA necessitates ongoing monitoring and evaluation to ensure compliance with applicable water quality standards. The FAA has evaluated the potential impacts of the Proposed Action on federally designated critical habitat for ESA-listed species, such as the piping plover and red knot, as well as habitats important to shorebirds protected under the Migratory Bird Treaty Act (MBTA). The FAA has determined that, with the implementation of mitigation measures, significant impacts to these habitats are not anticipated. Numerical and narrative criteria ensure that existing uses will be maintained and protected. 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. Texas law provides that water discharged under a TPDES permit becomes state water upon discharge, and SpaceX's activities comply with this regulatory framework.

Traffic and Shuttle Mitigation

The Final Tiered EA acknowledges that increased traffic and human presence may have varying effects on wildlife, including both the potential for some species to avoid the area due to increased disturbance and noise, as well as an increased risk of wildlife-vehicle collisions. Table 7 explicitly recognizes these dual effects, ensuring a balanced assessment of potential impacts. The Final Tiered EA and USFWS BA also evaluate the potential for increased vehicle collisions and mitigation measures and determined it to be insignificant based on the frequency and the implementation of the measures. The FAA has mandated specific mitigation measures to address potential adverse effects on biological resources from traffic. The FAA requires SpaceX to implement the following measures:

- 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. Note that the use of over 600 cars per day on State Highway 4 is avoided through use of the Employee Shuttle Service.
- 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.

While the Final Tiered EA does not explicitly quantify every category of vehicular traffic, the overall increase in activity at the site is accounted for in the cumulative impacts analysis. Moreover, the FAA has established mitigation measures described above. These measures apply to all vehicles supporting the proposed action using the roads, including those operated by contractors and employees. These measures are designed to mitigate the environmental impacts of increased traffic and have been incorporated into the FAA's decision-making process to ensure that SpaceX's operations do not result in significant environmental impacts by further reducing the number of traffic related incidents.

The FAA clarifies that the use of hovercraft is not part of the Proposed Action analyzed in the EA. Hovercraft operations, if conducted, would have independent utility and are not subject to review under NEPA in connection with the current Proposed Action. Thus, hovercraft use is outside the scope of the current analysis and does not impact the adequacy of the EA's assessment of traffic-related impacts.

Climate and Greenhouse Gas (GHG) Emissions

The Final Tiered EA quantifies direct and indirect emissions from the Proposed Action, including methane emissions from launches and increased truck traffic. Methane (CH_4) is accounted for in CO_2-equivalent (CO_2e) values using the global warming potential (GWP) factor recommended by the Intergovernmental Panel on Climate Change (IPCC). While the FAA acknowledges that GHG emissions contribute to climate change, FAA Order 1050.1F does not define a significance threshold for GHG emissions, as climate change is a global phenomenon influenced by countless sources. The Final Tiered EA follows NEPA's standard for

analyzing reasonably foreseeable impacts, which does not require an assessment of emissions from unrelated upstream activities beyond the direct scope of the Proposed Action. Extraction and processing of methane fuel occur outside the scope of the FAA's regulatory authority and are not unique to the Proposed Action, meaning they do not meet the NEPA standard for indirect effects that are reasonably foreseeable and sufficiently causally connected to the Proposed Action.

The EPA is the lead federal agency regulating methane emissions from oil and gas extraction, and any additional emissions from natural gas production are governed by EPA regulations rather than the FAA. 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 significantly contribute to the overall emissions of the Proposed Action or alter the finding of no significant impact on climate change. Mitigation measures, such as encouraging employee carpooling and utilizing efficient logistics planning, help minimize traffic-related emissions. Outside the scope of this Proposed Action, Brownsville Public Utility Board is planning to install a water line along State Highway 4 to substantially reduce truck traffic. The FAA acknowledges that anomalies could result in temporary releases of unburned methane, but these events remain infrequent, unpredictable, and therefore not reasonably foreseeable. The Final Tiered EA evaluates historical launch data to assess trends and probability, concluding that anomalies represent a small fraction of overall emissions and do not materially alter the total climate impact assessment.

While comparisons to total U.S. and global GHG emissions are included to provide context, the FAA does not rely solely on these comparisons to determine significance. SpaceX is developing advanced methane fuel production and recovery technologies, which could reduce the lifecycle emissions of future operations. SpaceX's focus on full reusability of the Starship/Super Heavy vehicles is a key mitigation factor, as it reduces the need for new manufacturing, thereby lowering the lifecycle emissions associated with each launch.

The Final Tiered EA provides a quantitative assessment of GHG emissions, including the estimated 97,342 metric tons of CO_2e per year from launches, venting, and associated activities. The FAA acknowledges that GHG emissions contribute to climate change, but FAA Order 1050.1F does not define a specific significance threshold for GHG emissions, as climate change is a global issue influenced by many sources worldwide.

The FAA acknowledges that every increase in emissions contributes to cumulative climate impacts but emphasizes that NEPA requires agencies to assess whether a specific project's emissions rise to a level of "significance" under the law. The Final Tiered EA provides a detailed breakdown of projected emissions sources, allowing for comparison across alternatives and mitigation measures.

The reference to declining truck emissions due to EPA regulations is based on established federal policies that will result in lower per-vehicle emissions over time. While these regulations do not immediately eliminate emissions, they contribute to long-term reductions and are relevant to assessing future cumulative impacts. The Final Tiered EA quantifies the increase in truck traffic under current conditions and does not rely solely on long-term regulatory trends. Unlike traditional expendable rockets, Starship is designed to be fully reusable, reducing emissions per mission by minimizing the need for new vehicle manufacturing and fuel extraction.

Reusability is a key factor in reducing the long-term climate impact of commercial spaceflight and aligns with broader sustainability goals in the aerospace industry. Fewer new rocket builds reduce the emissions from material extraction, processing, transportation, and assembly—factors that are significant contributors to lifecycle emissions in traditional expendable rocket programs.

The FAA must evaluate emissions within the broader regulatory framework of NEPA. The FAA's approach is consistent with recent federal court rulings, which have upheld agency discretion in determining the significance of GHG emissions based on scientific and policy considerations.

Land Use, Access Restrictions, and Cultural Resource Protections

The Final Tiered EA acknowledges the historical and cultural significance of the region and evaluates potential environmental impacts that could indirectly affect culturally significant sites and resources. The FAA's environmental review process follows the requirements of the National Historic Preservation Act (NHPA), NEPA, and Executive Order 13175 on Tribal Consultation. The FAA's review considers indirect effects on the natural environment, including impacts on wildlife species that may hold cultural or spiritual significance. While the Carrizo/Comecrudo Tribe is not federally recognized, the FAA invited Carrizo/Comecrudo Tribe to consult during the 2022 PEA and did not receive a response.

As described in the 2022 PEA, an archeology study was performed in 2012 in the proposed construction areas and a more expansive study (approximately 700 acres) in 2021, including areas in the immediate sites adjacent to the SpaceX VLA. No additional resources were found in the 2021 survey. Adverse impacts on the cultural resources are addressed in the 2022 Programmatic Agreement between the consulting parties. To address potential inadvertent discoveries during construction, SpaceX has implemented an Unanticipated Discoveries Plan which dictates if any artifacts, human remains, or cultural sites are discovered during construction or operations, applicable federal and state laws require that activity cease immediately, and the appropriate authorities, including Tribal representatives and the Texas Historical Commission, must be notified.

The Final Tiered EA evaluates closure impacts, including effects on the community, refuge, and park lands, and considers operational adjustments that may help reduce closure durations over time. The EA assumes approximately 500 hours of access restrictions annually for general operations and launches, with an additional 300 hours for anomaly response, consistent with prior assessments. SpaceX has implemented operational efficiencies, including moving some testing activities to the Massey's Test Site, which is expected to reduce the need for extended closures at the Boca Chica facility. FAA's calculations are based on historical trends and operational improvements, and the agency will continue to monitor actual closure hours to ensure that they align with projected estimates.

Anomaly and Debris Recovery Plans

The Final Tiered EA explains that design improvements and iterative testing enhance vehicle reliability and safety over time, reducing the likelihood of anomalies. SpaceX incorporates lessons learned from previous launches, integrates engineering advancements, and follows rigorous testing protocols to improve performance and mitigate risks. Additionally, the FAA's licensing process includes safety and reliability assessments to ensure compliance with regulatory standards. The expectation that changes to the rocket will not increase the chance of anomalies is supported by the industry standard practice of iterative design and refinement, which has been demonstrated in past aerospace programs.

The 2022 PEA and the Final Tiered EA addresses potential methane emissions in the event of an anomaly and is included in the methane venting in Table 4 of the EA. Anomalies are considered highly unlikely due to rigorous safety protocols and design measures in place. The Final Tiered EA concludes that even in the event of such an anomaly, the environmental impacts would be temporary and not significant.

The Final Tiered EA acknowledges that while the deluge water system is designed to reduce certain risks, such as pad damage and debris generation, it does not eliminate all potential anomalies. However, iterative testing and vehicle design improvements are expected to enhance reliability over time, reducing the likelihood of failures. The FAA's safety regulations and licensing process require SpaceX to implement risk mitigation measures to ensure public and environmental safety. The 300-hour closure estimate accounts for various operational scenarios, including routine activities, pre- and post-launch safety checks, and potential contingencies, rather than being solely indicative of expected anomalies. While an increase in launches inherently introduces more operational events, historical aerospace trends show that reliability improves as systems mature, decreasing the likelihood of unexpected failures.

SpaceX has successfully landed and recovered its Super Heavy booster. SpaceX has had no landing anomalies during the booster landings at the VLA. These advancements demonstrate SpaceX's commitment to (and success in) improving the safety and reliability of its launch and landing operations. The successful landings and recoveries indicate a reduced risk of anomalies during these critical phases. The recent successes in controlled landings and booster recoveries are promising indicators of progress toward these goals.

The Final Tiered EA and USFWS BA evaluate both the likelihood and potential consequences of anomalies, including debris dispersal, fire, and recovery operations. The Final Tiered EA acknowledges that anomalies may still occur but also considers that as the launch program progresses, the probability of anomalies decreases due to design improvements and operational experience.

The April 20, 2023, anomaly was analyzed separately from this NEPA document and is not within its scope. The Revised Draft Tiered Environmental Assessment (EA) evaluates the potential environmental impacts of the proposed increased launch cadence, including potential anomalies, based on forward-looking analysis. NEPA does not require retroactive assessments of past events unless they present new, significant information that changes the scope of the proposed action.

Following the April 2023 event, the FAA conducted an independent investigation, imposed corrective actions, and required SpaceX to implement mitigation measures before future launches. The current Final Tiered EA incorporates lessons learned from previous launches, ensuring that appropriate mitigations and safety measures are in place. The FAA's environmental review process remains compliant with NEPA and its regulations by focusing on the analysis of the proposed future activities rather than reanalyzing past incidents outside the scope of the proposed action.

Access Restrictions

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 implemented ongoing mitigation measures, including not restricting access on holidays, weekends in the summer months, and moving certain testing operations to Massey's Test Site, which reduces the need for extended closures of Boca Chica Beach. The FAA and SpaceX continue to implement measures to minimize closure durations, including more precise scheduling to reduce public access disruptions, advance notice to allow for better planning by Tribal members and local stakeholders, and efforts to consolidate activities to minimize the frequency of closures.

Pacific Ocean Landing Areas and Hawaiian Consultation

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 made revisions to the Environmental Assessment (EA) to address these issues. To mitigate potential effects on marine ecosystems and cultural resources, the FAA has revised the Final Tiered to remove the Exclusive Economic Zone (EEZ) from the Pacific action area from the EEZ and establish a buffer zone of 50 nautical miles around the Papahānaumokuākea Marine National Monument. These changes significantly reduce potential environmental impacts by:

Protecting Sensitive Ecosystems: The removal of the EEZ from the Pacific action area from the 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 shifting the action area, the likelihood of debris dispersion affecting the Hawaiian Islands and surrounding waters is significantly decreased and expected to be negligible.

These revisions and ongoing consultations with relevant agencies and stakeholders ensure that environmental and cultural considerations are appropriately addressed.

Launch Cadence and Alternative Analysis

The Final Tiered EA evaluates the proposed increase in launch cadence at Boca Chica based on SpaceX's stated programmatic needs, operational feasibility, and regulatory requirements. The FAA's consideration of alternatives is consistent with NEPA requirements, ensuring that the purpose and need of the action are met while minimizing environmental impacts. The increase to 25 launches per year 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. The current FAA-approved program envisioned a lower cadence during the early testing phases, but as SpaceX moves beyond initial test flights, an increased cadence is necessary to support long-term operational goals.

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.

The Final Tiered EA considers redundancy in launch locations and the role Boca Chica plays in SpaceX's developmental flight testing. Unlike other SpaceX facilities, Boca Chica allows for rapid prototyping, iterative testing, and advancements in Starship's fully reusable architecture.

The FAA 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.

The FAA's consideration of alternatives aligns with NEPA regulations (40 C.F.R. § 1502.14), ensuring that a reasonable range of alternatives was analyzed. The FAA assessed whether the proposed increase in cadence aligns with national spaceflight objectives, environmental considerations, and the FAA's regulatory authority. The Final Tiered EA provides a full assessment of potential environmental impacts and incorporates mitigation strategies to minimize disruption to local ecosystems and communities.

Preliminary Critique of EA and Noise Study

January 15, 2025

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Introduction

The following is a preliminary critique of The *Revised Draft Tiered Environmental Assessment for SpaceX Starship/Super Heavy Launch Vehicle Program Increased Cadence* (November, 2024)[1] and two accompanying noise reports in Appendix B.[2]

This critique is preliminary, because the EA, *Noise Assessment*, and *Sonic Boom Analysis* did not disclose enough information concerning their noise analysis to be certain about a host of noise impacts. Nevertheless, this preliminary critique concludes that the EA fails to rise to the challenge of addressing the technically complex science of acoustics with respect to rockets, combined with a unique and novel space vehicle, and relies on an outdated regulatory regime designed for traditional commercial fixed wing jet aviation. The result is a superficial and occasionally careless examination of the noise impacts of the proposed action.

The EA concluded that noise from the proposed activities will not have a significant impact because the facility and operations pass the three tests laid out in the Noise Assessment Guidelines described on page 5 of the *Noise Assessment*, Section 2.2.2:

1. Land Use Compatibility
   "FAA's published 14 Code of Federal Regulations (CFR) Part 150 defines land use compatibility guidelines for aviation noise exposure that are also applicable to rocket noise exposure. These guidelines consider land use compatibility for different uses over a range of DNL noise exposure levels, including the adoption of DNL 65 dBA as the limit for residential land use compatibility."
2. Hearing Conservation
   "Occupational Safety and Health Administration (OSHA)10 guidelines are to protect human hearing from long-term, continuous exposures to high noise levels and aid in the prevention of noise-induced hearing loss (NIHL). OSHA's permissible daily noise exposure limits include a LAmax of 115 dBA (slow response) for a duration of 0.25 hours or less."
3. Structural Damage
   "The potential for structural damage due to launch, landing, and static fire test events is assessed using the conclusions from a recent, applicable study to ascertain whether range activities (i.e., test, evaluation, demilitarization, and training activities of items such as weapons systems, ordinance, and munitions) would cause structural damage. The study concluded that structural damage becomes improbable below 140 dB [Maximum Un-weighted or linear Sound Level (Lmax)]. No glass or plaster damage is expected below 140 dB and no damage is expected below 134 dB."

[1] Here after referred to as the EA.

[2] *Starship Noise Assessment for Flight and Test Operations at Starbased* (August 28, 2024) hereafter referred to as the *Noise Assessment* and *Sonic Boom Analysis* (July, 2024).

This critique focuses on the exceptionally poor job the EA did in assessing the project with respect to the first two guidelines.

The critique is organized into five Parts:

- Part I: Clearly Flawed and Therefore Unreliable Noise Modeling
- Part II: Cumulative Impacts of Noise Not Fully Considered
- Part III: Insufficient Land Use Compatibility Assessment
- Part IV: Inadequate Noise Health Impacts Assessment
- Part V: Additional Mistakes, Misstatements, and Misleading Statements

Part I presents the EA's first critical mistake, which was to not accurately model the noise. Since the modeling is the basis for the EA noise analysis, and since the modeling is clearly wrong, the EA's assessment isn't reliable. Part II presents the second critical mistake, that neither the Land Use Compatibility assessment nor the Health and Hearing assessment considered the cumulative impacts of the action's noise.

Next, in Part III and IV, the critique presents the implications of 1) the flawed modeling, 2) the failure to consider cumulative noise, and 3) additional flaws in the EA, on the land use compatibility assessment and health and hearing impacts assessment. Finally, the critique examines a number of errors that are particularly misleading in Part V.

Each of the five Parts identifies a number of specific Problems, which are identified as Problems 1-18.

Part I. Clearly Flawed and Therefore Unreliable Noise Modeling

The noise modeling in the EA is premised on unrealistic and invalid assumptions and the results are therefore erroneous. Specifically, one of the most important noise modeling inputs, ground impedance, was simply incorrect. This means the modeling outputs were likewise wrong, and the modeling results cannot be relied upon. As the modeling is the basis for the entire noise assessment, the conclusions reached in the assessment are flawed and unreliable.

Problem 1. Wrong ground impedance used in modeling due to misrepresentation of the ground surface.

According to the *Noise Assessment*:

> Noise at the ground is computed accounting for distance, **ground impedance**, atmospheric absorption of sound, and uniform ground elevation.
>
> **Emphasis added**, *Noise Assessment*, 3

The choice of ground surfaces in a noise model is critical because sound waves interact with the ground surface, resulting in either reflection or absorption of sound energy. The amount of

reflection or absorption is dependent on the acoustic impedance of the ground surface. If the surface is hard, such as water, the surface reflects most of the sound energy. If the surface is soft, such as grass, the surface tends to absorb more of the sound energy.

Since sound that is reflected will be louder and propagate further than sound that is absorbed, the accuracy of noise modeling depends on the model using appropriate ground impedance between the source and the receiver. The choice of ground cover for the model therefore has a drastic impact on the projected noise levels, particularly the noise levels of the static fire tests such as depicted in Figure 18 of the *Noise Assessment* (see Figure 1 below).

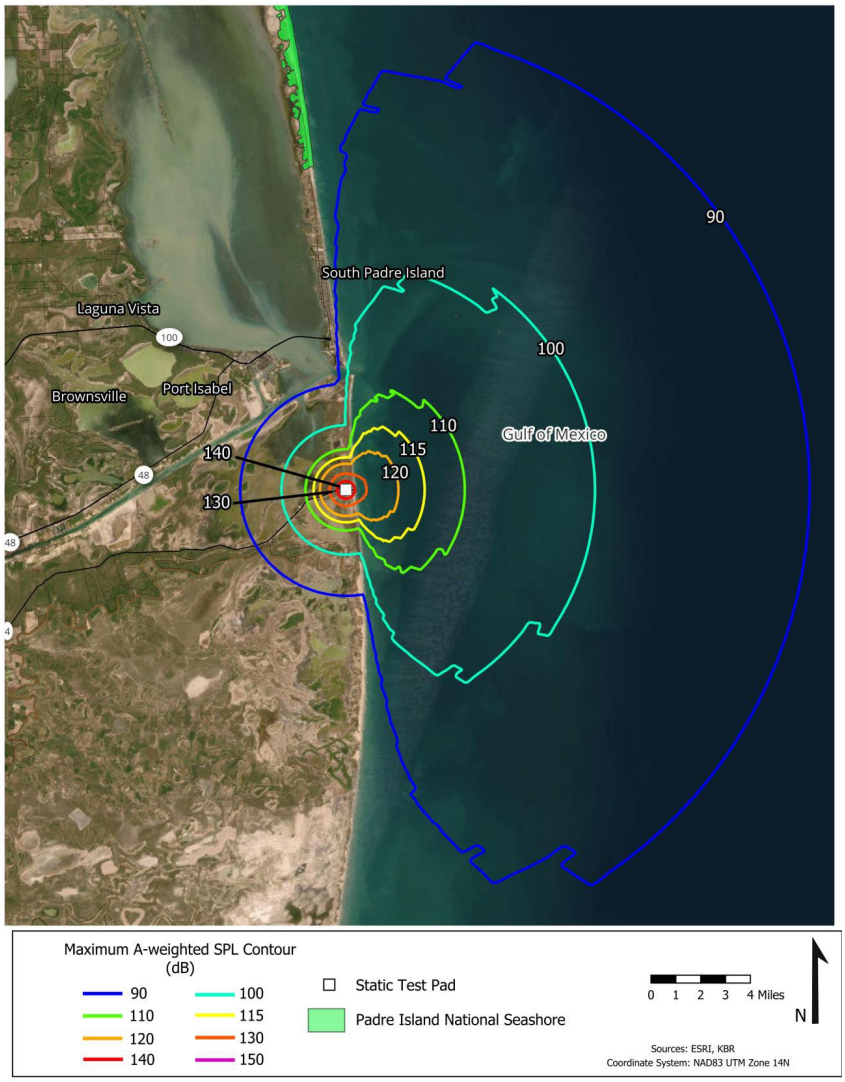

Figure 1: *Figure 18. Super Heavy Booster Static Fire Test at Starbase: Maximum A-Weighted Sound Levels* from the *Noise Assessment* shows the impact of the choice of ground impedance or ground surface. Note the dramatic difference in the contour lines over the Gulf compared to inland. One can clearly see the impact of using absorptive ground in the modeling by observing what happens to the contour line when it passes over what the EA modeled as soft ground.

As the *Noise Assessment* notes:

> "…the shape of the innermost contours is approximately circular. **The shape of the outermost contours is due** to rocket noise directivity and **the difference between the ground impedance values used for onshore and offshore areas**."
>
> **Emphasis added**, *Noise Assessment*, 6

Here, the Noise Assessment notes that:

> Land areas were modeled using a single ground impedance value estimated from the most common ground cover type in the vicinity of Boca Chica, TX and offshore water areas modeled as acoustically hard.
>
> **Emphasis added**, *Noise Assessment*, 6[3]

Basically, the Noise Assessment is claiming—without any disclosure, documentation, or evidence—that it accurately identified the appropriate ground impedance value for the most common ground type in the vicinity of Boca Chica, TX. The Noise Assessment doesn't document the actual ground cover type or the ground impedance used in the modeling, but it is clear from Figure 1 that the ground impedance value for areas other than the Gulf were absorptive (i.e., ground cover that absorbs noise and reduces noise levels). Otherwise, there would not be such a dramatic difference in the noise contours between the Gulf and inland areas, as the EA notes in the quote above from page 6.

The problem is, most of the nearby "ground" that is north and west of the launch facility is actually reflective, because it is water—specifically South Bay, Bahia Grande, and Laguna Madre. As Figure 6 of the EA demonstrates, the authors of the EA knew that most of what they were modeling as absorptive ground was actually hard, reflective water. See Figure 2 below.

Figure 3 below shows more clearly the water in relation to the launch facility. It uses the original Figure 6 roads, key, and categories, but is superimposed on a National Oceanic and Atmospheric Administration dataset showing open water.[4]

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[3] The quote was referring to Starship Launch modeling in Figures 3-8 of the *Noise Assessment* as an example. The EA and *Noise Assessment* failed to disclose how the static tests were modeled. (See problem 2.) They were presumably modeled in a similar manner and the quote applies to the later figures as well.

[4] This dataset is based on remote sensing done in 2021-2022. More information concerning the data can be found here: https://coast.noaa.gov/digitalcoast/data/ccaphighres.html; https://coast.noaa.gov/data/digitalcoast/pdf/ccap-highres-products-explained.pdf

The second dataset used for the small portion in Mexico is here: https://www.esa.int/ESA_Multimedia/Images/2018/10/Mapping_Mexico_s_land_cover

The definition of "Open Water – includes areas of open water, generally with less than 25 percent cover of vegetation or soil." https://coast.noaa.gov/data/digitalcoast/pdf/ccap-class-scheme-regional.pdf

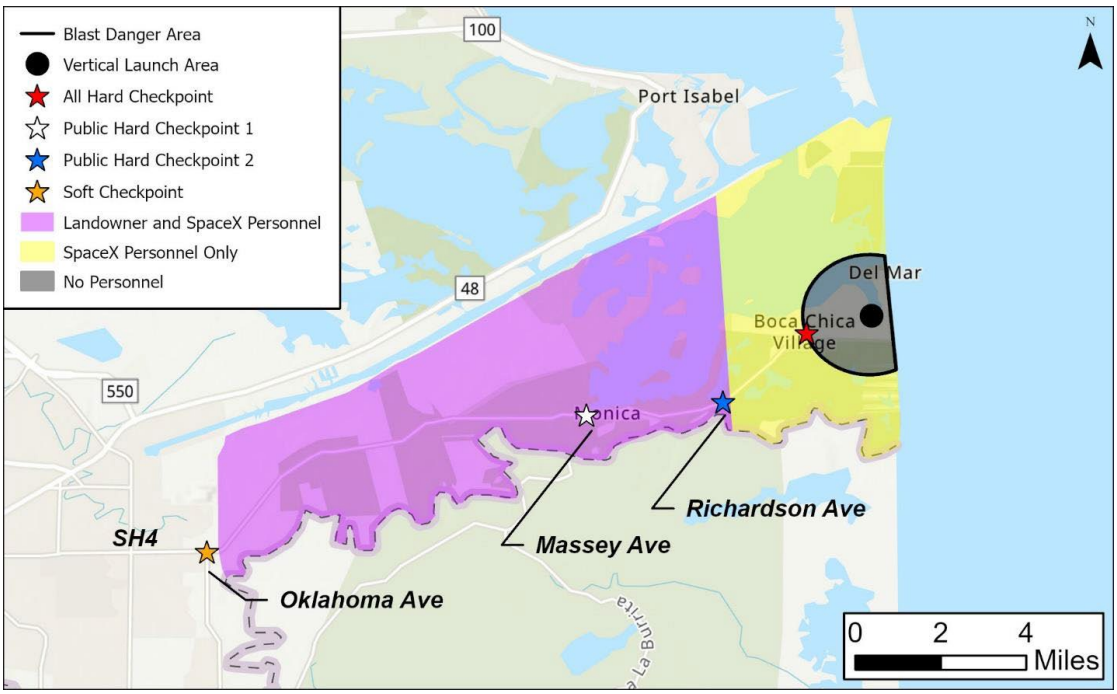

Figure 2: Figure 6 Access Restriction Area, from the EA.

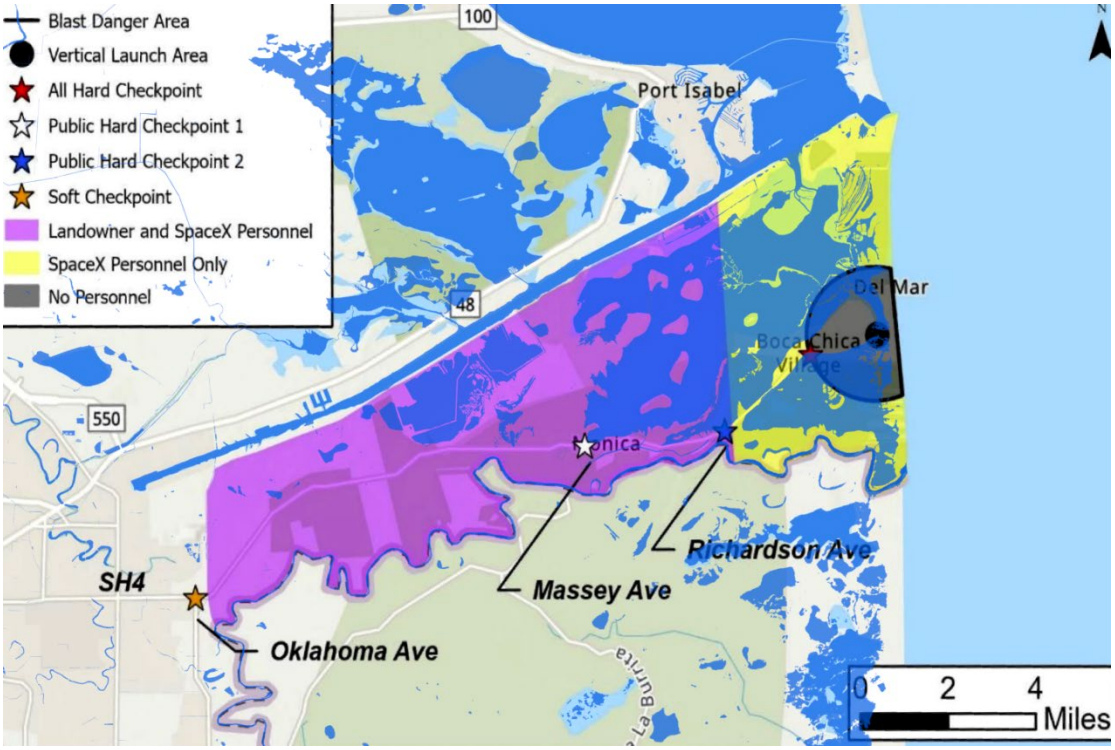

Figure 3. Figure 6 Access Restriction Area, from the EA, using National Oceanic and Atmospheric Administration open water data.

It is clear from Figure 3 that the most common ground cover type in the vicinity of Boca Chica, TX is water. In fact, water makes up 55% of the surface area within the inland portion of the 90 dBA contour found in Figure 18 of the EA. See Figure 4 below.

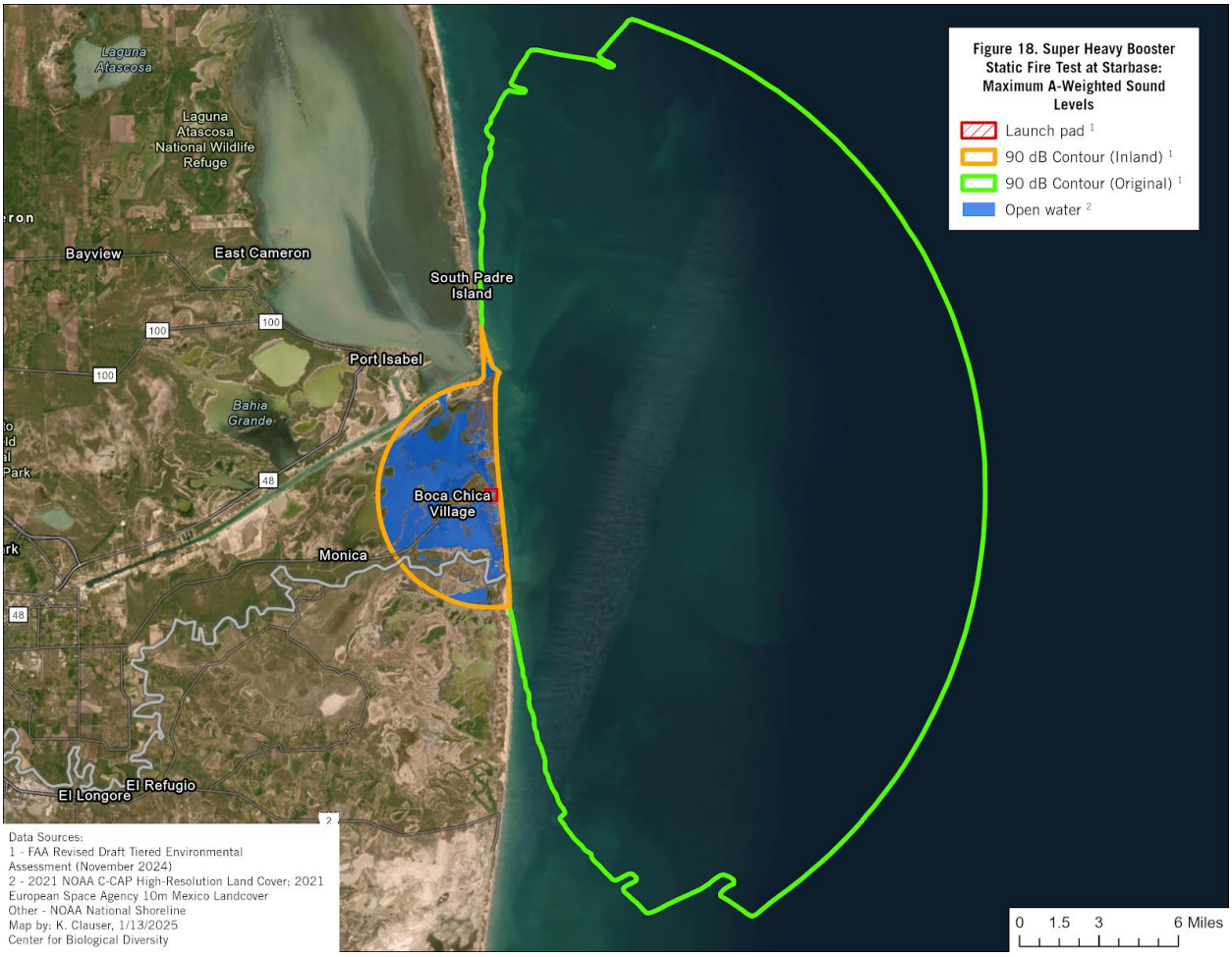

Figure 4. Figure 18 of the *Noise Analysis* 90 dBA Contour Line. The non-Gulf surface area within the orange line, the inland area that exceeds 90 dBA, contains approximately 20,700 acres, while the open water within that area accounts for approximately 11,500 acres.

Similarly, analysis of a wedge drawn from the launch site to Port Isabel, the path noise would follow from the launch site to Port Isabel, indicates that the intervening area is 55% water. See Figure 5 below.

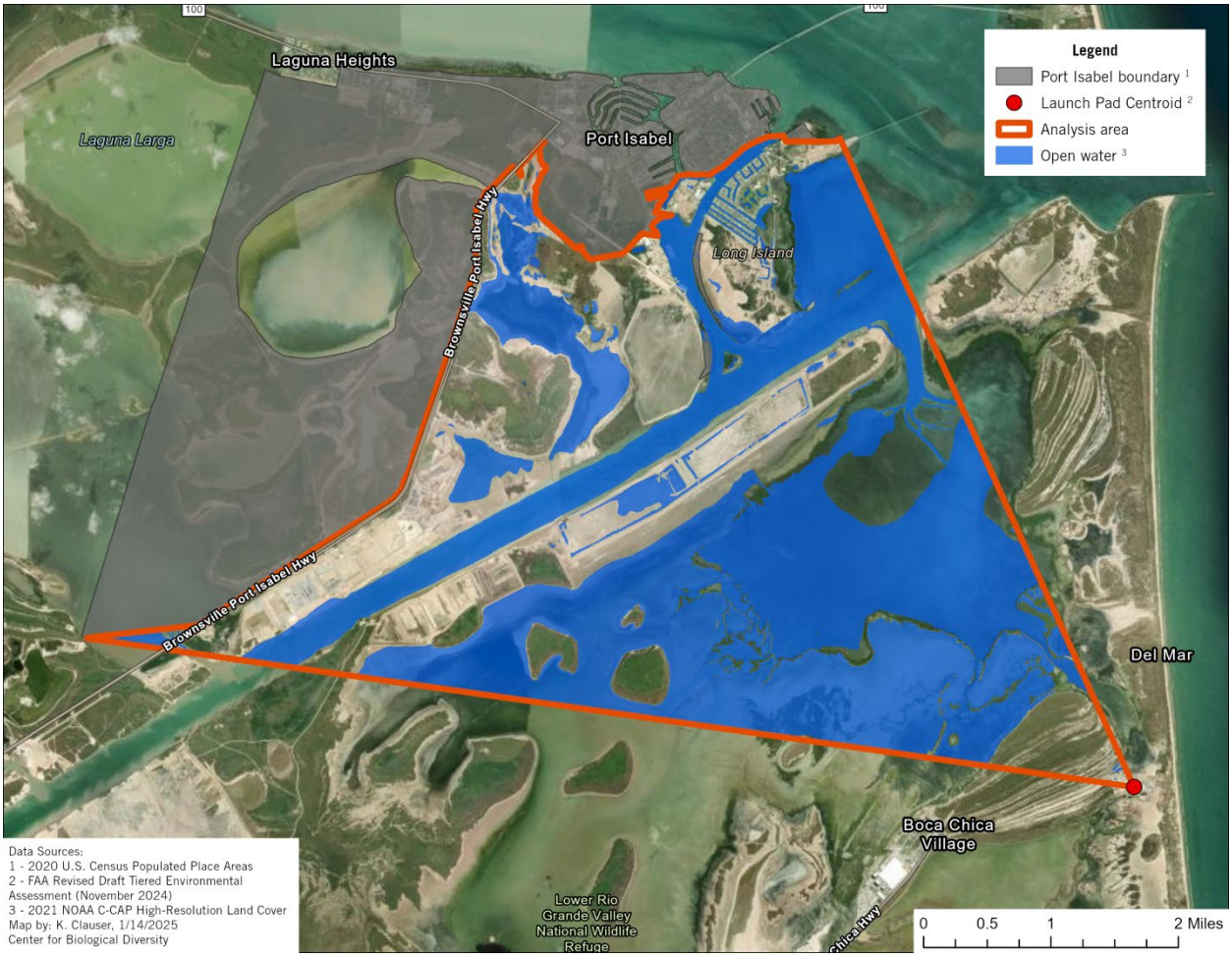

Figure 5. The Surface Area between Launch Site and Port Isabel. There are approximately 7,100 acres of open water compared to a total of 13,000 acres total within the red highlighted area.

The model erroneously defines areas as absorptive when in fact those areas will not absorb noise, but rather reflect it. Had the EA accurately modeled South Bay, Bahia Grande, Laguna Madre and other smaller areas of open water as reflective water, like it modeled the nearby water to the east (the Gulf), one would expect the contour lines, particularly to the north and west, in Figure 1 to be similar to those over the similarly hard water of the Gulf. This would drastically change the results of the noise model, since if the ground cover were properly modeled, higher noise levels would be experienced in populated areas. This is particularly true for the static tests, in which case the angle of incidence is low.[5] The number of people exposed to each noise level should have been disclosed by the EA, but were not provided or disclosed. Those values, however, surely factored into the EA's decision-making process. It is very likely,

[5] The angle of incidence increases quickly for launches, as the rocket climbs. A lower angle of incidence is more conducive to noise propagation to receivers at ground level.

had the EA properly identified and modeled the intervening surface type, the number of people exposed to each noise contour would be off by an order of magnitude or more.

In sum, mistaking South Bay, Bahia Grande, and Laguna Madre as land means that the modeling results, particularly in the north and west directions (it should be noted that there is also inland water south of the launch facility) means the modeling results in those directions are not reliable. Consequently, the modeling isn't reliable. Since the EA noise analysis is based on the modeling, therefore, the noise analysis, and specifically, the 65 DNL analysis and the health impacts analysis, are not reliable. This is fatal to the EA, as its entire noise analysis is based on the wrong modeling inputs.

Problem2: The EA Failed to Disclose the Modeling Inputs Used in the Noise Models.

As noted above, the EA doesn't state what the surface they used was other than the "most common ground cover type in the vicinity of Boca Chica, TX" (*Noise Assessment*, 6) and doesn't state what impedance values were used. Mistaking South Bay, Bahia Grande, and Laguna Madre as land is such a basic mistake it calls into question the reliability of other undocumented modeling assumptions. The modeling files and all modeling assumptions need to be provided to the public so that all assumptions in the modeling can be understood.

There are numerous modeling inputs that the public is unable to evaluate. For example, the EA notes: "A prevailing onshore or offshore breeze may also influence noise levels in these communities" (EA, 28). How the modeling addressed environmental and atmospheric conditions was not provided. Similarly, the assumed sound power level or input noise levels of noise sources also need to be provided, as well as the modeling files themselves.

Without this information, the modeling is a black box that the public cannot determine the validity of.

Problem 3: The EA Failed to Disclose and Account for the Accuracy of the Noise Models.

Noise models provide an estimation of the expected noise level of an event. Noise models are by their nature, never 100 percent accurate. There are too many unknown variables the models are trying to simulate, including ground type, atmospheric conditions, terrain, noise input levels, etc. for models to ever achieve 100 percent accuracy. Consequently, the results of noise models need to be considered a range rather than an exact amount.

Even the most scrutinized noise models available, such as those incorporating the formulas in ISO 9613 Part 2, have an accuracy of plus or minus 3 dBA.

Table 5 — Estimated accuracy for broadband noise of L_{AT}(DW) calculated using equations (1) to (10)

Height, h *)	Distance, d *)	
	$0 < d < 100$ m	$100 \text{ m} < d < 1\,000$ m
$0 < h < 5$ m	± 3 dB	± 3 dB
$5 \text{ m} < h < 30$ m	± 1 dB	± 3 dB
*) h is the mean height of the source and receiver. d is the distance between the source and receiver.		
NOTE — These estimates have been made from situations where there are no effects due to reflection or attenuation due to screening.		

Table 5 from ISO 9613-2.

Moreover, the accuracy in the ISO standard is an average accuracy for continuous events, with individual events and short-term events (such as rocket launches) expected to have an accuracy range that is considerably larger.

The SpaceX Noise Assessment, however, does not provide a range of accuracy. This ignores that even under the best model, people could be exposed to louder noises than the model predicts. This is particularly problematic when addressing hearing health criteria, as the predicted events are already very loud and either approach or exceed hearing health criteria (see Part IV below).

The failure of the EA to include any discussion of the accuracy and applicable confidence intervals for the modeled results indicate that the results of the analysis are unreliable, especially when assessing the maximum exposure, which is critical for assessing health impacts to hearing and sleep.

Problem 4: RNOISE Does Not Appear to Have Been Approved for Use in the EA.

The EA modeled noise using RNOISE. FAA Order 1050.1F states:

> b. FAA-Approved Models. The latest FAA-approved model must be used for both air quality and noise analysis. A list of approved models for each type of analysis is available in the 1050.1F Desk Reference. Prior approval from AEE is required to use other models or methodologies. At the completion of the NEPA process, all input files used in the analysis and corresponding output files must be provided to AEE. Details on requirements for noise analysis are located in Appendix B. In the event a model is updated or replaced after the environmental analysis process is underway, the updated or replacement model may be used to provide additional disclosure concerning noise or air quality impacts, but use of the updated or replacement model is not required.

FAA Order 1050.1F, 4-2

RNOISE is not an approved model and is not discussed anywhere in the Desk Reference. Moreover, we cannot find any disclosure or documentation that prior approval from AEE or FAA was acquired for the use of RNOISE. At the very least, documentation that approval prior to the use of the RNOISE model with respect to the *Revised Draft Tiered Environmental Assessment for SpaceX Starship/Super Heavy Launch Vehicle Program Increased Cadence* should be provided to the public. If no such prior approval was given, the EA noise analysis cannot be used pursuant to the FAA's own regulations.

Problem 5: The EA Failed to Consider and Analyze Landing Noise and Sonic Booms from Gulf Landings.

The EA notes that:

> The Proposed Action includes downrange landings no closer than 5 nautical miles offshore and the jettison of the heat shield no closer than 1 nm offshore.
>
> EA, 63

Sonic booms, however, can be heard at much greater distances than 1 or 5 nautical miles, as the EA clearly demonstrates. Yet the EA failed to model sonic boom noise from landings in the Gulf.[6] Similarly, landing noise is likely to impact the coast based on the distance the contour rings extend in the EA's modeling of onshore landings, yet the EA does not account for or consider the impacts of this noise.

Moreover, sonic boom noise from the hot staging ring falling into the gulf has been observed; yet the EA likewise failed to assess the noise from the jettisoned hot-staging ring.

In addition, the noise – including sonic booms – from nighttime Gulf landings would likely lead to sleep interference and annoyance, but the EA failed to disclose this because it failed to model it.

This is yet another example of the incomplete character of the EA noise assessment and the FAA's determinations are therefore based on inadequate information about the actual impacts of the proposed activities.

Part II. Cumulative Impacts of Noise Not Considered

The EA failed to consider the cumulative impacts of the noise associated with various aspects of the proposed action. In this Part, we focus specifically on sonic booms, which were not part of a comprehensive land use compatibility assessment and comprehensive hearing conservation assessment.

Problem 6: No Cumulative Launch/Landing Noise and Sonic Boom Noise Analysis Was Performed for the Compatible Land Use Assessment.

Sonic booms are acoustic events. They are unique in their rapid onset, intensity, and signature, but they are nonetheless, acoustic events. They can be heard just like other acoustic events and can be measured in many ways, just like other acoustic events.[7]

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[6] "…the nighttime landings that would occur at an offshore landing site were not included in the DNL estimate" (*Noise Assessment*, 30).

[7] We call the measures of noise, "noise metrics." The EA notes many of them. SEL, Lmax, Leq, and DNL, for example are noise metrics. Each of these metrics provides a "level" measured in decibels—that is what the "L" in SE**L**, **L**max, **L**eq, and DN**L** stands for. This level, measured in decibel is actually a unit less measure of noise based on the logarithm of the pressure of an event divided by a reference sound pressure which is approximately the threshold of human hearing. If it wasn't for the decisions of

The EA chose to analyze launch/landing noise in the *Noise Assessment* separately from sonic boom noise, which is provided in the Appendix to the *Noise Assessment*. Nowhere are the results combined into a cumulative analysis of all noise sources. The EA merely presents each separately, which does not provide a full picture of the noise impacts of the proposed actions.

This renders the Land Use Compatibility Assessment incomplete. With respect to its Land Use Compatibility Assessment, the EA specifically states, "**This calculation does not include noise from sonic booms from landing events"** (EA, 30).

The EA also states that, "Cumulative noise from sonic booms is discussed in 3.2.3.5," but that is not really accurate, since nowhere is there a cumulative assessment of **both** launch/landing noise and sonic boom noise. Had the launch/landing noise and the sonic boom noise been actually considered in a cumulative fashion, the results would have shown much higher impacts from noise associated with these events, likely exceeding the noise criteria discussed further below, and requiring further analysis of noise impacts. Because the noise assessment failed to consider the cumulative impacts of all noise sources together, the Land Use Compatibility Assessment cannot be considered complete or reliable.

Problem 7: No Cumulative Launch/Landing Noise and Sonic Boom Noise Analysis Was Performed for the Hearing Health Assessment.

The fact that no cumulative or comprehensive launch/landing noise and sonic boom noise analysis occurred was established above in Problem 6. The implications of this are even greater with regards to the hearing health assessment, because to assess the risk of hearing damage, one needs both instantaneous maximum levels and the cumulative exposure over a day or a workday.

The flawed hearing health analysis in the EA is discussed in Part IV below, but it is critical to know that the OSHA regulations the EA uses requires no exposure over 115 dBA, an 8 hour average exposure under 85 dBA to avoid a hearing conservation program, and an 8 hour average under 90 dBA regulatory limit. The latter two cannot be assessed without a cumulative noise assessment.

Without assessing the cumulative noise from sonic booms *and* launch/landing noise, the hearing conservation assessment is incomplete and unreliable. Moreover, from a hearing conservation perspective, the EA analyzed the launch noise independent of the booster landing

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engineers at Bell Labs in the 1920s who invented the "decibel," we would probably measure noise in terms of pressure today, in pounds per square foot or Pascals, similar to how the EA measured sonic booms. But in the 1920s, computations in pressure were difficult because humans can hear sounds from 20 micropascals to 20 pascals (a ratio of 1:10 million). In the 1920s, without calculators or computers, the slide rule and logarithms were the easiest way to deal with such a large range of numbers. So the decibel was invented. The takeaway is that noise is measured in pressure and then divided by a reference pressure. Noise could also be measured solely in terms of pressure, but that isn't our convention.

noise. Since these events occur on the same day, it is critical that the cumulative effects of the launch, landing, and sonic boom noise is assessed. The lack of a cumulative assessment in the EA means it is impossible for the FAA or the public to assess the risk to hearing from the proposed activities.

Problem 8: The EA Failed to Use the Primary Noise Metric and Elevated a Supplemental Metric to the Role of a Primary Metric.

The direct result of not doing a comprehensive cumulative noise assessment is that the EA elevated a supplemental metric to the role of a primary metric.

The FAA's *Order 1050.1F Desk Reference*, in the Noise and Noise Compatible Land Use chapter, notes—specifically concerning commercial space launches—that "…noise modeling and assessment for launch vehicles and sites differs from noise modeling and assessment for civil aircraft and airports. Nevertheless**, the basic elements of FAA noise assessment for NEPA, including the DNL 65 dB significance threshold, apply"** (1050.1 Desk Reference, Chapter 11, Noise and Noise-Compatible Land Use, 11-14).

Moreover, the Final PEA for Starship/Super Heavy at Boca Chica on page 54 states:

> The FAA has determined that the cumulative noise energy exposure of individuals to noise resulting from FAA actions must be established in terms of yearly Day-Night Average Sound Level (DNL), the FAA's primary noise metric. DNL accounts for the noise levels of all individual aircraft/launch vehicle events, the number of times those events occur, and the period of day/night in which they occur. The DNL metric logarithmically averages sound levels at a location over a complete 24-hour period, with a 10-decibel (dBA) adjustment added to those noise events occurring from 10:00 p.m. to 7:00 a.m. The 10-dB adjustment is added because of the increased sensitivity to noise during normal nighttime hours and because ambient (without aircraft/launch vehicles) sound levels during nighttime are typically about 10-dB lower than during daytime hours. More information about noise and noise-compatible land use can be found in Chapter 11 of the FAA Order 1050.1F Desk Reference (FAA 2020d).
>
> Final 2022 PEA, 54

The EA, however, did not provide the cumulative noise energy exposure from the proposed actions (see Problem 6 above).

Furthermore, the Desk Reference lists the "cumulative" metric used in the Sonic Boom Analysis, the CDNL, as a **Supplemental Metric**.

> The following supplemental metrics may be helpful to include in NEPA documents to describe launch noise and sonic boom. The metrics may be portrayed graphically as contour maps indicating relative location:...
>
> - C-weighted day night average sound level L_{Cdn}
>
> 1050.1 Desk Reference, 11-16

The EA, however, failed to use the primary metric and threshold for sonic boom noise - the DNL 65 dBA significance threshold – and combine those results with the launch/landing noise results. Instead it utilized the supplemental C-weighted metric and didn't do a cumulative analysis. As a practical matter, by not presenting the sonic boom noise in the primary metric, the EA has turned a supplemental noise metric into the primary noise metric and ignored the FAA's primary metric, rendering the analysis inadequate pursuant to the FAA's own standards.

The FAA has long insisted that the land use compatibility and community noise assessment must use a single metric and that metric must be A-weighted DNL. As the EA itself notes, "the FAA has established a system of noise measurement that comprises a single, core decision-making metric, the A-weighted DNL" (EA, 30).

Critics of the FAA have long held that the FAA's position concerning A-weighted DNL does not withstand scientific scrutiny, does not correlate well with many aviation noise impacts, and does not work well with impulsive noise, low frequency noise, and high frequency noise, and does not take into account non-acoustic factors that affect noise compatibility (see Part III below). But since the FAA has nevertheless been insistent upon its use, it is remarkable that the authors of the EA/*Noise Assessment* ignored the FAA's own position on noise metrics. Moreover, the use of a supplemental metric as the primary one in this EA is not supported by any health and safety related science—which is what the FAA is examining in its review of its noise policy.

If the launch noise, landing noise, and sonic boom noise had been combined, the cumulative exposure would obviously be louder than the individual events. More people would be subjected to louder noise than the EA discloses. Unfortunately we don't know how much louder and how many more people because the EA didn't disclose that.

The Land Use Compatibility Assessment must be rejected for the lack of a comprehensive cumulative noise assessment, its failure to use the FAA's designated primary metric, and its use of a supplemental metric as the primary metric.

Problem 9: The Cumulative Impact of All the Errors and Omissions is Significant.

The EA suffers from many errors and omissions as documented in the specific Problems identified in this critique. The cumulative effect of all of the errors and omissions is extremely significant. The incorrect modeling of South Bay, Bahia Grande, and Laguna Madre as soft ground impacts every contour map the EA presents. The unmodeled sonic booms from Gulf landings, the unmodeled nighttime Gulf landings, and the undisclosed modeling accuracy range all impact the cumulative analysis of noise impacts.

If, for example, we look at the impacts of noise on people in Port Isabel, and supposing the modeling accuracy were 3 dB, and the correct ground impedance were to add 5 dB, and if the landing levels were to add 3 dB to the noise values, and the sonic boom were to add a couple more dB to the cumulative noise experienced by the public there, the hearing conservation

assessment would be radically different and much more harm would occur than what is contemplated (see Part IV). Thus, the EA's failure to fully consider all of the noise sources and to account for the actual impacts of noise, renders the analysis inadequate.

Part III. Insufficient Land Use Compatibility Assessment

As noted in the Introduction above, page 5 of the *Noise Assessment* lays out the test the EA used to determine land use compatibility.

> FAA's published 14 Code of Federal Regulations (CFR) Part 150 defines land use compatibility guidelines for aviation noise exposure that are also applicable to rocket noise exposure. These guidelines consider land use compatibility for different uses over a range of DNL noise exposure levels, including the adoption of DNL 65 dBA as the limit for residential land use compatibility.
>
> *Noise Assessment*, 5

As already noted in Problem 8 above, the FAA requires the use of A-weighted DNL: "the FAA has established a system of noise measurement that comprises a single, core decision-making metric, the A-weighted DNL" (EA, 30). However, as noted above in Problem 6, the EA didn't undertake this analysis. Therefore, the EA purports to make a decision that is not based on its core decision-making metric.

In this Part, we further the critique of the EA's Land Use Compatibility analysis by noting that the FAA's 65 dBA DNL threshold and policy significantly lags the current science concerning noise impacts. In some sense, the FAA is aware of this. The EA notes an FAA review of its noise policy. But the EA also seeks to limit criticism of the current policy by noting:

> [7] The FAA determined that changes in transportation use, public expectations, and technology warrant a review of its civil aviation noise policy. On January 13, 2021, the FAA published in the Federal Register a notice entitled, *"Review of FAA Aircraft Noise Policy and Research Efforts: Request for Input on Research Activities to Inform Aircraft Noise Policy"*,86 FR 2722, which described the FAA's noise research portfolio and a first of its kind nationally scoped survey that updated FAA's understanding of the dose-response relationship between exposure to aircraft noise and community annoyance (Neighborhood Environmental Survey or NES). FAA also requested input on the FAA's research activities that would inform the FAA's noise policy and would inform the future direction of the FAA noise research portfolio. The NES showed that a higher percentage of people were "highly annoyed" by aircraft noise across all levels of noise exposure that were studied. In addition to setting forth the FAA noise policy and research efforts, this Notice described the results of research into the societal benefits and costs of noise mitigation measures. On May 1, 2023, the FAA published in the Federal Register a notice entitled *"Request for Comments on the Federal Aviation Administration's Review of the Civil Aviation Noise Policy, Notice of Public Meeting."* In this notice, the FAA announced that it intends to consider how changes to the FAA civil aviation noise policy may better inform agency decisions and the types of impacts FAA considers in making decisions (e.g., community annoyance, certain types of adverse health impacts highly correlated with aviation noise exposure). The FAA requested suggestions of potential improvements to how the FAA analyzes, explains, and presents changes in exposure to civil aviation noise. 88 FR 26641. In this notice, the FAA specifically sought public comments on whether it should establish noise thresholds for low-frequency events, such as those associated with the launch and reentry of commercial space transportation vehicles authorized by the FAA Office of Commercial Space Transportation, which metrics should be used to establish these noise thresholds, and the appropriate noise exposure level to define the threshold of significant noise impacts. As part of this policy review, FAA is also examining the body of scientific and economic literature to understand how aviation noise correlates with annoyance as well as environmental, economic, and health impacts. The FAA is also evaluating whether any of these impacts are statistically significant and the metrics that may be best suited to disclose them. Until this policy development process is concluded, the FAA will continue to rely on DNL to make decisions regarding the significance of potential noise impacts. In this Draft EA, the FAA is not seeking comment on whether and how its noise policy should be revised. Rather, the FAA seeks comments on its analysis of the impacts associated with the Proposed Action and potential for significance under the FAA's existing noise threshold set forth in FAA Order 1050.1F at Exhibit 4-1.
>
> EA, 30, Footnote 7

Since the FAA is insistent on maintaining the A-weighted DNL metric for the EA, this Part presents concerns about the inappropriateness of the 65 dBA threshold within the FAA's A-weighted DNL framework (Problem 10). Then a number of specific deficiencies in the EA are addressed.

Problem 10: The FAA's 65 dBA DNL Threshold for Land Use Compatibility is not Sufficiently Protective.

The FAA's 65 dBA DNL threshold for land use compatibility has lagged the science since its inception. See, for example, the EPA recommendation of 55 dBA DNL from 1974, which is used for similar analyses and is more protective.[8] Also, Theodore J. Schultz, the scientist behind the Schultz Curve, and whose name is most associated with the FAA's metric and threshold, wrote the Maryland Noise Abatement Plan prior to the FAA writing its Noise Abatement Policy. Its recommendation was to reduce the threshold level to 60 DNL "when US fleet noise level is reduced 5 dB below 1975 level." Since the 1970s, the 65 dBA threshold level has remained more a matter of "practicality" than science.

A 55 dBA DNL threshold, however, is supported by scientific research amassed by the EPA and World Health Organization. Both the EPA Levels Document and the WHO Guidelines for Community Noise recognize that to protect against community reaction and annoyance, a lower threshold is needed. (Both documents are included in the Appendix to this critique). Thus, the relevant science shows that the FAA's 65 dBA DNL threshold is not sufficiently protective and is outdated. Therefore, the analysis included in the EA regarding the impacts of noise is not based on the best available science, and is likely to result in harm that is being overlooked by the FAA.

Problem 11: The EA's Section 4(f) Analysis was Based on Faulty Noise Modeling.

The land use compatibility analysis requires special consideration for resources protected by Section 4(f). While Section 4(f) was "addressed" by the EA, it was done with faulty modeling as described in Problems 1, 5, 6, 8, and 9 above. Ironically, one of the major faults of the modeling was to falsely treat the nearby National Wildlife Refuges as containing only land, and moreover, as soft ground, rather than water. A careful Section 4(f) assessment should have recognized that the nearby National Wildlife Refuges included large areas of water. This is an example of extremely careless analysis. Proper modeling with surface type of the Section 4(f) properties correctly identified as a reflective surface will result in louder noise levels than initially considered. Moreover, the cumulative impact of omissions in the modeling (see Problems 5, 6, 8, and 9) will also increase the overall noise levels and thus the impacts to 4(f) properties. The failure to use accurate noise modeling renders the analysis of impacts to Section 4(f) properties invalid.

[8] The EPA Levels Document, also known as Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, is included as Appendix B to this critique.

Problem 12: Supplemental Metrics Were Not Used to Disclose Issues of Low Frequency Noise, Rumble, Rattle, and Crackle.

The Order 1050.1 Desk Reference notes:

> Noise analyses and evaluations of potential impacts for commercial space launch vehicles and sites can vary substantially from approaches used by the FAA for civil aircraft and airports for several reasons. One reason is the low-frequencies component of the spectral characteristics of the launch vehicle noise. Such low-frequency noise can propagate for much longer distances than noise from jet or propeller aircraft, and can be perceived as a "rumbling" noise.
>
> Order 1050.1 Desk Reference, 11-14

While the EA did present the unweighted sound pressure level of launch/landing noise, it failed to use that information to assess low frequency impacts. Indeed, the EA presents the unweighted values with little explanation for the public, and never discloses or discusses what impacts can occur from low frequency noise associated with the proposed activities.

Low frequency noise is important because it travels further and travels through walls of homes. It can invade every room in one's home and cause rattle within homes. One obvious impact on people that the EA ignores is whether people will hear the action within their own home. A map showing the area where people would likely hear the action in their own home would be much more helpful to the public than an unexplained unweighted map.

The term "low frequency," however, appears only once in the EA and once in the *Noise Assessment*, and never in relation to any impact. Rather, when "low frequency" is mentioned it is in a footnote concerning the revision of the FAA noise policy. No supplemental metrics were used to explain the low frequency impacts.

The EA not only didn't use the cumulative A-weighted DNL core decision making metric (see Problems 6 and 8 above), thereby failing to do the analysis the EA says the FAA requires, the EA also failed to use supplemental metrics to discuss low frequency noise. As a result, the full range of noise impacts have not been considered and analyzed and the EA's noise assessment is inadequate

Part IV. Inadequate Noise Health Impacts Assessment

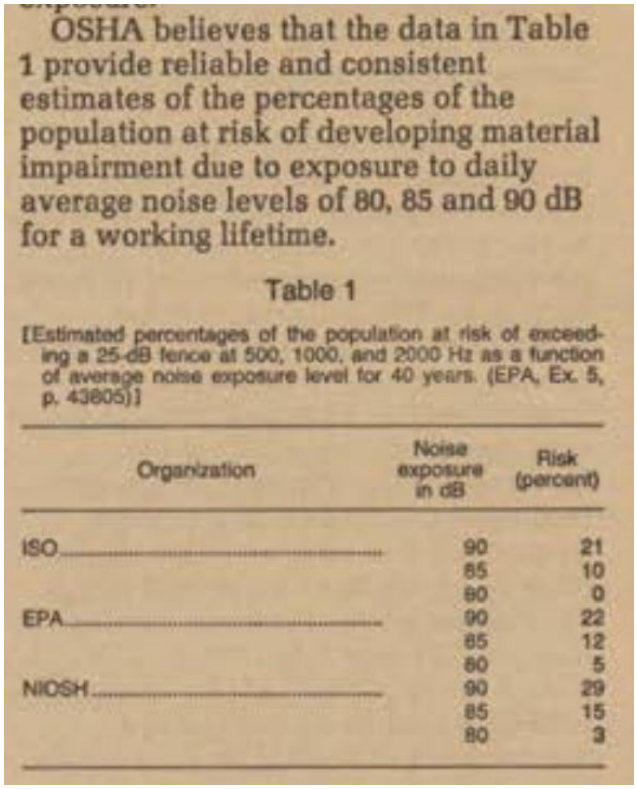
The noise related health assessment used in the EA was limited to only hearing conservation and didn't consider other health impacts such as annoyance and sleep interference. Moreover, the hearing assessment used inappropriate criteria to disclose health impacts.

Problem 13: The EA Should Have Used the US EPA and World Health Organization Guidelines to Assess Hearing Health.

According to the Hearing Conservation Guidelines on page 5 of the Noise Assessment, the EA relied on OSHA standards:

> "Occupational Safety and Health Administration (OSHA) guidelines are to protect human hearing from long-term, continuous exposures to high noise levels and aid in the prevention of noise-induced hearing loss (NIHL). OSHA's permissible daily noise exposure limits include a LAmax of 115 dBA (slow response) for duration of 0.25 hours or less."
>
> *Noise Assessment*, 5

There are numerous factual errors in the above statement that will be explained in this and the following Problems. The first error is that **the OSHA values do not protect human hearing from noise-induced hearing loss.** It has long been known and acknowledged by OSHA that a significant percentage of people will suffer hearing loss at OSHA Levels. On page 4084 of the Federal Register, Vol. 46, No. 11 (Jan. 16 1981) OSHA acknowledges this (see Figure 6).



OSHA believes that the data in Table 1 provide reliable and consistent estimates of the percentages of the population at risk of developing material impairment due to exposure to daily average noise levels of 80, 85 and 90 dB for a working lifetime.

Table 1

[Estimated percentages of the population at risk of exceeding a 25-dB fence at 500, 1000, and 2000 Hz as a function of average noise exposure level for 40 years. (EPA, Ex. 5, p. 43805)]

Organization	Noise exposure in dB	Risk (percent)
ISO	90	21
	85	10
	80	0
EPA	90	22
	85	12
	80	5
NIOSH	90	29
	85	15
	80	3

Figure 6. Table 1 from the OSHA Final Rule in the Federal Register Vol. 46, No. 11, 4084. In the table, the right hand column shows the increased risk of hearing loss at various exposure levels. The left hand column notes the entity reporting the increased risk as the International Standards Organization (ISO), the US EPA, and US NIOSH. In the middle column, the 90 dBA exposure is the OSHA value.

Thus, according to OSHA, between 21 and 29 percent of people exposed to the OSHA levels that the EA relies on will suffer a material hearing impairment.

Moreover, the OSHA definition of material hearing impairment is a 25 dB reduction in hearing ability at certain specific frequencies. This is actually a quite dramatic hearing damage. It is, for example, greater than the impairment one would experience if one lived with earplugs in their ears constantly.[9] So by using this OSHA standard for the EA, it suggests that the FAA doesn't think that the same impact as having to wear earplugs 24/7 is a problem. However, no one with normal hearing would say that living with earplugs in your ears does not have a significant impact on your hearing. What OSHA defines as material hearing impairment is a level of impairment most people would find very impactful, and therefore the EA's assessment of hearing damage is incredibly flawed.

The EPA and the World Health Organization have recommendations that address both OSHA's insufficient criteria for safety and its unacceptably high threshold for material hearing impairment. Both these organizations recommend a 70 dBA 24 hour Leq value. *See* EPA, Information on Levels of Environmental Noise Requisite to Protect the Public Health and Welfare with an Adequate Margin of Safety at 28. ("An Leq(24) of 70 dB is identified as protecting against damage to hearing.").

According to WHO:

> It is expected that environmental and leisure-time noise with a LAeq,24h of 70 dB(A) or below will not cause hearing impairment in the large majority of people, even after a lifetime exposure. For adults exposed to impulse noise at the workplace, the noise limit is set at peak sound pressure levels of 140 dB, and the same limit is assumed to be appropriate for environmental and leisure-time noise. In the case of children, however, taking into account their habits while playing with noisy toys, the peak sound pressure should never exceed 120 dB.
>
> WHO, Community Noise Guidelines, vii

It should be noted that NASA is well aware of this issue of hearing loss at what were once considered low exposure levels, as cosmonauts and astronauts have dealt with temporary and permanent hearing loss in 70 dBA or so environments on the International Space Station and other missions.

[9] The EPA required label on ear plugs typically have a Noise Reduction Rating (NNR) between 20 and 30 dB, meaning they reduce one's exposure, or conversely reduce one's hearing ability, by that much. Moreover, "OSHA acknowledged that in most cases, [the NNR] overstated the protection afforded to workers and required the application for certain circumstances of a safety factor of 50% to the NRR" (OSHA Technical Manual, Section III: Chapter 5). Basically, even a 33 dB NNR earplug would typically result in a 17 dB reduction in hearing ability.

The noise of the proposed action should have been assessed using the scientifically based EPA and WHO 70 dBA level. By not doing so, the EA missed finding and disclosing exposure to unhealthy noise levels for many people nearby.

Problem 14: The EA Misrepresents the OSHA Hearing Conservation Criteria and Therefore Neglects to Assess Three Important Criteria.

As Problem 13 notes, the EA didn't provide an adequate science-based assessment of the potential for hearing damage. But the EA didn't even adequately perform the assessment it claimed to carry out with respect to OSHA regulations.

OSHA regulations require three tests, none of which the EA examined. They are:

1. 85 dBA Leq (8hr) for the initiation of hearing conservation programs.
2. 90 dBA Leq (8hr) regulatory standard.
3. No exposure greater than 115 dBA.

Specifically, the OSHA rule states:

> This final rule establishes a hearing conservation program, including exposure monitoring, audiometric testing, and training, for all employees who have occupational noise exposures equal to or exceeding an 8-hour time-weighted average of 85 dBA.[10]
>
> OSHA Final Rule in the Federal Register Vol. 46, No. 11, 4078
>
> OSHA's existing standard for occupational exposure to noise (29 CFR 1910.95) specifies a maximum permissible noise exposure level of 90 dB for a duration of 8 hours, with higher levels allowed for shorter durations. (This level is called a time-weighted average sound level, abbreviated TWA.)
>
> OSHA Final Rule in the Federal Register Vol. 46, No. 11, 4078
>
> The current standard does not permit exposures above 115 dB, regardless of duration.
>
> OSHA Final Rule in the Federal Register Vol. 46, No. 11, 4132

[10] See also: Hearing conservation program, 29 CFR 1910.95(c)(1):
"The employer shall administer a continuing, effective hearing conservation program, as described in paragraphs (c) through (o) of this section, whenever employee noise exposures equal or exceed an 8-hour time-weighted average sound level (TWA) of 85 decibels measured on the A scale (slow response) or, equivalently, a dose of fifty percent. For purposes of the hearing conservation program, employee noise exposures shall be computed in accordance with appendix A and Table G-16a, and without regard to any attenuation provided by the use of personal protective equipment."

The EA did not evaluate the proposed action against any of these tests. To do so, it would have had to express the sonic boom noise as a decibel level to assess the third test, which it did not do. Also, it would need to combine the launch/landing noise values with the sonic boom dBA values for the 85 and 90 dBA tests, which it also did not do.

It is critical that these levels be assessed, in addition to the Health Assessment that should have happened and was referenced in Problem 13, because the rocket noise could impose significant costs on nearby employers and employees. At exposure levels above 85 dBA TWA, the employer is responsible for initiating a Hearing Conservation Program, including exposure monitoring, audiometric testing, and training that is quite costly to the employer. From the accessible data, it appears that SpaceX's activities could trigger the need for such programs at several locations, yet the EA does not consider this impact on the community.

The EA should therefore have discussed and provided maps showing the 85 dBA 8-hour TWA, the 90 dBA TWA, and the 115 dBA Lmax contour **for the combination of all noises associated with the proposed action**. This includes all noises experienced within one day, including the launch, the landing of boosters, and any sonic booms.

The EA/*Noise Assessment* simply failed to do the hearing conservation assessment it claimed it did, because it ignored the combination of launch and sonic boom noise. This is inconsistent with the OSHA criteria assessment specifically mentioned in the FAA Order 1050.1F Desk Reference, which requires an analysis of *both* launch and sonic boom noise:

> Indications that Occupational Safety and Health Association (OSHA) hearing damage criteria and/or structural damage criteria **for launch and sonic boom noise** (i.e., levels well above noise levels causing annoyance) may be exceeded should also be included.
>
> FAA Order 1050.1F Desk Reference, 11-17, **emphasis added**

As discussed above with regard to Problem 7, no cumulative launch/landing noise and sonic boom noise analysis was performed for the Hearing Health Assessment, which is particularly important to a hearing conservation assessment because hearing criteria require the cumulative exposure, independent of its source, over a specific time period. Sonic boom noise must be combined with launch noise and with landing noise to do such an assessment. The EA's hearing conservation assessment is therefore not reliable.

Problem 15: The EA Failed to Consider Cumulative Impacts of Noise Exposure Not Related to the Proposed Action.

The EA appears to have assumed that the SpaceX facility is entitled to OSHA's entire "permissible" dose of noise. But many people have occupational and recreational noise exposure independent of the rocket noise exposure. An outdoor worker, for example, who is

just below the hearing conservation program level, say 84.9 dBA, would be pushed over by the an additional exposure of 75 dBA from rocket noise. Basically, rocket noise exposures must be at least 10 dB less than the OSHA criterion levels to not impact the workers' exposure.

Consequently, to do an adequate cumulative impacts assessment for OSHA's required hearing conservation programs, a discussion of the 75dBA (8hr) and 80 dBA (8hr) contour lines is required.

The cumulative impacts of personal, occupational, and rocket noise exposure may push the public beyond the safe noise exposure level. Consequently, the EA maps showing, and a discussion of, the 60 dBA Leq(24) levels is also required with respect to the EPA and WHO hearing guidelines.

The EA's failure to address the additive effects of the noise from the proposed activities and how they interact with existing noise levels renders the analysis incomplete.

Problem 16: The EA Failed to Consider Noise Impacts on Children's Environmental Health.
The FAA Order 1050.1F Desk Reference notes:

> Pursuant to Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks 62 Federal Register 19885, (April 21, 1997), federal agencies are directed, as appropriate and consistent with the agency's mission, to make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children.
>
> FAA Order 1050.1F Desk Reference, 12-14

> Impacts to children are considered separately in NEPA reviews because children may experience a different intensity of impact as compared to an adult exposed to the same event.
>
> FAA Order 1050.1F Desk Reference, 12-14

That children's health needs to be assessed separately is particularly true with exposure to noise. The WHO, for example, in the quote referenced above in Problem 13 notes that: "In the case of children, however, taking into account their habits while playing with noisy toys, **the peak sound pressure should never exceed 120 dB**." The EA, in order to meet its obligation to address children's environmental health, needed to provide maps showing and a discussion of the 120 dB peak sound pressure contour. (It should be noted that "peak" sound pressure level is a noise metric different from Lmax, but laypeople might confuse the two as similar). This information, however, was not included in the EA or the *Noise Assessment*. The EA therefore failed to adequately investigate impacts on children's environmental health, as the FAA's Order requires.

Problem 17: The EA Failed to Assess Sleep Interference and Learning Impacts.

The FAA Order 1050.1F Desk Reference notes:

> The type and nature of activity potentially impacted should be considered. The FICON report identified sleep disturbance and speech interference as two areas where it is appropriate to consider supplemental metrics. In the case of sleep disturbance the predicted number of awakenings in the US may be calculated using the ANSI Noise Standard ANSI S12.9-2008/Part 6, Quantities and Procedures for Description and Measurement of Environmental Sound – Part 6: Methods for Estimation of Awakenings Associated with Outdoor Noise Events Heard in Homes. To examine speech interference (also used as a surrogate for children's learning), FICON recommended using a cumulative A-weighted metric that is limited to the affected time period hours or a Time-above analysis. Additionally, the FICON report provides a table that relates DNL to speech interference. The Federal Interagency Committee on Aviation Noise (FICAN) also provided updated background on these findings in their 2018 report Review of Selected Aviation Noise Research Issues.
>
> FAA Order 1050.1F Desk Reference, 11-12 and 13

Sleep interference would be implicated for nighttime launch events, for shift workers affected by daytime events, and for children and elderly taking daytime naps. The word "sleep" is not mentioned in the EA, and only once, tangentially, in the *Noise Assessment*, and not at all in the *Sonic Boom Analysis*. This is another situation where the EA failed to address the actual impacts of noise associated with the proposed activities, particularly as it relates to children's environmental health.

Part V. Additional Mistakes, Misstatements, and Misleading Statements in the EA

The EA contains a number of mistakes, misstatements, and misleading statements that need to be corrected. A number have already been noted, such as the misidentification of South Bay, Bahia Grande, and Laguna Madre as soft land and the mischaracterization of the OSHA guidelines. The following are some of the most egregious additional mistakes, misstatements, and misleading statements in the EA concerning noise.

Problem 18: The EA Deceptively Misrepresents the Noise Levels and Audibility.

The EA and Noise Assessment, in a number of locations, refer to the audibility of noise and noise levels.

> If the same launch occurs during the night, when background levels are lower than during the day (e.g., below 40 dB to 50 dB range), these residents may notice launch noise levels that exceed 60 dB.
>
> EA, 28

This statement is misleading on many levels. There are at least two interpretations of this statement. **If the statement is purely an assessment of audibility** (i.e., the launch noise is audible if it exceeds 60 dBA and the background is 40 to 50 dBA), it fails because the noise is well above background. Each 10 dBA increase is approximately a doubling of loudness. So in a 40 dBA background, launch noise would be 4 times louder than background. It would dominate the soundscape.

Moreover, people can hear sounds below the background level. That is why one can hear the violins even though the entire orchestra is performing. Launch noise, with its distinctive low frequency noise and high frequency crackle, and sonic booms with their rapid rise time, would be easy to detect at noise levels less than the existing background levels.

The statement also implies that the EA did an audibility assessment. However, the EA did *not* disclose any details of the analysis, if any such analysis occurred. Given the nature of the "noticeability" claims in the EA, it seems very unlikely that any analysis was actually performed. Since, the EA did not measure background levels but merely estimated them, the accuracy of any such audibility assessment is questionable. Audibility requires a knowledge of the background and source noises at various frequencies. Octave or third-octave noise levels were not part of the background noise estimates.

Another possible interpretation of the statement is that **the statement refers to launch noise levels in the area** (meaning the noise may exceed 60 dBA). In this case, the statement is true in a very deceptive way. It would be like saying people in Death Valley in the summer may experience temperatures of more than 60 degrees. While 120 degrees is more than 60 degrees, being told to prepare for temperatures more than 60 degrees provides more misinformation than useful information to a visitor of Death Valley. Similarly, knowing that areas that are actually 90-100 dBA may exceed 60 dBA provides more misinformation than information to the public.

Finally, the word "may" is extremely deceptive. The paragraph is discussing sound pressure levels that are well above the claimed background levels. The noise "will" be audible and noticeable.

The same claim is made on page 6 of the *Noise Assessment*:

> If the same launch occurs during the night, when background levels are lower than during the day (e.g., below 40 dB to 50 dB range), these residents may notice launch noise levels that exceed 60 dB.
>
> *Noise Assessment*, 28

A similar claim is made on Page 27 of the EA:

> Residents of Port Isabel may hear Starship landing events above 60 dB, particularly during nighttime landings.
>
> *EA,* 27

Figure 9, however, clearly shows the noise in parts of Port Isabel as between 90 and 100 dBA.

The following quote contains another claim about "noticing" noise, without any analysis of how that actually affects the community.

> Residents of Brownsville were expected to possibly hear noise levels above 60 dBA, but noise during offshore Super Heavy or Starship landing events was not expected to be noticed by residents along the coast.
>
> *EA,* 27

In addition to the dubious 60 dBA claim previously discussed, the coastline assessment is completely false. First, the offshore landings were not modeled or investigated, so there is no basis for the claim. Second, the Starship landing maximum A-weighted sound levels for South Padre Island show areas between 90 dBA and the 100 dBA contour, which is just south of the island (Figure 11). The unweighted levels in that area are over 110 dB. Thus, the statement that residents along the coast will not notice noise from landing events is simply false.

The Nosie Assessment likewise stated that:

> Residents of Port Isabel may hear Starship landing events above 60 dB, particularly nighttime landings. The 115 dB LAmax contour, which is used as a conservative limit for hearing conservation, is located approximately 1 mile from the landing pad.
>
> *Noise Assessment ,14*

However, "conservative" is not a word one would use to describe a 115 dBA noise, which is actually a very high noise limit. Moreover, this ignores OSHA's more conservative 85 dBA Leq OSHA criteria for hearing conservation, which the EA ignores. And even the OSHA levels are known to still cause hearing damage. Thus, the analysis certainly is not conservative.

Finally, as noted above, the EA misquotes the OSHA standard, which actually requires three tests, the 115 dBA Lmax, the 85 dBA (8hr) and the 90 dBA (8hr) test. . Yet the *Noise Assessment* repeatedly states otherwise:

> Residents of Port Isabel and eastern Brownsville may hear booster landing events above 60 dB, particularly nighttime landings. The 115 dB LAmax contour,

> which is used as a conservative limit for hearing conservation, is located approximately 1.5 miles from the landing pad.
>
> *Noise Assessment, 18*

> Residents of Port Isabel may hear Starship static test events above 60 dB, and particularly if onshore wind conditions favor sound propagation to the west. The 115 dB LAmax contour, which is used as a conservative limit for hearing conservation, is located approximately 1 mile from the static test site.
>
> *Noise Assessment ,22*

> Residents of Port Isabel may hear booster static test events above 60 dB, and particularly at night and if onshore wind conditions favor sound propagation to the west. The 115 dB LAmax contour, which is used as a conservative limit for hearing conservation, is located approximately 1.2 miles from the static test site.
>
> *Noise Assessment ,22*

The *Noise Assessment* therefore makes the same mistake over and over again.

Another particularly disingenuous analysis can be found on Page 64 of the EA:

> Additionally, prior to SpaceX converting the area to a testing facility, the Massey's site operated as a publicly accessible gun range, which exposed the surrounding area to operational noise. For comparison, according to the American Speech-Language-Hearing Association, the average gunshot is approximately 140 decibels (2023).
>
> *EA ,64*

However, there is no comparison between a gunshot and a sonic boom or a rocket launch. In terms of loudness or in terms of distance the noise can be heard, they are not at all comparable. Moreover, while we were unable to find the cited reference, the gunshot noise mentioned was probably an unweighted peak sound pressure level that occurred literally inches from the ear, while Figure 7 of the *Noise Assessment* shows the unweighted maximum sound pressure level of 140 dB to be between 1 and 2 miles from the launch site. Also, the metric probably used for gun noise, peak sound pressure level, is a different metric than the maximum sound pressure level used in Figure 7, with peak being even greater. Distance and metrics matter a lot when making noise comparisons. The analysis is therefore disingenuous, and the resulting conclusions are unreliable.

Conclusions

The EA contains a number of problems. These problems generally fall into the following five categories, although they overlap and impact each other. The five general categories are:

1. Inadequate disclosure—this includes inadequate disclosure of modeling inputs and assumptions, the accuracy of the noise modeling, whether AEE provided prior approval for the use of RNOISE, the failure to assess the sonic boom noise from the jettisoned heat shield, the noise from Gulf landings, and the cumulative impacts of all the noise using the A-weighted DNL, as well as inadequate disclosure of various health, sleep, and learning impacts.
2. Inaccurate modeling assumptions—such as ignoring the reflective surface of South Bay, Bahia Grande, and Laguna Madre.
3. Failure to consider cumulative impacts—particularly when evaluating the combined impact of launch, landing, and sonic boom noise with respect to health and land use compatibility, the failure to utilize the FAA's core decision making metric with respect to launch, landing, and sonic boom noise, failure to consider the effect of non-rocket related noise exposure, and failure to include Gulf landings.
4. Wrong impact criteria—such as not using the A-weighted DNL for cumulative impacts, not using the correct OSHA criteria, not using the EPA and WHO land use compatibility thresholds, not using the EPA and WHO hearing health criteria, not using accurate audibility criteria, not using sleep interference and learning interference criteria, not using peak sound pressure level exposure criteria to assess impacts to children's health.
5. Errors, omissions, and false and misleading statements—including the South Bay, Bahia Grande, and Laguna Madre land cover problem, mischaracterization of OSHA criteria, the omission of Gulf landings and Gulf nighttime landings, the lack of an A-weighted cumulative analysis, Section 4(f) analysis with inaccurate modeling, use of a supplemental metric as the primary metric, no treatment of low frequency noise, no treatment of sleep interference, no assessment of children's hearing health, the comparison of gun shots to rocket launches and sonic booms, and a host of misstatements about noise levels and the noticeability of noise.

In sum, it is my opinion that the EA failed to accurately quantify the noise levels and failed to accurately assess the noise impacts. The cumulative effect of all of the errors and omissions in the EA is extremely significant. The incorrect modeling of South Bay, Bahia Grande, and Laguna Madre as soft ground impacts every contour map the EA presents. The unmodeled sonic booms from Gulf landings, the unmodeled nighttime Gulf landings, and the undisclosed modeling accuracy range all impact the cumulative analysis of noise impacts. The lack of a true cumulative noise analysis is particularly troubling. Consequently, neither the Land Use Compatibility nor the Health/Hearing Conservation assessments are accurate or reliable.

Appendix A: List of Problems with the EA, Noise Assessment, and Sonic Boom Analysis

Problem 1. Wrong ground impedance used in modeling due to misrepresentation of the ground surface.
Problem2: The EA Failed to Disclose the Modeling Inputs Used in the Noise Models.
Problem 3: The EA Failed to Disclose and Account for the Accuracy of the Noise Models.
Problem 4: RNOISE May Not Have Been Approved for Use in an EA.
Problem 5: EA Failed to Consider and Analyze Landing Noise and Sonic Booms from Gulf Landings.
Problem 6: No Cumulative Launch/Landing Noise and Sonic Boom Noise Analysis Was Performed for the Compatible Land Use Assessment.
Problem 7: No Cumulative Launch/Landing Noise and Sonic Boom Noise Analysis Was Performed for the Hearing Health Assessment.
Problem 8: The EA Failed to Use the Primary Noise Metric and Elevated a Supplemental Metric to the Role of a Primary Metric.
Problem 9: The Cumulative Impact of All the Errors and Omissions is Significant.
Problem 10: The FAA's 65 dBA DNL Threshold for Land Use Compatibility is not Sufficiently Protective.
Problem 11: The EA's Section 4(f) Analysis was Based on Faulty Noise Modeling.
Problem 12: Supplemental Metrics Were Not Used to Disclose Issues of Low Frequency Noise, Rumble, Rattle, and Crackle.
Problem 13: The EA Should Have Used the US EPA and World Health Organization Guidelines to Assess Hearing Health.
Problem 14: The EA Misrepresents the OSHA Hearing Conservation Criteria and Therefore Neglects to Assess Three Important Criteria.
Problem 15: The EA Failed to Consider Cumulative Impacts of Noise Exposure Not Related to the Proposed Action.
Problem 16: The EA Failed to Consider Noise Impacts on Children's Environmental Health.
Problem 17: The EA Failed to Assess Sleep Interference and Learning Impacts.
Problem 18: The EA Deceptively Misrepresents the Noise Levels and Audibility.

Appendix B: Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety

Appendix C: Guidelines for Community Noise

DD. FAA-2024-2006-2520-A13

Comment Response

The Final Tiered EA and accompanying noise studies were conducted using established methodologies for assessing aviation and rocket noise impacts, incorporating FAA-approved models, noise thresholds, and analytical frameworks. The noise impact analysis considers land use compatibility, hearing conservation, and structural damage potential, aligning with FAA Order 1050.1F and relevant regulatory guidance.

Noise Modeling Methodology & Accuracy

The use of RNOISE in the Final Tiered EA is both appropriate and consistent with FAA precedent for evaluating launch noise impacts. While FAA Order 1050.1F and its Desk Reference primarily discuss noise models applicable to aircraft operations, RNOISE has been used extensively for space launch vehicle noise modeling, including in FAA-approved Environmental Impact Statements (EISs) and Environmental Assessments (EAs) for other launch facilities. RNOISE has been used in multiple FAA, NASA, and U.S. Air Force environmental reviews, including: Evolved Expendable Launch Vehicle (EELV) Program EIS (1998) NASA's X-33 Advanced Technology Demonstrator Vehicle Program Draft EIS (1997). RNOISE has been validated against measured launch noise data and has been refined over several decades, making it a reliable tool for assessing rocket launch noise. The FAA retains the discretion to apply appropriate modeling tools when evaluating unique noise sources such as rocket launches. Space launch noise differs significantly from conventional aircraft noise, necessitating the use of specialized models like RNOISE, which accounts for the unique acoustic properties of high-thrust launch vehicles. Given RNOISE's extensive prior use in FAA-approved environmental analyses, its application in the Final Tiered EA is consistent with past practice and does not require additional approval. The FAA has documented the use of RNOISE in the EA's technical appendices, ensuring transparency regarding the modeling approach.

The RNOISE modeling approach accounts for far-field community noise exposure and launch vehicle dynamics, incorporating data from previous launch events to refine assumptions. Ground impedance values, topography assumptions, and atmospheric propagation effects were carefully considered to improve accuracy. The FAA's analysis includes reasonable assumptions based on empirical data from prior Starship launches and validated methodologies used in environmental noise studies for other launch programs.

The noise assessment does not misclassify South Bay, Bahia Grande, or Laguna Madre as land. The modeling appropriately differentiates between land and water surfaces, accounting for differences in acoustic impedance. The selected ground impedance values were based on established environmental noise modeling practices and reflect a combination of coastal wetlands, estuarine environments, and open water conditions. Water bodies, including the Gulf of Mexico, were modeled as acoustically hard surfaces, as is standard practice in noise modeling for aviation and launch activities. Inland areas were modeled using a representative ground impedance value based on the most common ground cover types around Boca Chica. This includes a mix of wetlands, coastal scrub, and intertidal zones, which exhibit greater absorption than open water but are not entirely reflective. Shallow water bodies and estuarine environments absorb more sound energy than deep open water, meaning that not all water areas act as perfect reflectors. While some additional noise reflection may occur over partially inundated regions, the effect is not as extreme as implied and would not significantly alter overall exposure contours. While variability exists in how sound interacts with mixed-terrain landscapes, the EA's approach aligns with past

FAA, NASA, and U.S. Air Force environmental reviews for rocket noise assessments. The Final Tiered EA includes detailed descriptions of the modeling methodology, including references to the noise propagation model (RNOISE), data sources, and assumptions regarding atmospheric conditions. FAA-approved models, such as RNOISE, incorporate standardized input parameters that have been refined through decades of validation with real-world data. These models are routinely used in environmental impact assessments for spaceports and launch facilities. While the comment requests full disclosure of all modeling files, FAA policy does not require the release of proprietary modeling data or software code. However, the underlying methodology and assumptions used in the assessment are clearly presented. The Final Tiered EA acknowledges that prevailing wind conditions may influence noise propagation but does not rely on a single atmospheric condition for its conclusions. Rocket launch noise modeling accounts for varying meteorological conditions, ensuring a conservative estimate of potential noise impacts under different scenarios. The FAA assessed noise levels in surrounding communities, considering all relevant factors influencing noise propagation. The DNL 65 dB contour remains within areas that are not residential, and no significant population exposure beyond what was already assessed is expected. The number of affected individuals does not change by an order of magnitude, as suggested in the comment, since populated areas were already modeled based on empirical noise propagation trends from past launches. The core conclusions of the Final Tiered EA regarding noise impacts remain valid. Even if additional refinements were made to ground impedance values, they would not meaningfully change the significance determination under FAA Order 1050.1F. The modeling aligns with NEPA regulations, which require using the best available science but do not mandate absolute precision beyond reasonable scientific uncertainty. The Final Tiered EA follows established best practices for incorporating environmental conditions in noise propagation analysis. The FAA's noise analysis relies on validated, industry-standard models that have been tested and refined over multiple decades. The request for complete disclosure of modeling files, including proprietary software inputs, is not standard practice in NEPA reviews, as long as the methodology and results are sufficiently documented for public review.

The Final Tiered EA explicitly recognizes that noise modeling is an estimation tool and that real-world conditions such as ground impedance, atmospheric conditions, and terrain variations can influence noise propagation. While ISO 9613-2 applies to general noise propagation models, rocket launch noise involves unique acoustic properties, including high-intensity, transient noise sources that require specialized modeling approaches like RNOISE. The Final Tiered EA accounts for worst-case noise exposure scenarios by analyzing maximum A-weighted sound levels (LAmax) and cumulative noise exposure metrics (DNL/CDNL). OSHA hearing conservation guidelines (115 dBA LAmax for <15 minutes) provide a regulatory framework for evaluating hearing health impacts, and the Final Tiered EA demonstrates that predicted noise levels remain within those established limits.

The FAA’s methodology prioritizes conservative estimates, meaning that actual noise exposure levels are unlikely to exceed modeled predictions in a way that would significantly alter impact conclusions. The EA’s noise assessment aligns with prior FAA-approved environmental reviews for commercial space operations, including EISs and EAs for Cape Canaveral, Vandenberg, and Wallops Island. While confidence intervals are not explicitly included, the conservative assumptions built into the model inherently account for variations in real-world conditions. The FAA’s significance thresholds, as outlined in Order 1050.1F, focus on exposure levels relative to established criteria (e.g., DNL 65 dB for land use compatibility), ensuring that regulatory decisions are based on reliable and actionable data.

The Final Tiered EA assesses potential sleep disturbance using DNL and CDNL, which is the FAA's preferred metrics for noise sources like rocket launches. Peak noise levels are considered in relation to both land use compatibility and potential health impacts, ensuring that noise exposure remains within thresholds (noise sensitive receptors experiencing 65 db for the DNL and 60 dB for the CDNL) used in prior FAA environmental reviews for rocket launches.

The Final Tiered EA meets NEPA's requirements by providing a detailed summary of the methodology, key inputs, and conclusions, ensuring that the public can evaluate the overall findings.

Cumulative Noise Impacts

The FAA considered cumulative impacts of noise, including multiple launch and landing events, static fires, and associated operations. Cumulative noise levels were assessed using the Day-Night Average Sound Level (DNL) and C-Weighted DNL (CDNL) metrics, both of which are standard for assessing long-term exposure and community impacts on an annual time scale. CDNL is specifically used for impulsive noise sources (e.g., rocket launches and sonic booms) to better capture low-frequency energy propagation, which is why it is included in addition to DNL. The FAA also considered background noise levels, including aircraft operations, port activities, and seasonal noise from South Padre Island, which contribute to the overall noise environment.

Sonic booms and launch noise are distinct acoustic events that require separate modeling methodologies due to their different propagation characteristics. Cumulative impacts from sonic booms impulsive noise events, best evaluated using C-weighted Day-Night Average Sound Level (CDNL), which accounts for their unique low-frequency characteristics. Launch and landing noise, on the other hand are evaluated using an A-weighted DNL (Day-Night Average Sound Level), the FAA's established metric for land use compatibility. Combining these two metrics directly is not possible, as they are calculated and are weighted based on their frequencies differently. The Final Tiered EA does consider cumulative noise impacts by analyzing the spatial and temporal distribution of different noise sources. Section 3.2.3.5 of the Final Tiered EA discusses cumulative noise exposure from repeated sonic booms over time. The noise contour maps provide a comprehensive look at how different noise sources interact across the affected areas. FAA Order 1050.1F defines significance thresholds based on DNL 65 dB for land use compatibility.

The Final Tiered EA appropriately evaluates noise impacts by analyzing projected noise levels from SpaceX operations in accordance with FAA Order 1050.1F and relevant regulatory thresholds. However, it is important to clarify how cumulative noise exposure is considered and how regulatory limits are applied. OSHA regulations (29 CFR 1910.95) establish exposure limits based on an 8-hour time-weighted average (TWA), which applies to occupational settings. These standards are not intended to account for cumulative exposure from multiple sources beyond the workplace. The Final Tiered EA does not assume that SpaceX operations are entitled to OSHA's entire "permissible" dose of noise. Instead, it evaluates projected noise from launch and landing events relative to established health and safety thresholds. Outdoor workers, industrial sites, and other existing noise sources in the region contribute to baseline conditions, which are accounted for in the EA's background noise assumptions. The FAA's primary noise metric is A-weighted Day-Night Average Sound Level (DNL 65 dBA) for land use compatibility. WHO and EPA guidelines reference a 70 dBA Leq(24) threshold to prevent hearing loss, which aligns with OSHA's limits. The EA's noise modeling results indicate that noise exposure from SpaceX operations is below these levels for the vast majority of the surrounding area. The 60 dBA Leq(24) contour was not specifically mapped in the EA, but the DNL contours already incorporate cumulative exposure from repeated launch

events. Boca Chica and the surrounding area already experience variable noise levels from natural, industrial, and human activities. Final Tiered Launch-related noise exposure occurs infrequently and is transient—unlike continuous occupational noise exposure, which OSHA regulations are designed to address.

Even when considering multiple launch and landing events per year, the cumulative DNL remains below the threshold for significant land use impacts in noise-sensitive areas. Sonic boom events are factored into the cumulative exposure analysis using CDNL, and the Final Tiered EA finds that noise-sensitive areas remain below significance thresholds.

Land Use Compatibility

The Final Tiered EA applies FAA's 14 CFR Part 150 land use compatibility guidelines, which are widely used for assessing noise from aviation and space launch operations. Noise-sensitive areas near Boca Chica Beach are unoccupied during launch events due to safety-related closures, ensuring no direct human exposure to peak noise levels. DNL 65 dB is an established threshold for residential land use compatibility, and the analysis confirms that noise levels beyond this threshold do not extend into residential areas. Alternative thresholds, such as the EPA's 55 dBA DNL recommendation, were not developed for regulatory decision-making regarding aviation and rocket noise compatibility but rather represent a general noise exposure guideline. The 65 dBA DNL threshold is derived from social surveys and scientific studies assessing public reaction to noise exposure, including work by Theodore J. Schultz, whose Schultz Curve remains a cornerstone of noise impact analysis.

The FAA's 65 dBA DNL standard has undergone multiple reviews and remains the most appropriate regulatory standard for assessing noise compatibility, as reaffirmed in numerous NEPA reviews and aviation noise studies. While the FAA is engaged in an ongoing review of noise policy, this does not invalidate the current standard, nor does it require the use of alternative thresholds that have not been adopted into FAA regulatory guidance. The Final Tiered EA properly assesses cumulative noise exposure using the established DNL framework to determine land use compatibility. The FAA's noise assessment also considers localized conditions, including pre-existing ambient noise levels from natural and human sources (e.g., Port of Brownsville operations, South Padre Island activities, and seasonal noise events such as fireworks). The Final Tiered EA analyzes the proposed action. NEPA does not mandate the adoption of more restrictive noise thresholds, nor does it require agencies to base their analysis on speculative or unofficial recommendations. The FAA's noise significance threshold under NEPA is clearly defined in FAA Order 1050.1F (noise sensitive area that is exposed to noise at or above the DNL 65 dB noise exposure level), and the EA's application of this threshold is consistent with regulatory requirements.

The FAA evaluated noise impacts on wildlife and refuge areas, implementing mitigation measures such as monitoring and habitat protection to minimize disruption.

As discussed above, though FAA Order 1050.1F Desk Reference establishes DNL 65 dBA as the primary metric for land use compatibility assessments, sonic booms differ significantly from continuous aviation noise due to their low-frequency, high-energy impulse characteristics, requiring C-weighting for accurate assessment. The Desk Reference explicitly allows for the use of supplemental metrics, including CDNL, to assess noise impacts from space launch activities. A-weighted DNL (DNL 65 dBA) is optimized for continuous aircraft noise and does not accurately capture the low-frequency energy of sonic booms. CDNL provides a better representation of community response to impulsive noise events, which is why it has been used in past environmental analyses for space operations. This approach aligns with past FAA and

DoD analyses of sonic boom noise impacts. Sonic booms and launch noise originate from different sources and behave differently acoustically. Combining DNL and CDNL directly is not possible due to the differences in weighting methods. Instead, the Final Tiered evaluates the separate impacts of these noise sources using the most appropriate metrics for each type of noise. The Final Tiered EA appropriately evaluates land use compatibility using DNL 65 dBA for continuous launch and landing noise.

Noise Health & Hearing Conservation

The Final Tiered EA follows OSHA and EPA guidelines for occupational and environmental noise exposure, ensuring that hearing conservation measures are appropriate. Low-frequency noise impacts were assessed to determine potential effects on human health, wildlife, and structures. The maximum expected noise levels (LAmax) remain below the thresholds associated with structural damage and significant health risks.

The FAA applied OSHA's hearing conservation criteria, which focus on both peak noise levels (LAmax) and cumulative noise exposure (Leq over 8 hours). Launch and landing noise are not continuous occupational exposures but intermittent, short-duration events, meaning standard industrial noise exposure models are not directly applicable. The Final Tiered EA finds that maximum noise levels (LAmax) do not exceed OSHA's regulatory limit of 115 dBA, ensuring compliance with hearing safety thresholds. Instead, the Final Tiered EA evaluates the cumulative impact of repeated sonic boom events over time using the appropriate methodology. Hearing conservation regulations apply primarily to occupational settings where workers are exposed for extended periods. The EA's analysis focuses on environmental noise exposure rather than workplace-specific noise exposure assessments, which are the responsibility of individual employers under OSHA regulations. However, the Final Tiered EA does acknowledge that some locations may experience elevated noise levels, and mitigation measures, such as public notifications and controlled access to high-exposure areas, are in place to reduce potential impacts. FAA Order 1050.1F states that analyses should consider potential exceedances of OSHA criteria for launch and sonic boom noise.

The Final Tiered EA follows this both FAA and OSHA guidance by evaluating peak noise levels and applying established noise thresholds to assess potential health impacts. While additional cumulative noise exposure modeling could enhance the analysisis always possible, the EA remains is consistent with FAA and OSHA regulatory frameworks.

The Final Tiered EA appropriately applies OSHA guidelines for hearing conservation, as these standards are widely used and federally recognized for assessing occupational noise exposure. However, the Final Tiered EA also acknowledges other health-based noise thresholds, including EPA and WHO recommendations, in its broader analysis of community noise impacts. The OSHA permissible noise exposure levels (115 dBA max, 90 dBA for an 8-hour workday) provide a structured framework for assessing hearing health risks in workplace and environmental settings. While OSHA acknowledges that long-term exposure at these levels may pose a risk for some individuals, its criteria remain the primary regulatory standard for hearing conservation under U.S. law. The EA's reliance on OSHA standards ensures consistency with other federal noise assessments and regulations, including those applied to aviation and industrial activities. The EPA's 70 dBA Leq(24) guideline and WHO's recommendations provide valuable context for long-term noise exposure but are not legally binding U.S. regulations. The WHO's 120 dB peak threshold for children and 140 dB for adults aligns with existing OSHA safety thresholds, demonstrating that the EA's use of OSHA standards is consistent with international safety recommendations. The WHO's 70 dBA threshold applies to continuous lifetime exposure. The Final Tiered EA acknowledges that launch-

related noise is intermittent, not chronic, which reduces cumulative hearing risks compared to continuous occupational noise exposure. Since OSHA's regulatory thresholds account for cumulative noise dose, the EA's application of these standards remains appropriate. The Final Tiered EA does not dismiss concerns about noise-induced hearing loss but recognizes that brief, intermittent events (e.g., rocket launches) are fundamentally different from occupational or urban noise exposure patterns, which is not directly comparable to the short-duration, intermittent nature of rocket launch noise. The Final Tiered EA assesses peak noise levels from launches, landings, and static fire tests, ensuring that temporary exposure does not exceed thresholds associated with permanent threshold shifts (PTS) or temporary threshold shifts (TTS) in hearing ability. The use of Leq(24) (as referenced by WHO and EPA) would not be a suitable metric for assessing the short-duration, high-intensity nature of launch noise, as it is designed for evaluating long-term, continuous environmental noise exposure (e.g., traffic, industrial noise). The Final Tiered EA provides unweighted peak noise levels (dB LIN) to account for full-spectrum noise exposure, ensuring that impulsive and low-frequency noise effects are not underestimated.

General public exposure to launch noise is intermittent and short in duration, significantly reducing the risk of cumulative hearing damage.

The Final Tiered EA includes maximum A-weighted noise contours (LAmax) and analyzes peak noise exposure from launches and landings, but does not specifically analyze peak sound pressure levels exceeding 120 dB in residential or school areas. The children's threshold referenced in the comment refers to the 120 A-weighted peak sound pressure levels. WHO notes the LAmax fast response should not be applied, though the difference between slow and fast response is typically minimal. The RNOISE model used in the Final Tiered EA provides LAmax with slow response, an appropriate metric to apply to the 120 dB threshold. Importantly, the areas where noise could reach 120 dBA LAmax are controlled for public safety under 14 CFR 450, meaning no public access is allowed during launch operations. As a result, children and other sensitive populations would not be exposed to the highest noise levels. The transient nature of launch noise and public safety closures ensure that children are not present in areas of maximum noise exposure, mitigating any potential for harmful effects. Launch notifications provide advance warnings, allowing families, schools, and caregivers to take precautions where launch noise may be noticeable in nearby communities.

The EA's findings confirm that noise exposure levels remain within safe limits, even when considering multiple launch events

The Final Tiered EA does not explicitly assess sleep disturbance, but it evaluates cumulative noise exposure using the Day-Night Average Sound Level (DNL), which accounts for higher sensitivity to nighttime noise by applying a 10 dB penalty for noise occurring between 10:00 PM and 7:00 AM.

The FAA acknowledges that nighttime launches could contribute to sleep disturbance; however, these events are infrequent (limited to three per year) and of short duration, reducing the potential for chronic sleep disruption.

The ANSI Noise Standard ANSI S12.9-2008/Part 6 provides methods to estimate awakenings from outdoor noise events, but the model results do not indicate there would be widespread complaints or significant sleep disturbances in the surrounding communities. The Final Tiered EA does not specifically analyze speech interference or classroom learning impacts, but it does evaluate cumulative noise levels in areas surrounding residential and educational facilities. Studies cited by the Federal Interagency Committee on Aviation Noise (FICAN) suggest that speech interference becomes a concern above DNL 60-65 dBA, and

the EA's analysis of land use compatibility aligns with this standard. Additionally, schools and educational facilities are located outside areas where noise levels would exceed speech interference thresholds. The FAA recognizes the importance of considering supplemental noise metrics for evaluating impacts on sleep and speech interference, as noted in the FICON report.

Mitigation measures, including launch scheduling considerations, public notification procedures, and noise reduction efforts, continue to be implemented to minimize potential impacts.

Offshore Noise

The EA's analysis of sonic booms from onshore landings provides a conservative estimate of potential impacts, as offshore landings would occur at least 1 nautical miles from shore—resulting in significantly lower overpressure and noise levels along the coast. SpaceX has revised the Final Tiered EA to include impacts from a landing of the Starship nearshore in the Gulf of Mexico. The noise from the jettisoned hot-staging ring is expected to be negligible, as it follows a ballistic trajectory and does not generate sonic boom effects comparable to a full vehicle landing and would occur within the area experiencing impacts from launch and landing noise. The jettison occurs at high altitude over open water, where the rapid dissipation of the resulting sound minimizes any potential impact to coastal areas. The EA's noise analysis is based on the DNL (Day-Night Average Sound Level) metric, which includes a 10 dB penalty for nighttime noise events. This accounts for potential sleep disturbance effects in accordance with FAA and EPA noise guidelines. Given the offshore location of landings, any nighttime noise reaching populated areas would be well below the thresholds established for significant impact. The Final Tiered EA evaluates the full range of potential noise impacts using industry-validated noise modeling tools and applies FAA-approved significance criteria. Given the offshore nature of landings, the Final Tiered EA appropriately determines that any residual noise effects on coastal communities are not significant.

Addressing Specific Errors & Misstatements

The FAA's analysis is transparent, using the best available data and methodologies to assess noise impacts. The noise modeling used in the Final Tiered EA is consistent with previous environmental assessments for launch programs, and modifications were made to reflect lessons learned from past launches. FAA Order 1050.1F does not require public disclosure of all modeling inputs and assumptions, but the underlying methodology and assumptions used in the assessment are clearly presented. The approval and applicability of RNOISE for use in this Final Tiered EA followed FAA procedural review, and FAA remains open to refining noise modeling tools based on evolving industry standards.

The Final Tiered EA properly accounts for ground impedance based on site-specific data and validated modeling methodologies. The assumption that correcting for ground impedance would universally increase noise levels by 5 dB is unfounded. Impedance effects are highly localized and dependent on atmospheric and terrain factors, and the comment does not provide modeling evidence to substantiate its claim. The comment's suggestion of a +3 dB margin for model accuracy is speculative. Standard models like RNOISE have been validated against real-world launch noise measurements, demonstrating high reliability in predicting community noise exposure. The FAA is not required to incorporate unverified or speculative assumptions into its NEPA analysis. Final Tiered Combining noise sources arbitrarily, as suggested in the comment, is not scientifically valid. Noise levels in decibels do not sum linearly; instead, they follow logarithmic principles.

Sonic booms and launch noise propagate and are perceived differently, which is why they are assessed separately using CDNL for sonic booms and DNL for continuous sources. The FAA follows established best practices in using these metrics. Final Tiered The suggestion that cumulative noise levels would automatically result in hearing health risks is speculative and unsupported. Hearing conservation assessments in the Final Tiered EA are based on established OSHA and FAA exposure thresholds, which account for impulse noise exposure limits. The Final Tiered EA does not ignore potential health impacts but instead applies recognized noise exposure standards to ensure compliance with safety thresholds. Under NEPA regulations (40 C.F.R. § 1502.22), agencies are not required to engage in speculative analyses when data is incomplete or unavailable. Courts have repeatedly held that NEPA does not mandate an agency to analyze purely speculative or worst-case scenarios, nor does it require agencies to adopt assumptions that are not supported by scientific evidence. The Final Tiered EA relies on validated noise models and regulatory thresholds rather than unsupported assumptions that overestimate impacts.

The Final Tiered EA and Noise Assessment provide estimates of maximum noise levels (Lmax) and Day-Night Average Sound Level (DNL) but do not explicitly present a detailed audibility study that considers octave-band or third-octave band analysis. The statements regarding "noticeability" of noise levels above 60 dBA are intended as general descriptions of potential human perception but do not constitute a formal audibility assessment. The claim that "residents may hear launch events above 60 dB" is not intended to suggest that 60 dBA is the maximum or dominant noise level, but rather that noise levels exceed this threshold and will be noticeable in surrounding areas. The FAA acknowledges that noise levels in areas like Port Isabel and South Padre Island may significantly exceed 60 dBA LAmax, with contours reaching 90–100 dBA in certain locations (Figure 9 of the Noise Assessment). The word “may” is used to account for variations in atmospheric conditions, individual perception, and topographical differences; however, FAA agrees that the wording should be more precise to avoid misinterpretation. The EA’s reference to background noise levels (40-50 dBA) is an estimated baseline, not a direct measurement. FAA acknowledges that background noise measurements vary based on time of day, location, and environmental conditions. Noise levels at night are typically lower, making rocket launch noise more noticeable. The statement that launch noise may exceed background levels by 10 dB or more is qualitative rather than quantitative.

The Final Tiered EA refers to the 115 dBA Lmax contour as a “conservative limit for hearing conservation”, which has been misinterpreted. The 115 dBA limit is OSHA’s absolute maximum permissible exposure level for workplace settings, but it does not account for cumulative exposure over time. The Final Tiered EA does not include the 85 dBA (8-hour) and 90 dBA (8-hour) standards, which are also critical OSHA hearing conservation thresholds. The comparison between rocket launch noise and gunshots at the former Massey’s site is not meant to suggest that these sources are identical, but rather to provide context for prior noise exposure at the site. The metrics used for gunshot noise (peak sound pressure level) are different from the metrics used for rocket noise assessments (Lmax and DNL), and FAA recognizes that this distinction should be clarified. While both gunshots and sonic booms generate high peak sound levels, the propagation distance, duration, and frequency of exposure differ, making direct comparisons inappropriate.

January 16, 2025

Submitted via Regulations.gov under Docket No. FAA-2024-2006

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

Re: Comments on FAA's Draft Tiered Environmental Assessment ("EA") of the proposed increased launch cadence for SpaceX's Starship/Super Heavy vehicle launch program at Boca Chica, Texas

Dear Amy Hanson:

The Surfrider Foundation ("Surfrider") provides the following comments on the Federal Aviation Administration ("FAA")'s Draft Tiered Environmental Assessment ("EA") proposal to increase the cadence for the SpaceX Starship/Super Heavy vehicle launch program at the Boca Chica launch facility in Texas (the "Proposed Action"). Surfrider has also submitted comments through the Center for Biological Diversity, but we are submitting this letter for additional context. Surfrider is a 501(c)(3) nonprofit organization incorporated in California and comprised of a nationwide network of community-based chapters, including the Surfrider Foundation South Texas Chapter. Surfrider's mission is the protection and enjoyment of our ocean, waves, and beaches, for all people, through a powerful activist network. Surfrider has active members throughout Texas, a number of whom enjoy Boca Chica Beach and nearby public natural resources.

Surfrider members rely on clean water, abundant wildlife, and public access to visit and enjoy Boca Chica Beach. Our members are directly harmed by SpaceX activities through loss of ocean and coastal access due to frequent beach and highway closures for launch activities. Our members' enjoyment of the local natural resources continues to be lost or diminished by SpaceX's launch activities degrading habitat areas impacting protected species. Surfrider members in Texas have been monitoring SpaceX launch activities at Boca Chica Beach since 2014, and have been advocating for thorough environmental review of proposed launch activities, as well as adequate mitigation to offset impacts from launch activities.

Surfrider has several concerns with the Proposed Action as more specifically indicated below. The FAA has a duty to ensure that SpaceX's activities do not negatively impact environmental resources, including public access of natural and cultural resources, marine life, and ocean water quality, and the FAA has failed to take the requisite hard look at these impacts or

require SpaceX to implement mitigation measures in the Proposed Action to protect these resources.

I. The EA has not taken the requisite hard look at the significant impact the Proposed Action causes to marine life.

The EA indicates some of SpaceX's Super Heavy and Starship vehicles would be reused, while others may not be reused and will instead be "expended" into the ocean.[1] In other words, SpaceX proposes to intentionally dump toxic metal space debris into the sea, only recovering "large floating debris, as necessary."[2] The EA fails to include information about which vehicles would be reused and under which conditions, nor does it provide an estimate of how many vehicles would be expended into the sea. The EA fails to analyze the impacts from these ocean "landings". Throughout the EA, the FAA vaguely asserts the reliability of SpaceX's vehicles would increase with more launches, somehow reducing the risk of an anomaly. There is insufficient evidence to support this bold conclusory assertion.

A. The FAA has not taken a hard look at the impacts of discarding SpaceX's vehicles or debris from SpaceX vehicles at sea.

The Proposed Action proposes to abandon or discard some of SpaceX's space junk into the ocean. The EA asserts that SpaceX plans to abandon or discard its space junk in one of three ways: an explosive event at the surface, a "soft landing" where the vehicle would either tip over to sink or explode at the surface, or a vehicle exploding in flight during re-entry and subsequently showering debris into the ocean.[3] First, describing the "soft landing" as such is misleading if the vehicle could either tip over and sink to the ocean floor, *or* explode at the surface. Each of the three scenarios would negatively impact the ocean and marine life and yet, the EA fails to analyze the impacts from either of these three scenarios.

The EA notes that there are prior determinations by National Marine Fishery Service (NMFS) that prior proposed activities may affect, but are not likely to adversely affect, ESA-listed species or critical habitats. However, the EA notes that SpaceX is currently consulting with NMFS but does not have a current Letter of Concurrence or Incidental Harassment Authorization applicable to the Proposed Action. Thus, the EA fails to provide sufficient information to determine whether or not there are likely significant impacts, and avoidance or mitigation measures cannot be adequately contemplated by the public.

The FAA simply concludes in the EA that the probability of an expended vehicle impacting essential fish habitat would be negligible and that remaining structural debris are inert and "not

[1] See: Draft Tiered EA https://www.faa.gov/media/87646, November 2024, at page 11. (All further references to this document are described as "EA" throughout this comment letter).

[2] EA at 56.

[3] EA at 2, 11.

anticipated to affect water quality."[4] There is insufficient analysis to support these conclusions. The FAA must take a hard look at the individual and cumulative impacts to the ocean caused by *each* of the three scenarios where SpaceX vehicles or vehicle debris is discarded into the ocean at landing.

The EA asserts fuel onboard the launch vehicle is expected to be consumed during vehicle breakup, and for residual propellant to combust, and that SpaceX would continue to "either sink or recover any large floating debris, as necessary."[5] All of this is vague and conclusory and merely provides empty reassurances without analysis to show that fuel and propellant would not impact water quality or marine life. Further, the EA states that SpaceX promises to recover large debris as necessary, but the EA does not describe what constitutes "large" debris, or when recovery of debris is "necessary." The FAA has not included information on when SpaceX would or would not recover debris, nor has the FAA analyzed the impacts of recovering some, all, or none of the debris. Each of these scenarios and the impacts to wildlife and water quality must be properly analyzed in the EA, yet they are not.

The EA indicates SpaceX "anticipate[s] no more than 20 explosive events at the surface of the water for each vehicle for the life of the program."[6] There is no further explanation or analysis of these impacts, and the impacts are not analyzed by the FAA. If this means there would be a maximum of 20 explosions for each of the 25 Starship and each of the 25 Super Heavy vehicle landing events, then that amounts to 500 explosive events per year for Starship landings and 500 explosive events for Super Heavy vehicle landings for the life of the program. The FAA has not included detailed analysis for the up to 1,000 annual explosive events at the ocean's surface.

The ocean is not a dumping ground. The FAA has failed to provide analysis in the EA to show the materials dumped into the ocean from expended vehicles would not negatively impact the ocean and marine life. Even if the Proposed Action plans to avoid ESA habitat or marine protected areas, the FAA has failed to provide evidence in the EA to show ESA habitat would certainly be avoided. Even without an anomaly (explosion), the impacts of rocket debris and residual harmful contaminants falling from the sky into the ocean must be analyzed, and they are not. The EA fails to analyze the impacts of exploding metal rocket pieces or other hazardous materials to sea life, including the ocean water quality, in the vicinity of protected marine habitat, or those that ultimately sink to the sea floor.

B. The EA fails to take a hard look at the impact that littering space vehicle materials into the ocean will have on Rice's whales.

Rice's whales are one of the world's most critically endangered species of baleen whales, with an estimated population size of only 51 animals, and are found exclusively in the Gulf of

[4] EA at 56.

[5] EA at 56.

[6] EA at 11.

Mexico.[7] The threats to Rice's whales include marine debris, oil and gas operations such as seismic surveys, and vessel strikes.[8] Little information exists on the behavior of Rice's whales, but they are known to be "curious", and have been documented approaching ships in the Gulf of Mexico.[9] In 2023, NOAA proposed Critical Habitat designation to protect Rice's whales, and this proposed area overlaps with the landing zones SpaceX has proposed in the Gulf of Mexico.[10]

The Proposed Action plans to discard the heat shield into the ocean and expend Super Heavy boosters into the Gulf of Mexico, yet the FAA fails to take a hard look at the significant impacts that these activities would have on Rice's whales. First, the EA fails to analyze impacts to Rice's whale, such as a Rice's whale being struck or killed by a heat shield. The EA fails to acknowledge that SpaceX has no control of where the discarded heat shield will land and provides no guarantee that it would stay clear of the proposed critical habitat area for Rice's whales. The EA merely shows an "avoidance area" corresponding with Rice's whale habitat in Figure 2, but fails to provide information on how exactly impacts to Rice's whale would be avoided.

Second, the FAA fails to take a hard look at the potential impacts of discarded heat shields on Rice's whales for the duration of the project. The EA illegally dismisses potential impacts, suggesting that vague, possible "technology improvements" would somehow miraculously lead to future diminished impacts.[11] The EA fails to provide evidence in the record supporting its conclusion that heat shield impacts would disappear in the future. For that reason, the EA's analysis of heat shield impacts on Rice's whales or other marine life is arbitrary and capricious.

C. The EA fails to take a hard look at the impact abandoned space materials will have on the Flower Gardens Banks National Marine Sanctuary and sanctuary resources

The Flower Garden Banks National Marine Sanctuary ("FGBNMS") is located within the proposed Gulf of Mexico Super Heavy Landing Area, although the figure in the EA (Figure 2) makes it appear as if FGBNMS will somehow be avoided. Given that there is an inherent lack of specificity in controlling exactly where the Super Heavy booster may land, particularly in the event of an anomaly, it is unreasonable to expect that it will be within SpaceX's control to wholly avoid this area and the potential for impacts to sanctuary resources. The FAA fails to identify or analyze any potential impacts to the FGBNMS.

D. The EA fails to analyze impacts to landing zones, including impacts to Papahānaumokuākea Marine National Monument

[7] See: https://www.mmc.gov/priority-topics/species-of-concern/rices-whale/

[8] https://www.surfrider.org/campaigns/Protect%20the%20Rice's%20Whale%20in%20the%20Gulf%20of%20Mexico

[9] https://www.federalregister.gov/documents/2023/07/24/2023-15187/endangered-and-threatened-species-designation-of-critical-habitat-for-the-rices-whale

[10] Id.

[11] EA at 12.

SpaceX seeks authorization to expend or discard its vehicles into the Indian and Pacific Ocean in or near Hawaiian waters. The FAA cannot allow SpaceX to use these ocean "landing" zones as dumping grounds for commercial equipment. The FAA fails to analyze impacts of discarded space vehicles to these waters and sanctuary resources. For instance, there is no analysis of potential impacts to the Papahānaumokuākea Marine National Monument, which is an area that is home to numerous endangered species, critical habitat, and historical cultural significance, and which is located immediately adjacent to and in some instances overlapping with the Hawaii and Central North Pacific landing area proposed in the EA. The National Monument is home to more than 7,000 species, including: many threatened or endangered birds, plants, seals and sea turtles, as well as Humpback whales, Hawaiian Monk Seals (critically endangered), green sea turtles, critically endangered Laysan Duck, Nihoa Finches, Blackfooted Albatross, the critically endangered Hawksbill and Leatherback turtles, endangered Olive Ridley turtles, as well as other 14 million seabirds of 22 different native species, and corals and fishes. This marine life is already facing a number of threats, and the FAA has failed to include any analysis on the impacts to this area and the marine life inhabiting it.

The FAA has failed to include analysis on the significant impacts to natural and cultural resources. The FAA has not indicated whether any input was sought from representatives from all impacted stakeholders including, but not limited to, the Hawaiian and Islander Communities and those with expertise on the area including Papahānaumokuākea Marine National Monument, and this input is critical for determining impacts of the Proposed Action to the national monument.

II. SpaceX's plan to dump its space junk in the ocean violates the Ocean Dumping Act.

The Ocean Dumping Act, formerly known as the Marine Protection, Research, and Sanctuaries Act, prohibits dumping into the ocean material that would unreasonably degrade or endanger human health or the marine environment. The Ocean Dumping Act requires those who would dump waste into the ocean to first receive a permit from the Environmental Protection Agency (EPA) to do so. Ocean Dumping Act regulations state that "no permit will be issued when the dumping would result in a violation of applicable water quality standards." 40 C.F.R. §227.1(d). The EA fails to demonstrate that dumping space junk in the ocean would not violate water quality standards and that SpaceX could receive a permit for such dumping. Further, EPA will deny an ocean dumping permit where (1) there is no need for the dumping and alternative means of disposal are available; (2) where there are unacceptable adverse effects on esthetic, recreational or economic values, or (3) where there are unacceptable adverse effects on other uses of the ocean. *Id*. §227.2.

Here, there is no need for SpaceX to dump its space junk in the ocean. SpaceX could and should recover the materials it launches into the atmosphere, instead of planning to merely use the ocean as its dumping ground. Second, there are unacceptable risks to Rice's whale, marine protected areas, and nearshore areas near Hawai'i from SpaceX's plan to dump its space junk in the ocean. Allowing SpaceX to dump its space junk in the ocean will have unacceptable adverse effects on esthetic, recreationals, and tourism values. Therefore, SpaceX's plan to dump its space junk in the ocean does not qualify for an Ocean Dumping Permit and is illegal.

III. The EA fails to take the requisite hard look at impacts to public access.

The Proposed Action will negatively impact public access to public trust resources such as beaches and coastal waters for activities including but not limited to recreation, cultural observances, and environmental observation and data collection. Further, these impacts have not been properly analyzed. SpaceX launches to date have caused Boca Chica Beach and State Hwy 4 - the only access road leading thereto - to be closed for hundreds of hours throughout the year. The public, including Surfrider members, depend on low-cost recreation for physical and emotional wellbeing and as a matter of right. In the present EA, the FAA merely states SpaceX has coordinated with the Texas General Land Office (TGLO) and Cameron County and agreed upon access restrictions to protect public health and safety during launches.[12] There is no analysis in the EA to account for access impacts.

Merely pointing to a Memorandum of Agreement to close public access during launch and landing activities for safety does not constitute proper analysis of negative impacts. Closure of an important public access resource merits thoughtful and thorough analysis of impacts, opportunities to avoid impacts, and potential for mitigation of impacts. The law requires the FAA to consider direct, indirect, and cumulative impacts to public access. The FAA has failed to do so.

Throughout the EA, the words "beach access" and "public access" only each appear one time. In this EA, the FAA points to the 2022 PEA and asserts that no change in access would occur with the increased number of launches and landings under the present Proposed Action. There is no analysis to support this assertion. The 2022 PEA assumed around 500 hours of access restrictions annually and that even with an increased number of orbital launches and landings, the total access restrictions would not exceed the 500 hours annually, with an additional 300 hours possible if an anomaly occurs.

First, closing the beach for over 40 hours a month, assuming no anomaly occurs (which we cannot assume), is a significant environmental impact, for which there has been no analysis. Second, the EA arbitrarily concludes there would be no change in beach access closure hours in the event of an anomaly with the proposed increased launch cadence. The EA fails to provide evidence to support these conclusions. The EA merely states that with 25 launches, the likelihood of an anomaly would be the same as with only 5-10 launches, without any meaningful supporting evidence.[13] Stating hopes and dreams of vehicle reliability increasing with increased launches without evidence or analysis to support that bold claim is arbitrary and capricious. Third, because of the way that the FAA accounts for closures in the EA, the number of hours that public access is closed vastly undercounts the effective hours lost to the public. Closure announcements create effective closure hours, because members of the public accordingly would not plan to attempt to access Boca Chica beach during a closure. When a closure is subsequently cancelled the day of the planned closure, members of the public are not necessarily able to reclaim the opportunity to visit

[12] EA at 57.

[13] EA at 36.

the beach, resulting in a loss of public access opportunity as if there were still a closure. These hours of lost opportunity cannot simply be reclaimed by the public, and the EA fails to account for these hours as closure hours.

A. Boca Chica Beach is an important public resource.

Boca Chica is one of the few area beaches that the public can access without fees. Prior to SpaceX launch operations at Boca Chica, the public could freely access this pristine stretch of coastline to fish, surf, swim, snorkel, bird watch, or simply admire the beauty of the dune-backed beach and all its wildlife. Nearly 90% of Cameron County residents are Hispanic and over 22% of the population lives in poverty. Many Brownsville residents are closely connected to Boca Chica Beach because of its ease of access via Highway 4 that leads visitors right to the coast, making it closer than the beaches on South Padre Island.

B. The FAA has not taken a hard look at the significant impacts of beach closures on public recreation and the nearby environmental justice communities.

Nowhere in the entire document does the FAA account for the impacts to the public of lost access nor propose actual mitigation. Since the launch activities require closure of the access road, beach, and ocean, the public must now check a website for notice of planned closures, plan around those closures, and risk that their future plans to visit Boca Chica or any of the surrounding wildlife refuges could be cancelled. It is difficult, especially for low-income families, to plan to take time off of work, and the closures discourage people from planning a trip to the beach. The Proposed Action will have significant impacts on public access and beach recreation. The FAA has failed to consider this matter of environmental justice.

C. The FAA has failed to meaningfully engage with impacted environmental justice communities.

The FAA has failed to meaningfully engage nearby environmental justice communities regarding beach access impacts. The FAA has also failed to complete meaningful consultation with the Carrizo-Comecrudo Tribe of Texas to discuss the impacts of access closures, and SpaceX activities generally, on tribal resources and tribal members' ability to access cultural resources and engage in cultural observances.

D. The EA fails to identify mitigation measures that would reduce the beach closure impacts to a level that is not significant.

The FAA asserts in the EA that SpaceX "would continue to implement mitigation measures for access restrictions as described in the 2022 PEA."[14] However, SpaceX has not implemented actual mitigation measures for loss of beach access. Merely providing the public with *notice* of road and beach closures does not mitigate negative impacts to this important public resource. The

[14] EA at 36.

beach is a critical resource to the general public and a sacred place for the Carrizo-Comecrudo people.

Providing the public with some advance notice of closures is not mitigation for the lost resource. Beach access is a public right in Texas, enshrined in the Constitution of the State of Texas, Article I Section 33. The frequent closures of one of the most easily accessible, free beaches creates a burden on the public. More must be done to minimize the impacts on the community including minimizing road closures and beach closures, as well as minimizing "effective" closures resulting from noticed closures that end up cancelled, so that the public can access these public spaces.

IV. The EA does not state a purpose and need that justifies the currently proposed launch cadence increase.

The EA asserts that "flight cadence alternatives have not been evaluated in detail because the FAA and SpaceX have determined that a lower cadence alternative would not meet the Proposed Action's purpose and need."[15] The EA describes the proposed launch cadence as necessary to improve the design of the vehicle to reuse and "to support national space policies and other priorities, including under NASA's Artemis and Human Landing System (HLS) programs." *Id.* These statements vaguely describe SpaceX's goals, but without a clear and well-defined purpose and need, it is impossible to determine which of the alternatives would meet the stated need. The EA fails to explain how a lower launch cadence would fail to achieve the essential purpose and need for the project, and merely dismisses that as an option. The EA fails to provide information about how many launches are needed to meet these "national space policies and other priorities" or how many launches would merely provide extra commercial capacity.

V. The EA fails to analyze other reasonable alternatives to the Proposed Action.

The FAA fails to analyze the possibility of increasing the launches gradually under a lower cadence than the five-fold increase launch cadence proposed in the Proposed Action. The stated purpose and need in the EA fails to provide justification for overlooking serious potential negative impacts to natural resources. This information is critical to determine whether an alternative involving fewer launches per year could support national space priorities while minimizing impacts on the public, wildlife, and the habitat, and this information has not been included here.

Throughout the EA, the FAA concludes that impacts caused by the Proposed Action were previously analyzed and mitigated under the 2022 PEA. However, the 2022 PEA analyzed impacts much less frequent operations. The FAA's failure to meaningfully consider any other alternative besides the five-fold increase is arbitrary and capricious. Fewer launches would cause much less significant impacts and the FAA has failed to provide any analysis on other scenarios in this EA.

[15] EA at 18.

VI. The EA has not taken the requisite hard look at the direct, indirect, and cumulative impacts of increased launch cadence as proposed.

The Proposed Action will have significant environmental impacts. The EA has not adequately characterized or examined the direct, indirect, and cumulative environmental impacts of the Proposed Action. Throughout this EA, the FAA asserts that the risk of anomalies would decrease and that the SpaceX vehicles would somehow become more reliable with more launches. The EA has not provided sufficient evidence and analysis that support these conclusory assurances that more launches would result in the vehicle becoming more reliable.

The present EA repeatedly asserts environmental impacts were analyzed in the 2022 PEA. That 2022 PEA was based on far fewer launches and landings than what is being proposed here, and the FAA fails to fully analyze the direct, indirect, and cumulative impacts of the increased launch activity. For example, in the FAA's quick discussion of the heat shield impact, the EA again points back to "anticipated future improvements" to the Starship/Super Heavy vehicles that will enable SpaceX to not have to jettison the forward heat shield, then concluding that the action is anticipated to be temporary.[16]

Commercial enterprises like SpaceX cannot be allowed to forego analysis of negative impacts on the environment with only a promise that with more frequent launches, the technology will somehow improve. The FAA has a duty to take a hard look at the direct, indirect, and cumulative impacts on the marine environment, marine life, and beach access from the increased launch cadence, and has failed to do so in this EA; this is arbitrary and capricious. To increase launch cadence in a way that complies with NEPA, the FAA must take a hard look at the direct, indirect, and cumulative impacts of the Proposed Action, and has failed to do so here.

A. The proposed mitigation measures are wholly inadequate.

The EA states that SpaceX has completed or maintains ongoing compliance with 90% of mitigation measures.[17] This is vague and provides no indication of which mitigation measures SpaceX previously agreed to that they have failed to comply with. The FAA has not provided detailed information about the implementation and performance rate of current mitigation measures, making it impossible to determine whether or not their future implementation will indeed mitigate impacts to a level of insignificance. The EA has not provided any details about which mitigation measures have been implemented and which have not, what the effects are of failure to comply with mitigation measures thus far, nor has it proposed additional mitigation for the environmental impact of an increase in launch cadence.

Even at 5-10 launches per year, the Starship/Super Heavy launch program had significant environmental impacts. With the Proposed Action's proposal to increase that five-fold to 25 launches, it stands to reason that many, if not all, of those impacts will significantly increase

[16] EA at 12.

[17] EA at 20.

commensurate with the increase in launches. The EA merely promises improvements to the vehicles with increased launches and makes conclusory statements that the impacts will be the same as those that were previously analyzed for a smaller program in the 2022 PEA, rather than realistically reassessing, analyzing, and mitigating impacts of a program with a vast increase in the number of launches. The FAA has not required any additional mitigation for marine impacts, and proposes that for impacts near the launch facility, SpaceX make a mere $5,000 per year donation to the Animal Health Department at the Gladys Porter Zoo, along with continual monitoring to determine impacts. Impacts must be determined prior to authorizing additional launches so that the appropriate mitigation for *all* impacts can be considered. Without adequate analysis of impacts and mitigation, the FAA's proposed mitigation measures for impacts fall short. All of these significant impacts trigger the need for preparation of an Environmental Impact Statement.

B. The FAA has not taken a hard look at the negative environmental impacts from an anomaly or explosion.

Finally, the EA fails to analyze the environmental impacts of an anomaly, or the potential for an increase in anomalies, under this increased launch cadence, and instead relies on the 2022 PEA. This is arbitrary and capricious. SpaceX experienced an anomaly during the launch of the first Starship/Super Heavy rocket on April 20, 2023. This devastating explosion provided SpaceX and the FAA with data, and that information should have been used to analyze the potential negative environmental consequences that could result from future anomalies, and included in the EA. Instead, the FAA merely asserts that as the number of launches increases, the possibility of an anomaly decreases. This claim is completely without evidentiary support, and the FAA has failed to take the requisite "hard look" at the impacts of an anomaly.

Surfrider submits these comments alongside our comments with those submitted by the Center for Biological Diversity on our behalf. Thank you.

Respectfully submitted,

Tina Segura
Legal Associate
Surfrider Foundation
tsegura@surfrider.org

EE. FAA-2024-2006-2705-A1

Comment Response

Marine Debris

Historically all rocket stages have been discarded into the ocean after each launch, with the general exceptions of SpaceX's Falcon launch vehicle first stage and NASA's Space Shuttle Orbiter reentry vehicle. Both Starship and Super Heavy are proposed to be reused, though either stage could be expended depending on mission requirements and state of development of the program. Vehicle reliability is expected to increase over time as the program matures. SpaceX's Falcon 9 rocket has over a 99% mission success rate with over 430 missions launched to date. Additionally, SpaceX pioneered rocket landing with its first successful Falcon 9 landing in Dec 2015 and has now successfully landed its Falcon 9 rocket 374 times (a 97% success rate). This technology and the engineers behind these successes contribute to the advancement of Starship.

Starship-Super Heavy is constructed primarily of stainless steel, which is non-toxic and inert. Starship-Super Heavy's propellants are liquid oxygen and liquid methane which are not hazardous rather than highly toxic hypergolic fuel. NMFS stated the following in their Biological Opinion:

In the event that Super Heavy or Starship residual propellant ends up in the ocean, residual propellant is expected to evaporate or be diluted relatively quickly due to surface currents and ocean mixing. It is unlikely that residual propellant from either vehicle measurably contributes to the overall pollutant levels in the action area given the limited number of times either stage will be expended (and residual propellant would reach the ocean), and the large action area. The effects of residual propellant in the ocean on ESA-listed species is immeasurable and, thus, insignificant.

The Biological Opinion issued by NMFS has been appended to the Final Tiered EA. NMFS determined the Proposed Action did not warrant an Incidental Harassment Authorization under the Marine Mammals Protection Act. This correspondence has also been appended to the Final Tiered EA. Potential impacts from each landing scenario are included throughout Section 3.2 of the Final Tiered EA. SpaceX would continue to implement NMFS Conservation Recommendations as noted in the Final Tiered EA. A discussion of cumulative impacts to the broad open ocean due to potential marine debris has been added to the Final Tiered EA in Section 3.3.

No SpaceX activities addressed in the Final Tiered EA would constitute "dumping" under the Ocean Dumping Act. The intentional disposal of waste into the ocean is distinct from the incidental material release during space operations, which falls outside of the regulatory scope of the Ocean Dumping Act. 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. Planned downrange activities associated with Starship do not constitute ocean dumping as defined by the Ocean Dumping Act, as they involve incidental jettisoning of components designed for atmospheric reentry and controlled descent, not waste disposal. Space operations are governed by FAA regulations, international treaties, and MARPOL Annex V, which addresses unintentional marine debris from space activities.

SpaceX is actively developing full reusability for Starship and Super Heavy, which will substantially reduce the material released into the ocean. A detailed discussion of potential impacts to Rice's whale and other

marine species is included in the NMFS Biological Opinion (which is included in Appendix A of the Final Tiered EA) and summarized in the next section of this comment response, *Impacts to Marine Species*.

The Proposed Action is not anticipated to result in adverse impacts on marine protected areas or other nearshore areas, including their aesthetic, recreational, and/or economic values, as buffer zones are proposed to reduce the risk to sensitive ecosystems.

Impacts to Marine Species

The Final Tiered EA does not state that all potential ESA-listed species habitat would be avoided, as the ocean is vast and cannot be avoided. A detailed discussion of potential impacts to ESA-listed species is included in the NMFS Biological Opinion, which has been appended to the Final EA. An analysis of potential impacts to the ocean are included in Section 3.2.7 and 3.2.8 of the EA.

The NMFS Biological Opinion, which has been appended to the Final EA, discusses potential impacts of debris on Rice's whale and are summarized below.

Super Heavy and Starship are extremely small relative to the area in which either vehicle could land (see Figures 1–6) and relative to the area over which species can be distributed in the Gulf of Mexico, Atlantic, Indian, North Pacific, and South Pacific oceans. Stage and debris landings in the ocean will only occur temporarily until the launch vehicle is fully reusable, making the likelihood of striking an ESA-listed species extremely low. The likelihood that a marine species will be in the exact location at the exact same time that Super Heavy or Starship lands, is extremely low, and thus, not reasonably foreseeable under NEPA. Debris pieces from an in-flight breakup or an impact breakup (for which debris is expected to be contained within 1 km of the landing location) of either stage will be smaller than the stage itself. Radiosondes are also much smaller than either stage. Thus, the likelihood of debris or a radiosonde striking an ESA-listed species will be even smaller than that of Super Heavy or Starship striking an ESA-listed species.

The likelihood of the interstage [heat shield] striking an ESA-listed species is the same as what was considered in the NMFS October 2024, *Reinitiation and Conference of the Amended Programmatic Concurrence Letter for Launch and Reentry Vehicle Operations in the Marine Environment and Starship-Super Heavy Launch Vehicle Operations at SpaceX's Boca Chica Launch Site, Cameron County, Texas* (pages 14–16) because there are no proposed changes to interstage activities considered in that consultation (ID# OPR-2024-02422). In that consultation, NMFS determined that it is extremely unlikely an ESA-listed species will be directly struck by the interstage as it falls to the sea surface or by debris from its impact with the sea surface based on the interstage landing location, number of interstage landings, and species densities.

Falling objects may affect designated or proposed habitat that occurs in areas where falling objects may occur (Northwest Atlantic Ocean DPS of loggerhead turtle, Gulf sturgeon, North Atlantic DPS of green turtle, and Rice's whale). Falling objects may affect physical and biological features (PBFs) related to waters/passage free of obstructions and prey/cover availability: Northwest Atlantic Ocean DPS of loggerhead turtle foraging habitat, constricted migratory habitat, Sargassum habitat; Gulf sturgeon, North Atlantic DPS of green turtle, and Rice's whale (prey-related PBF only). Falling objects could create obstructions to waterways or access to refugia if they land in shallow enough areas or on top of underwater refugia, which is extremely unlikely given Starship and Super Heavy will be expended offshore, the limited number of times either vehicle will be expended, the small area of critical habitat relative to the action area, and the small size of Super Heavy and Starship (71x9 m and 50x9 m, respectively) and

debris relative to critical habitat (generally a couple thousand to hundreds of thousands of square kilometers except for one unit of Gulf sturgeon critical habitat off Florida which is approximately 500 square kilometers [km2]). Falling objects may also temporarily displace prey species as it sinks through the water column; however, this is not expected to affect the density, abundance, availability, or accessibility of prey in a manner that would measurably affect prey populations. Thus, the effect from falling objects on ESA designated or proposed critical habitat would be discountable or insignificant.

In summary, because it is not reasonably foreseeable that a falling object would strike or otherwise affect a marine species, the potential effects to marine species from a direct impact by falling objects are insignificant. The potential effects to designated and proposed critical habitat from falling objects are discountable and insignificant. Thus, NMFS concurred with FAA's determination that direct impacts from falling objects to ESA-listed species and designated or proposed critical habitat in the action area may affect, but are not likely to adversely affect, ESA-listed species and designated or proposed critical habitat.

Unrecovered debris may be ingested by ESA-listed species foraging in the action areas. ESA-listed marine mammals, sea turtles, and fishes can ingest various marine debris while foraging and nearly all such ingested debris is plastic (Alzugaray et al. 2020; de Carvalho et al. 2015; Im et al. 2020; Jacobsen et al. 2010; Rodríguez et al. 2022; Rosel et al. 2021; Schuyler et al. 2014b; Werth et al. 2024; Wilcox et al. 2018). In a recent global review on ingested marine debris, a majority of mortalities in marine mammals were caused by ingestion of film-like plastic (e.g. plastic bags), plastic fragments (hardness not specified), rope/nets, and fishing debris (Roman et al. 2021). For sea turtles, a majority of mortalities were caused by ingestion of hard plastic, film-like plastic, and fishing debris (Roman et al. 2021). Plastics are also the main type of debris ingested by fishes (Cliff et al. 2002; Germanov et al. 2018). Because the majority of debris generated by radiosondes, Super Heavy, Starship, and interstage debris, the majority of which is heavy-weight metals or composite materials like carbon fiber will sink immediately due to their weight, it is extremely unlikely that the debris would be ingested by ESA-listed species.

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. All rockets are designed to follow a precisely calculated trajectory using advanced guidance, navigation, and control (GNC) systems. These systems rely on a combination of GPS, onboard sensors, and programmed flight paths approved by the FAA, to ensure the vehicle stays on its intended course throughout ascent and descent. If Starship veers off course beyond acceptable limits, the Flight Termination System (FTS) is activated to immediately neutralize the vehicle. The FTS is a failsafe system mandated by the FAA and consists of an autonomous or manual detonation system that destroys the rocket.

Access Restrictions

SpaceX and the FAA have implemented several measures to mitigate the effects of temporary beach closures, including:

- Advance Public Notification – Access Restrictions notices are issued through multiple channels, including the Cameron County website, text alerts, and signage.
- Reduction in Access Restriction Hours Per Launch – As operational efficiency has improved, closure hours per launch have decreased by 95%, significantly reducing public inconvenience.

- Coordination with Local Authorities – The FAA and SpaceX coordinate with Cameron County to ensure closures adhere to legal requirements and minimize unnecessary disruptions.

Boca Chica Beach is a publicly accessible area under the jurisdiction of Cameron County, and access is regulated in accordance with public safety requirements under 14 CFR Part 450. While closures are necessary for safety during launch operations, the overall annual availability of beach access remains high, as demonstrated by a lack of exceedance in closure hours. For the Carrizo-Comecrudo Tribe, the FAA recognizes the cultural significance of Boca Chica Beach and remains committed to engaging in consultation efforts.

The Final Tiered EA does not dismiss the potential for anomalies but evaluates their likelihood and environmental consequences based on past launch data and mitigation measures. Anomalies are expected to decrease as the program develops and the number of launches increases. SpaceX has a wide range of successful experience launching and landing rockets, including the Starship vehicle on land during the suborbital testing, and in water on the recent orbital flights. SpaceX's Falcon 9 rocket has over a 99% mission success rate with over 430 missions launched to date. Additionally, SpaceX pioneered rocket landing with its first successful Falcon 9 landing in Dec 2015 and has now successfully landed its Falcon 9 rocket 374 times (a 97% success rate). This technology and the engineers behind these successes contribute to the advancement of Starship. The FAA has reasonably and appropriately taken this information into account in preparing the EA.

January 16, 2025

Ms. Stacy M. Zee, Manager
Operations Support Branch
Federal Aviation Administration
Attn: Ms. Amy Hanson, FAA Environmental Specialist
SpaceX EA
c/o ICF 1902 Reston Metro Plaza
Reston, VA 20190

Dear Ms. Zee:

I have reviewed the ***Revised Draft Tiered Environmental Assessment for SpaceX Starship/Super Heavy Vehicle Increased Cadence at the SpaceX Boca Chica Launch Site in Cameron County, Texas, November 2024***, and I have the following comments.

Sincerely,
Kenneth G. Teague, PWS (emeritus), Senior Certified Ecologist
Austin, Texas

General Comments

- ***First, I assert that the cumulative impacts of all SpaceX activities at Boca Chica have been significant, and will be significant when the current proposal is implemented. Therefore, an EA is not sufficient, and an EIS must be prepared. Prior EAs have also not been sufficient to meet the requirements of NEPA, and EISs should have been prepared in the past, rather than the multiple Eas.***

- I request clarification regarding this action's purpose and need. The EA includes the following statement under Purpose and Need:
  - *By providing a reusable launch vehicle that returns to its launch site, the proposed action would reduce the cost of launch and increase efficiency, delivering greater access to space and enabling cost-effective delivery of cargo and people to the Moon and* ***Mars****.*
  - Two commenters at the online public meeting on 1/13/24 mentioned the common understanding that one of the main reasons for SpaceX's activities at Boca Chica, is to fulfill its CEO's fever dream of human colonization of Mars.
  - My question to FAA is: ***Is it official U.S. government policy, to colonize Mars?*** *And if so, please explicitly disclose this in this, and any other NEPA documents related to SpaceX activities at Boca Chica.*

- If the answer to my questions is, that human colonization of Mars is an official U.S. government policy, then I have the following comment:
  - ***Human colonization of Mars is, or would be, an absurd and ridiculous offical U.S. government policy. Earth is the only home of humans. Earth is uniquely qualified to be the natural habitat of humans, and of all life known to humans. Earth is a magnificent planet that will forever be the home of life as we know it. Mars almost certainly contains no life. The physical and chemical characteristics make Mars very inhospitable to human life, and all life. The worst place on Earth, the worst time on Earth, is far more hospitable to human life than the best place on Mars, or the best time on Mars. If the U.S. government officially plans to colonize Mars, our government is even more insane and misguided than I think. If the SpaceX CEO plans to colonize Mars, SpaceX is an insane, misguided company, and the citizens of the U.S. should demand the U.S. cease its close relationship with it. Human colonization of Mars will be incredibly difficult and extremely expensive. The costs will dwarf all other U.S. projects to date. It will divert needed resources from Earth, resulting in reduced quality of life of U.S. citizens. A more rational policy would be to focus on protection and restoration of Earth, the home of humanity and of all life as we know it. If human colonization of Mars is aan official U.S. government policy, I want the FAA to know that I am most strongly opposed to such policy, and I recommend that it cease to be government policy immediately.***

- It is also a fundamental and critical matter, that the Boca Chica coastal ecosystem- the site chosen by SpaceX for this rocket launch site, as well as numerous SpaceX support facilities- is an incredibly unique, valuable, and sensitive coastal ecosystem. It is a bona fide biodiversity hotspot. All of FAA's NEPA documents related to SpaceX impacts at Boca Chica have failed to fully acknowledge this. SpaceX could not have chosen a worse place to impact, on the Texas coast. There are few places on the entire US coast, which would constitute more environmentally inappapropriate sites for the continually-expanding SpaceX facilities.
  - Boca Chica is, or may be, home to eleven threatened or endangered species- ocelot, Gulf coast jaguarundi, northern aplomado falcon, Kemp's ridley sea turtle, hawksbill sea turtle, leatherback sea turtle, green sea turtle, loggerhead sea turtle, piping plover, and red knot. Boca Chica also includes critical habitat for the piping plover.
  - SpaceX's postage-stamp size land parcels at Boca Chica are completely surrounded by, and immediately adjacent to, Federal and State protected environmental conservation lands, including the Boca Chica Unit of the Lower Rio Grande Valley National Wildlife Refuge, Boca Chica State Park, Las Palomas Wildlife Management Area, and South Bay Coastal Preserve. Nowhere else in the US where such a juxtaposition of multiple biodiversity conservation areas may occur, would the ongoing expansion of SpaceX be allowed to occur.
  - ***FAA should revise the EA to reflect the true environmental uniqueness, value, significance, and sensitivity of the Boca Chica coastal ecosystem. It should also revise its assessment of environmental impacts of SpaceX actiions, to reflect this.***

- Once again, the FAA has issued a NEPA compliance document on yet another incremental expansion of the SpaceX development at the extremely environmentally sensitive site at Boca Chica, TX, and has failed to properly disclose the true extent of SpaceX's cumulative, incremental environmental impacts here. FAA continues to redefine the environmental baseline- repeatedly "moving the goal posts" so that SpaceX's environmental impacts can never be found to be "significant". The correct environmental baseline against which SpaceX's impacts should be measured, is the state of the Boca Chica environment prior to all SpaceX activity there. A closely-related matter, is the fact- obvious in hindsight- that SpaceX is not being truthful in disclosing its future intentions, but rather "dribbles" its intentions out to us in small amounts, avoiding full disclosure. Whether FAA is also complicit in SpaceX's witholding of actual future intent, is unknown. Either way, the approach that has been taken in this regard is clearly not consistent with NEPA.
    - ***FAA should revise this EA to assess whether all of SpaceX's impacts at Boca Chica over time, are significant. I believe they are. In addition, FAA should demand that SpaceX disclose all future plans at Boca Chica. It is dishonest and unlawful to continue to lie about it and deceive the American people and the local people of the Rio Grande Valley, Texas.***

- FAA has failed to honestly disclose SpaceX's cumulative impacts on the Boca Chica ecosystem and on the human environment.
    - FAA falsely claimed that "...the baseline condition of the area is already an industrial setting", referring to the area SpaceX now calls "starfactory", at "starbase", which until recently was called "Boca Chica Village". It is clear that prior to SpaceX development at Boca Chica Village, sometime after January, 2016, the baseline condition of the area was a combination of open, undeveloped land, with a few roads, and a very small residential area. It was not an "industial setting", until SpaceX made it an industrial setting, sometime after 2016. This constitutes an impact that is attributable solely to SpaceX, and part of the cumulative impact of SpaceX activities at the VLA.
    - FAA falsely attributed the current heavy truck traffic on Highway 4, to what FAA incorrectly attributed to a historic practice of all water in Boca Chica being delivered by truck. While it may be true that all water provided to Boca Chica has been delivered by truck, until SpaceX invaded Boca Chica, little water was needed, so truck traffic was minimal. The current heavy truck traffic on Highway 4 is a cumulative impact of SpaceX activities.
    - FAA has failed to disclose pollutant discharges to the environment from any SpaceX sources, other than the deluge water discharge at the VLA. The extensive SpaceX industrial activity at Boca Chica undoubtedly results in contaminated wastewater, hazardous waste, and human sewage. While FAA did not disclose this, SpaceX has literally converted the entire Boca Chica landscape on the loma, from mostly undeveloped land with a very small footprint of residential land, to an impervious landscape. The stormwater runoff from this SpaceX landscape is undoubtedly much higher than it was before SpaceX, and it undoubtedly includes a much higher pollutant load. All wastewater and stormwater discharged from Boca Chica Village area drains into South Bay, a formally-designated Coastal Preserve under TPWD and GLO's Coastal Preserve Program. South Bay is a unique and sensitive coastal habitat, with seagrasses, mangroves, and oysters. The water quality risk to South Bay from SpaceX intensive industrial activity at Boca Chica Village has not been disclosed.

- The best example of FAA's failure to properly disclose and assess all of SpaceX's impacts at Boca Chica, is how FAA has repeatedly avoided disclosing SpaceX impacts at the phony company town it created at the community of Boca Chica Village. This entire massive industrial and residential development exists solely to support the launch site and the launches. To dismiss the impacts at this site as irrelevant to the proposed action, is contrary to NEPA, and unlawful. FAA has done this in every NEPA document it has issued dealing with SpaceX impacts at Boca Chica. I will not get into the related matter of the socioeconomic impacts of SpaceX taking complete control over this pre-existing community, or of the obvious ethical problems inherent in it. Suffice it to say, that none of FAA's documents discuss this as a socioeconomic impact of SpaceX activities at Boca Chica.
    - ***FAA should revise the current EA to honestly and accurately disclose ALL SpaceX environmental impacts at Boca Chica, which are all part of the activity ongoing at the VLA, and proposed for the future.***

- FAA has failed to disclose in any of its NEPA documents related to SpaceX's ever-expanding activities at Boca Chica, any details regarding SpaceX compliance with the Coastal Barrier Resources Act (CBRA). While this matter should have been mostly covered in the first EIS, it remains an issue since it has never been properly or adequately disclosed. The SpaceX VLA is almost entirely within CBRS Unit T12. Under CBRA, no Federal funds can be used for development within mapped units of the CBRS. SpaceX receives enormous sums of Federal funds, including for its work at Boca Chica. Therefore, it is critical that FAA should require SpaceX to disclose details of the source of funds that were used to pay for past and future development at the VLA. A related legal question, is whether CBRA also prohibits use of Federal funds for operating expenses.
    - ***FAA should amend this EA to include a discussion of FAA and SpaceX compliance with the CBRA. FAA should disclose whether it and SpaceX are compliant with CBRA, and if so, precisely how a determination of compliance was made, given the VLA constitutes part of a mapped unit of the CBRS. It should also disclose DETAILED FINANCIAL information, regarding funds used to develop the VLA, explicitly demonstrating that no Federal funds were used to develop the VLA.***

- FAA continues to fail to even attempt to describe, much less demonstrate, how required mitigation ensures that SpaceX impacts at Boca Chica are not significant. Not only that, but FAA continues to fail to disclose to the public whether it is monitoring SpaceX's required implementation of mitigation, and if there is any enforcement of these requirements. With this latest addition to the extensive FAA SpaceX NEPA library, FAA continues to fail to explain how newly-required mitigation ensures that SpaceX environmental impacts at Boca Chica, are not significant.
    - ***FAA should include in this EA, a detailed demonstration of how required mitigation ensures that ALL SpaceX impacts at Boca Chica are INSIGNIFICANT.***
    - ***FAA should include in this EA, a detailed description of all FAA monitoring of SpaceX compliance with mitigation requirements, including mitigation required under previous "Mitigated FONSIs" for Boca Chica.***

- ***FAA should include in this EA, a detailed description of FAA's enforcement policy regarding SpaceX's required mitigation, and of its enforcement program, including any actual enforcement actions FAA has taken against SpaceX for failure to comply with required mitigation, including any mitigation required under preveious NEPA documents.***

- An important and highly relevent scientific article was recently published describing SpaceX super heavy noise and sonic booms at Boca Chica:
  - Kent L. Gee, Noah L. Pulsipher, Makayle S. Kellison, Logan T. Mathews, Mark C. Anderson, Grant W. Hart; Starship super heavy acoustics: Far-field noise measurements during launch and the first-ever booster catch. *JASA Express Lett.* 1 November 2024; 4 (11): 113601.
  - It is not clear whether the EA includes this latest information. It is not clear whether the EA is consistent with this important scientific article.
    - ***I recommend FAA ensure that the EA is updated to reflect the findings and recommendations of this highly relevant, very recent scientific article. The public should be provided an opportunity to comment on any related revisions.***

- FAA failed to disclose-in light of *14 CFR § 91.817 - Civil aircraft sonic boom, and 49 U.S. Code § 44715 Controlling aircraft noise and sonic boom*- whether SpaceX's sonic booms at Boca Chica are lawful, and if so, how.
  - ***I recommend FAA explicitly discuss this regulation and how it applies, or doesn't apply to SpaceX at Boca Chica. More generally, I recommend FAA discuss the legality of sonic booms, and whether, and how any other restrictions on sonic booms apply to SpaceX at Boca Chica.***

- FAA has failed to demonstrate that the numerous sonic booms that will be created by the proposed numerous Super Heavy Booster landings, will not result in significant impacts to the human environment. FAA has not demonstrated that these sonic booms will not cause significant impacts to local people in South Padre Island, Port Isabel, and other nearby communities. Sonic booms are known to cause startle responses in people, disruption of ongoing activities, and disturbance of sleep and rest (https:hearinghealthmatters.org/hearing-international/2015/sonic-booms-another-source-of-noise-exposure). NASA researchers have found that sonic booms are disruptive, annoying, and can lead to sleep disturbances.
  - ***FAA should revise the current EA to honestly and accurately disclose the considerable potential for human impacts due to sonic booms. FAA should reconsider its determination that the impacts of SpaceX sonic booms at Boca Chica are, and will be INSIGNIFICANT.***
  - ***FAA should tell the local people, in person, that the impacts of SpaceX sonic booms are insignificant, after they have experienced a few more of these events.***

- FAA has also failed to demonstrate that the impacts of these sonic booms on wildlife- particularly on iconic threatened and endangered species, which are protected by the Endangered Species Act- will not be significant.
    - ***Immediately, and prior to issuance of a Final EA, and "mitigated FONSI", FAA should consult the best independent (e.g. not employees of SpaceX, or of Federal or State agencies, or contractors who could be pressured into providing a biased report) experts on threatened and endangered species at Boca Chica, and the best experts on noise and sonic boom impacts to wildlife generally. If these experts determine that existing research is inadequate to make an honest determination regarding the significance of such environmental impacts, FAA should postpone issuance of a Final EA and "mitigated FONSI" and fund the research necessary to make a reasonable determination of significance.***

- FAA has failed to demonstrate that SpaceX's discharges of deluge water have not, and will not significantly impact the environment. While FAA has disclosed regulatory actions related to SpaceX's deluge water discharges, which may reflect SpaceX compliance with the Clean Water Act going forward, it also discloses that SpaceX "allegedly" has not complied with the Clean Water Act in the recent past. Furthermore, regulatory compliance with the Clean Water Act does not necessarily equal no significant impact to the environment. For example, water quality data found in SpaceX's application for a TCEQ TPDES discharge permit for discharge of deluge water, revealed that concentrations of copper and zinc measured in SpaceX deluge water effluent, sometimes exceeded TCEQ criteria that should have triggered (as per TCEQ instructions) inclusion of effluent discharge limits for these pollutants in the permit. However, for unknown reasons, TCEQ has not included any discharge limits in this permit, suggesting that SpaceX's deluge water discharge ***may*** cause exceedances of the water quality criteria for copper and zinc at and near the discharge point to tidal flats on the Boca Chica Unit of the Lower Rio Grande Valley National Wildlife Refuge. Note that SpaceX has not proposed treatment of its deluge water discharge, nor has TCEQ required treatment. Deluge water will be discharged directly to the tidal flats during launches, and indirectly after the launch from holding ponds which provide very limited treatment, at best (via settling, sedimentation).
    - ***In view of the above, I recommend that FAA revise its finding that SpaceX's discharge of deluge water will not result in significant impacts to the environment.***

- FAA failed to disclose and assess the potential impacts of increased deluge water discharge onto the tidal flats, due to the effects of discharging this ***freshwater*** into the ***hypersaline*** tidal flat. In previous comments to TCEQ on the matter, Texas Parks and Wildlife Department suggested that this will impact the invertebrate community of the tidal flats, which is the food source for the threatened piping plover.
    - ***I recommend that FAA include consideration of this matter in the EA. FAA's EA does not even mention this concern. FAA should seek experts on Texas tidal flats and on piping plover in order to consider the issue.***

- FAA has failed to demonstrate that roadkills of wildlife- especially threatened or endangered species- is not now, nor will it in the future be, a significant environmental impact of SpaceX activities. Existing truck traffic, and other traffic on Highway 4 is already very heavy, and has been for some time. Traffic on Highway 4 has greatly increased since SpaceX began destroying Boca Chica, sometime around 2014. This increase to date has not been properly disclosed by FAA, nor has its impact been properly assessed. In the current EA, FAA has estimated that truck traffic will ***quadruple*** as a result of the proposed changes. However, FAA continues to assert that impacts due to traffic increases will not be significant. There does not appear to be any actual data regarding road kills on Highway 4, in particular data regarding roadkills of threatened or endangered species. This is unacceptable. A monitoring program has been needed since 2014.
    - ***I recommend that FAA have a traffic expert and a wildlife biologist make a determination regarding the whether any or all of the cumulative impacts of SpaceX's incremental destruction of Boca Chica, including but not limited to the current proposal, has resulted in significant, incremental increases in traffic on Highway 4, and increases in road kills of wildlife, particularly threatened or endangered species.***

- FAA has failed to demonstrate that the future increase in traffic will not significantly impact human safety and health, and the public's ability to enjoy the public resources of Boca Chica. As discussed in the comment above, traffic has greatly increased on Highway 4 since SpaceX began destroying Boca Chica, around 2014. In addition, FAA disclosed in the current EA that truck traffic is expected to nearly quadruple as a result of the proposed action. This cumulative impact would be expected to result in more traffic accidents, more human deaths and injuries, and more delays for citizen users of Boca Chica. None of this is addressed in this EA, and I am not aware of it having been addressed in previous FAA NEPA documents dealing with SpaceX activities at Boca Chica.
    - ***I recommend FAA revise the current EA to, perhaps for the first time, assess the cumulative impact of SpaceX activities on traffic on Highway 4, including accidents, deaths, injuries, and delays. FAA should consider whether this incremental increase in traffic has resulted in significant increases in accidents (including costs to the public), deaths, injuries, and delays.***

- FAA has consistently failed to honestly assess and disclose the impacts of SpaceX closures of access to Boca Chica. Counting only ***Actual Closures*** does not properly estimate the true impact of the SpaceX closure process. SpaceX notifies Cameron County of access restrictions and the county implements them, apparently. There are *planned* closures that are announced, then there are actual closures. Often, planned closures don't actually happen, and are not counted by SpaceX or FAA, but planned closures have the same effect on access as actual closures. Nobody plans to go to the beach when the county announces the beach is going to be closed, even if SpaceX changes its mind and the closure is not implemented. So the true impact of closures would best be measured by adding up all the *planned* but *unimplemented* closures, and the *implemented* closures. Even this probably would underestimate the true impact because undoubtedly a lot of people just don't even bother to think about going to Boca Chica anymore, because of SpaceX and the access closures as well as traffic and traffic delays.
    - ***FAA should honestly and properly estimate the impacts of Boca Chica access restrictions on public access to the state park and the beach, as discussed above, and disclose this in the EA.***

- Nox emissions to air are approximately the same as the conformity de minimus threshold, because the former are not significantly different than the latter, when the precision of the estimate is taken into account.
    - ***I recommend FAA require SpaceX to conduct a Nox conformity determination, and FAA should include in a revised Draft EA, an explanation and the results. Depending on the results, FAA's conclusion that the proposed action will not result in significant impact to air quality, may need to be revised.***

Additional More Detailed Comments

- 1. INTRODUCTION
- 1.3. Purpose and Need;
    - p. 4; 1st paragraph; 1st sentence: This purpose statement is too broad. It is of no value whatsoever, and does not fulfill the requirments of NEPA.
    - p. 5; 1st complete paragraph; 4th sentence: See p. 1 of these comments, 2nd comment.
- 1.5. Other Licenses, Permits and Approval ;
    - p. 6;
        - 1st bullet;
            - 3rd sentence: The public should be able to review the results of this formal consultation, and comment.
                - ***I recommend FAA include the detailed results of this consultation in this EA, and provide the public opportunity to comment on it.***
            - 5th sentence: This does not constitute adequate public disclosure and adequate opportunity for public comment. Is any "mitigation" that is critical to FAA's decision to issue a "mitigated FONSI" going to be required? How does FAA know the impacts will be mitigated, if it doesn't even have these results yet?
                - ***I recommend FAA include the Biological Conservation Opinion and the 2023 Addendum, in this EA, and provide the public opportunity to comment on it, and on FAA's assertion that it continues to ensure that SpaceX activities have no significant impact on threatened or endangered species: "***The prior BCO and Addendum contain Reasonable and Prudent Measures and associated Terms and Conditions to avoid, minimize, and mitigate the effects on listed species and critical habitat."
        - 2nd bullet; 2nd sentence: Does this constitute "mitigation" as per CEQ 2011 guidance? Does it constitute mitigation that is critical to a "mitigated fonsi"? If so, who is responsible for monitoring this mitigation, and enforcing it? What commitments have SpaceX and FAA made to implement these? Are these in the related decision documents as required by CEQ? Does FAA have a mitigation monitoring plan? Does it include these? Does FAA have funding to monitor them? What is the status? Has this mitigation been done?
            - ***I recommend FAA clarify in the EA, whether the above constitutes required mitigation. If it is, I recommend FAA include answers to my questions above, in the EA.***

- p. 7;
  - 1st bullet: It seems that FAA has not completed its assessment of these potential impacts, so a Draft EA may be premature at this time. Could these specific consultations result in mitigation that would be critical to the "mitigated FONSI"? If so, this Draft EA is definitely premature, as FAA is unable to even assess its impacts, much less commit to mitigation.
    - ***If these consultations may result in mitigation that would be critical to the "mitigated FONSI", I recommend FAA postpone issuance of a Final EA and "mitigated FONSI", and ensure that a draft EA is disclosed to the public that includes all required mitigation, thus avoiding issuance of a "mitigated FONSI" and an EA, that does not disclose to the public all mitigation required to avoid a finding that SpaceX activities will significantly impact the environment.***
  - 2nd bullet. Did TCEQ and EPA previously determine that SpaceX's MSS General Permit provided it with compliance with the Clean Water Act, while discharging water from the deluge system? Or did SpaceX and/or FAA simply assert this to be the case? I don't believe a draft TPDES permit is actually "issued". So that sentence doesn't make sense as written. Did the agencies notify FAA that SpaceX may continue to operate pursuant to the draft permit, until the final permit is issued? Is that what you meant to say? Please provide the written notification from TCEQ and EPA to FAA, prior to finalizing the EA. Is FAA committing SpaceX to comply with all applicable compliance terms set forth in these orders, to operate the deluge system in accordance with the permits, and to monitor effluent to ensure compliance with water quality standards, etc? How will FAA monitor SpaceX's compliance with all this? How will FAA enforce its commitment that SpaceX will comply with these requirements? Clearly, the above represents "mitigation" in support of a "mitigated FONSI" as defined by CEQ.
    - ***I recommend that FAA define "coverage" as used here. I recommend that FAA answer all the questions I pose in the comment above, in the EA. I recommend FAA revise these statements to make them accurate- for example, to avoid stating that the TPDES permit is issued. Include written notifications from TCEQ and EPA to FAA, that SpaceX is authorized to continue to operate while TCEQ drafts the permit, in the EA.***

- 2. DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES
  - 2.2. Launch Operations
    - p. 11; last paragraph; 3rd sentence: This is a bold assertion. I question its validity. In addition, this conclusion should be reconsidered, by explicitly taking into account, the effects of constantly changing launch plans, and associated changes in actual access closures, on public access to Boca Chica.
    - ***I recommend FAA revise the EA to include data that support this assertion. In addition, I recommend FAA revise its assessment of the impact of actual access closures, by accounting for the impact of constantly changing launch plans and associated changes in actual access closures, which has the effect of creating a much larger period of time during which the public simply cannot reasonably plan to visit Boca Chica.***

- 2.5. Waterway Closures: I assume this can affect recreational boaters in the area. Recreational boating is a big industry here. What are the risks to recreational boaters? How will they be informed? What are the socio economic impacts?
  - ***I recommend FAA revise the Draft EA to answer these questions. FAA should determine whether waterway closures could significantly impact recreational boating.***

- 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES
  - 3.1. VLA
    - p. 19; 2nd paragraph: Landscape changes since 2022 are apparent at the VLA since 2022, including changes in vegetation on the south side of the site, and possible loss of elevation/sediment. The developed footprint of the former Boca Chica Village has clearly expanded since 2022- the new residential area on the north end of this industrial landscape, for example. In addition, SpaceX is now discharging treated domestic wastewater at what was Boca Chica Village, and based on landscape changes, it is reasonable to assume that stormwater runoff from the former Boca Chica Village has changed as well. An even more dramatic change, is the changes to the former Boca Chica Village since 2017, which should have been assessed and disclosed previously. These changes would have resulted in greatly increased stormwater discharges, and likely, discharges of a variety of contaminants. All aquatic discharges from the former Boca Chica Village flow into the watershed of the nearby South Bay Coastal Preserve, a high quality secondary coastal bay that has been formally designated a protected area by Texas Parks and Wildlife Department and Texas General Land Office. South Bay includes extensive seagrasses, which are highly sensitive to water quality degradation. It also includes a unique population of high-salinity adapted oysters, which may be sensitive to changes in salinity.
      - ***I recommend FAA change the language in the EA to delete the assertion that the affected environment remains the same since 2022, and instead to acknowledge the obvious changes that have occurred.***
  - 3.2. Issues Evaluated in this EA
    - p. 20; 2nd paragraph: The 2nd and 3rd sentences are contradictory. In the 2nd sentence you assert that SpaceX is fully compliant with all mitigation requirements, while in the 3rd sentence you say they are 90% compliant. In addition, this entire paragraph consists of assertions with no supporting data. Precisely what are all the required mitigation? Describe FAA's monitoring program for compliance with required mitigation. Describe FAA's enforcement program for compliance with required mitigation. Disclose any actual enforcement.
      - ***I recommend that FAA actually determine the true extent of SpaceX compliance with required mitigation, and only assert that.***
      - ***I recommend that FAA answer all my questions above and include the answers in the EA.***

- ***3.2.1. Air Quality***
  - p. 20; 1st paragraph: The outrageous destruction and production of an enormous cloud of pulverized corncrete and soil during the launch on April 20, 2023, is vaguely alluded to here, but is dismissed as insignificant. Just because TCEQ did not take action in response to this event, does not mean it was not a significant impact to the environment. I would argue that it was. This event created unhealthy air conditions for a short time, and resulted in very significant deposition of pulverized concrete and soil, and possibly other substances, on all surfaces within a particular radius of the launch site. All this debris had to be cleaned up. And nobody actually determined whether vegetated habitats were affected by it.
    - ***I recommend that FAA discuss the event caused by the launch of April 20, 2023 honestly, and disclose the true nature of the event, and its impacts. It seems that we don't really even know the actual impacts of the event. FAA must be honest about that. FAA should provide the public with a much more robust defense of their assertion that this event resulted in insignificant impacts. This defense should include data and facts, not just opinions of non-experts.***
  - p. 21; Table 3: The proposed action's estimated Nox emissions are 98 tons per year, while the Conformity de minimis Threshold for Nox is 100 tons per year. The estimate is very close to the threshold, and the estimate almost certainly includes a lot of uncertains, so that I would argue there is no difference between the estimate and the threshold. Therefore, it seems to me that general conformity should apply to the proposed action- a conformity determination should be required, and no conclusion regarding the significance of air emissions can be made at this time.
    - ***I recommend FAA require SpaceX to conduct a conformity determination for Nox and the results should be included in a revised Draft EA for public review. The EA should be delayed pending this additional work. The conformity determination should be explained in the EA, and the results could require FAA to change their conclusion regarding SpaceX impacts to air quality.***

  - 3.2.2. Climate;
    - p. 22: This section fails to even mention methane emissions, even though methane is a powerful greenhouse gas, and the section immediately above discusses SpaceX plans to intentionally discharge methane directly into the atmosphere. This is unacceptable. FAA must disclose how much methane will be leaked and/or intentionally discharged to the atmosphere, and must discuss the significance of methane emissions to climate change.
      - ***I recommend FAA disclose how much methane will be leaked and/or intentionally discharged to the atmosphere, and discuss the significance of methane emissions to climate change.***
    - p. 23;
      - 1st paragraph: No basis for these sweeping generalizations is provided. For example, will traffic increase as a result of SpaceX? Provide estimates of anticipated greenhouse gas reduction in the near future, due to government regulation. Provide actual estimates of greenhouse gas emissions from traffic during the time period covered by this EA.

        - ***FAA should remove unsubstantiated opinions regarding future greenhouse gas emissions from traffic as a result of the proposed SpaceX action. Instead, FAA should actually quantitativly estimate these greenhouse gas emissions, with supporting evidence.***
    - 2nd paragraph; 6th sentence: "The social cost of carbon from the Proposed Action would be offset by the benefits of the program, including the economic and job creation benefits of U.S. competitiveness in the global launch market and the enabling of new business opportunities in space that will be made possible by those same advancements in space access.{
        - Comment: This seems to be nothing more than biased opinion, possibly originating with SpaceX itself.
        - ***FAA should either remove unsubstantiated, biased opinions such as this, or provide actual quantitative estimates to support such assertions.***
- p. 24; Table 5: These Estimated Social Costs of CO2 emissions due to the proposed action, are far lower than those disclosed by the USAF for similar SpaceX activities in California. I question why the estimates would be so different. See the October 17, 2024 letter from a consortium of environmental interests to:
    - Ms. Tiffany Whitsitt-Odell, Space Launch Delta 30, Vandenberg SFB, CA, regarding Draft Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) for the Falcon 9 Launch Cadence Increase at Vandenberg Space Force Base, California.
    - The USAF apparently estimated the Proposed Action would result in an additional 18,300 metric tons of CO2e per year, with the social cost of GHG (SC-GHG) associated with this additional carbon pollution as "over $14 million, under a 3% discount rate over $41 million, and at a 2.5% discount rate over $58 million".
    - ***I recommend FAA carefully review their estimated social costs of CO2 for the proposed action at Boca Chica, and ensure they are accurate and defensible. FAA should provide the details of their estimate, including assumptions.***
    - 1st paragraph following Table 6: Using this approach, we would conclude that no sources of greenhouse gas emissions are significant. A much better approach would be to compare the magnitude of emissions from the proposed project, to other individual industrial sources.
        - ***I recommend FAA revise this discussion to compare the estimated SpaceX greenhouse gas emissions to those of well known stationary local greenhouse gas emitters, such as an industry.***

- 3.2.3.2. Launch (Takeoff) Noise; p. 26;
    - The recently-published, highly relevant scientific article:
        - Kent L. Gee, Noah L. Pulsipher, Makayle S. Kellison, Logan T. Mathews, Mark C. Anderson, Grant W. Hart; Starship super heavy acoustics: Far-field noise measurements during launch and the first-ever booster catch. *JASA Express Lett.* 1 November 2024; 4 (11): 113601.
        - This is very recent and important information for this EA.The EA should reflect this latest information.

- ***FAA should ensure that this section of the EA is revised to update it based on all relevant information in this scientific article.***
- Last paragraph, 1st incomplete paragraph p. 27: Who decides what is considered "infrequent noise", especially when it comes to launches of the largest rocket ever created? Who decided that the only noise threshold that determines what constitutes significant noise for humans, is OSHA's 115-dbA threshold?
  - ***I recommend FAA use caution in its cavalier determination that estimated noise from 25 launches per year will not significantly impact people. I recommend FAA carefully review its efforts to trivialize these impacts to people.***

- 3.2.3.5. Sonic Booms
  - pp. 27-31: The recently-published, highly relevant scientific article:
    - Kent L. Gee, Noah L. Pulsipher, Makayle S. Kellison, Logan T. Mathews, Mark C. Anderson, Grant W. Hart; Starship super heavy acoustics: Far-field noise measurements during launch and the first-ever booster catch. *JASA Express Lett.* 1 November 2024; 4 (11): 113601.
    - This is very recent and important information for this EA.The EA should reflect this latest information.
      - ***FAA should ensure that this section of the EA is revised to update it based on all relevant information in this scientific article.***

- 3.2.3.6. Structural Damage Potential
  - pp. 31-32:The recently-published, highly relevant scientific article:
    - Kent L. Gee, Noah L. Pulsipher, Makayle S. Kellison, Logan T. Mathews, Mark C. Anderson, Grant W. Hart; Starship super heavy acoustics: Far-field noise measurements during launch and the first-ever booster catch. *JASA Express Lett.* 1 November 2024; 4 (11): 113601.
    - This is very recent and important information for this EA.The EA should reflect this latest information.
  - ***FAA should ensure that this section of the EA is revised to update it based on all relevant information in this scientific article.***

- 3.2.6. Department of Transportation Act Section 4(f): The Federal Highway Administration describes the Act as follows:
  - Section 4(f) requirements stipulate that FHWA and other DOT agencies cannot approve the use of land from publicly owned parks, recreational areas, wildlife and waterfowl refuges, or public and private historical sites unless the following conditions apply:

    - There is no feasible and prudent avoidance alternative to the use of land; and the action includes all possibleplanning to minimize harm to the property resulting from such use;
      OR

- The Administration determines that the use of the property will have a de minimis impact.

- p. 36; 4th complete paragraph: With the above in mind, how do the following ensure that SpaceX is mitigating its effects on Section 4(f) resources?
  - *Issuing notifications in accordance with its Access Restriction Notification Plan*
  - *Collaborating with USFWS to meet environmental education goals*
  - *Collaboration with Fishing's Future (an organization dedicated to bringing youth closer to nature)*
  - *Implementing the SpaceX Lighting Management Plan*
  - *Undertaking research on restoration of algal flats with Texas A&M University (TAMU)*
  - *Implementing measures to reduce noise levels generated by construction equipment and from truck traffic, including placing generators in baffle boxes and the use of mufflers on equipment.*
  - Comment: Only bullets 4 and 6 appear to relate to mitigating SpaceX effects on Section 4(f) resources. I would argue that bullets 1-3 in this list- while they may have some value- are completely irrelevant to Section 4(f), and bullet 5 is relevant, but does not itself constitute mitigation.
  - ***I recommend FAA revise this discussion and this list, to make it more honest, more accurate, more relevant, and more factual.***
- p. 37; 1st incomplete paragraph; 3rd complete sentence: Algal flat restoration research is just beginning. We don't even know if they can be restored. Clearly, it is premature to conclude that SpaceX will restore them. Therefore, it is also premature for FAA to determine that the proposed increase in operational activities would constitute a *de minimis* impact due to temporary occupancy of Section 4(f) properties.
  - ***I recommend FAA remove the above conclusion, and replace it with an acknowledgement that tidal flat restoration methods are still being developed. FAA should commit to TRY to restore any impacted tidal flat habitat. Finally though, FAA cannot assert that the proposed increase in operational activities will result in de minimis impact.***

- 3.2.7. Water Resources (including Wetlands, Floodplains, Surface Waters, Groundwater, Ocean Waters)
  - This entire discussion is inaccurate and misleading, given that compliance with agency Clean Water Act regulation (such as it is) does not guarantee there will be no significant environmental impact. SpaceX's application for a TPDES industrial wastewater discharge permit with TCEQ, included data on copper and zinc that exceeded criteria TCEQ uses to trigger inclusion of discharge limitations for these contaminants in the permit. However, for unknown reasons, TCEQ did not include any discharge limitiations in the permit for these contaminants. While these concentrations of copper and zinc were measured as total concentration, rather than dissolved concentration- on which the water quality criteria are based- the possibility exists that the samples may have exceeded the actual water quality criteria. Discharges of deluge water that

exceed water quality criteria can reasonably be expected to cause impacts (acute and/or chronic toxicity to aquatic life). In addition, discharges of deluge water that do not exceed the dissolved concentrations of contaminants that represent the actual water quality criteria, can still cause significant environmental impacts, if these discharges contain high concentrations of total contaminants. In this case, contaminants adsorbed to particles may be deposited on the algal flats and may contribute to sediment contamination with time. Sediment contamination above generally accepted screening values certainly would represent significant environmental impact.

- ***I recommend FAA rewrite this discussion to acknowledge that regulatory compliance with TCEQs TPDES permit process does not guarantee that significant impacts will not result from proposed deluge water discharges, particularly in light of the fact that TCEQ chose not to impose any contaminant discharge limits in the permit. FAA should acknowledge that the relatively high concentrations of copper and zinc in some samples of deluge water, constitute a legitimate environmental concern.***

- p. 38; 5-6th complete paragraphs: FAA should more fully disclose the details of the liquid oxgen spill, and assessment of potential impacts.
  - ***I recommend that FAA revise the Draft EA to include as an Appendix, any reports related to the liquid oxygen spill. Such reports should be available to the public. FAA should provide the public additional opportunity for review and comment, prior to completion of a Final EA.***
- p. 42; paragraph beginning with "Additionally…": SpaceX's application for an industrial wastewater discharge permit for deluge water discharge, does not indicate that the retention ponds are impermeable.
  - ***FAA should determine with high condence whether the retention ponds are actually impermeable, and revise this statement accordingly, if they are not.***
- This is the only reference to a Contaminant Monitoring Plan I have noticed in this or any other SpaceX Boca Chica document.
  - ***I recommend the FAA revise the EA to disclose to the public the details of this plan. FAA should provide the actual plan to the public for review, and additional opportunity for review and comment.***

- 3.2.8.1. Terrestrial Habitat and Wildlife
  - p. 43; 3rd paragraph: The recently-published, highly relevant scientific article:
    - Kent L. Gee, Noah L. Pulsipher, Makayle S. Kellison, Logan T. Mathews, Mark C. Anderson, Grant W. Hart; Starship super heavy acoustics: Far-field noise measurements during launch and the first-ever booster catch. *JASA Express Lett.* 1 November 2024; 4 (11): 113601.
    - This is very recent and important information for this EA.The EA should reflect this latest information.
    - ***FAA should ensure that this section of the EA is revised to update it based on all relevant information in this scientific article.***
  - Last paragraph: First, the impacts of heat briefly described here, do not seem insignificant to me. Furthermore, they reflect a very superficial assessment. In addition, this is almost certainly land of the Boca Chica Unit of the Lower Rio

Grande Valley National Wildlife Refuge. Have refuge managers or other appropriate officials of the U.S. Fish and Wildlife Service given explicit, written approval for SpaceX to create these impacts on their property?

- ***FAA should determine whether SpaceX's ongoing heat impacts to habitats near the VLA, on property of the US government, or other conservation properties, are lawful. If not, FAA must disclose this fact in the EA. Further, FAA should carefully reconsider its determination that these heat impacts are insignificant. FAA must not make such a determination cavalierly. It seems likely that the proper assessment activities haven't even been made to determine the actual impacts of extensive heat surrounding the VLA. FAA should provide any revisions of the EA to the public for review and comment, as well as provide time for review and comment following any revisions.***

- p. 44; 2nd to last paragraph; last sentence: This assertion is completely contrary to the findings of David Newstead and his colleagues, for piping plover.
  - ***FAA should revise the Draft EA to include acknowledgement of the findings of declining piping plover use of the area near the VLA, by David Newstead and his colleagues. FAA should either replace their assertions with the conclusions of Newstead and others, or should carefully explain how such contrary conclusions could be made. This would likely require an independent scientific peer review of both studies.***
- pp. 44-45; Bulleted list of mitigation actions to minimize impacts to nests near the VLA: Whiile these actions probably have value very generally, and several have value for monitoring, I do not agree that they will miniize impacts to nests near the VLA.
  - ***I recommend that FAA revise their description of these action items to reflect their true value. In addition, I recommend FAA create a new list of action items that actually could minimize impacts to nests near the VLA.***
- p.45; last paragraph: It seems that FAA and USFWS may need to conduct additional consultation regarding the likely effects of the proposed action on listed species as a result of possibly different estimates of sonic boom impacts, as a result of the recently published scientific paper:
  - Kent L. Gee, Noah L. Pulsipher, Makayle S. Kellison, Logan T. Mathews, Mark C. Anderson, Grant W. Hart; Starship super heavy acoustics: Far-field noise measurements during launch and the first-ever booster catch. *JASA Express Lett.* 1 November 2024; 4 (11): 113601.
  - ***I recommend FAA discuss the matter with USFWS, and if USFWS determines it is necessary, FAA and USFWS conduct such revised consultation. In this case, I recommend FAA delay completion of a Final EA for this proposed action, pending revision of the Draft EA to include the results of any such revised consultation, with disclosure to the public, and time for review and comment.***
  - Item #1, at bottom of page: "SpaceX will conduct a review of the existing literature on impulsive noise effects of other non-domesticated shorebird species for purposes of comparison. SpaceX will deliver this review to the Service (USFWS) prior to the conclusion of consultation on Addendum #2 or as soon as possible."

        - Comment: If such a review is needed, then it is premature to be making conclusions regarding the significance of the proposed action on listed species.
        - ***I recommend FAA, USFWS, and SpaceX collaborate on needed independent scientific deliberation to develop the necessary science to actually support an effects determination based on noise and/or sonic booms. This should all be completed prior to any such determination, and this EA should not be finalized until that determination is completed, based on defensible science.***
    - p. 47; 1st incomplete paragraph; last sentence: *Consistent with the PEA, SpaceX plans to eventually expand the VLA and develop the area south of the existing pad boundary*
        - Comment: FAA and SpaceX should be aware that this plan will require a Clean Water Act, Section 404 permit. Such permits require compliance with the 404(b)(1) Guidelines, which require that alternatives be considered, and demonstration of efforts to avoid and minimize impacts to aquatic habitats. A highly relevent question is: Why didn't SpaceX disclose this to the regulatory agencies when they first requested authorization to destroy aquatic habitats at the VLA? How much more future destruction of aquatic habitat at the VLA should we expect?
    - 2nd complete paragraph: Rather than automatically warranting an increase in the amount of authorized take, perhaps an alternate interpretation of the implications of the frequency of detections of green sea turtle false crawls, could include one or more of the following?
        - SpaceX needs to do something different to avoid causing this to happen.
        - SpaceX needs to stop its activities altogether, to avoid causing this to happen.
        - SpaceX needs to artificially correct the false crawls.
        - ***I recommend that FAA support the spirit and intent of the ESA, and seek to avoid impacting listed species with its actions, rather than simply jumping to seek authorization to kill more individuals of listed species.***
    - p. 48: last paragraph, just above Table 7: The public should have the opportunity to review the results of this consultation, and to comment on the NEPA implications.
        - ***I recommend FAA delay issuance of a Final EA, pending completion of this consultation, and inclusion of discussion of the consultation and its results in a revised Draft EA, along with opportunity for further public review and comment.***
- Table 7; p. 52
    - Table entry: *Vehicle traffic during daily operations from SpaceX operations personnel could potentially increase the likelihood of wildlife being killed by a collision with a vehicle. In addition, traffic and human presence could cause wildlife to avoid the area. The area is already trafficked by humans, and to date, monitoring has not shown any documented "take" of ESA-listed species due to vehicle strikes involving SpaceX.*
        - Comment: Not only vehicle traffic from SpaceX operations personnel could increase risk of roadkills, but any and all vehicle traffic. For the purposes of this EA though the relevant question is whether traffic related to SpaceX Boca Chica, in any way, has increased roadkills.

- Comment: What monitoring is referred to here? Describe it in detail in the EA, provide a reference, and provide any reports as an Appendix. Provide the public opportunity for review and comment.
- Comment: The appropriate baseline for assessing potential significant impact is not just changes in traffic since the last EA, but rather changes in traffic since SpaceX first began destroying Boca Chica. Cumulative impacts must be considered.
- ***I recommend FAA revise this table entry, and any other related discussion to properly incorporate the points in my comments above. I also recommend FAA provide documentaion of the roadkill monitoring program mentioned.***

- Table entry: Some of the operational measures include education plans for personnel on the potential for vehicle collision with ocelots and jaguarundis, ***encouragement for personnel to use employee shuttle***, speed limits of 25 miles per hour at the VLA with restrictions to operated vehicles only in existing paved and dirt roads and parking, and water truck delivery limited to daylight hours as practicable.
  - Comment: Use of the employee shuttle should not be voluntary. It should be mandatory. In addition to reducing risk of roadkills, it could reduce the need to destroy aquatic habitat or other habitats, just to provide parking. Note the large area of habitat on the sides of Highway 4 at the VLA that is always used for parking. Is this even legal? Mandatory use of a shuttle could reduce several kinds of impacts.
  - ***I recommend that FAA require SpaceX to make use of the employee shuttle mandatory for employees and contractors, as required mitigation.***

- 3.2.9. Land Use
  - p. 57; 2nd paragraph; last sentence: As previously stated, actual closures underestimate the effects of public access closures on the public, because SpaceX's constantly changing planned closures result in what amounts to extended closure periods, since people cannot plan to access Boca Chica during periods when closures are announced, even if SpaceX changes the plan and doesn't actually close the areas. The effect is much greater than the period of actual closures suggests. SpaceX and FAA are consistently underestimating the true effects on the public.
    - ***I recommnend that FAA acknowledge the above in the EA, and develop a better way of assessing the impacts of constantly changing planned/announced access closures and actual closures, on public access. The FAA should use this improved assessment method, and incorporate results in a revised Draft EA, with time for public review and comment.***

- 3.2.10. Hazardous Materials, Solid Waste, and Pollution Prevention
  - p. 58; 2nd paragraph: SpaceX had a spill of liquid oxygen, which FAA briefly disclosed under water resources, but did not mention here. Why not? That spill resulted in impacts, but they were not well described. Did it impact the tidal flats? Was the invertebrate community of tidal flats impacted? What are the risks from a future spill, to the tidal flat? It should be disclosed.
    - ***I recommend that FAA disclose the liquid oxygen spill under this section, and answer my questions above.***
  - 3rd paragraph; last sentence: This makes it sound like there have not been any spills. See above.
    - ***I recommend FAA revise this discussion to avoid the inaccurate impression that no spills have occurred, when a liquid oxygen spill is discussed elsewhere in the EA.***
  - 3rd paragraph (generally): Multiple assertions in this paragraph incorrectly assert that there is no reason to believe there could be problems with excessive concentrations of contaminants being discharged from the deluge water or elsewhere. This is simply incorrect. SpaceX's application for a TPDES industrial wastewater discharge permit with TCEQ, included data on copper and zinc that exceeded criteria TCEQ uses to trigger inclusion of discharge limitations for these contaminants in the permit. However, for unknown reasons, TCEQ did not include any discharge limitiations in the permit for these contaminants. While these concentrations of copper and zinc were measured as total concentration, rather than dissolved concentration- on which the water quality criteria are based- the possibility exists that the samples may have exceeded the actual water quality criteria. Discharges of deluge water that exceed water quality criteria can reasonably be expected to cause impacts (acute and/or chronic toxicity to aquatic life). In addition, discharges of deluge water that do not exceed the dissolved concentrations of contaminants that represent the actual water quality criteria, can still cause significant environmental impacts, if these discharges contain high concentrations of total contaminants. In this case, contaminants adsorbed to particles may be deposited on the algal flats and may contribute to sediment contamination with time. Sediment contamination above generally accepted screening values certainly would represent significant environmental impact.
    - ***FAA should revise this discussion to reflect the above, and to eliminate the biased assertions that there is no risk of contamination in these effluents.***

- 3.2.12.3. Children's Environmental Health and Safety Risks
  - p. 63; bullet: I disagree with FAA's conclusion that noise will not impact children. I believe the sonic booms will terrify many children, possibly causing mental health or behavioral problems.
    - ***I recommend FAA reconsider its conclusions regarding this. I recommend FAA consult with sound and hearing experts, and experts in human effects of sonic booms, and most importantly, experts on the effects of sonic booms on children.***

- 3.3.1.4. Visual Resources
  - 2nd paragraph; 2nd sentence: "However, the baseline condition of the area is already an industrial setting…".
  - Comment: This assertion is very important, not just for this section. It reflects an extreme bias and denial on the part of FAA. The current condition of the former Boca Chica Village and the VLA are "an industrial setting", but this was not the case prior to SpaceX beginning its destruction of Boca Chica around 2014 or slightly later. The "baseline condition" of the entire Boca Chica area, prior to SpaceX destruction, was relatively unimpacted natural habitat for listed species, nearly all of which was on a federal wildlife refuge, a state wildlife refuge, and a state park. The only exception was the former Boca Chica Village, which except for the very small residential area, a few roads, and some mowed areas, was very lightly impacted.
  - ***I recommend FAA remove this comment from the EA, and remove any similar comments. I recommend FAA remove other similar examples of bias and denial. I recommend FAA make efforts to honestly describe the baseline condition of the Boca Chica ecosystem, prior to SpaceX destruction, and use that as the actual baseline from which to assess the significance of all SpaceX activities at Boca Chica.***

- 3.3.1.7. Water Resources
  - 2nd paragraph: As I have repeatedly commented, this characterization is simply not accurate. SpaceX's application for a TPDES industrial wastewater discharge permit with TCEQ, included data on copper and zinc that exceeded criteria TCEQ uses to trigger inclusion of discharge limitations for these contaminants in the permit. However, for unknown reasons, TCEQ did not include any discharge limitiations in the permit for these contaminants. While these concentrations of copper and zinc were measured as total concentration, rather than dissolved concentration- on which the water quality criteria are based- the possibility exists that the samples may have exceeded the actual water quality criteria. Discharges of deluge water that exceed water quality criteria can reasonably be expected to cause impacts (acute and/or chronic toxicity to aquatic life). In addition, discharges of deluge water that do not exceed the dissolved concentrations of contaminants that represent the actual water quality criteria, can still cause significant environmental impacts, if these discharges contain high concentrations of total contaminants. In this case, contaminants adsorbed to particles may be deposited on the algal flats and may contribute to sediment contamination with time. Sediment contamination above generally accepted screening values certainly would represent significant environmental impact.
    - ***I recommend FAA revise these comments to reflect what I have stated above. FAA and SpaceX's denial of the actual results of contaminant testing of the deluge effluent, and of the potential risks of discharge of excessive contaminants, are inappropriate. Revise the Draft EA accordingly and provide the public opportunit for review and comment.***

FF. FAA-2024-2006-2729-A1

Comment Response

The FAA fully acknowledges that the area surrounding the launch facility is a sensitive and unique coastal ecosystem that supports a variety of protected species and designated wildlife refuges. The EA, along with the 2022 PEA, provides a thorough discussion of the existing environmental conditions in the Affected Environment sections. The 2022 PEA and this Final Tiered EA describe the ecological importance of the region, including habitats within the Lower Rio Grande Valley National Wildlife Refuge, Boca Chica State Park, Laguna Atascosa National Wildlife Refuge, and nearby estuarine and coastal ecosystems. These NEPA documents also evaluate potential impacts on species such as the piping plover, red knot, northern aplomado falcon, ocelot, and several species of sea turtles, all of which are addressed in the FAA's consultations under the Endangered Species Act (ESA). Mitigation measures are outlined to minimize effects on these resources, including habitat protection efforts, monitoring programs, lighting restrictions, and coordination with U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS). The FAA has not ignored or failed to recognize the sensitivity and importance of this region. Instead, both the 2022 PEA and this Final Tiered EA analyze and disclose the potential impacts, mitigation measures, and regulatory compliance efforts undertaken to protect the surrounding environment.

In accordance with 14 CFR Part 450, the FAA must ensure that commercial launch and reentry operations comply with environmental regulations and do not pose an undue hazard to public health and safety, national security, or foreign policy interests. The FAA's environmental review process, conducted under the National Environmental Policy Act (NEPA), evaluates potential environmental impacts associated with licensed commercial spaceflight activities, including those at the SpaceX Boca Chica launch site. The Environmental Assessment (EA) for SpaceX Starship/Super Heavy at Boca Chica evaluates the effects of activities requiring an FAA launch or reentry license; private development activities at Boca Chica Village, including production, manufacturing, and facility construction, are not part of the federal action and fall outside the scope of this NEPA analysis. Industrial activities outside FAA-licensed launch and reentry operations fall under state and local jurisdiction, such as Texas Commission on Environmental Quality (TCEQ) regulations for water quality, stormwater management, and hazardous waste disposal.

Water Quality

While the FAA does not administer the Texas Pollutant Discharge Elimination System (TPDES) permit process, the permitting process overseen by TCEQ 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 TPWD raises concerns about pollutants such as copper, mercury, zinc, and hexavalent chromium, the Final Tiered EA notes 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. Indeed, the source of the water used in the deluge system is potable water trucked to Starbase from the Brownsville Public Utilities Board (BPUB). Based on the sampling data collected for the deluge system and the requirements in SpaceX's TPDES permit for the deluge system, the FAA concludes that the deluge system will not have significant effects. The sampling results of the water indicate that the water will not degrade wildlife or nearby habitat, and numerical and narrative criteria ensure that existing uses of nearby waters will be maintained and protected. 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.. 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.

Mitigation

FAA acknowledges the commenter's concerns regarding mitigation (i.e., disagreeing with the proposed mitigation and requesting new mitigation) but that the comment did not provide any substantive information in order for FAA to directly address; nevertheless, additional information and clarification has been provided below.

The Environmental Assessment (EA) evaluates mitigation measures designed to minimize or eliminate significant environmental impacts from licensed launch and reentry activities. The FAA determines significance based on scientific data, consultation with regulatory agencies, and impact thresholds set under NEPA. The FAA's approach to mitigation is adaptive, allowing for adjustments based on monitoring results and emerging scientific data. Mitigation measures outlined in the Final Tiered EA include:

- Noise and lighting minimization measures to reduce impacts on wildlife and local communities.
- Habitat protection efforts, including monitoring of federally protected species and coordination with USFWS.
- Water quality protection, with ongoing sampling and compliance with Texas Pollutant Discharge Elimination System (TPDES) requirements.
- Debris recovery and marine impact minimization measures, with consultation from the NMFS.

The FAA requires SpaceX to comply with the terms outlined in the Mitigated Finding of No Significant Impact (FONSI) and applicable environmental regulations. The FAA coordinates with regulatory agencies such as USFWS, NMFS, Texas Commission on Environmental Quality (TCEQ), and Texas Parks and Wildlife Department (TPWD) to monitor compliance and assess mitigation effectiveness. SpaceX is required to submit environmental compliance reports, detailing the implementation of required mitigation measures. The FAA reviews these reports and considers agency feedback when evaluating the effectiveness of mitigation strategies. State and federal agencies independently monitor environmental conditions and regulatory compliance, with the authority to enforce violations where applicable. The FAA enforces compliance with its launch and reentry licenses through permit conditions and regulatory oversight under 14 CFR Part 450. If SpaceX fails to comply with FAA-imposed mitigation requirements, the FAA may take enforcement actions, which can include modifying, suspending, or revoking launch licenses. FAA's role is distinct from environmental regulatory agencies such as EPA and TCEQ, which enforce compliance with environmental laws and permits outside of FAA-licensed activities.

Certain mitigation and monitoring reports may be subject to regulatory or proprietary confidentiality protections The FAA will continue to ensure that environmental concerns, including those related to spills, are properly assessed and documented in accordance with applicable regulations.

Noise

Model Prediction of Launch Noise - 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 actually 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 be occur with an increased launch rate. Additionally, SpaceX has collected launch and landing noise and submitted it to the FAA, which are in agreement with the predicted models 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, which is more appropriate for assessing impulsive noise events like rocket launches because it accounts for low-frequency energy in launch noise, which can cause vibrations and impact structures. Using both A-weighted and C-weighted DNL ensures that both general noise exposure and low-frequency noise impacts are accurately assessed, providing a more complete evaluation of potential noise impacts.

Model Prediction of Sonic Boom - 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 modeling results

Based on the Final Tiered EA findings, the FAA has determined that no significant effects are anticipated due to launch-related noise, including sonic booms. For human noise effects, 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. The FAA found that noise levels would exceed neither of these thresholds in areas where humans would be present during a launch or landing activity. The FAA also found that sonic boom levels would not significantly affect humans in areas outside the hard checkpoint preventing the public from accessing the area around the launch site during a launch or landing event.

The FAA did not inappropriately use the C-weighted DNL as its primary metric for evaluating noise effects, and in any event, C-weighted DNL more accurately assesses the risk of rocket noise than A-weighted DNL because it accounts for lower-frequency noise that makes up launches and landings. Section 3.2.3 includes results comparing noise levels to both the A-weighted and C-weighted DNL.

Noise effects on structures are described in Section 3.2.3.6 in the EA. As described in the EA, at 10 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 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).

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. Any such claims of damage would be subject to the insurance policy terms and process specified by CSLA and FAA regulations. 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 would not 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.

Biological Resource Impacts

The FAA acknowledges concerns regarding the potential impacts of sonic booms on threatened and endangered species at Boca Chica. The FAA consulted with USFWS and the NMFS to ensure that impacts on ESA-listed species are fully evaluated under Section 7 of the ESA.

The Biological Assessment (BA) submitted to USFWS on SpaceX's increased launch cadence concluded that the Proposed Action may affect and is likely to adversely affect certain ESA-listed species. The Biological Opinion issued by USFWS concluded the impacts are not expected to jeopardize the continued existence of any species or result in the destruction or adverse modification of designated critical habitat. The FAA's evaluation of sonic boom impacts on wildlife is based on the best available scientific data, including previous studies on impulsive noise impacts and consultations with federal and state wildlife agencies. The FAA has also incorporated findings from recent monitoring data and scientific literature relevant to the region. The FAA's environmental review process follows established scientific methodologies and relies on expertise from USFWS, NMFS, and other federal and state wildlife agencies, which have the legal mandate and scientific expertise to assess threatened and endangered species impacts.

While the FAA welcomes input from independent scientific experts, the suggestion that agency scientists and regulatory experts cannot be relied upon is not consistent with NEPA's requirements, which prioritize expert agency consultation and peer-reviewed science.

The FAA remains open to integrating new scientific findings into its environmental analysis as research advances. If further independent studies indicate significant new information regarding the effects of sonic booms on wildlife, the FAA may incorporate this data into future environmental reviews.

The FAA has concluded that effects to wildlife, including federally listed species, will not be significant. Impacts to terrestrial and marine wildlife are addressed in Section 3.2.8 of the EA. A summary of impacts to Endangered Species Act (ESA)-listed species, 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 6. A detailed analysis of impacts to federally listed species, including the Hawaiian monk seal and Rice's whale, is provided in 1) the USFWS Biological Opinion, Appendix A of the EA, and 2) the NMFS's Biological Opinion, Appendix A of the EA. Based on these analyses, FAA has determined that the Proposed Action is likely to adversely affect the Green sea turtle (North Atlantic Distinct Population Segment), Kemp's ridley sea turtle, Leatherback sea turtle, and Loggerhead sea turtle (Northwest Atlantic Ocean Distinct Population Segment) and is conducting formal consultation under Section 7 of the ESA with NMFS for these species. The Final Tiered EA includes the results of these consultations.

The FAA acknowledges concerns about potential heat impacts on adjacent lands and has incorporated updated measurements into the EA. Heat plume extents were measured during previous launches at the Boca Chica Launch Site, and findings indicate that the actual heat plume footprint is significantly smaller than what was originally projected in the 2022 PEA. However, to ensure a conservative approach to impact assessment, the heat plume extents from the 2022 PEA were still used in this EA. This approach ensures that potential impacts remain comprehensively evaluated and that mitigation measures remain protective of surrounding habitats. For further details, please refer to Final Tiered EA Section 2.2, where the FAA discusses the heat plume analysis.

SpaceX's biological monitoring results to date 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 the vicinity of the launch site following launches. The effects of small fires following launches have also not been significant, resulting only in temporary ecosystem disturbances similar to the effects of prescribed burns. Avian monitoring since 2015 has not demonstrated any long-term negative population

trends in avian species in the vicinity of Boca Chica. 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 will help 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. The FAA recognizes concerns regarding green sea turtle false crawls and has carefully evaluated the available monitoring data. While an increase in false crawl frequency has been observed, it is uncertain to what extent this trend is directly attributable to SpaceX's activities at Boca Chica. In response to these findings, SpaceX is seeking an increase in authorized incidental take of green sea turtles based on updated monitoring results. However, the mitigation measures imposed by the 2022 PEA, along with any additional reasonable and prudent measures required by USFWS and/or NMFS, will ensure that potential impacts to green sea turtles and other sea turtle species would not be significant. Regarding the comment suggesting that SpaceX "should do something different" or "stop its activities altogether," the FAA must respond to SpaceX's application for a new or modified license per the statutory requirements summarized in Final Tiered EA Section 1.2.1 and NEPA. The completion of the environmental review process does not guarantee that the FAA will issue a license 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, Parts 400–460. The FAA notes that the Final Tiered EA also analyzes the No Action Alternative, which is the scenario in which the FAA would not modify or issue a license to SpaceX for increased launch and landing cadence from the Boca Chica Launch Site. The FAA will issue a decision based on all statutory and regulatory requirements for review of SpaceX's launch license application. The comment expressed specific concern about effects from increased traffic on wildlife, including federally threatened and endangered species. SpaceX employees are instructed to report any wildlife that is injured from vehicle traffic. To date, no threatened or endangered species have been reported. The FAA acknowledges that changes in traffic patterns may alter species behavior near roadways. The Final Tiered EA and Biological Opinion evaluate the potential for increased vehicle collisions and other traffic-related effects and mitigation measures to ensure that traffic effects are not significant. FAA has mandated the following specific mitigation measures to address 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. Note that the use of over 600 cars per day on State Highway 4 is avoided through use of the Employee Shuttle Service
- 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.

In response to concerns regarding potential effects in the Pacific Ocean near Hawaii, tThe FAA has revised the Final Tiered EA to remove the Pacific action area from the Hawaiian Exclusive Economic Zone (EEZ)

and establish a buffer zone of 50 miles around the Papahānaumokuākea Marine National Monument. These changes ensure that potential environmental impacts will not be significant 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 shifting the action area, the likelihood of debris dispersion affecting the Hawaiian Islands and surrounding waters is significantly decreased and expected to be negligible.

Commenters also raised concern 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. More information on the potential effects of hazardous materials can be found in Response to Comment 12 below.

The FAA acknowledges concerns regarding the potential impacts of SpaceX's Starship/Super Heavy operations on the piping plover population and the discrepancy between the findings in the Final Tiered EA and those of David Newstead and his colleagues. Newstead and Hill (2021) report the results of a mark-resight study they conducted on piping plover that were marked with uniquely identifiable leg bands in their breeding range and migrated to the Boca Chica area for the winter season. Their study estimated abundance, encounter probability, and apparent survival in the years 2018-2021 using mark-resight models and then they performed a linear regression through the estimates to characterize population trend. The mark-resight models they applied are generally suitable for this data type, however violations of some of the model assumptions and inconsistencies in survey methods compromise the reported confidence in the results. As a result of these likely violations of the geographic closure assumption, the population being estimated by Newstead and Hill (2021) is undefined. As discussed by McClintock and White (2012), such estimates are unsuitable to monitoring population density (i.e., abundance in Boca Chica/South Bay) over time. Consequently, a linear regression through four years of estimates does not constitute a robust or reliable evaluation of population trend. The inconsistent survey methods used in the study did not adequately address variable detection probability and likely resulted in overly precise confidence intervals. Consequently, the analysis is not sensitive enough to detect a difference in abundance of 50% in a short 4-year period. The quality of the abundance and survival estimates are questionable for two primary reasons:

1. The ZPNE model's assumption of a closed geographic population was likely violated, meaning the population that is being estimated is undefined and may have changed over the period of study; and

2. The modeling process did not account for variable detection probability, which is known to result in underestimates of abundance and overestimates of precision, the degree of which is unknown may vary each year.

The report does not change the FAA's conclusion that SpaceX's activities have not to date and will not significantly affect piping plover populations.

Access Restrictions

The proposed increase in launch cadence does not change the total number of authorized closure hours, which remains at 500 hours per year for general operations and 300 hours for anomaly response. Actual closures have not exceeded these authorized limits, and operational efficiencies have led to a 95% decrease in closure hours needed per launch compared to earlier launches in the program. SpaceX has implemented ongoing mitigation measures, including moving certain testing operations to the Massey's Test Site, which reduces the need for extended closures at Boca Chica. The FAA and SpaceX continue to implement measures to minimize closure durations, including:

- More precise scheduling to reduce public access disruptions.
- Advance notice to allow for better planning by Tribal members and local stakeholders.
- Efforts to consolidate activities to minimize the frequency of closures.

Air Quality

The FAA recognizes that the April 2023 launch resulted in the spread of debris and particulates over the area surrounding the launch pad. Post-launch monitoring showed minimal damage to vegetation (sediment on top) associated with the dust and gravel cloud that resulted from this launch. SpaceX has since implemented mitigation measures, including reinforcing the launch pad with a steel plate and installing a deluge water system, to prevent the spread of dust and debris during subsequent launches. No further complaints have been reported to TCEQ.

The FAA is committed to ensuring that mitigation measures remain effective in preventing similar air quality impacts. SpaceX is required to continue monitoring particulate emissions and air quality impacts from launch operations.

Climate

The Final Tiered EA quantifies emissions from the Proposed Action, including methane emissions from launches. Methane (CH_4) is accounted for in CO_2-equivalent (CO_2e) values using the global warming potential (GWP) factor recommended by the Intergovernmental Panel on Climate Change (IPCC). The Final Tiered EA compares emissions from the project to state, national, and global emissions.

While the FAA acknowledges that GHG emissions contribute to climate change, FAA Order 1050.1F does not define a significance threshold for GHG emissions, as climate change is a global phenomenon influenced by countless sources. The Final Tiered EA follows NEPA's standard for analyzing reasonably foreseeable impacts, which does not require an assessment of emissions from unrelated upstream activities beyond the direct scope of the Proposed Action. Extraction and processing of methane fuel occur outside the scope of the FAA's regulatory authority and are not unique to the Proposed Action, meaning they do not meet the NEPA standard for indirect effects that are reasonably foreseeable and causally connected. The EPA is the lead federal agency regulating methane emissions from oil and gas extraction,

and any additional emissions from natural gas production are governed by EPA regulations rather than the FAA. 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 significantly contribute to the overall emissions of the Proposed Action or alter the finding of no significant impact on climate change. Mitigation measures, such as encouraging employee carpooling and utilizing efficient logistics planning, help minimize traffic-related emissions. Outside the scope of this Proposed Action, the Brownsville Public Utility Board is planning to install a water line along State Highway 4 to substantially reduce truck traffic. The FAA acknowledges that anomalies could result in temporary releases of unburned methane, but these events remain infrequent, unpredictable, and therefore not reasonably foreseeable. The Final Tiered EA evaluates historical launch data to assess trends and probability, concluding that anomalies represent a small fraction of overall emissions and do not materially alter the total climate impact assessment.

While comparisons to total U.S. and global GHG emissions are included to provide context, the FAA does not rely solely on these comparisons to determine significance. SpaceX is developing advanced methane fuel production and recovery technologies, which could reduce the lifecycle emissions of future operations. SpaceX's focus on full reusability of the Starship/Super Heavy vehicles is a key mitigation factor, as it reduces the need for new manufacturing, thereby lowering the lifecycle emissions associated with each launch.

The FAA also acknowledges that every increase in emissions contributes to cumulative climate impacts but emphasizes that NEPA requires agencies to assess whether a specific project's emissions rise to a level of "significance" under the law. The Final Tiered EA provides a detailed breakdown of projected emissions sources, allowing for comparison across alternatives and mitigation measures.

The reference to declining truck emissions due to EPA regulations is based on established federal policies that will result in lower per-vehicle emissions over time. While these regulations do not immediately eliminate emissions, they contribute to long-term reductions and are relevant to assessing future cumulative impacts. The Final Tiered EA quantifies the increase in truck traffic under current conditions and does not rely solely on long-term regulatory trends.

Reusability is a key factor in reducing the long-term climate impact of commercial spaceflight and aligns with broader sustainability goals in the aerospace industry. Fewer new rocket builds reduce the emissions from material extraction, processing, transportation, and assembly—factors that are significant contributors to lifecycle emissions in traditional expendable rocket programs. Unlike traditional expendable rockets, Starship is designed to be fully reusable, reducing emissions per mission by minimizing the need for new vehicle manufacturing and fuel extraction. The reusability of Starship/Super Heavy factors into the FAA's evaluation of climate effects and determination of no significant impacts.

Hazardous Waste

The FAA has considered the potential impacts of hazardous materials, including the handling and storage of hazardous materials, and evaluates the risk of spills or releases. The FAA works with relevant agencies to ensure that risks to the environment, including tidal flats and other sensitive habitats, are adequately assessed and mitigated. Regarding the specific liquid oxygen spill referenced, shortly after, a representative of SpaceX Environmental Health & Safety and its environmental consultant, SWCA, surveyed the area and determined that no restoration work was necessary. All vented oxygen evaporated and fully rejoined the atmosphere within 4hr 29min.

While there was minor loss of vegetation observed in connection with the oxygen vent/release due to the cold temperature of the oxygen, new growth was identified a little over a week later, on July 15, 2022. SpaceX discussed the results of its survey with USFWS. SpaceX also communicated to USFWS that the area impacted was within the area being proposed for future pad expansion. Liquid oxygen is a substance that, when spilled, can potentially affect water and surrounding environments. The FAA remains committed to ensuring that SpaceX's operations follow best practices for pollution prevention, hazardous materials management, and spill response to minimize risks to the environment.

Federal Aviation Administration

In the Matter of
SpaceX

Comments on the SpaceX Starship/Super Heavy Vehicle Increased Cadence at the Launch Site in Cameron County, Texas (docket number: FAA-2024-2006) Program

South Texas Environmental Justice Network and the Carrizo/Comecrudo Tribe of Texas (collectively, "Commenters") submit these comments regarding the Federal Aviation Administration's ("FAA") draft programmatic environmental assessment ("DPEA") for the SpaceX Starship/Super Heavy Launch Vehicle Program at the SpaceX Boca Chica Launch Site in Cameron County.

Space Exploration Technologies Corporation ("SpaceX") seeks authorization for Increased Cadence at the Launch Site in Cameron County, Texas (docket number: FAA-2024-2006) from the FAA.

As commenters explain below, the DPEA for SpaceX's proposal fails to satisfy the obligations imposed by the National Environmental Policy Act ("NEPA"). The DPEA contains numerous informational gaps. These deficiencies are severe enough that they must be corrected with a comprehensive draft environmental impact statement ("EIS") and a fresh opportunity for public comment. Ultimately, however, it is clear that SpaceX's proposal will have such severe adverse impacts on the local environment and surrounding communities that the proposal is contrary to the public interest and must be denied.

I. FAA Has Not Provided Sufficient Opportunity for Public Participation

The FAA has failed to provide a public participation process that allows the community to receive information in Spanish, learn about the concerns of their peers, and receive adequate notice of the meetings to provide comments on SpaceX's proposal. In 2022, the South Texas Environmental Justice Network, in partnership with other local organizations, submitted a complaint to the FAA's Office of Civil Rights, urging for all documents to be translated into Spanish and interpreted throughout the application review processes for SpaceX. The FAA has not responded to the complaint in a just

way; the FAA did not translate the entire draft EA into Spanish and did not translate the public meeting slides into Spanish. The Cameron County community is a bilingual English/Spanish region because of its proximity to the U.S./Mexico Border, and therefore, requires language access in order to understand the impact of SpaceX's proposal and be able to submit a public comment to the FAA. Moreover, there was no translation for American Sign Language. This excludes members of our community who are hearing impaired. FAA should provide ASL interpreters for all Public Meetings.

The FAA failed to provide adequate notice of the public meetings for the Cameron County community. In early January, the FAA provided only a few day's notice of the cancellation of the public meetings in Port Isabel, TX. The City of Port Isabel and the Laguna Madre area communities are directly impacted by SpaceX's daily operations and testing and live very far from the FAA's Brownsville public meeting locations, about 30-40 miles away. The City of Port Isabel is actively monitoring the integrity of the Lighthouse, a historic structure in the city, and the negative impact that SpaceX launches have on the lighthouse. For these reasons, the FAA must have better outreach to these communities. We demand that the FAA restart the review process for SpaceX's proposal, host at least two public meetings in the Laguna Madre area, translate all materials into Spanish, and extend the comment period by at least 90 days to allow for better public participation.

FAA and contractors prepared a pre-recorded presentation that they presented and screened to the audience. Although presented on two screens, neither screen presented Spanish subtitles. The ICF did not present her introduction nor information in Spanish. Neither did the FAA provide a Spanish speaker to make a similar introduction and presentation in Spanish. When the public asked questions from contracted staff, either SWCA or ICF, not all of them provided adequate information to public members' questions.

For this reason alone, new public meetings should be rescheduled in Brownsville, Texas, in Port Isabel, Texas, in Laguna Vista, Texas, and in various appropriate locations in Hawai'i. To grant any more launch licenses to SpaceX before such meetings are held, a new DPEA presented, and at least 90 days for public comment, is unacceptable.

II. FAA and SpaceX have not consulted with the Carrizo/Comecrudo Tribe of Texas.

The legacy of Native American genocide and displacement in Texas is one of the most thorough examples of land dispossession in the Americas. The disregard

for sovereignty, access to land, land rights has been denied to virtually all indigenous peoples throughout Texas history. No existing tribe or nation with ancestral ties to the land in Texas has federal recognition. The three existing federally recognized reservations in the state serve peoples who were forcibly displaced from other homelands. Despite the state-driven erasure of the Native population there exists a thriving indigenous population with histories, languages and culture. One tribe, the Esto'k Gna commonly referred to as the Carrizo/Comecrudo, has ancestral ties to the immediate region of the Lower Rio Grande Valley.[1] The Esto'k Gna recognizes the project area and its surroundings to be an extremely important sacred cultural, ancestral, and historic site. Although the Esto'k Gna have not yet been granted federal recognition. That does not invalidate Esto'k Gna's cultural affiliation with the lands of their ancestors, nor their sacred sites, among which are the Mouth of the Rio Grande and the river itself, including access to the river and the area surrounding the mouth of the river. The protection of sacred sites is a Human Rights issue under the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). Expansion of SpaceX would continue this unfortunate colonial legacy of erasure and disregard. Furthermore, neither SpaceX, nor the FAA, and other regulators have respected and secured Free Prior and Informed Consent (FPIC) of the Esto'k Gna people, which is also recognized as a Human Right by the UNDRIP.

While there has been no archeological study in the immediate construction site of SpaceX, patterns of archaic burials in the area show a need for more protections in the area. It is likely that there are burials or artifacts or remains of villages in the construction site of SpaceX. The law has been slow to act for cultural protection. Although the tribe is currently not recognized, the Native American Graves Protection and Registration Action (NAGPRA) still applies, we must not deny that culturally informed archeological studies and cultural data that include direct consultation with the Esto'k Gna need to be conducted and assessed before any future building permits are granted.

There has not yet been a thorough enough archeological survey nor study of the current SpaceX site nor the area proposed for the project's expansion. There is high probability that archaic and archeological sites may be disturbed by SpaceX expansion and high probability that the current SpaceX project has disturbed and unearthed archeological and historic material significant to the original people of the land, the Esto'k Gna. As previously stated, neither SpaceX nor the FAA have consulted with the Esto'k Gna, nor informed them if they have encountered material or human remains in the construction of their projects. Although the Esto'k Gna do not hold Federal recognition currently, it is still a violation of the Native American Graves Protection and Repatriation Act to ignore the responsibility to inform and consult with culturally affiliated tribes, even if they lack Federal recognition.

[1]https://insideclimatenews.org/news/13052024/native-elder-fights-fossil-fuel-companies-rio-grande-delta-texas/

The Esto'k Gna (Carrizo Comecrudo Tribe of Texas) would prefer that ancestral human and material remains be undisturbed. However, SpaceX has neither sought nor received free prior and informed consent from the Esto'k Gna, and are thus in violation of NAGPRA and UNDRIP, if they have disturbed human remains and/or objects of cultural patrimony, and/or funerary items and have neglected to inform the Esto'k Gna. As there are many ancestral village sites near the river and throughout the so called Rio Grande Valley, it is likely that SpaceX's activity has disturbed and damaged sites in the area. One noted Esto'k Gna village site lies within an area known as Garcia Pasture. Garcia Pasture, which is noted on the Federal Register of historic sites, includes archeological remains of the indigenous people of the land, including pre-contact material. This area of concern, known as Garcia Pasture, is another sacred site of the Esto'k Gna, the Carrizo Comecrudo. Garcia Pasture is also located within the DPEA area of assessment for cultural and historic sites. A proposed fracked gas export terminal project known as Texas LNG would destroy this sacred site and the archeological and historic remains still there. From this site, the current SpaceX launch facility and rockets are clearly visible. This has a negative aesthetic impact on the view and surrounding landscape to which the Esto'k Gna did not consent nor were they consulted. The proposed Super Heavy rockets would be an even greater challenge to the aesthetic and view of the landscape, not to mention the danger of the largest rocket ever created exploding, setting off chain explosions in the surrounding gas and oil industries. Again the land and the are sacred to the Esto'k Gna. Any expansion of SpaceX would erase what little sacred and archeological sites left to the Esto'k Gna who are culturally affiliated to the Lower Rio Grande Valley including the areas SpaceX is using and destroying. The permit for increased cadence should be denied and the Esto'k Gna should be consulted regarding any further expansion projects or any industrial projects planned in the area.

For years, the Esto'k Gna people have submitted public comments with their concerns and opposition to SpaceX to the following regulatory agencies and public officials: Federal Aviation Administration, Texas Commission on Environmental Quality, Congressman Vicente Gonzalez, Cameron County Commissioners, City of Brownsville, and the Texas Parks & Wildlife Commission, and have not received adequate responses. The Esto'k Gna has also taken legal action to protect the sacred land that SpaceX occupies, including a lawsuit challenging the FAA for licensing SpaceX, a lawsuit against the TCEQ for allowing SpaceX to temporarily illegally dump in Cameron County, a lawsuit against the Texas General Land Office and Cameron County for excessively closing HWY 4.

III. The DPEA Fails to Consider the Impact of Boca Chica Beach Closures on Nearby Residents and Researchers

The DPEA does not accurately convey the number of hours that SpaceX closes State Highway 4. For example, the DPEA suggests that only 500 hours of closure would be necessary for up to 25 launches per year. SpaceX has exceeded its hours of closure. The public has complained for years about losing access to Boca Chica Beach because it is of important cultural significance and used for recreation and fishing. For this reason, there is an active lawsuit against Cameron County and the Texas General Land office for the excessive HWY 4 beach closures that prevent access to Boca Chica beach.

Additionally, Cameron County's system of announcing the HWY 4 closures is inadequate and confusing for the public. Cameron County website will list several closure dates and alternate closure dates virtually every week, giving the public the illusion that the beach could be closed multiple times a week and making it difficult for the public to plan beach visits. The County will then cancel a HWY closure date or alternate closure date on short notice. The county will also announce the closure dates with less than a week's notice, which makes it difficult for the public to plan beach visits. The County should not be allowed to list multiple closures or alternate closure dates a week. The county's text message alert system for beach closures is also inadequate; it does not always send out a text when the beach is closed, and the messages are only in English. The text alert system should be in English and Spanish because the community is bilingual or Spanish monolingual.

Moreover, in refusing Native American people to access Boca Chica and other sacred sites, the FAA and SpaceX are violating human rights and violating the American Indian Religious Freedoms Act. The DPEA does not even mention these violations in its assessment of cultural impacts.

IV. The DPEA Fails to Adequately Consider the Environmental Justice Impacts of Existing and Proposed SpaceX Operations

The FAA should not agree to nor grant any launch license to SpaceX because it is out of compliance with state laws and the Clean Water act. SpaceX built its Water Deluge System for launches without a permit from the TCEQ. That means all 6 launches of Starship/Superheavy that have used the water deluge system (and all prior tests of that system) have occurred without a legal state permit. The FAA should not approve SpaceX's proposal because it lacks permits from the TCEQ for its deluge system. The TCEQ is facing a lawsuit from our organization for temporarily allowing SpaceX to dump polluted water without a permit.

The FAA has neglected to consult with Kanaka Maoli (Native Hawaiian people) for this DPEA regarding the areas where Starship is supposed to pollute through landing/crashing in the Pacific Ocean. This omission is also

completely unacceptable. FAA must conduct public meetings in Hawaii and provide all materials in English and translated to Native Hawaiian language. Kanaka Maoli have stories and ceremonies and traditions that concern the offshore areas that SpaceX wishes to pollute via Starship landings. FAA must restart this process with a Full EIS and include the populations of the Hawaiian archipelago as well as center the voices and concerns or Native Hawaiian people. Not to do so is a violation of human rights and is also in violation of UNDRIP and American Indian Religious Freedoms Act (AIRFA)

V. The DPEA Fails to Adequately Consider Reliability and Safety of the SpaceX Proposal

Launch number 7 of Starship/SuperHeavy occurred on 16 January 2025. The Starship exploded and the debris scattered to the planet over the Caribbean Sea. This anomalous event endangered air travel, and debris landed in human occupied areas as well as international waters. Starship for flight 7 was not fully ready for launch and thus exploded before reaching orbit. This event causes international pollution and debris dangers not just in the SpaceX facility area, but in lands and waters that do not belong to SpaceX as private property. SpaceX is not engineering adequately or safely, yet the DPEA claims that there is no significant change in the effects of the project. Such risks are unacceptable.

As for issues of safety, SpaceX has not adequately presented plans for addressing and mitigating anomalies and catastrophic events for SpaceX launches and operations. SpaceX does not address issues of elderly, incapacitated, or disabled persons who may not be able to access potential evacuations of affected areas in the case of a disaster.

Given these shortcomings, the FAA should halt all SpaceX operations. The FAA should conduct a full EIS by trustworthy, independent, third-party researchers. For example, when one of our commenters asked the SWCA biologist about the lack of data regarding the rapid depopulation of the piping plover in the Boca Chica area, the SWCA biologist responded by stating that “we do a lot of monitoring of the piping plover,” and also commented about how cute and adorable that particular species is. This is an inappropriate response to a direct public question about the lack of data and presentation of results in the DPEA that may cast the project in a negative light. Such rhetorical evasion and conversational misdirection is consistent with techniques of public relations rather than biological scientific observation and reporting. This casts doubt on the findings and validity of the DPEA.

1. The DPEA Does Not Consider the Risks Associated With the Nearby Proposed Rio Grande LNG, Texas LNG, and Rio Bravo Pipeline Projects, and the Existing Valley Crossing Pipeline

In the DPEA, SpaceX's plan for anomalies, including an explosion on the launch pad that would spread debris, does not include mention of impacts of debris to existing and proposed oil & gas infrastructure or to nearby communities. These existing sites include the Valley Crossing Pipeline and proposed sites include Texas LNG, Rio Grande LNG, Rio Bravo Pipeline, and Jupiter oil refinery. The draft environmental impact statements (DEIS) for Texas LNG and Rio Grande LNG and the Rio Bravo Pipeline recognizes potential impacts to and from the Projects and the nearby SpaceX Commercial Spaceport Project, which is located approximately 5.4 miles southeast of the proposed Terminal. A news outlet has created a map showing the debris field from previous SpaceX launches, and notably, the debris field includes the proposed sites of the LNG facilities. The discussion of the unique risks posed by the SpaceX launch site on Rio Grande's LNG Terminal and the cumulative risks posed to the public as a result of this launch site on the three currently proposed LNG terminals along the Brownsville Ship Channel is grossly inadequate.

VI. The DPEA Fails to Adequately Analyze the Proposal's Existing and Future Impact on the Recreational Fishing and Shrimping Industries

South Bay is a delicate and special eco zone that contributes to wild life, marine life, and recreation. SpaceX has applied to TCEQ for permission to dump 200,000 Gallons a day of treated industrial wastewater directly into South Bay near the SpaceX facility. The DPEA does not address this potential pollution of waters of the United States in violation of the Clean Water Act which SpaceX has already violated on numerous occasions. South Bay is also used for recreational fishing. SpaceX dumping waste daily into South Bay will negatively impact recreation and marine life and other aquatic species that live on, nearby, and adjacent to South Bay.

VII. The DPEA Fails to Adequately Assess Impacts on Sensitive Habitats

The DPEA does not adequately address the significant environmental, habitat, or the significant wildlife impacts from the proposed proposal. Additionally, it does not outline potential alternatives to mitigate wildlife impacts for the public to consider. Since the start of operations, there have been numerous examples of damages to wildlife habitat and species by SpaceX. These include:

- November 2018 - During the Federal Government shutdown and furlough, SpaceX announced they would change activity from a launch facility to a testing facility which eventually resulted in increased explosions and debris into habitat.
- April 21, 22 - 2019 - SpaceX test caused a large wildfire into nearby habitats
- November 20, 2019 - MK 1 explosion resulted in a Nose cone north into HW 4
- February 28, 2020 - SN1 explosion sent debris north of HWY 4

- December 9, 2020 - SN8 explosion send debris into nearby habitat resulting in damaged flats
- March 30, 2021 - explosion resulting in more debris into nearby habitat

Increased construction and operations at the site could result in SpaceX employees, related personnel, and outside visitors trampling into unauthorized areas of protected habitat. The DPEA fails to acknowledge past occurrences of unauthorized entry and has not provided plans to prevent further occurrences.

South Bay is a delicate and special eco zone that contributes to wild life, marine life, and recreation. SpaceX has applied to TCEQ for permission to dump 200,000 Gallons a day of treated industrial wastewater directly into South Bay near the SpaceX facility. The DPEA does not address this potential pollution of waters of the United States in violation of the Clean Water Act which SpaceX has already violated on numerous occasions.

VIII. The DPEA Fails to Adequately Assess the Proposal's Significant Effects on Listed Species

SpaceX operations impact adjacent wildlife habitats including the Lower Rio Grande Valley Wildlife Refuge, Boca Chica Beach State Park, and the Laguna Atascosa Wildlife Refuge which are home to a number of species listed under the Endangered Species Act (ESA). This includes the federally Threatened Piping Plover and Red Knot, and the Endangered Northern Aplomado Falcon, the ocelot, and several species of sea turtle. The FAA should require SpaceX to provide as many future plans as possible for an EIS because operations are constantly changing, and experts/researchers need the opportunity to analyze effects on ESA-listed species and critical habitats.

1. Endangered Ocelot

The ocelot (Leopardus pardalis) is an endangered species with nearby U.S. populations, at the Laguna Atascosa National Wildlife Refuge which is approximately 5 miles from the SpaceX site. The ocelot also has been sighted 25 miles north of the refuge on private ranchland in Kenedy and Willacy Counties, and at the adjacent Lower Rio Grande Valley Wildlife refuge. According to the DPEA, The Lower Rio Grande Valley Wildlife refuge, which is in the vicinity of the SpaceX site, has had numerous ocelot sightings over the past 25 years. FWS and NGOs have been working for decades to protect and restore the ocelot in the U.S., but the DPEA states that the Proposal "is likely to adversely affect" the ocelot due to "construction activities, daily operations, and launch and test operations."

The DPEA understates the impact of the project on the north-south ocelot movement corridor. For decades, FWS and partner organizations have been purchasing land and arranging easements including habitat north and south of the

Brownsville Ship Channel (BSC) with the goal of protecting habitat and wildlife corridors that would maintain connections between ocelot populations in the U.S. with the ultimate vision of connectivity to the population in Tamaulipas, Mexico.The cumulative effects of the proposed SpaceX expansion and the Rio Grande LNG and Texas LNG projects along the channel would be to greatly reduce the width of the existing corridor to lighted, noisy LNG terminals and SpaceX rocket launches that ocelots are likely to avoid. Once SpaceX launches increase and LNG plants are under construction, an ocelot has to approach the lighted, noisy plants via a narrow easement on either side of the BSC, swim the channel, and then exit via another easement. In addition, ocelots would have to use culverts to cross access roads. It is unlikely that ocelots would successfully run this gauntlet and therefore it is probable that the plants would permanently cut connection between ocelots north and south of the BSC. The DPEA fails to adequately acknowledge the large role it would play in cutting this vital corridor and proposes nothing to offset this loss of connectivity that may jeopardize long-term viability of the U.S. ocelot population by substantially deterring ocelots from available surrounding wildlife habitat and ending hope of eventual gene flow from the Mexican population. The DPEA also fails to acknowledge the already existing vehicular deaths to not only ocelots in the area, but other wildlife as well that are directly related to the influx of traffic and road closures. The FAA should conduct a comprehensive environmental impact statement to disclose and evaluate the cumulative effects of SpaceX's operations including an LNG plant in Donna, TX and other nearby industrial projects like the LNG terminals. This failure to fully disclose and analyze impacts on the ocelot violates NEPA's "hard look" requirement and prevents the public from "understand[ing] and consider[ing] the pertinent environmental" effects of RG Developers' proposed terminal and pipeline.

Additionally, SpaceX has not provided information specific as to what off-site mitigation acres they would create, restore, or protect, so it is impossible to evaluate whether mitigation actions would avoid, eliminate, or minimize the significant impacts to the ocelot. Given the disastrous effect this proposal would have on long-term plans for ocelot recovery, if sufficient mitigation is even possible, it should be substantial. To be sufficient, ocelot mitigation should offset degradative effects: (1) loss of ocelot habitat per se, primarily thorn scrub, and (2) loss of connectivity between existing and/or potential ocelot habitat north and south of the BSC.

Regarding the second issue, the DPEA fails to explain what measures may be taken to compensate for loss of connectivity; these measures should be included in a draft EIS. As described above, blocking connectivity would effectively end the long-term FWS and NGO plan of ensuring connectivity north and south of BSC, as well as ensuring connectivity with ocelots in Mexico. The EIS must evaluate both these effects and should include, at minimum, population viability assessments for scenarios that would include connection with Mexico. Additionally, mitigation of lands to protect the corridor between Laguna Atascosa, the Lower Rio Grande Valley Wildlife Refuge, and the corridor to the north on private ranches must also be addressed. The DPEA fails, however, to adequately consider or address any mitigation that would provide reasonable and sufficient offset for lost connectivity. Based on this failure, the Commission has not taken the "hard look" at ocelot impacts necessary to comply with NEPA.

2. Threatened Piping Plover, Red Knot, and other Migratory Birds

The habitat surrounding the SpaceX site is vital for migrating bird species to rest and refuel so they can successfully complete their journeys. The website eBird lists 262 bird species that thrive on Boca Chica Beach and 178 bird species that can be found at Boca Chica State Park. SpaceX construction and operations has increased over the past three years resulting in damage to federal and state wildlife lands. Additionally, SpaceX has "increased traffic on State HWY 4 and has led to mortality of wildlife, with carcasses of Piping Plover, Common Nighthawk, Harris's Hawk, Rose-breasted Grosbeak, and Eastern Meadowlark. All of these bird species are designated as Birds of Concern by the U.S. Fish and Wildlife Service.

Certain species of bird populations are declining in the habitat surrounding the SpaceX site. According to a recent analysis conducted by the Coastal Bend Bays & Estuaries Program, the Piping Plover population has decreased by 54% over the past three years (2018 - 2021) since SpaceX began construction and rocket testing operations. The failure to fully analyze potential impacts to the piping plover, and the absence of any proposed mitigation measures in the DEIS again violates NEPA's "hard look" requirement.

An adequate EA would have shown actual data and shown or at least mentioned that this listed species has been negatively impacted significantly in the years of SpaceX operation. This fact alone brings into doubt the entire biological assessment within this DPEA. We demand a full environmental impact statement (EIS) be conducted.

3. Endangered and Threatened Sea Turtles

The DPEA contains insufficient information to determine whether there are sufficient mitigation measures to minimize the proposed impacts on listed sea turtles. Sea turtle species that may be present within the project's general area include Kemp's ridley, hawksbill, leatherback, loggerhead, and green sea turtles. All these species are endangered except for the green, whose population off the Texas coast is classified as threatened. Critical habitat for the loggerhead turtle has been mapped offshore. The critical habitat surrounding the SpaceX site has been identified as an aquatic resource of national importance (ARNI).

Turtles are vulnerable because they surface to breathe; often bask, feed; and mate near the surface; and are more vulnerable during cold spells when they are unable to move as well. Turtles are known to be present in high density in this area, as shown in the map below, so rocket debris affecting turtle habitat is likely.

Also, the Texas Tortoise (Gopherus berlandieri) is another threatened species that is not monitored enough nor adequately mentioned in the DPEA. This omission is very concerning.

IX. Conclusion

In conclusion, the DPEA for SpaceX's proposal is entirely inadequate and fails to meet the standards set by the National Environmental Policy Act on multiple accounts. This DPEA has numerous informational gaps that are so severe they must be corrected with a fully comprehensive draft environmental impact statement and a new, equitable opportunity for public comment that is actually accessible to the community. However, we maintain that not only SpaceX's proposal, but their existence as well, has had such critical and adverse impacts on the local environment and surrounding communities that this proposal is contrary to the public interest and public safety and must be denied.

The Commenters, submit these comments regarding the draft programmatic environmental assessment for SpaceX's proposal to increase launches at the SpaceX Boca Chica Launch Site in Cameron County to oppose the approval of any permits for this expansion project as it goes against public interest with far too many adverse cumulative effects to be in the best interest of public safety.

Sincerely,

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GG. FAA-2024-2006-8142-A1

Comment Response

Cultural Resources

The Final Tiered EA acknowledges the historical and cultural significance of the region and evaluates potential environmental impacts that could indirectly affect culturally significant sites and resources. The FAA's environmental review process follows the requirements of the National Historic Preservation Act (NHPA), NEPA, and Executive Order 13175 on Tribal Consultation. The FAA's review considers indirect effects on the natural environment, including impacts on wildlife species that may hold cultural or spiritual significance. While the Esto'k Gna Tribe is not federally recognized, the FAA invited Esto'k Gna Tribe to consult during the 2022 PEA and did not receive a response.

As described in the 2022 PEA, an archeological study was performed in 2012 in the proposed construction areas and a more expansive study (approximately 700 acres) in 2021, including areas in the immediate sites adjacent to the SpaceX VLA. No additional resources were found in the 2021 survey. Adverse impacts on cultural resources are addressed in the 2022 Programmatic Agreement between the consulting parties. SpaceX remains in compliance with the mitigation measures in the Programmatic Agreement. To address potential inadvertent discoveries during construction, SpaceX has implemented an Unanticipated Discoveries Plan which dictates if any artifacts, human remains, or cultural sites are discovered during construction or operations, applicable federal and state laws require that activity cease immediately, and the appropriate authorities, including Tribal representatives and the Texas Historical Commission, must be notified. No unanticipated discoveries have occurred.

The FAA is committed to ensuring that all public comments, including those submitted by the Esto'k Gna people, are thoroughly considered as part of the environmental review process. As part of the review required by 14 CFR Part 450, the FAA is responsible for evaluating the potential environmental impacts of SpaceX's proposed operations. This includes considering any relevant cultural and environmental concerns and ensuring compliance with all applicable laws and regulations. The FAA coordinates with other federal, state, and local agencies involved in regulating SpaceX's activities, including the Texas Commission on Environmental Quality (TCEQ), the Texas General Land Office (TGLO), and local authorities, to ensure that all relevant concerns are addressed and that the proper regulatory processes are followed. While the FAA is not responsible for managing the closure of HWY 4 or regulating wastewater discharges, the FAA is committed to ensuring that SpaceX's operations are conducted in a way that adheres to safety, environmental, and cultural protections.

Access Restrictions

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 implemented ongoing mitigation measures, including moving certain testing operations to Massey's Test Site, which reduces the need for extended closures of Boca Chica Beach. The FAA and SpaceX continue to implement measures to minimize closure durations, including more precise scheduling to reduce public access disruptions, advance notice to allow for better planning by Tribal

members and local stakeholders, and efforts to consolidate activities to minimize the frequency of access restrictions.

Water Resources

The FAA coordinates with regulatory agencies such as the Texas Commission on Environmental Quality (TCEQ) to ensure compliance with environmental permitting requirements, including SpaceX's Water Deluge System. While the FAA does not issue state permits, the agency reviews regulatory compliance as part of its licensing process. Prior to pursuing an Individual Permit to operate the Water Deluge System, SpaceX operated under a Multi-Sector General Permit (MSGP) issued by TCEQ.

The FAA acknowledges concerns regarding environmental justice, regulatory compliance, and consultation with affected communities, including the Kanaka Maoli (Native Hawaiian people). The FAA has revised the Environmental Assessment (EA) Section 2.3, to remove the Pacific action area from the Exclusive Economic Zone (EEZ) and establish a buffer zone of 50 nautical miles to the boundary of the Papahānaumokuākea Marine National Monument. These changes significantly reduce potential environmental impacts by:

- Ensuring that the operations avoid areas with unique biodiversity and cultural importance, minimizing risks to marine life and ecosystems associated with the monument; and
- Ensuring that activities remain at a safe distance from the boundary of the Marine National Monument, further reducing the likelihood of any adverse impacts. By shifting the action area, the likelihood of debris dispersion impacts affecting the Hawaiian Islands and surrounding waters is expected to be negligible and not significant.

The EA process is distinct from the operational requirements regulated by other entities. While some specific plans, such as the Safety Risk Analysis and Hazard Risk Analysis, may not be detailed in the EA, these are developed and reviewed as part of licensing and operational compliance under FAA regulations, such as 14 CFR Part 450. The FAA ensures that these plans are in place and meet all regulatory requirements before any launch licenses are issued.

Anomalies

The FAA acknowledges concerns regarding potential risks associated with SpaceX's Starship/Super Heavy operations and their proximity to existing and proposed oil and gas infrastructure, including the Valley Crossing Pipeline, Texas LNG, Rio Grande LNG, Rio Bravo Pipeline, and Jupiter oil refinery. Under 14 CFR Part 450, the FAA evaluates potential safety risks and environmental impacts of commercial space launch activities, including possible interactions with nearby industrial facilities. The Final Tiered EA considers potential risks associated with anomalies, including explosions and debris dispersion. The FAA requires commercial space operators to assess and mitigate risks to public safety, including potential impacts on infrastructure. The agency coordinates with relevant federal and state regulatory authorities to ensure that safety measures are in place to minimize risks to surrounding facilities.

NEPA does not require an analysis of failures or worst-case scenarios because its focus is on assessing the *reasonably foreseeable* environmental impacts of a proposed action. The purpose of NEPA is to evaluate the potential effects of a project on the environment, not to predict catastrophic events that are unlikely or speculative. As such, NEPA requires an analysis of impacts based on normal, expected operations, not hypothetical or extreme failure scenarios, unless such scenarios are deemed to be reasonably foreseeable

and likely to occur within the context of the proposed action. While the Final Tiered EA evaluates the potential effects of anomalies, it does not evaluate speculative worst-case scenarios such as debris or vibrations damaging LNG infrastructure.

The FAA has thoroughly analyzed past anomalies, including the January 16, 2025, and their environmental impacts as part of the NEPA process. The EA includes discussions of potential anomalies (such as explosions, debris dispersal, and fuel combustion events) throughout the resource sections of the Final Tiered EA including, but not limited to, Section 3.2.6, Section 3.2.7, and Section 3.2.8, and outlines mitigation strategies to address environmental risks associated with launch operations.

The FAA and SpaceX have implemented multiple mitigation measures to reduce the likelihood and environmental consequences of anomalies, including:

- Use of a water deluge system and reinforced launch pad to minimize debris dispersal.
- Monitoring and cleanup plans for post-anomaly environmental restoration.
- Habitat assessments before and after launches to detect and mitigate potential disturbances.
- Coordination with USFWS and TPWD on protecting sensitive habitats.

Scope of the Federal Action

The FAA's environmental review is limited to assessing the impacts of FAA-licensed activities, such as launches, landings, and related operations. Wastewater discharges from non-launch activities at Starbase, including the daily discharge referenced in the comment, fall outside the scope of the proposed action and are regulated by the Texas Commission on Environmental Quality (TCEQ) under the Texas Pollutant Discharge Elimination System (TPDES).

The Final Tiered EA does evaluate water quality impacts associated with launch-related activities, particularly the use of deluge water during launches at the Vertical Launch Area (VLA). The analysis concludes that:

- Deluge water consists of potable water that does not undergo any industrial process.
- Sampling data from previous launches have not detected contaminants exceeding state or federal thresholds.
- Ongoing monitoring and mitigation measures are in place to ensure compliance with water quality standards.

Since the TCEQ permit and associated wastewater discharges are not part of the proposed action, the FAA has no jurisdiction over this permit and does not analyze it in the EA.

Biological Impacts

The FAA acknowledges the comment regarding Aquatic Resources of National Importance (ARNI) and confirms that ARNI was addressed in the 2022 PEA. Since no construction is proposed as part of the current action, ARNI is not a relevant issue for this EA. The FAA has reviewed potential impacts to aquatic resources and has determined that the proposed action does not result in changes that would significantly affect ARNI-designated waters.

Regarding the Texas tortoise (Gopherus berlandieri), this species was evaluated in the 2022 PEA for impacts from construction activities which would not occur under this Proposed Action.

The FAA acknowledges the concern regarding unauthorized entry into protected habitat due to increased construction and operations. However, no construction is proposed under the EA, and therefore, construction-related impacts are not within the scope of this document. Regarding unauthorized entry into protected habitat, SpaceX implements access control measures to prevent personnel and visitors from entering restricted or environmentally sensitive areas, such as bollard fencing and educational signs. FAA-required mitigation measures include coordination with USFWS and TPWD to minimize human disturbance to protected habitats. SpaceX's environmental training programs for employees and contractors further reinforce awareness of protected areas and restrictions on unauthorized entry.

Additionally, the FAA evaluates compliance with environmental requirements through ongoing consultation with regulatory agencies. Any unauthorized entry into sensitive habitats would be subject to enforcement actions under applicable federal and state laws designed to protect conservation lands and listed species. The FAA will continue to coordinate with relevant agencies to ensure that mitigation measures remain effective in minimizing potential impacts to protected areas.

The FAA has concluded that effects to wildlife, including federally listed species, will not be significant. Impacts to terrestrial and marine wildlife are addressed in Section 3.2.8 of the EA. A summary of impacts to Endangered Species Act (ESA)-listed species, including piping plover, red knot, northern aplomado falcon, ocelot, and sea turtles, due to potential noise, heat, lighting, vibration, hazardous materials, debris, anomalies, traffic, and visitor increases is provided in Table 7. A detailed analysis of impacts to federally listed species, including the Hawaiian monk seal and Rice's whale, is provided in 1) the USFWS's Biological Opinion, Appendix A of the EA, and 2) the National Marine Fisheries Service's (NMFS's) Biological Opinion, Appendix A of the EA. Based on these analyses, FAA has determined that the Proposed Action is likely to adversely affect the Green sea turtle (North Atlantic Distinct Population Segment), Kemp's ridley sea turtle, Leatherback sea turtle, and Loggerhead sea turtle (Northwest Atlantic Ocean Distinct Population Segment) and has conducted formal consultation under Section 7 of the ESA with NMFS for these species. FAA also determined the Proposed Action may affect and is likely to adversely affect ocelot, northern alpomado falcon, piping plover, red knot, Green sea turtle, Hawksbill se turtle, Kemp's sea turtle, leatherback sea turtle, loggerhead sea turtle, and piping plover and red knot critical habitat. The FAA has concluded formal consultation with the USFWS on these species and the Final Tiered EA includes the results of these consultations.

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 the vicinity of the launch site following launches at the Boca Chica Launch Site. The effects of small fires following launches have also not been significant, resulting only in temporary ecosystem disturbances similar to the effects of prescribed burns.

The FAA acknowledges concerns regarding bird populations in the vicinity of the SpaceX launch site and highway mortality along Highway 4. However, the assertion that SpaceX's operations are the cause of a 54% decline in the Piping Plover population lacks supporting evidence from long-term monitoring data and scientific studies. The Final Tiered EA incorporates avian monitoring data collected as part of SpaceX's environmental compliance efforts. SpaceX conducts regular avian monitoring in coordination with USFWS. This data does not indicate a clear causal link between SpaceX activities and a population-level decline in

Piping Plovers. Additionally, Piping Plover populations can fluctuate due to multiple environmental and ecological factors, including habitat changes from storms, tidal shifts, and erosion Predation and natural mortality, regional and migratory trends affecting population distribution, climate-related impacts on habitat suitability. The Final Tiered EA includes references to monitoring reports that track bird abundance, nesting activity, and habitat use. These reports inform mitigation measures to reduce potential effects on avian species. For example, mitigation measures include habitat restoration, vehicle speed limits, and monitoring programs to minimize disturbance to shorebirds... 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 will help 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. SpaceX is seeking an increase in authorized take of green sea turtles based on these monitoring results. But the mitigation measures imposed by the 2022 PEA, as well as any reasonable and prudent measures required by NMFS in authorizing incidental take, will ensure that effects to green sea turtles and other sea turtle species are not significant.

The FAA acknowledges concerns regarding the potential impacts of SpaceX operations on the ocelot and emphasizes that these concerns have been thoroughly analyzed in both the 2022 Programmatic Environmental Assessment (PEA) and the Endangered Species Act (ESA) consultation process. The ocelot has not been observed near the launch site for over 25 years, and the nearest known population is located approximately 20 miles away, across the Brownsville Ship Channel in the Laguna Atascosa National Wildlife Refuge. The FAA's environmental review did not identify any suitable ocelot habitat within the immediate launch facility footprint. Importantly, the Proposed Action does not include any new construction, so concerns related to habitat fragmentation, disruption of connectivity, or habitat loss are not applicable to this EA. Connectivity issues were addressed in the 2022 PEA and associated ESA consultation, and the FAA, U.S. Fish and Wildlife Service (USFWS), and Texas Parks and Wildlife Department (TPWD) have already considered these factors in prior analyses. Even though ocelots are not present in the immediate project area, SpaceX has implemented several mitigation measures to reduce any potential effects, including contributing to the Friends of Laguna Atascosa National Wildlife Refuge (NWR) Adopt-an-Ocelot Program to support habitat conservation efforts, constructing vehicle barriers along State Highway 4 to reduce road mortality risks for wildlife, including ocelots, and collaborating on potential wildlife crossings to improve habitat connectivity in South Texas.

The FAA has consulted with USFWS on ocelot impacts, and previous consultations concluded that the activities associated with SpaceX's operations do not significantly affect the species. Table 6 in the Final Tiered EA outlines the potential effects on wildlife, including ocelots, and describes measures to avoid or minimize impacts. The increase in launch cadence does not change the previous analysis, as launches do not create additional habitat disturbances beyond what has already been evaluated and mitigated.

The FAA has fully addressed potential ocelot impacts through previous environmental reviews and consultations. No new construction or land disturbance will occur under the Proposed Action, meaning that concerns related to habitat connectivity are not relevant to this EA. The FAA and SpaceX have implemented proactive measures to support ocelot conservation, and increased launch frequency does not alter these commitments.

Lower Rio Grande Valley SIERRA CLUB

January 17, 2024

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

Re: FAA's Revised Draft Tiered Environmental Assessment for the Proposed Increased Launch Cadence for the SpaceX Starship/Superheavy Vehicle Launch Program at Boca Chica, Texas Docket No. FAA-2024-2006

The Lower Rio Grande Valley Sierra Club Group (LRGVSCG) hereby submits this comment regarding the FAA's Revised Draft EA for the proposed increase in launches of the Starship/Superheavy, Docket No. FAA-2024-2006. The members of the LRGVSCG reside in the Rio Grande Valley, including the region of influence of the Proposed Action.

The LRGVSCG respectfully requests that the cancelled meeting in Port Isabel be rescheduled. Port Isabel is the community most impacted by SpaceX operations. Not having a meeting in Port Isabel for the public to voice their concerns regarding the revised draft EA is an environmental justice issue.

Additionally, due to the cancelling of the meeting in Port Isabel, LRGVSCG requests the comment deadline be extended to an appropriate time after a rescheduled meeting in Port Isabel.

Need For An EIS And Accounting For All Infrastructure, Operations, And Cumulative Impact (Not Just An EA)

In 2014, an analysis and an EIS was published with regards to SpaceX's Falcon 9 and Falcon Heavy launch operations, as well as operation of reusable suborbital launch vehicles, from a launch site in Cameron County, Texas (i.e., the Boca Chica Launch Site). That analysis continues to be the basis for re-evaluations for a completely different operation for a completely different launch vehicle. An EIS is needed to evaluate the impacts of SpaceX's new proposals, especially considering SpaceX's own indications of increased operations beyond what they are

currently requesting. The adopted practice of Written Reevaluations and Tiered Environmental Assessments have segmented the project and NEPA analysis which has resulted in unforeseen consequences to the public, the public's safety, environment, and to wildlife. When the terminology of revised, draft, and tier are combined for an assessment, it inherently indicates that an EIS is overdue. Furthermore, as stated in 2.1 in the proposed action in the 2022 PEA, "the FAA may tier off of this PEA environmental reviews of additional proposed landing sites from launches at the SpaceX Boca Chica Launch Site." The Proposed Action of increased launches is outside the scope of a tiered EA as defined and limited to in the 2022 PEA, thus the tiered approach should not apply.

Impacts to LNG Operations and Infrastructure

LRGVSCG, and the public of the Rio Grande Valley, have routinely called on the FAA and FERC for an analysis of impacts of the Starship/Superheavy operations on LNG infrastructure and operations at the Port of Brownsville. An increase of launches, landings, and return of Starship on a floating platform to the Port of Brownsville poses interruptions in ship traffic into and out of the Port, including LNG vessels. An EIS is needed for cumulative impact analysis of waterway closures. The Proposed Action does not assess or quantify waterway closures or redirection of marine vehicles for the increased number launches and landings.

SpaceX operations pose a possible risk to infrastructure and facilities at the Port of Brownsville that have yet to be adequately analyzed and assessed. Measurements of the first, and to date, the only catch of the superheavy booster on relanding indicate larger impacts than suggested in the EA. These measurements were published on November 15th, 2024 in the Journal of the Acoustical Society of America. Among the findings, the researchers found that the "sonic boom overpressures around 10 km are 1–4 psf greater than modeled, with the possibility of exceeding 10 psf (0.48 kPa) and increasing structural damage claims. By 20 km, these flyback booms have similar perceived levels as Falcon 9 at 10 km and are about 50% louder than a Concorde boom. Fourth, a launch noise comparison between Starship, NASA's SLS, and Falcon 9 suggests Starship is significantly louder by both unweighted and A-weighted metrics. At these distances, the noise from one Starship launch is equivalent to around 4–6 SLS launches and at least 10 Falcon 9 launches. Although these are relative comparisons, they provide greater insight into a vehicle that may soon launch more than 100 times per year".[1]

FERC required the LNG companies at the Port of Brownsville to have an independent failed launch analysis with regards to the Falcon 9 operations to analyze and assess impacts to LNG infrastructure and operations. As one example, among the findings were potential debris impacts from a failed launch on Texas LNG tanks which prompted a change from a single tank containment to a double tank containment design. This singular example illustrates the need for an EIS for SpaceX's Starship/Superheavy program to adequately analyze and assess impacts,

[1] Kent L. Gee, Noah L. Pulsipher, Makayle S. Kellison, Logan T. Mathews, Mark C. Anderson, Grant W. Hart; Starship super heavy acoustics: Far-field noise measurements during launch and the first-ever booster catch. *JASA Express Lett.* 1 November 2024; 4 (11): 113601. https://doi.org/10.1121/10.0034453

to ensure the safety of the public, minimize risk, and to allow other industries and operations to plan accordingly to potential risk, emergency management, and impacts to their routine operations.

Water Resources

The Rio Grande Valley is experiencing a water crisis. Water scarcity has been resulting in constant water restrictions for the public. In August, 2024, it was reported that Amistad Reservoir is at just below 20% of its total capacity, and Falcon Lake is at approximately 11.5% capacity.[2] SpaceX's source of water for their operations is the Brownsville Public Utilities Board (BPUB). Each ignition event on the launch pad uses hundreds of thousands of gallons of potable water for the deluge system. With SpaceX's current activity, SpaceX used the deluge system 16 times between July of 2023 and October of 2024 and 19 times total up to the point of the publishing of the Proposed Action, as indicated on p37. Cumulatively, SpaceX has been purchasing millions of gallons of water from the BPUB. Water usage of this magnitude combined with dwindling water supply in the Rio Grande Valley is an impact to the public that cannot be ignored. An EIS is needed for a cumulative analysis of water use (i.e. supply, demand, sustainability) especially due to the fact that water scarcity is a long term issue in the RGV.

Regulatory Coordination and Adherence to Regulations

An incomplete analysis along with SpaceX's use of a continued tiered review has resulted in a practice that has avoided minimizing impacts. The unpermitted use of a water deluge system and the handling of deluge water has now come into question along with impacts that have resulted. According to the EPA, as reported by NPR, each launch 34,200 gallons of deluge water end up directly in the wetlands after each launch.[3] From scraping their initial Falcon 9 proposals, to countless written re-evaluations, constructing infrastructure without FAA approval (e.g. launch tower), or conducting operations with permits (e.g. water deluge system), SpaceX has demonstrated a practice of operating without concern to minimizing risk or impact. An EIS would identify the long term plans and enhance coordination with regulatory agencies and cement SpaceX's plans for infrastructure and operations so that impacts can be mitigated and minimized.

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[2] Gonzalez, Roberto, "The Rio Grande Valley's Water a Sobering Picture", Texas Border Business, August, 23, 2024, https://texasborderbusiness.com/the-rio-grande-valleys-water-a-sobering-picture/
[3] Brumfiel, Geoff. SpaceX Wants to Go To Mars. To Get There, Environmentalists Say It's Trashing Texas. National Public Radio. October 11, 2024.

Beach Access and Highway 48

The Texas Natural Resources Code: Title 2: Subtitle E; Chapter 61: SUBCHAPTER B. ACCESS TO PUBLIC BEACHES gives the public free and unrestricted right of ingress and egress to and from the state-owned beaches. Even with SpaceX's current operations, they are far exceeding the agreement with the General Land Office and the 500 hours of annual access restrictions determined in the 2022 PEA, consequently infringing on the public's right of access to Boca Chica Beach. Increasing launches inherently consequently increases closures and will further violate the intent of the Texas Open Act. The proposed actions of no change to the 500 hours of annual access restrictions for operations and 300 hours hours of annual operations for response (e.g. debris clean-up) is not accurate nor transparent to the public, Cameron County, and cooperating agencies.

Increased use of Highway 4 from the estimated 6,000 trucks per year in the 2022 PEA to 23,771 trucks under the Proposed Action is a burden on the public. Increased public services such as road maintenance, repair, security, emergency response, etc. is a cost to the public of which SpaceX is largely the beneficiary. Impacts such as these need to be assessed cumulatively in an EIS.

Impact on Wildlife

It has been witnessed and documented that launches are impacting nesting birds. A report published by the Coastal Bend Bays & Estuaries Program published a report on June 6, 2024, documenting missing and damaged eggs of nesting shorebirds as a result of SpaceX operations in a singular case.[4] In this singular event, species affected were the near threatened Snowy Plover (Anarhynchus.nivosus; SNPL), the Wilson's Plover (Anarhynchus.wilsonia; WIPL) a species in population decline, and Least Tern (Sternula.antillarum; LETE), a species recently removed from the endangered species list. Additionally, the fact that consultations with USFWS and NMFS concurred with the FAA's determination that the Proposed Action is likely to adversely affect ESA-listed species and critical habitat under NMFS jurisdiction further justifies an EIS to adequately identify and implement actions to minimize impacts and mitigation measures.

[4] LeClaire, J., Newstead, D. Shorebird Nest Fates at Boca Chica After Rocket Launch Test. Coastal Bend and Bays Estuary Program. June 6, 2024

Summary Statement

The Lower Rio Grande Valley Sierra Club, with regards to the aforementioned reasons and concerns, urge that an EIS be conducted in accordance with the NEPA for the safety of the public, environment, wildlife, and to minimize and mitigate impacts.

Lower Rio Grande Valley Sierra Club Executive Committee
Patrick Anderson
Bill Berg
Therese Gallegos
Mary Elizabeth Hollmann
Kathy Raines

HH. FAA-2024-2006-9739-A1

Comment Response

Access Restrictions

The FAA acknowledges concerns regarding potential impacts of SpaceX's Starship/Super Heavy operations on LNG infrastructure and vessel traffic at the Port of Brownsville. Under 14 CFR Part 450, the FAA evaluates potential environmental and operational impacts of commercial space launch activities, including airspace and waterway usage. 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, including LNG vessel operations.

Regarding the request for an Environmental Impact Statement (EIS), the FAA determines the appropriate level of environmental review based on the significance of potential impacts. The agency recognizes the importance of cumulative impact analysis and will review whether additional clarifications or assessments regarding waterway closures and marine traffic redirection should be incorporated into the Final EA.

Noise

Model Prediction of Launch Noise - 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 actually 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 be occur with an increased launch rate. Additionally, SpaceX has collected launch and landing noise, submitted to FAA, and show agreement with the predicted models 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, which is more appropriate for assessing impulsive noise events like rocket launches because it accounts for low-frequency energy in launch noise, which can cause vibrations and impact structures. Using both A-weighted and C-weighted

DNL ensures that both general noise exposure and low-frequency noise impacts are accurately assessed, providing a more complete evaluation of potential noise impacts.

Model Prediction of Sonic Boom -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 modeling results

Based on the Final Tiered EA findings, the FAA has determined that no significant effects are anticipated due to launch-related noise, including sonic booms. For human noise effects, 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. The FAA found that noise levels would exceed neither of these thresholds in areas where humans would be present during a launch or landing activity. The FAA also found that sonic boom levels would not significantly affect humans in areas outside the hard checkpoint preventing the public from accessing the area around the launch site during a launch or landing event.

The FAA did not inappropriately use the C-weighted DNL as its primary metric for evaluating noise effects, and in any event, C-weighted DNL more accurately assesses the risk of rocket noise than A-weighted DNL because it accounts for lower-frequency noise that makes up launches and landings. Section 3.2.3 includes results comparing noise levels to both the A-weighted and C-weighted DNL.

Noise effects on structures are described in Section 3.2.3.6 in the EA. As described in the EA, at 10 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 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).

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. Any such claims of damage would be subject to the insurance policy terms and process specified by CSLA and FAA regulations.

While noise effects on humans and structures would not 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.

Safety

The FAA acknowledges the concern regarding the need for a failed launch analysis for SpaceX's Starship/Super Heavy program and its potential impacts on LNG infrastructure at the Port of Brownsville. Under 14 CFR Part 450, the FAA requires commercial space launch operators to conduct a thorough safety analysis, including risk assessments for potential impacts on surrounding infrastructure and public safety.

NEPA does not specifically require an analysis of failures or worst-case scenarios because its focus is on assessing the *reasonably foreseeable* environmental impacts of a proposed action. The purpose of NEPA is to evaluate the potential effects of a project on the environment, not to predict catastrophic events that are unlikely or speculative. As such, NEPA requires an analysis of impacts based on normal, expected operations, not hypothetical or extreme failure scenarios, unless such scenarios are deemed to be reasonably foreseeable and likely to occur within the context of the proposed action.

Water

The FAA acknowledges concerns regarding water scarcity in the Rio Grande Valley and the potential cumulative impact of SpaceX's water usage. The FAA evaluates the potential environmental impacts of commercial space launch activities, including resource consumption such as water use in Section 3.2.7 of the Final Tiered EA.

While each launch event uses 350,000 to 400,000 gallons of water, these events are intermittent and non-continuous. The Final Tiered EA compared the cumulative water withdrawals—which, even at an increased launch cadence, amount to millions of gallons over an extended period—to the overall water supply managed by the Brownsville Public Utilities Board (BPUB). The analysis determined that the volume of water used for launch operations is only a small fraction of BPUB's overall allocation and is consistent with existing water management practices.

The Final Tiered EA incorporates site-specific data and validated water resource modeling to assess the impacts on local water supplies. This analysis demonstrates that the current and projected water use for launch operations remains within the capacity of BPUB's water system. Moreover, the Final Tiered EA does not assume an across-the-board increase in water demand due to speculative margins; rather, it uses actual usage data and forecasts to ensure the analysis is scientifically robust.

Under NEPA and FAA guidance (FAA Order 1050.1F and 14 CFR Part 450), the EA is required to assess cumulative impacts only when supported by available data. In this case, while water scarcity is a recognized long-term regional challenge, the EA's cumulative analysis finds that the additional water withdrawals associated with SpaceX's operations do not significantly exacerbate the existing water scarcity issues. The water used for launch events is accounted for in the broader water management

framework of the region, and there is no evidence that these operations will deplete the regional water supply to a degree that affects public water availability.

NEPA does not mandate an EIS when the cumulative impacts are not significant The EA's analysis, which includes water usage data from SpaceX and water supply information from BPUB, indicates that the proposed actions are not likely to significantly impact water quality. Should new data or significant changes in water availability emerge, the analysis can be revisited; however, at this time, the impacts do not warrant the preparation of an EIS.