March 23, 2026

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

via ICFS Electronic Filing

In re: Space Bureau Accepts For Filing SpaceX's Application For Orbital Data Centers	)	**DA/FCC #: DA-26-113**

REPLY COMMENTS OF THE CENTER FOR SPACE ENVIRONMENTALISM

The Center for Space Environmentalism (CSE) respectfully submits this reply in response to the consolidated opposition to petitions and response to "Consolidated Opposition to Petitions and Response to Comments" filed by Space Exploration Holdings, LLC (SpaceX) on March 16, 2026. **While SpaceX characterizes environmental and sustainability concerns as "baseless fearmongering",[1] its response fails to address the cumulative, multi-generational risks of a one-million-satellite constellation**.

I. The "Volume" Fallacy and Orbital Risk

SpaceX attempts to minimize the physical impact of its proposed system by calculating that it would occupy only "0.005% of the 1.1 trillion cubic kilometers of space" in the target orbits.[2] The CSE rejects this "static volume" metric as a deliberate misrepresentation of orbital dynamics. Collision risk is not a function of volume displacement, but of the probability of intersecting paths among a million high-speed objects. SpaceX's own filing admits it intends to operate within "narrow 50 km altitude bands" to minimize local density.[3] This would create high-traffic "highways" where the local density is orders of magnitude higher than their global average suggests.[4] This increases the risk of conjunction events that

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[1] SpaceX, *Consolidated Opposition to Petitions and Response to Comments of Space Exploration Holdings, LLC, In re Space Exploration Holdings, LLC*, ICFS File No. SAT-LOA-20260108-00016 (Mar. 16, 2026), at iii.
[2] *Consolidated Opposition to Petitions and Response to Comments*, supra note 1, at 3.
[3] *Consolidated Opposition to Petitions and Response to Comments*, supra note 1, at iv.
[4] *Inter-Agency Space Debris Coordination Committee (IADC) Report on the Status of the Space Debris Environment (2026)*, U.N. Doc. A/AC.105/C.1/2026/CRP.10, § 3.2 (Feb. 2, 2026). https://www.unoosa.org/oosa/oosadoc/data/documents/2026/aac.105c.12026crp/aac.105c.12026crp.10_0.html The report identifies the risk of narrow-shell stacking in creating "unprecedented conjunction flux bottlenecks" that significantly increase the local density of active-on-active satellite paths. The report labels this "shell-wise density increase" as the most significant new risk factor for triggering a collision cascade in low-Earth orbit and warns that even with high-fidelity automated maneuvering, the statistical probability of a "seed collision" in these stacked

require thousands of automated maneuvers daily, which SpaceX admits is their primary safety mechanism.[5] This 'stacking' approach creates unprecedented bottlenecks that could trigger a runaway debris cascade, rendering near-Earth space inaccessible for centuries. SpaceX's own reasoning relies on near-perfect automated maneuvering. Even a 99% success rate in end-of-life disposal leaves 10,000 derelict spacecraft for a one-million-satellite fleet, which exponentially increases the "critical density" threshold for the onset of Kessler Syndrome.

II. Challenging the Extraterritoriality of NEPA

SpaceX asserts that the National Environmental Policy Act (NEPA) "plainly does not apply to operations in space" because they are "'extraterritorial activities... with effects located entirely outside of the jurisdiction of the United States.'"[6] The CSE contends this legal interpretation is dangerously narrow. Federal law dictates that the Commission cannot segment the orbital phase of spaceflight from the launch and reentry phase.[7] The nearly daily launches required to maintain a million-satellite fleet with a five-year replacement cycle occur at U.S. launch sites and discharge tons of black carbon (soot) directly into the U.S. stratosphere – not in "outer space." Under NEPA, these are "connected actions."[8]

If the FCC grants the license, the proposed action will be the proximate cause of these domestic environmental impacts. As SpaceX concedes, it will need to coordinate with NASA and the NSF to study how the proposed system "interacts with Earth's atmosphere."[9] Because these effects directly impact the "quality of the human environment," a full Environmental Impact Statement (EIS) is required under NEPA regardless of where the satellites ultimately reside.[10] An FCC license is the "Major Federal Action" that enables the cumulative system SpaceX proposes. This position is supported by a coalition of 17 state Attorneys General, who formally reminded the Commission in September 2025 that it remains bound by the D.C. Circuit's requirement for public notice and environmental review of infrastructure that has documented domestic effects.[11]

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shells is rising faster than the rate of active debris removal (ADR) capabilities. It argues that such narrow-shell stacking effectively "warehouses" orbital capacity, precluding other operators from accessing those regions safely and creating a "fragile foundation" for space sustainability.

[5] *Consolidated Opposition to Petitions and Response to Comments*, supra note 1, at 2.

[6] *Consolidated Opposition to Petitions and Response to Comments*, supra note 1, at 17.

[7] *See, e.g.,* 40 C.F.R. § 1501.9(e)(1) (requiring agencies to consider "connected actions" in a single review); *Delaware Riverkeeper Network v. FERC*, 753 F.3d 1304, 1313 (D.C. Cir. 2014) (prohibiting the "segmentation" of a project to avoid addressing its true scope); *United Keetoowah Band of Cherokee Indians in Okla. v. FCC*, 933 F.3d 728 (D.C. Cir. 2019) (vacating FCC rules that attempted to exempt small cell deployments from NEPA review).

[8] 40 CFR § 1501.3(b).

[9] *Consolidated Opposition to Petitions and Response to Comments*, supra note 1, at ii.

[10] While 47 C.F.R. § 1.1306(a) "categorically exclude[s] from environmental processing … Commission actions not covered by § 1.1307 (a) and (b) [that] are deemed individually and cumulatively to have no significant effect on the quality of the human environment," the Commission has not determined this. We contend that SpaceX has provided insufficient information in its application to make any such determination.

[11] A coalition of 17 state Attorneys General and the District of Columbia recently argued that the FCC cannot legally exclude satellite operations from environmental review under the National Environmental Policy Act (NEPA). They urged the Commission to recognize that geographic area and site-based licenses for satellite infrastructure are clearly "major federal actions" under NEPA and "undertakings" under the National Historic Preservation Act (NHPA). See *Comments of 17 State Attorneys General and the District of Columbia, Modernizing the Commission's National Environmental Policy Act Rules*, WT Docket No. 25-217 (filed Sept. 19, 2025).

III. The False Narrative of “Green” AI Computing

SpaceX baselessly argues that moving data centers to orbit is the “most environmentally responsible choice” because it reduces terrestrial water and energy consumption.[12] This is a false trade-off that exports terrestrial industrial costs to the upper atmosphere. While SpaceX claims to bypass the terrestrial grid, the “millions of tons of mass” it proposes to launch via Starship[13] will leave a permanent chemical footprint in the stratosphere. Recent NOAA research confirms that by 2040, satellite reentries could deposit enough aluminum oxide to rival the natural flux from meteoroids, potentially altering stratospheric temperatures by 1.5°C.[14] Although the global radiative forcing is relatively small, the localized heating effects in the middle and upper atmosphere represent a significant and previously understudied anthropogenic shift in Earth's climate system. These temperature shifts are expected to weaken the Southern Hemisphere polar vortex by as much as 10%, which could indirectly affect the size and recovery of the Antarctic ozone hole. Humanity must not sacrifice the long-term health of the atmosphere in this manner to facilitate energy-intensive AI workloads.

IV. Public Interest vs. "Kardashev-II" Ambition

The Applicant defines its system as a “first step towards becoming a Kardashev II-level civilization”.[15] SpaceX characterizes the concerns of companies Amazon/Blue Origin and Viasat as “anticompetitive gamesmanship”,[16] yet it offers no evidence of a public mandate for a private actor to unilaterally reshape the night sky for the benefit of a specific commercial sector. SpaceX targets a brightness threshold of visual magnitude 7 (“VM7”), which it concedes still renders its satellites “visible even in the darkest skies.”[17] However, the aggregate light reflected from one million server nodes, even if individually faint, threatens to fundamentally alter the human experience of the cosmos and blind ground-based astronomy. Even if individual server nodes are faint, the sunlight reflecting off a million surfaces, combined with the spurious radiation (also known as "unintended electromagnetic radiation," or UEMR) SpaceX mentions as a byproduct of their high-speed electronics, could raise the “noise floor” for both optical and radio astronomy.[18] SpaceX’s mitigation strategy is a piecemeal approach that fails to account for the total environmental effect of entire orbital shells.

V. Conclusion: Denial of Waivers is Mandatory

SpaceX maintains that its requested waivers for surety bonds and milestones are "fully justified."[19] **The CSE maintains that these are essential guardrails.** Exempting a one-million-satellite constellation from

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[12] *Consolidated Opposition to Petitions and Response to Comments*, supra note 1, at ii.
[13] *Consolidated Opposition to Petitions and Response to Comments*, supra note 1, at i.
[14] Christopher M. Maloney et al., *Investigating the Potential Atmospheric Accumulation and Radiative Impact of the Coming Increase in Satellite Reentry Frequency*, J. Geophysical Res.: Atmospheres, Mar. 2025, https://doi.org/10.1029/2024JD042442
[15] SpaceX, *Narrative, Application for Authority to Launch and Operate the SpaceX Orbital Data Center System*, ICFS File No. SAT-LOA-20260108-00016, at 1 (filed Jan. 8, 2026).
[16] *Consolidated Opposition to Petitions and Response to Comments*, supra note 1, at 5.
[17] *Consolidated Opposition to Petitions and Response to Comments*, supra note 1, at 14.
[18] See, e.g., Alejandro S. Borlaff, Pamela M. Marcum & Steve B. Howell, *Satellite Megaconstellations Will Threaten Space-Based Astronomy*, 648 Nature 51 (2025), https://doi.org/10.1038/s41586-025-09759-5
[19] *Consolidated Opposition to Petitions and Response to Comments*, supra note 1, at 21.

financial and operational accountability, given the many unknowns involved presently, is a dereliction of the Commission's public interest mandate. SpaceX asks, in effect, that the Commission simply trust its assurances while providing little in the way of evidence to support them. In requesting these waivers, SpaceX is essentially asking the American public to underwrite the environmental risk of their private AI venture. If anything, the bonding requirement should actually be *increased* proportionally to the constellation size to prevent a "too big to fail" scenario in low-Earth orbit.

We therefore reiterate our request that the Commission:

1. **Mandate a full EIS** to study the aggregate atmospheric and debris impacts.
2. **Reject all bond and milestone waivers**, as a million-satellite shell represents an unprecedented risk of orbital warehousing.
3. **Establish strict limits on visual brightness and spurious radiation** before any license is granted.

Respectfully submitted,

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on behalf of the Center for Space Environmentalism

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