



September 7, 2022

BY ELECTRONIC FILING

Marlene H. Dortch
Secretary
Federal Communications Commission
45 L Street, N.E.
Washington, DC 20554

Re: *IBFS File Nos. SAT-LOA-20200526-00055 and SAT-AMD-20210818-00105*

Dear Ms. Dortch:

The Natural Resources Defense Council (NRDC) and the International Dark-Sky Association (IDA) oppose authorization by the Federal Communications Commission (FCC) of the 30,000 satellites proposed by Space Exploration Holdings, LLC (SpaceX). NRDC is a non-profit, national environmental organization whose organizational interests and members are harmed by the FCC's failure to analyze the potential significant impacts on the human environment of the proposed satellites as required by the National Environmental Policy Act (NEPA). IDA is a non-profit, international organization whose organizational interests and members are harmed by the FCC's failure to analyze the potential significant impacts on the human environment of the proposed satellites as required by NEPA. Based on the information presented herein and elsewhere in the record of this proceeding, NRDC and IDA petition the FCC pursuant to 47 C.F.R. § 1.1307(c) to assess the potential significant environmental impacts of the proposed action.

The proposed authorization is exactly the kind of federal action that Congress intended to be taken only after a thorough assessment of its potential impacts. As the U.S. Supreme Court has said, "NEPA ensures that important effects will not be overlooked or underestimated only to be discovered after resources have been committed or the die otherwise cast."¹ The

¹ *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 349 (1989).

proposed 30,000 satellites are part of a series of mega-constellations that SpaceX and other companies are planning in order to provide commercial internet services. Never before have humans put so much into space. NEPA does not prohibit the FCC's authorization of commercial wireless communication from space, but it does require that the FCC analyze the environmental impacts of doing so. NEPA requires that the FCC look before launch. So far, it has not.

I. NRDC's Interests and IDA's Interests

SpaceX's proposed satellites will dump millions of pounds of pollution into the atmosphere causing significant environmental impacts both in space and on the ground. By design, SpaceX's proposed satellites will be deployed into low-earth orbit where they will operate for a few years and then burn up. NEPA requires the FCC to evaluate the proposed 30,000 satellites in the context of past, present and reasonably foreseeable future actions.² This legal obligation requires the FCC to assess the environmental impacts of SpaceX's proposed satellites in the context of satellites already approved as well as those that may be approved.

Failure to complete such analysis harms NRDC's organizational interests as well as the interests of its members. A 501(c)(3) organization, NRDC advocates for environmental and public health protections for all.³ Founded the same year that former President Nixon signed NEPA into law, NRDC has worked for over 50 years to fulfill NEPA's promise of meaningful environmental review of federal actions and public participation in federal decision-making. NRDC and its members rely on NEPA to ensure that federal government decisions – including the authorization at issue here – are informed by the best available science and input from citizens affected by those decisions.

In addition to its general NEPA advocacy, NRDC has actively engaged in matters relating to the FCC's NEPA compliance. In 2018, NRDC filed comments opposing the FCC's order proposing to eliminate environmental and historic review for certain cell towers and other wireless infrastructure. As a result of a petition for review by NRDC and others including

² See, e.g., 40 C.F.R. § 1508.1(g)(3) (definition of cumulative effects are those “are effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.”); *Baltimore Gas & Elec. Co. v NRDC*, 462 U.S. 87, 106-07 (1983); *Dine Citizens Against Ruining Our Environment v. Bernhardt*, 923 F.3d 831, 853 (10th Cir. 2019); *Grand Canyon Tr. v. FAA*, 290 F.3d 339, 345 (D.C. Cir. 2002).

³ See www.nrdc.org. NRDC's mission is “to safeguard the earth – its people, its plants and animals, and the natural systems upon which all life depends.”

sixteen Indian Nations, the D.C. Circuit invalidated the FCC's action. *United Keetoowah Band of Cherokee Indians v. FCC*, 933 F.3d 728 (D.C. Cir. 2019).

Failure to analyze the potential environmental effects of the 30,000 satellites proposed by SpaceX harms IDA's organization interests. A 501(c)(3) organization, IDA advocates for the protection of the night sky from light pollution for all.⁴ Founded in 1988, IDA is the recognized authority on light pollution and is the leading organization combating light pollution worldwide. Among our programs, IDA certifies 200 International Dark Sky Places worldwide, including 134 in the United States. The International Dark Sky Places program was founded in 2021 to encourage communities, parks and protected areas around the world to preserve and protect dark skies through responsible lighting practices and public education. These protections are now at risk from the proposed satellites.

NRDC and IDA members will be harmed by the authorization of the proposed 30,000 satellites in a number of ways including: (1) increased alumina in the atmosphere will contribute to catastrophic climate change and destructive heat waves, floods, hurricanes and wildfires; (2) ozone depletion will increase the risk of cancer and other negative health effects; and (3) light pollution will have negative impacts on the health and quality of life of NRDC and IDA members as well as on the plants and animals such members value.

Completing an Environmental Impact Statement – or at the very least an Environmental Assessment – before authorizing SpaceX's proposed 30,000 satellites will address the harm to the interests of NRDC and its members. Relying on a categorical exclusion to authorize the proposed 30,000 satellites without any assessment of the potential significant impacts denies the information, inclusion and protection that NEPA guarantees.

The FCC should not rely on the recent decision by the United States Court of Appeals for the District of Columbia⁵ to justify the use of a categorical exclusion for NEPA compliance. While the court held that the petitioners' interests did not fall within the zone of interests protected by NEPA, those of NRDC and IDA do. The D.C. Circuit did not reach the merits of the NEPA claims raised. As explained below, reliance on a categorical exclusion to authorize the 30,000 satellites proposed by SpaceX is unlawful.

⁴ See www.darksky.org. IDA's mission is to "protect the night from light pollution." IDA's vision is that "the night sky, filled with stars, is celebrated and protected around the world as a shared heritage benefitting all living things."

⁵ See *Viasat, Inc. v. F.C.C.*, Case No. 21-1123 (D.C. Cir. Aug. 26, 2022), [https://www.cadc.uscourts.gov/internet/opinions.nsf/2A60C2722AD42005852588AA0051E2BE/\\$file/21-1123-1960984.pdf](https://www.cadc.uscourts.gov/internet/opinions.nsf/2A60C2722AD42005852588AA0051E2BE/$file/21-1123-1960984.pdf).

II. FCC's Failure to Comply with NEPA

A. NEPA Applies to this Application

The FCC's authorization of the 30,000 satellites proposed by SpaceX is a major federal action significantly affecting the human environment subject to review under NEPA.⁶ The action affects the human environment in two different ways: (1) impacts to the space environment from the authorized satellites; and (2) impacts to the Earth environment from the launch, operation and re-entry of the authorized satellites.

Given the increasing human activity in space, space is part of the human environment. Recent proposals for space activities include: government and commercial crewed missions to the Moon and Mars, including permanent stations; orbital and space tourism; spacing mining of the moon and asteroids; and in-orbit and in-situ manufacturing. Such advances can bring significant, economic and scientific benefits. But they also can be quite damaging such as a recent proposal to use the night sky for advertising products to Earth from satellites.⁷

One of NEPA's core principles is the benefit of proactively considering environmental impacts before action occurs so that the negative benefits can be identified and mitigated.⁸ Congress recognized the environment as a shared commons that required analysis to protect it not only for current but for future generations.⁹ As two scholars recently wrote, "As human

⁶ See 42 U.S.C. § 4332(2)(C). SpaceX is wrong when it asserts in its August 29, 2022 letter that it is "already apparent" that "NEPA does not apply to operations in space." Space Exploration Holdings, LLC, Letter to Marlene H. Dortch (August 29, 2022), at 4.

⁷ Holly Brockwell, *The great ad-space race: the history of space advertising*, TECHRADAR (Mar. 30, 2019), <https://www.techradar.com/news/the-great-ad-space-race-the-history-of-space-advertising>.

⁸ See, e.g., *Marsh v. Or. Nat. Res. Council*, 490 U.S. 360, 371 (1989) ("NEPA ensures that the agency will not act on incomplete information, only to regret its decision after it is too late to correct."); *Oglala Sioux Tribe v. U.S. Nuclear Regul. Comm'n*, 896 F.3d 520, 530 (D.C. Cir. 2018) (NEPA "requires agencies to take a 'hard look' at environmental consequences before undertaking any such action."), citing *Robertson*, 490 F.3d at 350; *Pub. Emps. for Env'tl. Responsibility v. Hopper*, 827 F.3d 1077, 1081 (D.C. Cir. 2016) (holding that an agency's decision to issue a lease for a windpower project "without first obtaining sufficient site-specific data ... violated" NEPA (internal quotation marks omitted); *Sierra Club v. U.S. Army Corps of Eng'rs*, 803 F.3d 31, 37 (D.C. Cir. 2015) (explaining that NEPA requires agencies to take a "hard look" at environmental consequences of proposed actions "in advance of deciding whether and how to proceed").

⁹ 42 U.S.C. § 4331(a) (commits the Federal Government "to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans").

uses of space, including human presence, expand rapidly, employing a proactive policy for the use and development of the space environment is critical to avoid unintended affects.”¹⁰ Such proactive policy is exactly what Congress mandated in NEPA and the FCC must follow.

Congress viewed the “human environment” broadly. NEPA requires federal agencies to “recognize the worldwide and long-range character of environmental problems and, where consistent with the foreign policy of the U.S., lend appropriate support to initiatives, resolutions and programs designed to maximize international cooperation in anticipating and preventing a decline in the quality of mankind’s world environment.”¹¹ NEPA speaks to the “profound impact of man’s activity on the interrelations of all components of the natural environment.”¹² As NEPA’s text makes clear, Congress recognized that “new and expanding technological advances” could alter man’s interactions with nature. Restoring and maintaining environmental quality was critical to the “overall welfare and development of man.”¹³ Excluding space from NEPA’s definition of “human environment” conflicts with the law’s fundamental purpose.

Regardless of whether NEPA applies in space, it unambiguously applies to this application because of the impacts that the proposed 30,000 satellites will have on the ground. It is undisputed that deployment of additional satellites will increase the amount of aluminum oxide (or alumina) as well as soot in the atmosphere. Increasing evidence suggests that such atmospheric pollution contributes to climate change with potentially devastating consequences on mankind, including U.S. residents and the U.S. environment. Such consequences include increasing frequency and intensity of wildfires, hurricanes and heat waves. All three lead to injury and death of humans, as well as the loss of property and livelihood and significant damage to flora and fauna.

Moreover, the various rocket launches required to deploy the 30,000 satellites that SpaceX proposes can contribute to the problem of stratospheric ozone depletion.¹⁴ NRDC has worked to limit stratospheric ozone depletion since the 1980s.¹⁵ Stratospheric ozone protects humans from dangerous ultraviolet radiation. Loss of it increases rates of skin cancer, cataracts

¹⁰ Alexander Q. Gilbert and Monica Vidaurri, *Major Federal Actions Significantly Affecting the Quality of the Space Environment: Applying Nepa to Federal and Federally Authorized Outer Space Activities*, 44 *Environs Env'tl. L. & Pol'y J.* 221, 238 (Spring 2021).

¹¹ 42 U.S.C. § 4332(f).

¹² 42 U.S.C. § 4331(a).

¹³ *Id.*

¹⁴ See, e.g., Martin Ross, Darin Toohey, Manfred Peinemann & Patrick Ross (2009) *Limits on the Space Launch Market Related to Stratospheric Ozone Depletion*, *ASTROPOLITICS*, 7:1, 50, 52.

¹⁵ See, e.g., *An NRDC Earth Action Guide: Saving the Ozone Layer* (Oct. 6, 1991),

https://www.nrdc.org/sites/default/files/glo_11062101a.pdf

and other illnesses.¹⁶ Many ozone-depleting chemicals can also act as powerful heat-trapping gases accelerating the dangerous weather extremes of climate change.¹⁷

In addition, the proposed 30,000 SpaceX satellites will increase light pollution that can cause devastating effects on humans, as well as the flora and fauna humans value for many reasons. The action SpaceX proposes for FCC authorization will add thousands of light-reflecting objects to the night sky visible from earth. Light pollution from existing commercial satellites is already a problem.¹⁸ The FCC cannot meet its legal obligations under NEPA without analyzing the potential impacts of the 30,000 additional satellites SpaceX has proposed in the context of past, present and reasonably foreseeable satellites and other space objects causing light pollution on Earth. Courts have consistently affirmed the obligation to address cumulative impacts under NEPA. The following section provides a more detailed discussion of these potential significant effects on the ground.¹⁹

B. Use of Categorical Exclusion is Unlawful

NEPA requires federal agencies to include “a detailed statement” (an Environmental Impact Statement or EIS) regarding the environmental impact of “any major Federal actions significantly affecting the quality of the human environment.”²⁰ If the agency is uncertain about whether its action will significantly affect the environment, it can prepare an Environmental Assessment (EA) to determine if a Finding of No Significant Impact (FONSI) is justified.²¹ Here, the FCC has done neither.

While the use of a Categorical Exclusion to avoid either an EIS or EA may be appropriate under some circumstances, it is not here. FCC regulations provide that actions that “may significantly effect” the quality of the human environment require the preparation of EAs.²² If

¹⁶ David Doniger, *Giving Thanks for the Montreal Protocol – Proof that Companies Actually Can Cooperate* (Nov. 25, 2011), <https://www.nrdc.org/experts/david-doniger/giving-thanks-montreal-protocol-proof-countries-actually-can-cooperate> .

¹⁷ *Id.*

¹⁸ M. Kocifaj et al., *The Proliferation of Space Objects Is a Rapidly Increasing Source of Artificial Night Sky Brightness*, Monthly Notices of the Royal Astronomical Society, at L41 (Mar. 29, 2021), <https://academic.oup.com/mnras/article/504/1/L40/6188393> .

¹⁹ Because of the potential significant effects that the 30,000 satellites proposed by SpaceX have on the ground in the United States, NEPA’s application here is not a question of extraterritorial application. The presumption against extraterritorial application of U.S. law articulated by the U.S. Supreme Court is not applicable. For a discussion of this presumption, see *Smith v. United States*, 507 U.S. 197 (1993).

²⁰ 42 U.S.C. § 4332(2)(C).

²¹ 40 C.F.R. § 1501.3; see also 40 C.F.R. § 1508.1(l).

²² 47 C.F.R. § 1.1307(a).

any doubt exists regarding whether the action before the FCC for approval will have a significant effect on the human environment, the FCC must at least prepare an Environmental Assessment.²³ Here, evidence in the record establishes that the 30,000 satellites SpaceX proposes may have a significant effect on the human environment.

1. Proposed Authorization of Satellites May Increase Harm from Climate Change.

Both the launch and the re-entry of the 30,000 satellites proposed by SpaceX threatens to release pollutants in the atmosphere that contribute to warming and climate change. In particular, re-entry of the 30,000 satellites proposed by SpaceX will increase the aluminum oxide (“alumina”) in the atmosphere.²⁴ By design, these satellites will be deployed into low-earth orbit, function for a few years, and then burn up in the atmosphere. They are composed largely of aluminum and their combustion produces alumina.²⁵ Alumina can contribute to warming and increase the risk of catastrophic climate change.²⁶

Moreover, as explained below, the numerous rocket launches required to deploy the 30,000 satellites proposed by SpaceX produce ozone depleting pollutants. In addition to depleting stratospheric ozone, many of these chemicals can also act as powerful heat-trapping gases accelerating the dangerous weather extremes of climate change.²⁷

Any dispute over the magnitude of the environmental effects is a reason to require an Environmental Assessment. The use of a categorical exclusion is only justified where the impacts of the proposed action are known to lack significant environmental impacts both individually and cumulatively (i.e, when combined with past, future and reasonably foreseeable actions such as other FCC satellite authorizations).²⁸ Evidence as exists here suggesting that

²³ See, *American Bird Conservancy, Inc. v. F.C.C.*, 516 F.3d 1027, 1033 (FCC regulations require an EA “when an action ‘may’ have a significant environmental effect).

²⁴ The Aerospace Corporation, a nonprofit dedicated to advising the government on space enterprise, described the alumina deposits from satellite reentry as having the “capability to warm Earth’s atmosphere” and “pos[ing] a global threat” due to alumina’s “ability to deplete ozone.” P. Marks, *Dodging debris*, Aerospace America (July/August 2021), <https://aerospaceamerica.aiaa.org/features/dodging-debris/>

²⁵ See *Viasat Petition to Deny or Hold in Abeyance* (Feb. 8, 2022)[hereafter “Viasat Petition”], at 58-59.

²⁶ See, e.g, A. Boley & M. Byers, *Satellite mega-constellations create risks in Low Earth Orbit, the atmosphere and on Earth*, SCIENTIFIC REPORTS (May 20, 2021), <https://www.nature.com/articles/s41598-021-89909-7> .

²⁷ Doniger, *Giving Thanks*, *supra* note 16.

²⁸ 47 C.F.R. § 1.1306 (The FCC’s own regulations limit the use of a categorical exclusion to those actions “deemed individually and cumulatively to have no significant effect on the quality of the

there may be significant environmental effects triggers the requirement for at least an Environmental Assessment.

2. Proposed Authorization of Satellites May Increase Harm from Ozone Pollution.

The numerous rocket launches needed to deploy the 30,000 satellites that SpaceX proposes will add ozone-depleting pollutants to the atmosphere. Stratospheric ozone depletion significantly harms the human environment—*e.g.*, by increasing the amount of ultraviolet radiation that reaches Earth, which leads to increased rates of skin cancer and cataracts.²⁹

In addition, during launch “particles injected into the stratosphere absorb and reflect solar energy, changing the flow of radiation in the atmosphere, heating the stratosphere and cooling the surface, respectively. This radiative forcing has the effect of changing the Earth’s albedo and so the amount of solar energy injected into the atmosphere. These thermal changes also deplete the ozone layer.”³⁰

The FCC cannot simply rely on analysis by the Federal Aviation Administration of launch impacts. The Commission can incorporate the FAA’s analysis into its own, but it still must make its own independent determination and document the absence of significant effects.³¹ So far, the FCC has failed to do so in its consideration of previous SpaceX satellite proposals.

3. Proposed Authorization of Satellites May Increase Harm from Light Pollution.

Two different sources of light pollution are likely to result from the 30,000 satellites that SpaceX proposes. First, the proposed satellites will increase the amount of sunlight reflected

human environment.”); *see also*, 40 C.F.R. § 1508.1(g)(3) (CEQ regulations define effects that must be considered to include cumulative effects – “which are effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non–Federal) or person undertakes such other actions.”). *See also*, *Dine Citizens Against Ruining Our Environment*, 923 F.3d at 853 (Bureau of Land Management violated NEPA by failing to consider cumulative climate and water impacts of oil and gas leases around New Mexico’s Chaco Canyon in San Juan Basin).

²⁹ *See, e.g.*, M. Norval et al., *The Effects on Human Health from Stratospheric Ozone Depletion and Its Interactions with Climate Change*, 6 Photochemical & Photobiological Scis. 232 (2007).

³⁰ *Viasat Petition, supra* note 25, at 57, quoting Martin Ross and James A. Vedda, *The Policy and Science of Rocket Emissions*, The Aerospace Corporation, April 2018.

³¹ *See Calvert Cliffs’ Coordinating Comm., Inc. v. U. S. Atomic Energy Comm’n*, 449 F.2d 1109, 1117-18 (D.C. Cir. 1971)(Commission must both fully and adequately analyze *and* consider the environmental impacts of the proposed action).

toward the Earth's surface. Second, the proposed satellites will increase "skyglow" – i.e., background light. As explained in detail in Viasat's Petition to Deny Authorization, both types of light pollution can have significant and adverse aesthetic, scientific, social and cultural, and health effects on the human environment on Earth.³²

Numerous studies show the negative impacts that light pollution can have on human health including sleep disruption.³³ Light is the most powerful stimulus for regulating human circadian rhythms and is the major environmental cue for synchronizing the circadian clock.³⁴ In addition to resetting the daily circadian rhythm, light also stimulates additional neuroendocrine and neurobehavioral responses, including suppression of melatonin release from the pineal gland, activating the limbic system improving alertness and performance.³⁵

The significant impacts of increased light pollution on animal and plant life have been well documented.³⁶ One report specifically addressed the impact on "animal and insect life" from satellites in low-earth orbit³⁷ – the zone in which SpaceX proposes to operate its 30,000 satellites. Humans – including NRDC and IDA members – value animal and plant life for a variety of reasons including food, income from tourism, quality of life, as well as for cultural and religious purposes.³⁸

³² *Viasat Petition, supra* note 25, at 61-67.

³³ See, e.g., United Nations Office for Outer Space Affairs, et al, *Dark and Quiet Skies for Science and Society: Report and Recommendations* (2020) [hereafter "*UNOOSA Report and Recommendations*"] (analyzes results of numerous studies), 92-102, <https://www.iau.org/static/publications/dqskies-book-29-12-20.pdf> .

³⁴ Wright, K.P. Jr, McHill, A.W., Birks, B.R., Griffin, B.R., Rusterholz, T. & Chinoy, E.D. 2013. Entrainment of the human circadian clock to the natural light-dark cycle. *Curr. Biol.* 23:1554-8.

³⁵ Evans, J.A. & Davidson, A.J. 2013. Health consequences of circadian disruption in humans and animal models. *Prog Mol Biol Transl Sci.* 119:283-323.

³⁶ See, e.g., UN Environmental Programme, *Global Light Pollution is Affecting Ecosystems: What Can We Do?*, <https://www.unep.org/news-and-stories/story/global-light-pollution-affecting-ecosystems-what-can-we-do> ; International Dark-Sky Association, *Light Pollution Effects on Wildlife and Ecosystems*, <https://www.darksky.org/light-pollution/wildlife/> ; National Park Service, *Animals Need the Dark*, https://www.nps.gov/articles/nocturnal_earthnight.htm ("A naturally dark environment is a vital resource to all living things. Like sleep, without it no one functions well."); J. Foster et al., *How animals follow the stars*, *Proceedings of the Royal Society B* (2018), <https://royalsocietypublishing.org/doi/10.1098/rspb.2017.2322> .

³⁷ *UNOOSA Report and Recommendations, supra* note 33, at 28.

³⁸ See, e.g., Nikita Amir, *Light Pollution Threatens Millenia-old Indigenous Navigation Methods*, *DISCOVER MAGAZINE* (Oct. 27, 2021) ("Satellites now overcrowd the lower Earth orbit, and their artificial light interferes with stargazing activities worldwide."), <https://www.discovermagazine.com/environment/light-pollution-threatens-millennia-old-indigenous-navigation-methods> .

Krystal De Napoli, an astrophysics graduate student at Monash University in Australia who has researched the cultural impacts of light pollution, compares each star to a book in a library. In Napoli's words, "if we start to cover up and lose sight of those books, we lose our reference points, we lose that link and our information."³⁹

Increasing light pollution from commercial satellites including the 30,000 proposed by SpaceX will harm the wilderness experience NRDC members and others value for the solitude and escape from technology and urbanization it provides.⁴⁰ According to one hiker, "When solitude engulfs me in the backcountry, I give myself fully to what the trail demands. There is no chatter, no pinging from my cellphone, nobody to help me make decisions."⁴¹ The American Psychological Association has linked hiking in the wilderness and other exposure to a host of health benefits, including improved attention, lower stress, better mood, and reduced risk of psychiatric disorders. The light of passing satellites compromises the wilderness experience and its benefits in the same way that "pinging of a cellphone" does. The "untrammelled"⁴² nature promised by the 1964 Wilderness Act is lost. Unfortunately, such light pollution is increasing every day.⁴³

Light pollution will also impact the ability of ground-based telescopes to search for and identify Near-Earth Objects (NEOs) and Potentially Hazardous Asteroids (PHAs).⁴⁴ The NASA Near-Earth Object Observations Program uses a network of observatories that play a key role in

³⁹ *Id.*, referencing Duane W. Hamacher, Krystal D. Napoli and Bon Mott, *Whitening the Sky: Light Pollution as a Form of Cultural Genocide*, JOURNAL OF DARK SKIES (Vol. 1 Preprint), <https://arxiv.org/ftp/arxiv/papers/2001/2001.11527.pdf>

⁴⁰ See, e.g., Sharon Buccino, *Wilderness Warriors – Needed More Now than Ever* (September 3, 2014), <https://www.nrdc.org/experts/sharon-buccino/wilderness-warriors-needed-now-more-ever> .

⁴¹ Wudan Yan, *The Science of Solo Time in the Wilderness: A writer unpacks the latest findings on solitude and the outdoors*, SIERRA MAGAZINE (July 6, 2022), https://www.sierraclub.org/sierra/2022-2-summer/field-trip/science-solo-time-wilderness?utm_source=facebook&utm_campaign=sierramag&utm_medium=social&fbclid=IwAR3F8DOKuMDdaY-VJgN97RVP0aMt966kRZG1M3kn3ZJBmUFvs3M2U6vQlw8 .

⁴² 16 U.S.C. § 1131(c).

⁴³ See, Cinnamon Janzer, *Angel of Darkness: Bill Wren Has Spent Decades Helping to Preserve Dark Skies*, SIERRA MAGAZINE (Summer 2022), 16, (In the words of a former employee of the University of Texas's McDonald Observatory, "The next big thing, as far as the night sky goes, is all these communication satellites. In the evening twilight, you'll look up and the constellations will be fluid because there will be so many satellites moving around. It's going to be insane, honestly."), <https://digital.sierramagazine.org/publication/?m=43145&i=749682&p=18&ver=html5> .

⁴⁴ <https://www.nasa.gov/planetarydefense/neo>

planetary defense. For example, the Haleakalā observatory in Maui has identified almost 60% of the largest and most dangerous objects with sizes greater than 140 meters across. Any degradation in sky quality over the observatory will impact the mission and the ability to offer early warning capabilities for potentially catastrophic asteroid collisions. Without early warning and the ability to change an asteroid's course, as evaluated in the NASA Double Asteroid Redirection Test (DART),⁴⁵ the impact would devastate the human environment.

While the light from the proposed SpaceX satellites themselves may not produce all of these negative impacts, such light can certainly contribute to the harm. The FCC must address the potential indirect and cumulative effects of the 30,000 satellites that SpaceX has proposed. This requires putting the proposed SpaceX satellites in the context of other sources of light pollution including the other commercial satellites that the FCC and others have and may in the future authorize.⁴⁶

Significant new information related to light pollution from satellites is now available that was not when the FCC addressed the issue in its authorization of SpaceX's 1G 2,800 satellites in April 2021.⁴⁷ While the American Astronomical Society and others have worked with commercial satellite operators to mitigate light pollution, such efforts have not removed the adverse environmental impacts.⁴⁸ Mitigation does not excuse the failure to prepare an Environmental Assessment. In authorizing SpaceX's first collection of satellites, the Commission assumed that SpaceX would mitigate the impacts of its Starlink operations.⁴⁹ As noted by Viasat in its Petition to Deny, SpaceX has not satisfied those commitments or otherwise mitigated the impacts of its Starlink operations.⁵⁰ The FCC should not reward SpaceX's inaction by authorizing a seven-fold increase in the size of the Starlink system.

⁴⁵ <https://www.nasa.gov/planetarydefense/dart/dart-news>

⁴⁶ See *infra* note 2.

⁴⁷ See, e.g., Samantha M. Lawler, Aaron C. Boley, and Hanno Rein, *Visibility Predictions for Near-Future Satellite Megaconstellations: Latitudes near 50° will Experience the Worst Light Pollution*, THE ASTRONOMICAL JOURNAL (2021), <https://iopscience.iop.org/article/10.3847/1538-3881/ac341b>;

⁴⁸ See Przemek Mroz *et al.*, *Impact of the SpaceX Starlink Satellites on the Zwicky Transient Facility Survey Observations*, THE ASTROPHYSICAL JOURNAL LETTERS (Vol. 924, No. 2 2022) (recent study published by the AAS finds a dramatic increase in the number of astronomical images affected by light pollution caused by Starlink satellites. The authors conclude, “[t]he number of images affected by satellite trails is alarmingly growing as more and more Starlink satellites are being deployed in orbit.”), at <https://iopscience.iop.org/article/10.3847/2041-8213/ac470a>; see also Michael Kan, *Starlink Satellites Are Photo Bombing Astronomy Images*, PCMAG (Jan. 18, 2022), at <https://www.pcmag.com/news/starlink-satellites-are-photo-bombing-astronomy-images>

⁴⁹ *Space Exploration Holdings, LLC*, 36 FCC Rcd. 7995, ¶ 87 (2021).

⁵⁰ *Viasat Petition*, *supra* note 25, at 67.

Arguably, the FCC's best approach under NEPA would be to prepare a Programmatic Environmental Impact Statement analyzing the potential consequences of the proposed operations of all commercial satellite operators before authorizing satellite deployment. If the Commission chooses not to conduct such programmatic review, it must at the very least evaluate the SpaceX proposal now before it in the context of the satellites that the FCC has already authorized combined with those for which SpaceX – as well as other operators – have indicated they intend to seek authorization. The Commission cannot legally authorize the proposed 30,000 satellites without completing such cumulative analysis.

III. Conclusion

In sum, based on the information presented here and elsewhere in the record of this proceeding, the FCC cannot lawfully authorize the 30,000 satellites proposed by SpaceX without analyzing the potentially significant environmental impacts of such action in an Environmental Impact Statement or at the very least documenting the absence of significant environmental impacts in an Environmental Assessment.

Sincerely,



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