WRITTEN RE-EVALUATION OF THE 2020 FINAL ENVIRONMENTAL ASSESSMENT FOR SPACEX FALCON LAUNCHES AT KENNEDY SPACE CENTER AND CAPE CANAVERAL AIR FORCE STATION

SPACEX FALCON 9 LICENSE MODIFICATION FOR DRAGON 2 CARGO AND CREW MISSIONS AT SLC-40

Introduction and Background

Introduction

Space Exploration Technologies Corporation (SpaceX) has requested a modification to license LLO 18-105 for launches of Falcon 9 vehicles from Cape Canaveral Space Force Station (CCSFS)[1] Space Launch Complex 40 (SLC-40) to add Dragon 2 cargo and crew missions as a payload. This written re-evaluation (WR) evaluates whether supplemental environmental analysis is needed to support the Federal Aviation Administration (FAA) Office of Commercial Space Transportation decision to modify SpaceX's license LLO 18-105 for the addition of Dragon 2 cargo and crew missions at SLC-40. The affected environment and environmental impacts of cargo-only Dragon 1 and Dragon 2 missions (launched as a payload on a SpaceX Falcon 9 vehicle) and Dragon reentry operations from SLC-40, among other things, were analyzed in the 2020 *Final Environmental Assessment for SpaceX Falcon Launches at Kennedy Space Center and Cape Canaveral Air Force Station* (hereafter referred to as the 2020 EA; FAA 2020). The FAA issued a Finding of No Significant Impact (FONSI) based on the 2020 EA on July 8, 2020. This WR provides the determination of whether the contents, analyses, and conditions of approval in the 2020 EA remain current and substantially valid.

Modification of a license is a major federal action subject to the requirements of the National Environmental Policy Act of 1969 (NEPA). As such, the FAA must assess the potential environmental impacts of modifying LLO 18-105 to authorize cargo and crew Dragon 2 missions from SLC-40. The FAA's environmental policies and procedures for implementing NEPA (FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*) provide that the FAA may prepare a WR to determine whether the contents of previously prepared environmental documents remain substantially valid or whether significant changes to a previously analyzed proposed action require the preparation of a supplemental Environmental Assessment (EA) or Environmental Impact Statement (EIS).

In accordance with Paragraph 9-2.c of FAA Order 1050.1F, the preparation of a new or supplemental EA is not necessary when the following can be documented:

[1] Previously Cape Canaveral Air Force Station.

1. The proposed action conforms to plans or projects for which a prior EA and FONSI have been issued or a prior EIS has been filed and there are no substantial changes in the action that are relevant to environmental concerns;
2. Data and analyses contained in the previous EA and FONSI or EIS are still substantially valid and there are no significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts; and
3. Pertinent conditions and requirements of the prior approval have been, or will be, met in the current action.

This WR provides documentation for the above three factors as well as the FAA's conclusion that the contents of the 2020 EA remain current and substantially valid and the decision to modify LLO 18-105 to add the subject missions does not require the preparation of a new or supplemental EA.

Background

In 2007, the U.S. Space Force (USSF, previously U.S. Air Force) analyzed the potential environmental impacts of revitalizing SLC-40 as a launch facility for the Falcon launch vehicle program, including construction of a new hangar facility with supporting systems and Dragon reentry operations in the Atlantic and Pacific Oceans, in the *Final Environmental Assessment for the Operation and Launch of the Falcon 1 and Falcon 9 Space Vehicles at Cape Canaveral Air Force Station, Florida* (2007 EA). The 2007 EA analyzed a maximum of 12 launches annually each for the Falcon 1 (no longer in operation) and the Falcon 9. In 2011 and 2012, USSF considered additional infrastructure improvements (construction of a hangar annex and support facility and modifications to the SLC-40 launch pad and facility) in Categorical Exclusions. In 2013, USSF analyzed the operation of a newer version of the Falcon 9 in the *Final Supplemental Environmental Assessment to the November 2007 Environmental Assessment for the Operation and Launch of the Falcon 1 and Falcon 9 Space Vehicles at Cape Canaveral Air Force Station*. In 2018, the FAA analyzed further vehicle modifications (to increase vehicle thrust) in a Written Reevaluation.

The FAA analyzed adding Dragon landing locations in the Gulf of Mexico in the *Final Environmental Assessment and Finding of No Significant Impact for Issuing a Reentry License to SpaceX for Landing the Dragon Spacecraft in the Gulf of Mexico* (hereafter referred to as the 2018 EA; FAA 2018).

The FAA prepared the 2020 EA as a comprehensive analysis of the potential environmental impacts of SpaceX launch and reentry programs occurring at Kennedy Space Center (KSC) Launch Complex-39A (LC-39A); CCSFS SLC-40; CCSFS Landing Zone (LZ)-1 and/or LZ-2; drone ship landings in the Atlantic Ocean; and Dragon capsule splashdowns in the Pacific Ocean, Atlantic Ocean, and the Gulf of Mexico. The launch and reentry vehicles considered in the analysis were the Falcon 9; the Falcon Heavy; the Dragon 1 capsule; and the new Dragon variant, the Dragon 2. The 2020 EA analyzed the potential environmental impacts associated with SpaceX's typical launch azimuths (approximately 39, 43, and 44 degrees), as well as a southern launch azimuth (approximately 154 degrees) to support missions with payloads requiring polar orbits,[2] from LC-39A and SLC-40. Analysis of Falcon and Falcon Heavy launches included first stage booster landings at CCSFS LZ-1 and/or LZ-2 and on a drone ship in the

[2] SpaceX missions with payloads requiring polar orbits utilize trajectories greater than 145 degrees.

Atlantic Ocean. The 2020 EA also analyzed cargo Dragon missions from LC-39A and SLC-40, as well as crew Dragon missions from LC-39A. Dragon splashdown locations included the Atlantic Ocean and Gulf of Mexico, with backup locations in the Pacific Ocean.

On May 24, 2022, FAA prepared a WR that analyzed jettisoning MVac skirt rings in the Atlantic Ocean during Falcon licensed launches from KSC and CCSFS and concluded that the data and findings contained in the 2020 EA remained valid for the action.

The USSF evaluated the construction of a new Dragon crew tower at SLC-40 and documented their Categorical Exclusion determination in an AF Form 813 in December 2022. The approximately 300 feet tall crew tower at SLC-40 is similar in design to the existing crew access tower at LC-39A. To comply with NASA and DAF pad safety requirements, an emergency egress is required to ensure astronauts could evacuate safely at the pad should unforeseen circumstances occur. The emergency egress would be incorporated into the tower design and confined within the SLC-40 launch pad boundary. Exterior lights on the crew tower must comply with SLD45's local guidance for exterior lighting to minimize nighttime lighting impacts on the environment, and the Light Management Plan (LMP) for SLC-40 must be updated to include the new crew tower infrastructure and be approved by the USFWS to cover operations during sea turtle nesting season (1 May through 31 October).

Since completion of the 2020 EA, SpaceX has worked with the FAA Air Traffic Organization to reduce the size and duration of airspace closures associated with Falcon missions. This work has included improved modeling for airspace closures and the implementation of "critical decision windows" to release airspace back to the National Airspace System in the case of a scrubbed or delayed launch. SpaceX continues to work with the FAA to explore opportunities to reduce airspace closures.

Executive Order 12114, *Environmental Effects Abroad of Major Federal Actions*, requires federal agencies to assess whether its proposed action would have a significant effect outside the United States, its territories, and possessions. As documented in this WR, the Proposed Action is not expected to result in significant impacts in any location.

Proposed Action

The FAA's Proposed Action is to modify SpaceX license LLO 18-105 to include Dragon 2 cargo and crew missions from SLC-40 for the duration of the license. All other aspects under the current licenses for Falcon 9/Falcon Heavy and Dragon (RLO 20-007) would remain the same, including Falcon 9 operations (launches from LC-39A and SLC-40, first stage returns to LZ-1 and LZ-2, and downrange drone ship landings), other aspects of Dragon launches and missions (crew and cargo), and Dragon splashdown areas. Dragon 2 cargo and crew missions at SLC-40 would not increase the number of annual Falcon 9 launches from SLC-40 and would not increase the total number of crew or cargo Dragon missions from LC-39A and SLC-40.

SpaceX's Proposed Action is to obtain a license modification to authorize Dragon 2 cargo and crew missions from SLC-40, providing a redundant site for Dragon 2 cargo and crew missions should LC-39A not be available. The Proposed Action would result in no net increase in Falcon 9 launches from what was analyzed in the 2020 EA.

Similar to the previous Dragon missions that have flown from SLC-40, Dragon 2 cargo and crew missions would launch on Falcon 9 from SLC-40. After completing its mission in space, Dragon would execute a deorbit burn and re-enter Earth's atmosphere on a pre-planned trajectory and splash down with the assistance of two drogue parachutes and four main parachutes. Following splashdown, a pre-positioned recovery vessel (a 160-ft ship equipped with a helideck and "A-Frame" would locate and recover Dragon. Pre-positioned rigid-hulled inflatable boats (RHIBs) would arrive at Dragon and assess its condition; this assessment includes checking for hypergol vapors and ensuring the capsule is floating in an upright and stable position. Dragon propellant storage is designed to retain residual propellant, so any propellant remaining in Dragon is not expected to be released, and it is unlikely a propellant leak would occur. In the unlikely event the tank ruptures on impact, the fuel would almost immediately form nitric and nitrous acid on contact with water and would be quickly diluted and buffered by seawater.

Following the assessment of Dragon's condition, the lift would bring Dragon gently out of the water and onto the deck of the recovery vessel. While Dragon is loaded onto the recovery vessel, a RHIB would attempt to recover all drogue and main parachutes deployed. However, it is possible that some or all parachutes would not be recovered due to sea or weather conditions. Following recovery, Dragon would be returned to port by the recovery vessel, and crew and/or time-critical cargo would be transported via helicopter to the nearest airport.

Affected Environment

SpaceX currently launches the Falcon 9 and Dragon 1 cargo missions from SLC-40 at CCSFS. CCSFS occupies approximately 15,800 acres of land on Florida's Cape Canaveral barrier island and is directly south and adjacent to KSC.

The environmental impact categories assessed in detail in the 2020 EA include air quality; biological resources; climate; coastal resources; Department of Transportation Act Section 4(f); hazardous materials, solid waste, and pollution prevention; historical, architectural, archeological, and cultural resources; land use; natural resources and energy supply; noise and noise-compatible land use; socioeconomics; visual effects (including light emissions); and water resources (surface waters and groundwater).

The following environmental impact categories are not analyzed in detail for the reasons stated:

- Farmlands: There are no designated agricultural lands at CCSFS or KSC. Therefore, the Proposed Action would not impact farmlands.
- Floodplains and Wetlands: Launch operations would not affect floodplains or wetlands at KSC or CCSFS. Therefore, the Proposed Action would not impact floodplains or wetlands.
- Environmental Justice and Children's Environmental Health and Safety: The Proposed Action includes activities that regularly occur at KSC and CCSFS. There would be no impacts that disproportionately adversely affect environmental justice populations. Additionally, no component of the Proposed Action would result in a disproportionate health and safety risk to children.

- Wild and Scenic Rivers: The Proposed Action would not impact wild and scenic rivers because there are no wild and scenic rivers located near KSC and CCSFS.

With the exception of biological resources, the affected environment under the Proposed Action remains the same as discussed in the 2020 EA.

The U.S. Fish and Wildlife Service's (USFWS) Information for Planning and Consultation system (IPaC; USFWS 2023) was consulted for changes in listing statuses since publication of the 2020 EA and associated Endangered Species Act (ESA) Section 7 Consultation.

Updates are summarized below:

- The eastern black rail (*Laterallus jamaicensis sub species Jamaicensis*) was considered in the 2020 EA and ESA Section 7 consultation; it was previously proposed as threatened but was listed as threatened on November 9, 2020, after the 2020 EA (85 *Federal Register* [FR] 63764). The FAA made a determination of "no effect" for the species due to the fact that there were no documented occurrences of the species at or near the launch and recovery sites evaluated in the 2020 EA and ESA Section 7 consultation. The Proposed Action does not change that determination.
- The USFWS proposed delisting the ivory billed woodpecker (*Campephilus principalis*) on September 30, 2021 (86 FR 54298). The species was considered in the 2020 EA and ESA Section 7 consultation. The Proposed Action does not change the FAA's conclusion or effects determination for the species.
- The threatened (in Florida only) American crocodile (*Crocodylus acutus*) was not considered in the 2020 EA/ESA Section 7 consultation but was identified by IPaC in the action area (the species was listed in 1975, so it is not a newly listed species). However, the American crocodile in Florida predominantly occurs within the southern tip of mainland Florida and the upper Florida Keys (FR 70 15052) and has not been documented at KSC or CCSFS (NASA 2020; IMSS 2018). Therefore, the Proposed Action would have "no effect" on this species.
- The monarch butterfly (*Danaus plexippus*) was listed as a candidate species on December 17, 2020 (85 FR 81813). The USFWS determined that listing the monarch butterfly as an endangered or threatened species is warranted but precluded by higher priority listing actions. Candidate species have no statutory protection under ESA, and therefore, ESA Section 7 consultation is not required; however, were the species to become listed as threatened or endangered, the Proposed Action would have "no effect" on this species as the Proposed Action would not impact monarch butterfly habitat.
- The 2020 EA and ESA Section 7 consultation only considered listed plants occurring in Brevard County that had potential to be affected by the 2020 EA's Proposed Action. FAA made a "no effect" determination for these plants. Based on the IPaC results, no plants have been newly listed as proposed, threatened, or endangered in Brevard County. Therefore, The Proposed Action does not change the FAA's effects determinations for federally listed plants.
- Critical habitat has been proposed and/or designated in the action area (as defined in the 2020 ESA consultation) for two listed species. Critical habitat for the Florida bonneted bat

(*Eumops floridanus*) was proposed on June 10, 2020 (85 FR 35510) and critical habitat for the piping plover (*Charadrius melodus*) was designated on July 10, 2001 (66 FR 36038). The Proposed Action would not impact any proposed or designated critical habitat because the Proposed Action does not include construction activities, and the proposed and designated critical habitats for both species are outside of Brevard County and not in the action area.

- On September 14, 2022, the USFWS proposed to list the tricolored bat (*Perimyotis subflavus*) as an endangered species under ESA. While this species does not show up in the IPaC results, the proposed rule indicates the species' range to include Florida. However, the tricolored bat is rarely encountered and considered uncommon in the state of Florida (University of Florida 2021) and has not been documented at CCSFS (NASA 2020). Further, as identified by USFWS, tricolored bat habitat consists of a dense growth of trees and underbrush covering a large tract; this habitat is not present at SLC-40 (USFWS, 2022a). Under ESA Section 7, a conference consultation is required for a proposed species if the federal agency's action is likely to jeopardize the continued existence of the proposed species. However, due to the rarity of the species in Florida, that absence of habitat at the launch locations, and no construction being proposed, the Proposed Action would not jeopardize the existence of the tricolored bat. Therefore, no conference consultation is required, and FAA has concluded its obligation under ESA Section 7.

No other substantial changes or alterations have occurred to the environmental impact categories or the study area. The 2020 EA remains a valid discussion of the affected environment for the Proposed Action for all other resource categories.

Re-evaluation of Environmental Consequences

Air Quality

Air quality impacts under the Proposed Action would be the same as those impacts described in the 2020 EA. Since the 2020 EA, Brevard County has remained in attainment status for all criteria pollutants under the National Ambient Air Quality Standards (EPA 2023). There would be no increase in emissions, as the total number of Falcon 9 launches at SLC-40 would not change. As discussed in the 2020 EA, launching and landing emissions would result in combustion of rocket propellant (RP-1). Emissions from Falcon 9 launches include carbon dioxide, carbon monoxide, water vapor, nitrogen oxides, and carbon particulates.

As discussed in the 2020 EA, three vessels would be required for a Falcon 9 booster drone ship landing in the Atlantic Ocean: the drone ship, support vessel, and ocean tug. As discussed in the 2020 EA, a recovery vessel would be used to recover Dragon. As described in the 2020 EA, emissions from operating the vessels would be below the major source threshold of 100 tons per year for all criteria pollutants. There would be no changes in Dragon recovery operations compared to those analyzed in the 2020 EA.

Temporary airspace closures associated with commercial space operations would result in additional emissions due to aircraft rerouting and expending more fuel. However, the amount of time an aircraft would spend being rerouted would be short-term and emissions would occur above the mixing layer

(3,000 feet), thus would not affect ambient air quality. Additionally, since a majority of the additional launches would occur at night, it is anticipated that fewer aircraft would be affected by rerouting.

Accordingly, the data and analyses contained in the 2020 EA remain substantially valid, and the Proposed Action would not have a significant impact on air quality.

Biological Resources (including Fish, Wildlife, and Plants)

Impacts to biological resources under the Proposed Action would be the same as those impacts described in the 2020 EA, as the same Falcon 9 launch vehicle would be used and therefore the same exhaust plume generated. The same number of Falcon 9 launches would occur at SLC-40 and the same number of total Dragon missions from SLC-40 and LC-39A would occur.

Launch noise and related impact types and mechanisms that could affect wildlife would be similar to those described in the 2020 EA. The number of sonic booms due to Falcon boosters landing at CCSFS and Dragon 2 landings in the water would be the same as analyzed in the 2020 EA. Given the short-term nature of operational noise (including a sonic boom upon reentry), no significant impacts to general wildlife species are anticipated.

As described in the 2020 EA, wildlife within the vicinity of the CCSFS and KSC would be temporarily disturbed by Falcon vehicle-related noise. Wildlife responses to noise can be physiological or behavioral. Physiological responses can range from mild, such as an increase in heart rate, to more damaging effects on metabolism and hormone balance. Behavioral responses to man-made noise include attraction, tolerance, and aversion. Each has the potential for negative and positive effects, which vary among species and among individuals of a particular species due to temperament, sex, age, and prior experience with noise. Responses to noise are species-specific; therefore, it is not possible to make exact predictions about hearing thresholds of a particular species based on data from another species, even those with similar hearing patterns. Given the short-term nature of operational noise (including a sonic boom), no significant impacts to general wildlife species are anticipated.

Impacts to prescribed burning would be similar to those described in the 2020 EA. KSC, CCSFS, and Merritt Island National Wildlife Refuge conduct prescribed burns under the conditions outlined in the 2019 Prescribed Burn Memorandum of Understanding. The Proposed Action would not create new operational smoke buffers or smoke sensitive areas. Notification of prescribed burns would continue to occur as described in the 2020 EA.

As part of the 2020 EA and in accordance with Endangered Species Act (ESA) Section 7, the FAA conducted consultation with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS). The USFWS and NMFS concurred with the FAA's determination that the Proposed Action is not likely to adversely affect ESA-listed species or designated critical habitat.

Per the requirements of the USFWS Biological Opinion (BO) (FWS Log No. 41910-2009-F-0087) for light management at CCSFS, the Proposed Action requires SpaceX to update the LMP for SLC-40 due to the additional exterior lighting associated with the new crew tower. As required by the BO, SpaceX has coordinated an updated LMP through SLD45 and submitted the plan to USFWS for approval. An

approved LMP must be in place prior to launches occurring during sea turtle nesting season (1 May through 31 October).

Additionally, the FAA recently completed a programmatic ESA consultation with NMFS for launch and reentry operations in the marine environment (NMFS 2022). This programmatic consultation supersedes the consultation conducted with NMFS during preparation of the 2020 EA. NMFS concurred with the FAA's determination that the space launch and reentry activities presented in the programmatic consultation, which includes up to ten spacecraft reentries and landings in the Gulf of Mexico, up to ten spacecraft reentries and landings in the Atlantic Ocean, and up to three spacecraft reentries and landings in the Pacific Ocean, are not likely to adversely affect ESA-listed species or adversely modify designated critical habitat and issued a programmatic Letter of Concurrence (LOC) to the FAA. The LOC includes protection and monitoring measures that must be followed during and after launch activity. As stated in the LOC, booster landing failures are not included in the consultation. If a failure were to occur in the marine environment, the FAA may be required to reinitiate consultation. The FAA will collaborate with SpaceX to collect and report on the annual reporting information required by the LOC. Accordingly, the Proposed Action would not result in significant impacts on biological resources.

In the unlikely circumstance of an off-nominal marine landing event, given the low frequency of launch operations and the fact that marine wildlife spends the majority of their time submerged as opposed to on the surface, potential adverse impacts are unlikely. As stated in the 2020 EA, the FAA is aware that recovery efforts could extend beyond the U.S. border. The same types of impacts on biological resources described in the 2020 EA would occur in the areas beyond the U.S. border that are exposed to launch noise (engine noise and sonic booms). No adverse effects on any marine wildlife species are anticipated.

Dragon 2 cargo and crew missions at SLC-40 would not substantially change impacts on biological resources. Accordingly, the data and analyses contained in the 2020 EA remain substantially valid, and the Proposed Action would not result in significant impacts on biological resources.

Climate

Climate impacts under the Proposed Action would be the same as those impacts described in the 2020 EA. As described in the 2020 EA, greenhouse gas emissions include those associated with Falcon 9 takeoff and landing, the vessels transiting between Port Canaveral and the landing location, and Dragon recovery vessels. Mobile source activities would be limited on an annual basis, and their incremental contributions to global emissions would not be of such magnitude to make a direct correlation with climate change. There would be no change in the number of Falcon 9 launches at SLC-40 or the number of total Dragon missions from SLC-40 and LC-39A.

Temporary airspace closures associated with commercial space operations could result in additional emissions due to aircraft rerouting and expending more fuel. However, the amount of time an aircraft would spend being rerouted would be short-term, and the number of aircraft that would be impacted per launch would not be expected to produce additional emissions that would have a notable effect on climate.

Accordingly, the data and analyses contained in the 2020 EA remain substantially valid, and the Proposed Action would not result in a significant climate-related impact.

Coastal Resources

Coastal resource impacts under the Proposed Action would be the same as those impacts described in the 2020 EA. The Proposed Action does not involve any coastal construction or seafloor-disturbing activities. Falcon 9 droneship landings would occur off the coast of Florida at least ten nautical miles offshore. Payload fairing and Dragon 2 cargo and crew landing and recovery would take place no closer than five nautical miles offshore. Landing and recovery operations would operate as they currently do. Accordingly, the data and analyses contained in the 2020 EA remain substantially valid, and the Proposed Action would not have a significant impact on coastal resources.

Department of Transportation Act Section 4(f)

Impacts on Section 4(f) resources under the Proposed Action would be the same as those impacts described in the 2020 EA, as there would be no change in number of Falcon 9 missions at SLC-40 and no additional ground disturbance would occur. As stated in the 2020 EA, the FAA determined that the Proposed Action would not result in a physical use, direct taking, or temporary occupancy of any Section 4(f) property. Also, the FAA determined that the noise associated with Falcon 9 launches and landings would not result in a constructive use of any Section 4(f) property. The Florida coast near KSC and CCSFS has been experiencing launch noise (engine noise and sonic booms) for many years from launch operations at KSC and CCSFS, including government and commercial launches, Shuttle landings, and SpaceX Falcon 9 booster landings. Although some of the Section 4(f) properties are natural areas with typically quiet settings, Dragon 2 cargo and crew missions at SLC-40 would not diminish the significance and enjoyment of these properties due to the low magnitude of overpressure and infrequency of Falcon 9 launch and landing events. Accordingly, the data and analyses contained in the 2020 EA remain substantially valid, and the Proposed Action would not have a significant impact on Section 4(f) properties.

Hazardous Materials, Solid Waste, and Pollution Prevention

Impacts related to hazardous materials, solid waste, and pollution prevention under the Proposed Action would be the same as those impacts described in the 2020 EA. The Proposed Action would not change the existing management of hazardous materials, solid waste, and pollution prevention at SLC-40 or the number of Falcon 9 launches at SLC-40. Potential adverse impacts on the environment associated with hazardous materials and waste management would continue to be minimized through strict compliance with all applicable federal, state, and local laws and regulations. Dragon 2 cargo and crew missions from SLC-40 would not substantially change hazardous materials, solid waste, and pollution prevention impacts. Hazardous materials, substances, and wastes used and generated as part of recovery operations would be collected, stored, and disposed of using practices that minimize the potential for accidental releases or contact with storm or marine water in accordance with applicable spill prevention plans and federal regulations. Accidental spills would be cleaned up quickly and appropriately in accordance with applicable laws and established emergency

response plans. Accordingly, hazardous materials and waste impacts would be less than significant. Accordingly, the data and analyses contained in the 2020 EA remain substantially valid, and the Proposed Action would not result in a significant impact related to hazardous materials, solid waste, and pollution prevention.

Historical, Architectural, Archeological, and Cultural Resources

Historical, architectural, archeological, and cultural resource impacts under the Proposed Action would be the same as those impacts described in the 2020 EA. As part of Section 106 consultation conducted during preparation of the 2020 EA, the Florida State Historic Preservation Officer concurred with the FAA's definition of the Area of Potential Effects (APE) and determination that the Proposed Action would not adversely affect historic properties. The APE was defined as the areas predicted to experience sonic booms during launches, including landings. Dragon 2 cargo and crew missions at SLC-40 would not increase the number of Falcon 9 annual launches from SLC-40 or cause sonic booms in areas not previously consulted on. A review of the National Register of Historic Places found one new listed property, the Imperial Towers in Titusville, FL (listed on April 19, 2023), located approximately 20 miles west of SLC-40, and within the area of potential effects evaluated in the 2020 EA (National Parks Service 2023). Effects to this property would be limited to launch noise and sonic booms below two pounds per square foot. As discussed in the EA, potential damage from sonic booms below two pounds per square foot is very unlikely. Additionally, these effects are the consistent with ongoing effects as the structure has experienced from existing launches at KSC and CCSFS. Accordingly, the data and analyses contained in the 2020 EA remain substantially valid, and the Proposed Action would not have a significant impact on historical, architectural, archeological, and cultural resources.

Land Use

Land use impacts under the Proposed Action would be the same as those impacts described in the 2020 EA. The Proposed Action would not involve any land-disturbing activities. Falcon 9 and Dragon 2 cargo and crew recovery and transport would occur as they do under the existing Falcon and Dragon launch programs. Dragon 2 cargo and crew missions at SLC-40 would not change land use impacts. Accordingly, the data and analyses contained in the 2020 EA remain substantially valid, and the Proposed Action would not have a significant impact on land use.

Natural Resources and Energy Supply

Impacts related to natural resources and energy supply under the Proposed Action would be the same as those impacts described in the 2020 EA. Dragon 2 cargo and crew missions at SLC-40 would not require the use of scarce or unusual materials and would not measurably increase demand on local supplies of energy or natural resources beyond what would already be used for Falcon 9 launches at KSC and CCSFS. The number of Falcon 9 launches from SLC-40 would not increase. Dragon 2 cargo and crew missions at SLC-40 would not substantially change impacts on natural resources and energy supply. Accordingly, the data and analysis contained in the 2020 EA remain substantially valid, and

the Proposed Action would not result in a significant impact related to natural resources and energy supply.

Noise and Noise-Compatible Land Use

Impacts related to noise and noise-compatible land use under the Proposed Action would be the same as those impacts described in the 2020 EA. The total number of Falcon 9 missions at SLC-40 would not change from those analyzed in the 2020 EA. No additional sonic booms on land are expected as the Proposed Action does not include additional land landings of first-stage boosters. Engine noise levels generated during launches would be the same under the Proposed Action because the same rocket was analyzed in the 2020 EA.

As stated in the 2020 EA, sonic booms would be generated during Falcon 9 booster descent. The majority of Florida within the sonic boom footprint is expected to experience overpressures of 0.25 to 0.5 psf, which is similar to distant thunder. The sparsely populated land areas located within the descent sonic boom footprint for a downrange first stage booster landing would experience overpressures less than 0.5 psf. As stated in the 2020 EA, sonic booms overland would be experienced intermittently and, in the majority of the overland area, would be perceived as a distant thunderclap. Engine noise levels associated with proposed landing activities would last less than 1 minute and occur infrequently, and no significant noise impacts are expected.

Dragon 2 cargo and crew reentry would generate a sonic boom. The sonic boom would most likely only impact the ocean's surface; however, the sonic boom could extend inland at extremely low overpressures. Noise associated with Dragon reentries, splashdowns, and recovery operations would be similar to noise already occurring in the open ocean and at CCSFS. The total number of Dragon missions from SLC-40 and LC-39A would not change from those analyzed in the 2020 EA.

Accordingly, the data and analyses contained in the 2020 EA remain substantially valid, and the Proposed Action would not result in significant impacts related to noise and noise-compatible land use.

Socioeconomics

Impacts related to socioeconomics would be the same as those impacts described in the 2020 EA. SpaceX would continue to use its existing workforce for launch operations, which would not change with the addition of Dragon 2 cargo and crew missions from SLC-40. There would be the same number of Falcon 9 launches from SLC-40 and the same total number of Dragon missions from SLC-40 and LC-39A as analyzed in the 2020 EA. The Proposed Action would not significantly affect the local housing market and would not negatively affect the local economy.

Temporary access restrictions on navigable waters would be necessary to ensure public safety during recovery operations. Advance notice via Notices to Mariners would assist mariners in scheduling around any temporary disruption of flight, shipping, or boating activities in the area of operation. Recovery operations would be of short duration and scheduled in advance to minimize interruption to waterways. For these reasons, temporary waterway access restrictions would not result in significant marine, commercial, or recreational impacts.

On April 13, 2023, the FAA issued a *Notice of Updated Factors for Optimizing Use of the National Airspace System*. To mitigate the impacts of increased commercial space operations on other aircraft flight operations without impeding commercial space operations, the FAA updated factors to inform decisions to optimize the National Airspace System. The factors include, among other things, limiting launches during times of high NAS congestion (such as holidays), encouraging commercial launches during nighttime hours when other flight operations tend to be reduced, and minimizing launch windows. The anticipated impact from implementation of these factors was to minimize disruptions to and reroutes of other airspace users.

Based on the above, the data and analyses contained in the 2020 EA remain substantially valid, and the Proposed Action would not significantly affect the local housing market and would not negatively affect the local economy.

Visual Effects (including Light Emissions)

Visual effects under the Proposed Action would be the same as those described in the 2020 EA. Facilities at CCSFS would continue to operate under Light Management Plans (LMPs) to mitigate potential wildlife impacts from nighttime lighting. Falcon 9 launches and landings would result in light emissions and visual impacts, but the number of Falcon 9 launches at SLC-40 would not change. Exterior lights associated with Dragon 2 cargo and crew missions from SLC-40 would be approved by the USFWS to cover operations during sea turtle nesting season (1 May through 31 October). Dragon 2 cargo and crew mission lighting would not substantially degrade the existing visual character or quality of the site and its surroundings, as launches regularly occur at KSC and CCSFS. Accordingly, the data and analyses contained in the 2020 EA remain substantially valid, and the Proposed Action would not have a significant impact related to visual effects.

Water Resources (including Surface Waters and Groundwater)

Impacts to water resources would be the same as those impacts described in the 2020 EA . The number of Falcon 9 launches from SLC-40 and total Dragon missions from SLC-40 and LC-39A would not change, and no ground disturbance is proposed. As described in the 2020 EA, minimal impacts to groundwater, if any, would occur. Potential impacts on surface water quality during an unsuccessful Falcon 9 booster offshore drone ship landing would be the same as described in the 2020 EA. Similarly, potential impacts on surface waters from an off- nominal landing scenario would be similar to those discussed in the 2020 EA for a failed landing attempt. While a successful barge landing would not affect water quality, an unlikely, off-nominal landing would result in some RP-1 being released into the ocean, as well as any unrecovered debris. Light oils, including RP-1, are highly volatile, which means they evaporate quickly when exposed to the air, and are usually completely dissipated within one to two days after a spill. Clean-up following a spill is usually not necessary, or possible, with spills of light oil, particularly with such a small quantity of oil. Therefore, no attempt would be made to boom or recover RP-1 if any of the fuel is released directly into the ocean. Any RP-1 remaining on the barge from an unsuccessful landing attempt would be recovered, contained, and handled in accordance with applicable requirements. SpaceX would not attempt to recover launch vehicle debris, as any unrecovered debris is expected to sink. Launch and ground operations would continue to be

conducted under existing Stormwater Pollution Prevention Plans and National Pollutant Discharge Elimination System permits. Accordingly, the data and analyses contained in the 2020 EA remain substantially valid, and the Proposed Action would not result in a significant impact on water resources.

Cumulative Impacts

The Proposed Action is to add Dragon 2 cargo and crew missions from SLC-40. The Proposed Action would not result in significant cumulative impacts to any environmental impact category. SpaceX is not proposing to exceed the total annual number of Falcon 9 launches at SLC-40 or the total number of Dragon missions from LC-SLC-40 and LC-39A analyzed in the 2020 EA. The Proposed Action would not result in a long-term operational noise increase.

Since the completion of the 2020 EA, two new small-lift class vehicles have launched from CCSFS a total of three times. The National Aeronautics and Space Administration also launched its Space Launch System vehicle in 2022. In 2023, the United States Space Force (USSF) allocated historic launch complexes to commercial operators at CCSFS. However, it may be a number of years before these programs have matured and reached their operational cadence. Upcoming launch programs considered in the 2020 EA have also experienced delays, and it is unclear when these programs will become operational. Each launch program is required to undergo a review under NEPA prior to obtaining an FAA license or conduct a mission for the Department of Defense, and each would have its own cumulative effects assessment. Finally, the USSF manages the range-wide annual launch cadence and retains the authority to prohibit launches. Accordingly, the cumulative impact analysis contained in the 2020 EA remains substantially valid, and the Proposed Action would not result in significant cumulative impacts to any environmental impact category.

Conclusion

The 2020 EA examined the potential for significant environmental impacts and defined the regulatory setting for impacts associated with the consolidated Falcon program launch operations from KSC and CCSFS. The areas evaluated for environmental impacts in this WR include air quality; biological resources (including fish, wildlife, and plants); climate; Department of Transportation Act, Section 4(f); hazardous materials, solid waste, and pollution prevention; historical, architectural, archaeological, and cultural resources; land use; natural resources and energy supply; noise and noise-compatible land use; socioeconomics; visual effects (including light emissions); and water resources (including surface waters and groundwater).

Based on the above review and in conformity with FAA Order 1050.1F, Paragraph 9-2.c, the FAA has concluded that adding Dragon 2 cargo and crew missions from SLC-40 at CCSFS conforms to the prior environmental documentation, that the data contained in the 2020 EA remain substantially valid, that there are no substantial changes in the action or significant new circumstances or information relevant to environmental concerns, and that all pertinent conditions and requirements of the prior approval have been met or will be met in the current action. Therefore, the preparation of a supplemental or new environmental document is not necessary.

STACEY MOLINICH ZEE

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Responsible FAA Official: _____

Date Issued: _____

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