

# WRITTEN RE-EVALUATION OF THE 2014 FINAL ENVIRONMENTAL IMPACT STATEMENT FOR THE SPACEX TEXAS LAUNCH SITE

## Introduction and Background

### Introduction

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 issue launch licenses and/or experimental permits to Space Exploration Technologies Corp. (SpaceX) to conduct experimental test flights of a reusable suborbital launch vehicle from SpaceX's Texas Launch Site. The affected environment and environmental impacts of construction and operation of the Texas Launch Site in Cameron County, Texas were analyzed in the 2014 *Final Environmental Impact Statement for the SpaceX Texas Launch Site* (2014 EIS; FAA 2014a). The FAA's Record of Decision (ROD) was issued for this action on July 9, 2014. Following the ROD, a WR (FAA 2014b) was developed in November 2014 to re-evaluate modifications to the site design of the Control Center Area. In October 2017, another WR (FAA 2017) was developed to re-evaluate modifications to the Control Center Area and Vertical Launch Area (VLA). Since the publication of the 2014 EIS and ROD, and the 2014 and 2017 WRs, SpaceX has developed specific vehicle technology it plans to test at the Texas Launch Site as part of the reusable suborbital launch vehicle classification considered in the 2014 EIS. This WR describes the specific suborbital launch vehicle technology and evaluates whether the proposed activities fall within the scope of the 2014 EIS.

Issuance of a launch license or experimental permit 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 SpaceX's proposed suborbital experimental test program. 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 EIS. Additionally, FAA Order 1050.1F, Paragraph 9-1.d, provides time limits for final EISs and states:

1. If major steps toward implementation of the proposed action (such as the start of construction, substantial acquisition, or relocation activities) have not commenced within three years of approval of the final EIS, a WR must be prepared (unless a decision has been made to prepare a new or supplemental EIS); or
2. If the proposed action is to be implemented by the FAA in stages or an action implemented by an applicant requires successive FAA approvals, a WR of the continued adequacy, accuracy, and validity of the EIS must be made at each major stage or approval point that occurs more than three years after approval of the final EIS.

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

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 2014 EIS remain current and substantially valid and the decision to issue a launch license or experimental permit to conduct tests of the proposed reusable suborbital launch vehicle from the Texas Launch Site does not require the preparation of a new EA or EIS. During preparation of this WR, the FAA distributed a draft copy of the WR to the consulting parties to the National Historic Preservation Act Section 106 process for the project—Texas State Historic Preservation Officer, National Park Service, Advisory Council on Historic Preservation, U.S. Fish and Wildlife Service (USFWS), and Texas Parks and Wildlife Department.

## Background

The NEPA process for SpaceX's original proposal was initiated with the publication of the Notice of Intent in the *Federal Register* on April 10, 2012 (77 FR 21619-21620). The FAA published a Notice of Availability (NOA) of the Draft EIS in the *Federal Register* on April 19, 2013 (78 FR 23629-23630). The NOA described the Proposed Action, provided the public hearing date and time, informed the public on how to obtain a copy of the Draft EIS, and initiated the public comment period. The FAA also announced the availability of the Draft EIS and the public hearing date in area newspapers. Flyers were posted in the local area to announce the NOA and comment period for the Draft EIS. Copies of the Draft EIS were distributed the week of April 8, 2013. The FAA sent notification letters, e-mails, and compact discs containing the Draft EIS to individuals; federal, state, and local agencies; elected officials; various interest groups that were part of the mailing list compiled during the scoping period; and Native American tribes.

At the request of Environmental Protection Agency (EPA) Region 6, the public comment period was extended 21 days until June 24, 2013 (78 FR 35067). The FAA held a formal public hearing in Brownsville, Texas on May 7, 2013. The EPA issued an NOA for the Final EIS on June 6, 2014 (79 FR 32729). The FAA signed its ROD on July 9, 2014.

## Proposed Action

The FAA's Proposed Action, which was the subject of the ROD and is described in full in Section 2.1 of the 2014 EIS, is to issue launch licenses or experimental permits to SpaceX to conduct launches of

a reusable suborbital launch vehicle from the Texas Launch Site. During development of the 2014 EIS, SpaceX did not have specific plans for a suborbital test program such that the FAA could evaluate it in the EIS. The proposed experimental test program has progressed to the extent that specific vehicle specifications and test plans can be provided and considered within the context of the 2014 EIS.

## **Experimental Test Program Overview**

SpaceX remains committed in its mission to colonize Mars. To achieve this mission, SpaceX is developing a new rocket called the Starship and Super Heavy. A key part of the mission is developing the Starship spacecraft. In order to fully develop the vehicle, an experimental test program is needed. The proposed experimental test program involves testing a spacecraft—the Starship—which would serve as the second stage of the rocket. The objective of the experimental test program is to perform a suborbital space flight from the Texas Launch Site.

The proposed experimental test program involves modifications to the VLA's and Control Center Area's infrastructure as analyzed in the 2014 EIS, as described below. The modifications remain entirely within the property boundary and project area described and analyzed in the 2014 EIS.

SpaceX anticipates the test program would last around 2–3 years and would be iterative, consisting of three phases. The results of Phases 1 and 2 would inform Phase 3. At this time, SpaceX is unable to provide the FAA adequate data and information regarding Phase 3 to enable the FAA to analyze the potential environmental impacts of Phase 3. Therefore, the scope of this WR is limited to Phases 1 and 2 (Table 1). The “hops” in Phase 1 and 2 are launches. Launches require a license or permit from the FAA, or the granting of a waiver to the requirement for a license. Prior to commencing Phase 3, SpaceX would be required to submit data and information to the FAA so the FAA can conduct another environmental review before issuing any new or modified licenses or permits to conduct these operations (per FAA Order 1050.1F, Paragraph 9-1.d). Table 1 provides a breakdown of each phase. Phases 1 and 2 are expected to last around 2 years. The total number of events shown in the table are for the entire test program (2–3 years) and do not represent a number of monthly or annual operations.

**Table 1. Phases of the Experimental Test Program**

Phase	Test	Total # of Events <sup>a</sup>	Description
1	Wet Dress	5–10	Verify ground systems and spacecraft by fueling the Starship.
	Static Fire	5	Verify engine ignition and performance by conducting a brief (few seconds) ignition of the Starship’s engines.
	Small Hops	3	Verify engine ignition and thrust to lift the Starship a few centimeters off the ground.
2	Small Hops	3	Engine ignition and thrust to lift the Starship over 30 cm and up to 150 m.
	Medium Hops	3	Engine ignition and thrust to lift the Starship over 30 cm and up to 3 km.
3	Large Hops	3	Engine ignition and thrust to lift the Starship to 100 km, flip the Starship at high altitude, and conduct a reentry and landing.

Notes:

<sup>a</sup> The total number events are for the entire test program (2–3 years) and do not represent a number of monthly or annual operations.

cm = centimeter; m = meter; km = kilometer; 1 cm = 0.40 inches; 1 m = 3.28 feet; 1 km = 0.62 miles

## Starship

The initial version of the complete. Phase 1 construction in the VLA included the initial build of the propellant farms and associated ground equipment, the development of an initial command and control system, establishment of necessary security and safety systems, establishment of water storage for fire suppression (three aboveground tanks), and the construction of a small vehicle pad intended for static fire tests and small hops.

Figures 2 and 3 display the notional layout of Phase 1 infrastructure. The key ground system of Phase 1 is a concrete pad. The pad is configured to provide a platform to house the Starship and provide the required commodity storage needed to support Phase 1 tests. The pad is located at the VLA, in the area previously intended for the integration and processing hangar (refer to Exhibit 2.1-3 in the 2014 EIS). This is the same area that was stabilized for construction via the surcharging project conducted in 2016 (see Figure 4). The proposed footprint of Phase 1 falls entirely within the previously approved project area. SpaceX would reassess the need for the integration and processing hangar at this location following the completion of the Starship experimental test program.





**Figure 4. Soil Surcharge Area**

The main work area of the pad is elevated with two asphalt or concrete access roads (a primary and secondary) at 2–4 percent grade up to the pad. The primary entrance is on the northeast corner of the pad and ties into State Highway 4 to the northeast. The secondary access road originates on the western side of the pad and ties into the highway to the northwest. An at-grade ring road allows access to both CH<sub>4</sub> and LOX offload areas.

A number of commodities are stored onsite to support Phase 1 testing (Table 2).

**Table 2. Phase 1 Commodities**

Commodity	Quantity	Description
Liquid Oxygen	95,980 gallons	Starship propellant (blue tanks in Figures 3 and 4)
Methane	2 tanks: 60,000 gallons 18,000 gallons	Starship propellant (red tanks in Figures 3 and 4)
Liquid Nitrogen	Two 6,000-gallon tanks	Propellant densification/Gaseous Nitrogen Recharge/Densification
Water	100,000-gallon tank	FireX (underground tank location shown in Figure 4)

In order to facilitate the safe storage and transfer of propellant, a methane flare<sup>1</sup> is to be used. The location of the flare is shown in Figure 3. The flare stack is approximately 30 feet tall and is supported by three guy wires, forming an approximately 19-foot radius around the stack base.<sup>2</sup> The flare stack and guy wire anchor are inside the construction project area. The guy wire anchors consist of galvanized steel and are augered into the ground.

<sup>1</sup> Flaring is the controlled burning of natural gas and a common practice in oil/gas exploration, production, and processing operations. A flare system consists of a flare stack and pipes that feed gas to the stack. A flare is an important safety device, particularly at gas processing plants. In an emergency situation where equipment or piping becomes over-pressured, special valves on the equipment automatically release gas through piping to flare stacks. In the absence of safety flares, plants would be at higher risk for fires and explosions.

<sup>2</sup> SpaceX is still determining whether the guy wires are needed, but this re-evaluation assumes they will be needed.

Liquid nitrogen is stored in two vertical tanks, approximately 45 feet tall. The height of the tanks are above 30 feet; therefore, the tanks would be painted or covered in a color agreed upon by the Section 106 consulting parties per the Memorandum of Agreement (MOA).

Command and control during Starship tests occurs from the Control Center Area. The test program would involve the use of the launch control centers, Falcon support building, ground tracking antenna dishes, and solar power farm and/or generators. SpaceX would construct a building at the Control Center Area used to manufacture, fabricate, and assemble the Starship and spacecraft vehicle components. The building would be 200 feet x 100 feet and approximately 16 feet tall. Due to the high wind gusts in the area and the potential to damage the Starship, two v-shaped wind breaks would be constructed to protect the spacecraft when vertical in Parcel 1. The wind breaks would each be 80 feet wide and 100 feet tall. The height of the wind breaks would be above 30 feet; therefore, the wind breaks would be painted a color agreed upon by the Section 106 consulting parties per the MOA.

Additionally, SpaceX has installed a temporary (1–2 years) tent structure in Parcel 1 of the Control Center Area. The tent was installed in the location of the proposed support buildings mentioned in the 2014 EIS. The tent is used to house welding and fabrication activities needed for structures at the VLA. The height of the tent is above 30 feet; therefore, the tent will be painted or covered in a color agreed upon by the Section 106 consulting parties per the MOA. Work activities inside the tent occur at night and therefore require lighting. The tent is enclosed, so light is not be visible from outside the tent. Road base was installed for parking next to the tent.

A layout of Control Center Area Parcel 1 is shown in Figure 5 below. The proposed manufacturing and assembly building, tent, and parking area would not increase the footprint of Parcel 1.

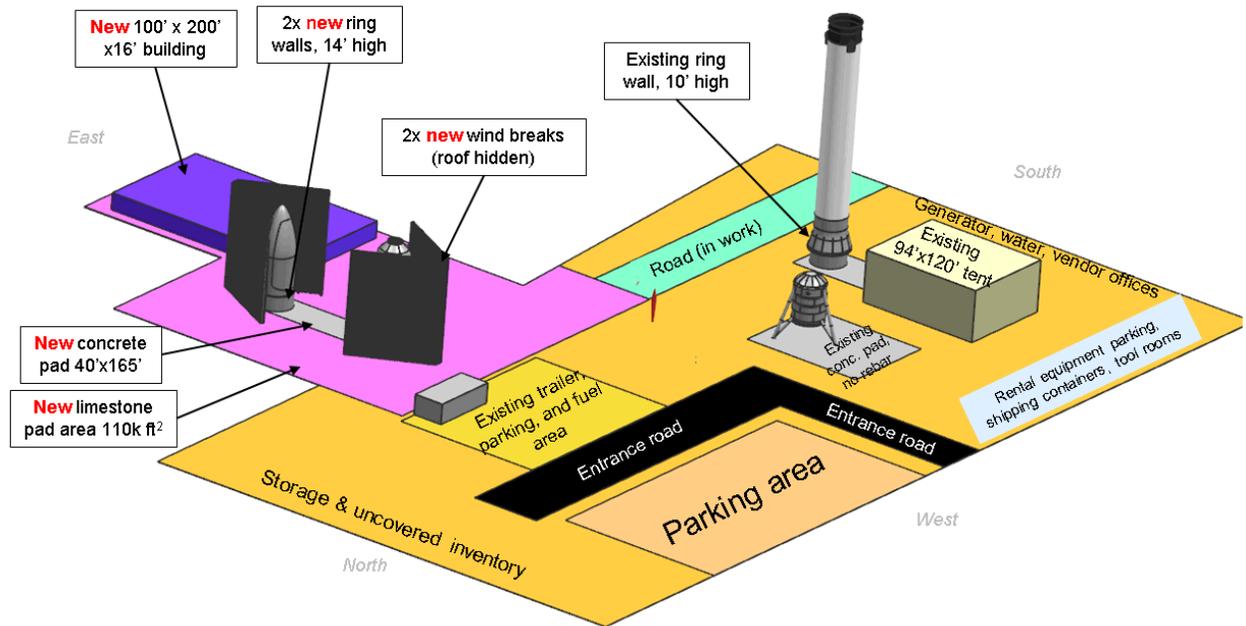


Figure 5. SpaceX Diagram of Control Center Area Parcel 1 Infrastructure

## Phase 2 Construction

Phase 2 construction includes the necessary systems and equipment for higher hop tests. Phase 2 infrastructure includes all of the ground equipment required for Phase 1 plus a takeoff/landing pad and a road connecting the pad and Phase 1 infrastructure (Figures 6 and 7). The footprint of Phase 2 also falls entirely within the previously approved project area. FireX (fire suppression) and composite overwrapped pressure vessels (pressurized methane and gaseous oxygen tanks) would be relocated from the Phase 1 pad to the takeoff/landing pad as part of Phase 2. SpaceX plans to overlap the earthwork of Phase 1 with Phase 2. However, final grading and concrete work associated with Phase 2 would occur in mid to late 2019, after Phase 1 completion.

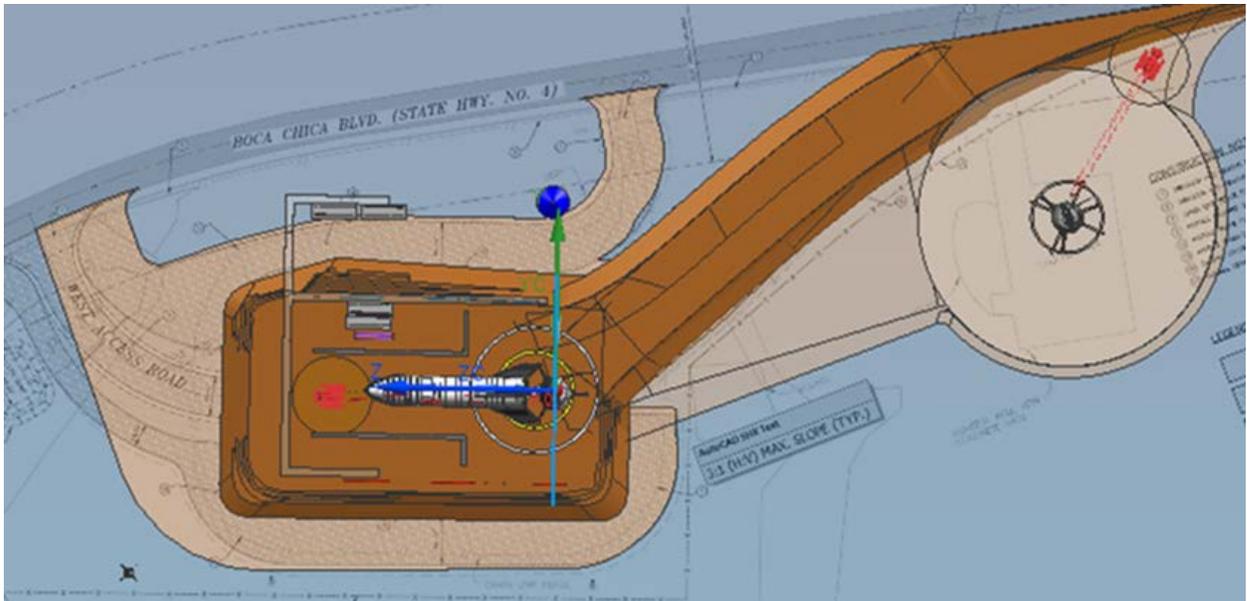


Figure 6. SpaceX Diagram of Phase 2 Infrastructure

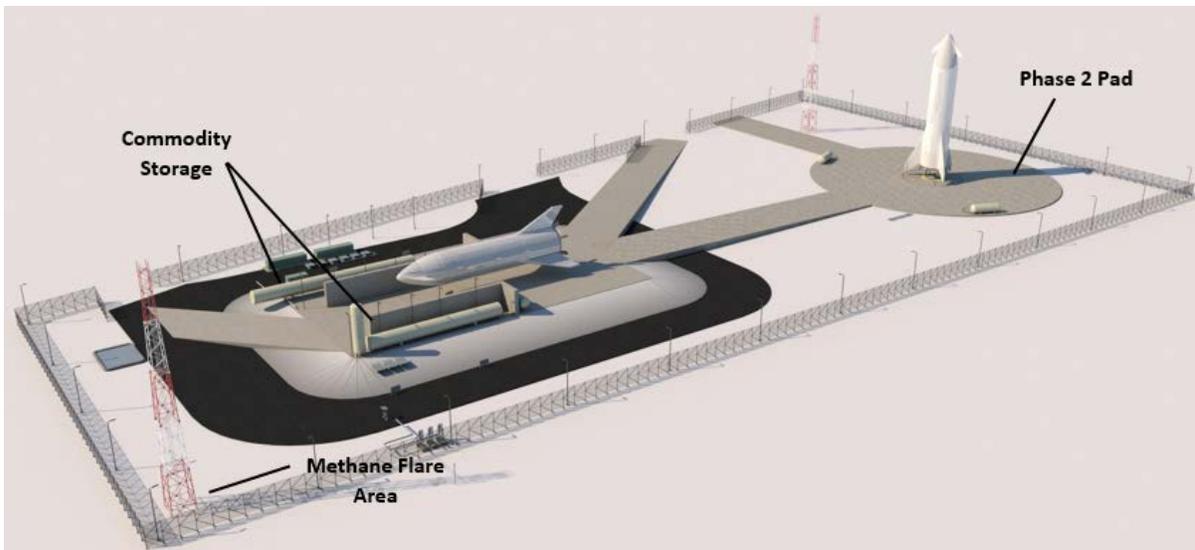


Figure 7. SpaceX's Notional Layout of Phase 2 Infrastructure

(Note: the two red/white towers would not be installed – refer to Figure 3 for a more accurate depiction of Phase 1 Infrastructure)

Additional commodities for Phase 2 are shown in Table 3. The exact staging and location of the commodities are not yet determined but will be located on the east or west concrete pad.

Table 3. Phase 2 Commodities

Commodity	Quantity	Description
Nitrogen	302 cubic feet	Starship purges/pneumatics
Helium	2 tanks: 302 cubic feet 450 cubic feet	Starship pneumatics
Liquid Nitrogen	Two tanks:	Propellant densification/Gaseous Nitrogen

	16,000 gallons 60,000 gallons	Recharge/Densification
Gaseous Oxygen	1550 cubic feet	Starship Oxygen Tank Press
Gaseous Methane	1040 cubic feet	Starship Methane Tank Press

## Phase 1 and Phase 2 Operations

Phase 1 and Phase 2 operations would include mission rehearsals (wet dress tests) and static fire engine tests, similar to the discussion of pre-launch activities in Section 2.1.1.5 of the 2014 EIS. In addition to these two types of tests, the proposed experimental test program would include a series of “hops,” as outlined in Table 1. SpaceX would use up to 7,000 gallons of deluge water for fire suppression during the tests. Based on the distance to site boundaries and site topography, SpaceX does not expect the water to discharge offsite. As stated in Section 2.1.1.5 of the EIS, the public would be notified prior to each test and SpaceX would implement its Security Plan. The amount of nighttime lighting at the VLA would be less than that discussed and analyzed in the 2014 EIS. Aside from the methane flare, SpaceX is planning to avoid or minimize nighttime lighting at the VLA.

## Affected Environment

The existing conditions for the environmental impact categories analyzed in the 2014 EIS are unchanged except with regard to the construction of SpaceX Texas facilities. Such changes include alterations to the existing natural and physical conditions at the VLA and Control Center Area. Since publication of the 2014 EIS, SpaceX has conducted soil surcharging and pad area development at the VLA. Soil surcharging is essentially laying soil on top of soil in order to compact the lower layer of soil to make it more conducive for foundations. Soil surcharging has occurred at the west end of the VLA in the area previously intended for the integration and processing hangar (Figure 4). Additionally, SpaceX has started clearing locations previously intended for the Falcon launch pad (Figure 4).

Changes to the Control Center Area include installation of the solar farm (Figure 8). In order to provide power for the launch site, SpaceX installed a solar farm on Parcel 2. Each solar panel is non-reflective and approximately five feet tall and used to provide power to the Control Center Area, VLA, and the University of Texas Rio Grande Valley’s STARGATE facilities. The solar farm also includes supporting infrastructure for batteries and backup power generation.



Figure 8. Solar Farm in Control Center Area

SpaceX also installed two antenna dishes in the Control Center Area (Figure 9). These dishes are required to receive data from the launch vehicle in flight, and to communicate commands to the vehicle as needed. These dishes are located on the north side of Parcel 2, in the middle of the parcel.



**Figure 9. Antenna Dishes in the Control Center Area**

## **Re-evaluation of Environmental Consequences**

The re-evaluation of environmental consequences focuses on construction and operations in the VLA. SpaceX's proposal does not include major changes to the Control Center Area. SpaceX would install a manufacturing and fabrication building, wind breaks, and a temporary (1–2 years) tent structure in Parcel 1 of the Control Center Area during Phase 1 and Phase 2 construction. The tent would be installed in the location of the proposed support buildings mentioned in the 2014 EIS. The tent would be used to house welding and fabrication activities needed for structures at the VLA. The height of the tent and wind breaks would be above 30 feet; therefore, these structures would be painted or covered in a color agreed upon by the Section 106 consulting parties per the MOA. The FAA does not believe these structures would affect species listed under the Endangered Species Act (ESA) in a manner not considered in the Biological Opinion (BO) issued by the USFWS in 2013 and would not increase the amount of take provided in the USFWS's incidental take statement for the ocelot, Gulf Coast jaguarondi, northern aplomado falcon, and piping plover. The FAA coordinated with the USFWS regarding potential effects to ESA-listed species from SpaceX's proposed changes to the launch site. Accordingly, the data and analyses for the Control Center Area contained in the 2014 EIS for remain substantially valid, and the temporary tent would not significantly affect any environmental impact category.

## Air Quality

Air quality impacts under the Proposed Action would be less than those impacts described in the 2014 EIS, which included air emissions associated with construction of the Texas Launch Site, static engine tests, and up to 12 annual Falcon launches. The Proposed Action would result in temporary air emissions associated with Phase 1 and Phase 2 construction (similar to the Control Center Area and VLA construction analyzed in the 2014 EIS) as well as a total of five static engine tests (each lasting a few seconds), six small hops, and three medium hops. Thus, compared to the 2014 EIS, air emissions would be much less. Emissions from a closed-cycle LOX/CH<sub>4</sub> engine include water vapor, carbon dioxide (CO<sub>2</sub>), carbon monoxide (CO), hydrogen, CH<sub>4</sub>, and oxygen. Table 4 presents the projected air emissions of the criteria pollutant (CO) for the annual operations of Phase 1 and Phase 2 activities.

**Table 4. Projected Annual Air emissions (Tons per Year)**

Phase	Test	CO
1	5 Static Fires 3 Small Hops	9.4
2	3 Small Hops 3 Medium Hops	48.8
Total		58.2

Notes: CO = carbon monoxide

As stated in the 2014 EIS, Falcon launches emit CO<sub>2</sub>, CO, water vapor, nitrogen oxide (NO<sub>x</sub>), and carbon particulates. NO<sub>x</sub> emissions occur primarily above the mixing height (3,000 feet). The 2014 EIS projected approximately 2,790 tons per year of CO, the highest quantity of the criteria pollutants. The 2014 EIS concluded that the estimated emissions from construction and operation of the launch site represent an extremely small percentage of the Cameron County regional emissions and would not cause any National Ambient Air Quality Standards to be exceeded. As shown in Table 4, the emissions associated with Starship testing are within the scope of impacts analyzed in the 2014 EIS. Accordingly, the data and analyses contained in the 2014 EIS remain substantially valid, and the Proposed Action would not result in a significant impact on air quality.

## Biological Resources (including Fish, Wildlife, and Plants)

Biological resource impacts under the Proposed Action in the Control Center Area and VLA would be similar to those impacts described in the 2014 EIS for construction and operations. However, annual effects to wildlife from launch operations would occur a fewer number of times under the Proposed Action. In the 2014 EIS, the FAA determined that a total of 15.74 acres of upland habitat would be removed as a result of the construction of the vertical launch and control center areas. In accordance with Section 7 of the Endangered Species Act (ESA), the FAA prepared a Biological Assessment (BA) and entered into formal consultation with the USFWS to address potential effects to ESA-listed species, species proposed for listing, and critical habitat. Based on the analysis presented in the BA, the FAA determined the Proposed Action “may affect and is likely to adversely affect” the following species: piping plover and its critical habitat, red knot, northern aplomado falcon, Gulf Coast jaguarundi, ocelot, and Kemp’s ridley, hawksbill, leatherback, loggerhead, and

green sea turtles. The FAA determined the Proposed Action “may affect, but is not likely to adversely affect” the West Indian manatee. Consultation with USFWS was completed with issuance of a Biological Opinion (BO) on December 18, 2013. The BO concurred with the findings in the BA and concluded no jeopardy to any species and no adverse modification to critical habitat. The BO included an incidental take statement and specified non-discretionary terms and conditions that are necessary to minimize impacts to listed species and critical habitat. The FAA and SpaceX are committed to implementing the conservation measures and terms and conditions outlined in the BO to minimize potential effects to ESA-listed species and critical habitat.

During preparation of the 2017 WR, the FAA re-initiated consultation with the USFWS on January 26, 2017 to assess potential effects on ESA-listed species as a result of installing a security fence and road at the VLA. After learning of SpaceX’s proposed changes to the Control Center Area site design, the FAA expanded the consultation with USFWS to include these changes. The FAA concluded no take of species beyond that issued in the BO was anticipated from SpaceX’s proposed modifications to the Control Center Area and VLA. An additional take of approximately 0.082 acres (3,572 square feet) of piping plover critical habitat would occur from installation of the security fence and road. The USFWS stated they plan to amend the BO to account for the additional incidental take of piping plover critical habitat.

The FAA coordinated with the USFWS regarding potential effects to ESA-listed species from SpaceX’s proposed changes to the launch site. The FAA believes SpaceX’s proposed changes to the launch site would not (1) cause effects to ESA-listed species or critical habitat in a manner or to an extent not considered in the BO or (2) result in an increase in the amount of take of ESA-listed species and critical habitat provided in the USFWS’s incidental take statement. The FAA and SpaceX are committed to complying with the terms and conditions stated in the BO.

Accordingly, the data and analyses contained in the 2014 EIS and 2017 WR remain substantially valid, and the Proposed Action would not result in a significant impact on biological resources.

## Climate

Climate-related impacts under the revised Proposed Action would be similar to those impacts described in the 2014 EIS for Control Center Area and VLA construction and operations. Climate impacts were addressed in Appendix L of the 2014 EIS. The 2014 EIS concluded that greenhouse gas (GHG) emissions from all construction would be less than 800 metric tons of CO<sub>2</sub> equivalent (CO<sub>2</sub>e) per year for the estimated two-year construction period.

GHG emissions under the Proposed Action would be minimal, and the source of emissions would be temporary, occurring only during the period of construction and launch operation. During Starship tests, methane emissions associated with the storage and loading of methane would be managed with the use of emission control flares. These flares would be coordinated with and permitted by the Texas Commission on Environmental Quality. Accordingly, the data and analyses contained in the 2014 EIS remain substantially valid, and the Proposed Action would not result in significant climate-related impacts.

## Coastal Resources

Coastal resource impacts under the Proposed Action would be similar to those impacts described in the 2014 EIS for construction and operations. Although not required by the Coastal Zone Management Act,<sup>3</sup> during preparation of the 2014 EIS, a Federal Consistency Determination was submitted to the Texas General Land Office (TGLO). The TGLO raised no objections to the Federal Consistency Determination. Based on this consultation, the FAA determined construction and operation of the launch site was consistent with the enforceable policies of the Texas Coastal Management Program. The Federal Consistency Determination remains unchanged. Therefore, the Proposed Action is still consistent with the Texas Coastal Management Program. Accordingly, the data and analyses contained in the 2014 EIS remain substantially valid, and the Proposed Action would not result in a significant impact on coastal resources.

## Department of Transportation Act Section 4(f)

Impacts on Section 4(f) properties under the Proposed Action would be similar to those impacts described in the 2014 EIS for construction and operations. The 2014 EIS determined construction and operation of the VLA and Control Center Area would not result in a physical or constructive use of any Section 4(f) property. The Proposed Action would not result in any potential construction-related or operational impacts on Section 4(f) properties which would be considered outside the scope of impacts analyzed in the 2014 EIS. Construction would occur within the same project area analyzed for the Control Center Area and VLA and launch operations would occur at a lower frequency than analyzed in the 2014 EIS. Accordingly, the data and analyses contained in the 2014 EIS remain substantially valid, and the Proposed Action would not result in a significant impact on Section 4(f) properties.

## Farmlands

There are no farmlands located within or near the Texas Launch Site. Farmlands were dismissed from analysis in the 2014 EIS. Thus, the Proposed Action would not impact farmlands.

## Hazardous Materials, Solid Waste, and Pollution Prevention

Impacts related to hazardous materials, solid waste, and pollution prevention under the Proposed Action would be similar to those impacts described in the 2014 EIS for construction and operations. Construction and operations would use products containing hazardous materials, including propellant, paints, solvents, oils, lubricants, acids, batteries, surface coating, and cleaning compounds. Implementation of appropriate handling and management procedures for hazardous materials, hazardous wastes, and solid wastes, would avoid or minimize the potential for impacts. Any potential accidental releases of hazardous materials would be managed according to SpaceX's Hazardous Materials Emergency Response Plan. Accordingly, the data and analyses contained in the

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<sup>3</sup> Because the applicant (SpaceX) is seeking a license from the FAA, and the action is not a direct Federal activity (15 CFR part 930), the FAA is not required to submit a consistency determination. Rather, the applicant (SpaceX) is required to submit a consistency certification.

2014 EIS 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 similar to those impacts described in the 2014 EIS for construction and operations. The 2014 EIS determined construction and operation of the launch site would directly impact the historic integrity of the Palmito Ranch Battlefield National Historic Landmark (NHL) through visual impacts, including construction of towers and lighting. The FAA and other consulting parties executed a Programmatic Agreement (PA) and MOA to mitigate adverse effects on historic properties. Under the Proposed Action, to avoid or minimize visual impacts on the NHL, any infrastructure over 30 feet tall would be painted a color that is agreed-upon by the consulting parties, in accordance with the MOA. No additional impacts to the historic integrity of the Palmito Ranch Battlefield NHL or any other historic property would occur from construction and operations associated with the Starship experimental test program. The methane flare stack would not be over 30 feet tall. Based on 1) the distance from the VLA to the NHL and 2) photographs taken from the NHL looking towards the VLA, the flare stack would not be noticeable to the naked eye from the NHL. However, when the stack is emitting a flame (i.e., whenever methane is being stored or loaded and unloaded from the Starship), the flame may be visible from the NHL (most noticeable at night). Additional information on visual impacts is found below in the visual effects section.

In accordance with Stipulation VIII of the PA, the FAA notified the Section 106 consulting parties of the proposed changes to the undertaking. The FAA has determined the proposed changes do not require modifying the PA. The FAA did not receive any objections from the consulting parties. Along with this WR, the FAA sent a letter to the consulting parties identifying the proposed changes to the undertaking.

The Proposed Action is not expected to impact archeological resources. Any unanticipated discoveries during construction would be subject to the management guidelines established in the Unanticipated Discoveries Plan. Accordingly, the data and analyses contained in the 2014 EIS remain substantially valid, and the Proposed Action would not result in a significant impact on historical, architectural, archeological, and cultural resources.

## **Land Use**

Land use impacts under the Proposed Action would be similar to those impacts described in the 2014 EIS for construction and operations. Phase 1 and Phase 2 construction would change land use from vacant, undeveloped, open space, to a mixed-use facility. Since Cameron County does not have a land use plan or zoning in unincorporated areas, these land use changes do not violate local land use ordinances. Accordingly, the data and analyses contained in the 2014 EIS remain substantially valid, and the Proposed Action would not result in 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 similar to those impacts described in the 2014 EIS for construction and operations. Energy required for construction activities would predominantly be associated with operating construction equipment and generators, which would require the supply of gasoline and diesel fuels. Although construction may have a minimal requirement for single-phase electrical power, no significant impact to energy supply is anticipated. The solar arrays could provide for all of the power demands of the launch site, making the launch site self-sustaining, utilizing a fully renewable energy source. If utility upgrades were not needed, the use of solar technology would have a beneficial effect on energy supply. The region surrounding Brownsville has sufficient supply of aggregate to meet the requirements for construction. No significant impacts to municipal water supply in Brownsville, or groundwater supply in Cameron County, were identified in the 2014 EIS. Accordingly, the data and analyses contained in the 2014 EIS 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**

Noise and noise-compatible land use impacts from the Proposed Action would be similar to those impacts described in the 2014 EIS for construction and less than those impacts discussed for launch operations. The 2014 EIS concluded significant impacts to land use compatibility would occur because of increased personnel working on-site, traffic, and noise generated from operational activities and from increased noise during launches, particularly to Boca Chica Village (a residential area) and the surrounding public lands.

The estimated noise levels presented in the 2014 EIS for Falcon 9 and Falcon Heavy launches and SpaceX's estimated noise levels for the Proposed Action are shown in Table 5. The noise levels of the Proposed Action are based on SpaceX-measured data from Raptor engine tests conducted at SpaceX's testing facility in McGregor, Texas. Sound pressure levels were measured at varying distances from the test stand before engine ignition and continued until the ignition burn was complete. These measurements were scaled to account for the three Raptor engines that Starship would use.

**Table 5. 2014 EIS Maximum Predicted  $L_{A,max}$  by distance for Falcon 9 and Falcon Heavy vs the Proposed Action (Maximum A-Weighted OASPL)**

Distance (miles)	$L_{A,max}$ (dBA)		
	2014 EIS Prediction		Proposed Action Prediction
	Falcon 9	Falcon Heavy	Starship
0.2	130	135	117
0.3	128	133	112
0.4	125	130	108
0.5	123	128	105
0.6	122	126	103
0.7	120	125	102
0.8	119	123	100
0.9	118	123	99
1	117	122	98
1.5	113	118	93
2	111	115	90
3	107	112	86
4	104	109	84
5	102	107	82
6	100	105	80
7	99	104	79
8	98	103	78
9	96	101	77
10	95	100	76
12	94	99	74
15	92	97	72
17	91	95	71
20	89	94	70

Notes:  $L_{A,max}$  = A-weighted maximum sound level; OASPL = overall sound pressure level; dBA= A-weighted decibel.

In the 2014 EIS, the model predicted a maximum overall sound pressure level of 114 A-weighted decibels (dBA) for the Falcon 9 and 119 dBA for the Falcon Heavy at the nearest house location (approximately 1.8 miles away) during a single launch. The predicted maximum OASPL for the Starship at the nearest house location is 91 dBA. The 2014 EIS concluded that noise levels may exceed the 115 dBA guideline within distances up to approximately 1.2 miles for the Falcon 9 and 2.1 miles for the Falcon Heavy. The noise levels of the Starship may exceed the 115 dBA up to approximately 0.23 miles.

For a Falcon 9 launch, the short-term impacts based on the hearing conservation guideline were not anticipated to be adverse, as there are no housing developments within 1.2 miles of the VLA. However, the short-term impacts based on the hearing conservation guideline within 2.1 miles from a Falcon Heavy launch were anticipated to be adverse, as the 115 dBA guideline would be exceeded

at this distance. The 2014 EIS concluded that significant<sup>4</sup> noise impacts would occur in Boca Chica Village during a nighttime launch of the Falcon 9 or Falcon Heavy (but not daytime launches).

Because 1) the Starship would produce lower noise levels than a Falcon 9 and Falcon Heavy and 2) SpaceX would not be conducting tests at night, no significant noise impacts to Boca Chica Village are expected. Accordingly, the data and analyses contained in the 2014 EIS remain substantially valid, and the Proposed Action would not result in a significant impact related to noise and noise-compatible land use.

## **Socioeconomics, Environmental Justice, and Children’s Environmental Health and Safety Risks**

Impacts related to socioeconomics, environmental justice, and children’s environmental health and safety risks under the Proposed Action would be similar to those impacts described in the 2014 EIS for construction and operations. The 2014 EIS concluded construction and operation of the launch site might have a beneficial impact on the local economy through direct spending, and that the related economic activity might lead to indirect job creation in areas such as the accommodation and food services and retail trade sectors. Construction activities would not result in significant impacts to the housing market.

The Proposed Action would not strain the capacity or affect the quality of emergency response, medical, or public education services. Changes to the viewshed from State Highway 4 would be similar and affect all viewers equally and would therefore not result in disproportionate impacts to environmental justice populations (including minorities and low-income populations). The Proposed Action would not disproportionately adversely affect children’s environmental health and safety. While effects on property values cannot be quantified, potential effects to quality of life for Boca Chica Village residents would still occur based on changes to the noise environment, visual viewshed, nighttime light emissions, traffic, and numbers of people in the vicinity. The Proposed Action would not result in additional construction or operations impacts related to this impact category which are outside the scope of impacts analyzed in the 2014 EIS. Accordingly, the data and analyses contained in the 2014 EIS remain substantially valid, and the Proposed Action would not result in a significant impact related to socioeconomics, environmental justice, and children’s environmental health and safety risks.

## **Visual Effects (including Light Emissions)**

Visual effects under the Proposed Action would be similar to those impacts described in the 2014 EIS for construction and operations. The 2014 EIS determined construction activities would impact the visual environment of residents of Boca Chica Village and travelers on State Highway 4, but the impacts would be intermittent, temporary, and minimized through SpaceX’s Lighting Management

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<sup>4</sup> An impact is considered significant if the action would increase noise by day-night average sound level (DNL) 1.5 dB or more for a noise sensitive area that is 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 no action for the same timeframe.

Plan. In addition, the 2014 EIS concluded that launch site operations would likely have a significant impact on visual resources along State Highway 4 and the Palmito Ranch Battlefield NHL, and that nighttime launch operations (occurring only once per year) would result in considerably higher levels of light emissions than those currently present at Boca Chica Village.

All lighting during Phase 1 and Phase 2 would adhere to SpaceX's Facility Design and Lighting Management Plan, which is intended to minimize lighting impacts on the night sky. The amount of nighttime lighting at the VLA would be less. Aside from the methane flare, SpaceX is planning to avoid or minimize nighttime lighting at the VLA. The approximate 30-foot flare stack would emit a flame whenever methane is being stored or loaded and unloaded from the Ship. The flame is not expected to result in significant visual effects. Accordingly, the data and analyses contained in the 2014 EIS remain substantially valid, and the Proposed Action would not result in a significant impact related to visual effects.

### **Water Resources (including Wetlands, Floodplains, Surface Waters, Groundwater, and Wild and Scenic Rivers)**

Impacts on water resources under the Proposed Action would be similar to those impacts described in the 2014 EIS for construction and operations. There would be no impacts to Wild and Scenic Rivers. The 2014 EIS concluded construction of the launch site (namely the VLA) would result in approximately 6.19 acres of wetland impacts, including direct impact to approximately 3.34 acres of wetlands and the indirect impact to approximately 2.85 acres of wetlands. The U.S. Army Corps of Engineers issued a permit (SWG-2012-00381) on September 9, 2014, which authorized the placement of fill material in 3.3 acres of waters of the U.S. SpaceX requested modifications to the permit to add an additional 2.13 acres of wetland fill. As analyzed in the 2017 WR, the installation of the security fence and road in the VLA would impact approximately 0.08 acres of wetlands bringing the total direct impacts to 5.5 acres.

Phase 1 and Phase 2 construction would not result in a greater amount of wetland impacts. During Phase 2 construction, small areas of the delineated wetlands that were previously identified as being impacted would now be avoided, and areas that were previously identified as being avoided would now be impacted. As shown in Figure 10, the new impact areas are in pink, areas no longer being impacted are shown in white, and previously approved impacts are shown in blue.



**Figure 10. Wetland Impacts from Phase 1 and Phase 2**

(Note: pink = new impact; white = no longer an impact; blue = previously approved impacts)

The total direct wetland impact would be reduced to approximately 5.31 acres when compared to the currently permitted 5.5 acres (Table 6).

**Table 6. Wetland Impact Summary**

Total Currently Permitted Impact	5.5 acres
Total Proposed Impact Avoidance	1.75 acres
Total Proposed New Impact	1.56 acres
<b>Revised Anticipated Total Impact</b>	<b>5.31 acres</b>

SpaceX has received a Section 404 permit from the Corps for wetland impacts and is applying for a permit modification for the reduced area of impact. SpaceX would implement the wetland mitigation plan approved by the Corps.

The launch site is located within the 100-year floodplain. The 2014 EIS determined approximately 4.22 acres of floodplain Zone V10 and 4.37 acres of Zone A8 would be filled in the VLA. The EIS concluded that based on the expected notable adverse impacts on some of the natural and beneficial floodplain values, the Proposed Action would result in a significant floodplain encroachment per Department of Transportation Order 5650.2. In the 2014 EIS, the FAA determined there were no practicable alternatives that would totally avoid impacts to wetlands and floodplains.

All construction would be conducted in accordance with applicable county zoning and would be coordinated with the Cameron County floodplain administrators to receive a development permit. Additional coordination with Cameron County would be required to ensure the proposed construction meets the requirements of the National Flood Insurance Program (NFIP). The NFIP permits development in the floodway if it can be demonstrated that “no-rise” in the base flood elevation would occur. All construction would occur on previously analyzed parcels.

Accordingly, the data and analyses contained in the 2014 EIS remain substantially valid, and the Proposed Action would not result in a significant impact on water resources.

## **Cumulative Impacts**

The Proposed Action would not result in cumulative impacts that would be substantially different from those cumulative impacts analyzed in the 2014 EIS. The 2014 EIS analyzed the environmental impacts of construction and operation of the Texas Launch Site along with the potential environmental impacts of past, present, and reasonably foreseeable future actions and determined the federal action would not result in significant cumulative impacts to any environmental impact category. As discussed above, no significant impacts are expected from the Proposed Action. Impacts associated with the Proposed Action would not be expected to increase beyond those considered in the 2014 EIS. Accordingly, the data and analyses contained in the 2014 EIS remain substantially valid, and the Proposed Action would not be expected to result in significant cumulative impacts.

## **Conclusion**

The 2014 EIS examined the potential for significant environmental impacts and defined the regulatory setting for impacts associated with the FAA issuing launch licenses and/or experimental permits to SpaceX that would allow SpaceX to conduct launches of the Falcon 9 and Falcon Heavy orbital vertical launch vehicles and a variety of reusable suborbital launch vehicles from a private launch site on privately owned property in Cameron County, Texas. The 2014 EIS included constructing a launch site and launching reusable suborbital vehicles. The areas evaluated for environmental impacts included air quality; biological resources (fish, wildlife, and plants); climate; coastal resources; Department of Transportation Section 4(f); farmlands; hazardous materials, pollution prevention, and solid waste; historical, architectural, archaeological, and cultural resources; land use; natural resources and energy supply; noise and noise-compatible land use; socioeconomics, environmental justice, and children's environmental health and safety risks; visual effects (including light emissions); water resources (including surface waters, groundwater, wetlands, floodplains, and wild and scenic rivers); and cumulative impacts.

Based on the above review and in conformity with FAA Order 1050.1F, Paragraph 9-2.c, the FAA has concluded that the issuance of launch licenses and/or experimental permits to SpaceX to conduct Starship tests (wet dress rehearsals, static engine fires, small hops, and medium hops) conforms to the prior environmental documentation, that the data contained in the 2014 EIS remain substantially valid, that there are no significant environmental changes, 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 to support the FAA's action.

Responsible FAA Official: 

Location and Date Issued: Washington DC, May 21, 2019

## References

FAA (Federal Aviation Administration). 2014a. Final Environmental Impact Statement for the SpaceX Texas Launch Site. May.

FAA. 2014b. Written Re-evaluation of the 2014 Final Environmental Impact Statement for the SpaceX Texas Launch Site.

FAA. 2017. Written Re-evaluation of the 2014 Final Environmental Impact Statement for the SpaceX Texas Launch Site.