Federal Aviation Administration

Final Environmental Assessment, Finding of No Significant Impact/Record of Decision for the Kodiak Launch Complex Launch Pad 3

April 2016

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Final Environmental Assessment, Finding of No Significant Impact/Record of Decision for the Kodiak Launch Complex* Launch Pad 3

April 2016

**The Kodiak Launch Complex was renamed as Pacific Spaceport Complex Alaska, effective April 21, 2015. This Final EA keeps the name as Kodiak Launch Complex (KLC) for continuity and ease of reviewing.*

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FINAL ENVIRONMENTAL ASSESSMENT

Kodiak Launch Complex Launch Pad 3

AGENCY: Federal Aviation Administration (FAA), lead agency; National Oceanic and Atmospheric Administration (NOAA), Missile Defense Agency (MDA), National Aeronautics and Space Administration (NASA), U.S. Air Force Space and Missile Systems Center (SMC), cooperating agencies.

ABSTRACT: This Final Environmental Assessment (EA) addresses the potential environmental impacts of the Proposed Action where the FAA would modify the Alaska Aerospace Corporation's (AAC) Launch Site Operator License for the Kodiak Launch Complex (KLC)[1]. The EA evaluates the potential environmental impacts of modifying the Launch Site Operator License to include medium-lift launch capability at KLC with the addition of new infrastructure necessary to support these types of launches, including the construction of a launch pad and associated facilities.

PUBLIC REVIEW PROCESS: In accordance with the National Environmental Policy Act of 1969, as amended (NEPA; 42 United States Code [U.S.C.] 4321, et seq.), Council on Environmental Quality NEPA implementing regulations (40 CFR Parts 1500 to 1508), and FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures*, Change 1 the FAA released the Draft EA for public review on September 15, 2014. A public meeting was held in October 2014 and the comment period ended on November 1, 2014. The FAA issued an updated version of the Draft EA for a second 30-day public review and comment period on December 4, 2015. Interested parties were invited to submit comments by January 11, 2016.

CONTACT INFORMATION: To request copies of the Final EA, please contact Stacey M. Zee, Office of Commercial Space Transportation, Federal Aviation Administration, 800 Independence Avenue, SW, Suite 325, Washington, DC 20591; email Stacey.Zee@faa.gov; or phone (202) 267-9305.
This EA becomes a Federal document when evaluated, signed, and dated by the responsible FAA official.

Issued in Washington, DC on: April 8, 2016

Dr. George C. Nield
Associate Administrator for
Commercial Space Transportation

[1] The Kodiak Launch Complex was renamed as Pacific Spaceport Complex Alaska, effective April 21, 2015. This Final EA keeps the name as Kodiak Launch Complex (KLC) for continuity and ease of reviewing.

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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Office of Commercial Space Transportation

AGENCY: Federal Aviation Administration (FAA), lead; National Oceanic and Atmospheric Administration (NOAA), Missile Defense Agency (MDA), National Aeronautics and Space Administration (NASA), U.S. Air Force Space and Missile Systems Center (SMC), cooperating agencies

ACTION: Kodiak Launch Complex, Kodiak, Alaska, Finding of No Significant Impact (FONSI) and Record of Decision (ROD)

SUMMARY: The FAA is issuing this FONSI/ROD for the modification of Alaska Aerospace Corporation's (AAC's) Launch Site Operator License (LSOL) for the Kodiak Launch Complex (KLC)[1], a commercial launch site currently operated under an FAA LSOL (LSO-03-008), in Kodiak, Alaska. The FAA prepared the attached *Final Environmental Assessment for the Kodiak Launch Complex Launch Pad 3* (the Final EA) in accordance with the National Environmental Policy Act of 1969 (NEPA), 42 United States Code (U.S.C.) §§ 4231–4347 (as amended), and Council on Environmental Quality (CEQ) NEPA implementing regulations (40 Code of Federal Regulations [CFR] Parts 1500 to 1508) to analyze the potential environmental impacts of expanding the launch capability of the KLC to include medium-lift launch capability, with the addition of new infrastructure necessary to support these types of launches, particularly the construction of Launch Pad 3 (LP3). The modified LSOL would authorize KLC to conduct up to six orbital small lift launches and three medium-lift launches per year from the existing launch pads and the proposed LP3. The existing LSOL authorizes KLC to conduct up to nine small-lift orbital and suborbital class launches per year from the existing launch pads. The Final EA evaluated the potential environmental impacts associated with the Proposed Action and the No Action Alternative.

After reviewing and analyzing currently available data and information on existing conditions and the potential impacts of the Proposed Action, the FAA has determined that the Proposed Action would not significantly impact the quality of the human environment. Therefore, preparation of an Environmental Impact Statement (EIS) is not required, and the FAA is issuing this FONSI/ROD. The FAA made this determination in accordance with all applicable environmental laws. The Final EA is incorporated by reference in this FONSI/ROD.

FOR A COPY OF THE ENVIRONMENTAL ASSESSMENT: Visit the following internet address: http://www.faa.gov/about/office_org/headquarters_offices/ast/environmental/nepa_docs/review/operator/ or contact Stacey Zee, Environmental Specialist, Federal Aviation Administration, 800 Independence Avenue, SW, Suite 325, Washington, DC 20591; e-mail Stacey.Zee@faa.gov; or phone (202) 267-9305.

PURPOSE AND NEED: The purpose of FAA's Proposed Action, in connection with the AAC's request for a modification of its Launch Site Operator License at KLC, is to fulfill the FAA's responsibilities as

[1] On April 6, 2015, AAC notified the FAA to change the name of the Kodiak Launch Complex to the Pacific Spaceport Complex Alaska (PSCA), effective April 21, 2015. The FAA responded on April 13, 2015 and updated the launch site operator license, accordingly. This Final EA keeps the name of Kodiak Launch Complex for continuity and ease of the reviewer.

authorized by Executive Order 12465, *Commercial Expendable Launch Vehicle Activities* (49 *FR* 7099, 3 CFR, 1984 Comp., p. 163), and the Commercial Space Launch Act (51 U.S.C. Subtitle V, ch. 509, §§ 50901-50923) for oversight of commercial space launch activities, including issuing launch site operator licenses for the operation of commercial space launch sites. The Proposed Action would be consistent with the objectives of the Commercial Space Launch Act. The need for FAA's Proposed Action results from the statutory direction from Congress under the Commercial Space Launch Act to protect the public health and safety, safety of property, and national security and foreign policy interest of the U.S. and to encourage, facilitate, and promote commercial space launch and reentry activities by the private sector in order to strengthen and expand U.S. space transportation infrastructure.

The purpose of AAC's proposal is to fulfill the AAC charter as stated in Alaska Statue 26.27.090 to lead the development and exploration of space in the State of Alaska by developing the launch infrastructure to support space launch activity. The need for AAC's proposal is based on potential business ventures that are considering the KLC as the site to launch medium-lift launch vehicles for a variety of commercial, civil, and defense payloads. Currently, Vandenberg Air Force Base, California, is the only launch site in the United States that can launch medium-lift launch vehicles into Polar, Sun Synchronous, and Highly Elliptical orbits. Expanding the existing capabilities at the KLC is expected to provide commercial and government missions schedule flexibility, cost competition, and launch site resilience, and may keep space launch missions from going overseas.

PROPOSED ACTION: Under the Proposed Action addressed in the attached Final EA, the FAA would modify the AAC's LSOL (LSO-03-008) for KLC to include medium-lift launch capability, with the addition of new infrastructure necessary to support those launches. As part of the Proposed Action, AAC would make improvements to the KLC to add both solid and liquid-propellant, medium-lift launch capability, and to operate the KLC in the future as a small-lift and medium-lift launch complex. Proposed improvements include Launch Pad 3 (LP3), a Vehicle Processing Facility, a Rocket Staging Facility, a Liquid Fuel Facility, a Mission Control Center, and modifications to Pasagshak Point Road. The KLC could be used to conduct up to six orbital small lift launches and three medium-lift launches per year from the existing launch pads and the proposed LP3. To be conservative in the analysis of potential environmental impacts in the Final EA, nine medium-lift launches per year are used as inputs.

ALTERNATIVES CONSIDERED: Alternatives analyzed in the EA include the Proposed Action and the No Action Alternative. Under the No Action Alternative, the FAA would not modify the AAC's LSOL for the KLC to include medium-lift capability. The AAC would not proceed with the construction of medium-lift launch support infrastructure at KLC, including LP3. The No Action Alternative would not meet the purpose and need for the action.

PUBLIC INVOLVEMENT

On September 15, 2014, the FAA released the *Draft Environmental Assessment for the Kodiak Launch Complex Launch Pad 3* (2014 Draft EA) for a 30-day public review and comment period, which was extended to November 1, 2014, in response to public comments. The FAA received 54 written comments and 26 oral comments on the Draft EA during the 30-day comment period.

After taking into consideration the nature of public comments received on the 2014 Draft EA, the FAA issued an updated *Second Draft Environmental Assessment for the Kodiak Launch Complex Launch Pad 3* (2015 Second Draft EA) on December 4, 2015, providing the public with an opportunity to review and comment on updates and clarification information that had been added to the EA in response to public

comments received on the 2014 Draft EA. The public review period ended on January 11, 2016, and the FAA received 4 written comments on the Second Draft EA.

The Final EA appendices contain information on the agency and public involvement documentation. Please see Appendix R and Appendix T for comments received on the Draft EA and Second Draft EA, respectively, and the FAA's responses to those comments.

ENVIRONMENTAL IMPACTS

The potential environmental impacts from the Proposed Action and No Action Alternative were evaluated in the attached Final EA for each of the environmental impact categories identified in FAA Order 1050.1E, Change 1, *Environmental Impacts: Policies and Procedures*[2]. Chapter 3 of the attached Final EA describes the physical, natural, and human environment within the project ROI. In addition, this chapter identifies those environmental impact categories that are not analyzed in detail, explaining why the Proposed Action would have no potential effects on those environmental impact categories. Those categories are coastal resources, wild and scenic rivers, farmlands, and floodplains. Chapter 4 of the attached Final EA provides detailed evaluations of the environmental consequences for each of the remaining environmental impact categories and documents the finding that no significant environmental impacts would result from the Proposed Action. In addition, Chapter 4 addresses the requirements of special purpose laws, regulations, and executive orders. A summary of the documented findings for each impact category, including requisite findings with respect to relevant special purpose laws, regulations, and executive orders, is presented below.

Air Quality

Though the construction and operational impacts associated with the Proposed Action would increase total annual emissions compared to current operations, they would not exceed the National Ambient Air Quality Standards (NAAQS), and impacts to air quality would be less than significant. During construction, a temporary, localized degradation of air quality would occur from the increased airborne particulate levels and emissions; however, these impacts would be minor as construction activities would be limited. Launch operations would generate additional emissions; however, emissions from rocket launches dissipate after each launch and short-term effects are minor and temporary in nature. Furthermore, the expanded launch capabilities at the KLC would not increase the total number of launches per year, and the chemical composition of the exhaust products from the proposed medium-lift solid-propellant rockets would be the same when compared to small-lift rockets previously launched from the KLC, but in larger quantities. As Kodiak Island is well suited to the dispersion of pollutants due to the prevailing wind conditions, the additional emissions associated with the Proposed Action would not have negative, long-term atmospheric effects.

Compatible Land Use

The Proposed Action is expected to have a negligible effect on compatible land use as there would be no changes in land use, and a negligible increase in temporary noise effects when compared to the existing launch effects. The Proposed Action is within the boundaries of the existing KLC

[2] On July 16, 2015, FAA Order 1050.1F became effective, updating and replacing Order 1050.1E. Because this EA was substantially drafted while Order 1050.1E was in effect, it would not be practicable to fully revise the document to follow the procedural structure of Order 1050.1F. See Order 1050.1F para. 1-9.

Interagency Land Management Assignment (ILMA) and there would be no additional land acquisitions, conversions, or changes to the ILMA.

Department of Transportation Act, Section 4(f)

The only Section 4(f) resource that occurs within the vicinity of the KLC is the Pasagshak State Recreation Site, which is located approximately six miles from the KLC. No construction associated with LP3 would occur within or adjacent to this 4(f) resource; therefore, no physical use of this Section 4(f) property would occur. The Proposed Action would not involve an increase in launch frequency, and no additional KLC-related increases in visitation are anticipated. Noise associated with launch operations would slightly increase at the Pasagshak State Recreation Site under the Proposed Action. However, because these impacts would be minor, temporary, and would only occur 9 times a year at a maximum, the recreational value of the Pasagshak State Recreation Site would not be substantially impaired. Therefore, there would be no constructive use of this Section 4(f) resource. In a letter to ADNR dated October 15, 2014, the FAA requested concurrence with its determination that the Proposed Action would not constitute a constructive use of the Pasagshak State Recreation Site. On November 3, 2014, ADNR concurred with the FAA's determination that the operational activities associated with the proposed modifications to the KLC would not constitute a constructive use of the Pasagshak State Recreation Site. Because there would be no direct or constructive use of any 4(f) resource, there would be no significant impacts to 4(f) resources from the Proposed Action.

The Proposed Action is expected to have a minor effect on recreation opportunities at Narrow Cape. However, these activities occur within the boundaries of the KLC, an existing facility which is not a Section 4(f) resource. Consistent with procedures occurring prior to the implementation of the Proposed Action, the Narrow Cape area would be closed to the public immediately before and during launch activities. During these brief closure periods, Fossil Beach, Surf Beach, Twin Lakes, and other state land used for recreation on Narrow Cape and within KLC would not be accessible to the public. However, these areas would remain open for recreational activities at all other times. As a result, impacts would be less than significant.

Fish and Wildlife

Fish

The Proposed Action is not expected to result in significant impacts to fish or wildlife. The Proposed Action is not anticipated to directly or indirectly affect fish populations. The Proposed Action does not involve construction within any fish-bearing stream or water body, nor would it result in measurable degradation of surface water quality.

Birds (including Bald Eagles)

Adverse effects to land and marine birds are not anticipated to result from the Proposed Action. Bald eagle nest sites are known and have been monitored since the construction of the KLC; however, the closest eagle's nest is 1.3 miles from the proposed location of LP3, well beyond the .5 mile noise-buffer zone recommended by the United States Fish and Wildlife Service (USFWS) for bald eagles. The USFWS stated a permit is not clearly necessary for medium-lift launches, but AAC may wish to apply for a permit to ensure AAC has appropriate protections in place if take were to occur.

Mammals

Potential direct and indirect effects on terrestrial marine mammals are predicted to be minor and isolated, consisting primarily of disturbances from the noise-related effects of rocket launches. Disturbances from rocket launches would be brief and are not expected to have a lasting effect on wildlife. The Proposed Action is not anticipated to affect local mammal populations.

Based on previous rocket launches at the KLC, the National Marine Fisheries Service (NMFS) has concluded that physical effects to marine mammals are not anticipated to result from the Proposed Action. Increases in anticipated noise intensities and durations from the medium-lift rockets are small when compared to small-lift rockets, and do not exceed the 101.4 A-weighted Decibel (dBA) level for which NMFS' analysis was based upon in its Biological Opinion (BO) and Letter of Authorization. No direct or indirect noise effects on harbor seals are anticipated from the Proposed Action. Therefore, no additional noise effects to marine mammals from the Proposed Action are anticipated to result from the expanded launch capabilities at the KLC. Sonic booms would occur beyond the edge of the Outer Continental Shelf break over the deep ocean, at a high altitude (several miles above the ocean depending on specific mission parameters), and far offshore, and thus would not adversely affect marine mammals. Falling debris from rockets has been assessed as extremely unlikely to injure any marine mammals. The FAA sent a letter, dated January 29, 2013, to the NMFS stating that the FAA believes 50 CFR 217 Subpart H and associated Letter of Authorization (LOA) remain valid for the Proposed Action and requested the NMFS to contact the FAA if the NMFS disagrees. NMFS has concurred with FAA's conclusion and no further consultation with the NMFS is necessary under the Marine Mammal Protection Act.

Threatened or Endangered Species

No federally-listed threatened, endangered, or candidate avian or terrestrial mammal species occur within the vicinity of the KLC. However, there are several federally-listed marine mammals present in waters offshore and on Ugak Island, and there are two bird species listed as threatened or endangered within the action area: Steller's eider and short-tailed albatross. Two candidate bird species could occur within the vicinity of Narrow ape. Kittlitz's murrelet and yellow-billed loons. However, occurrences of these candidate species are uncommon or rare near Narrow Cape, and potential effects are anticipated to be negligible.

The FAA reinitiated Section 7 consultation with the USFWS in October 2012. Regarding Endangered Species Act (ESA)-listed species under NMFS jurisdiction (three whale species and Steller sea lion), the FAA sent a letter to NMFS on January 29, 2013 stating the FAA believes the NMFS BO remains valid for the Proposed Action and requested the NMFS to contact the FAA if the NMFS disagrees. NMFS concurred with FAA's conclusion and no further consultation with the NMFS is necessary under the ESA.

Steller Sea Lion

The FAA sent a letter dated January 29, 2013 to the NMFS stating the FAA has determined that the existing NMFS BO remains valid for the Proposed Action; the NMFS has concurred with the FAA's conclusion. No further consultation for the Steller Sea Lion with the NMFS is necessary under the ESA.

Northern Sea Otter

The FAA determined that the Proposed Action is *not likely to adversely affect* the Northern Sea Otter. Construction and operational activities associated with the Proposed Action would have *no effect on designated critical habitat*. On December 14, 2012, the USFWS concurred with the FAA's determination regarding these species and critical habitat determinations.

Whales

In its 2011 BO, the NMFS determined that these whale species would be *not likely to be adversely affected* by the construction and operation of the KLC. The FAA has determined that the NMFS BO remains valid for the Proposed Action. The NMFS has concurred with the FAA's conclusion and no further consultation with the NMFS under the ESA for protected whales is necessary.

Avian Species

The FAA has determined that the Proposed Action would not adversely affect the Kittlitz's Murrelet or the Yellow-Billed Loon, and is *not likely to adversely affect* the Steller's eider; the short-tailed albatross,. The USFWS concurred with the FAA's determination regarding the Kittlitz's Murrelet, Steller's eider, and Yellow-Billed Loon. The USFWS determined the Proposed Action would have no effect on the short-tailed albatross.

Plants

Direct effects to plants are anticipated to result from construction activities; however, the disturbed plant communities are not unique or of high value. Approximately 22 acres of plants would be disturbed by construction activities, 16 of which would be replanted. The vast majority of the KLC would remain vegetated, and future operational activities of the Proposed Action would not disturb plant communities beyond current operational activities. No permanent adverse direct or indirect effects are anticipated in association with launch activities.

Hazardous Materials, Pollution Prevention, and Solid Waste

Direct and indirect effects would not occur as a result of increased fuel storage at the KLC. The Proposed Action would not increase the number of launches per year, but would require additional storage capacity for liquid fuels. The proposed liquid propellants consist of a combination of Rocket Propellant 1 (RP1) and liquid oxygen. An estimated 30,000 gallons of RP1 would need to be stored onsite at the KLC. The increased volume of storage items would not increase likelihood of a spill; though the potential volume of a spill could be greater. However, several of the KLC's existing facility plans, such as the Spill Prevention, Control, and Countermeasure plan, would to be updated to reflect changes in hazardous materials storage and hazardous waste management policies, and hazardous materials would continue to be handled according to Federal, state, and local laws and regulations. Furthermore, the proposed launching of medium-lift rockets would not increase the amount of solid waste generated at KLC; solid waste management would continue as it is currently authorized.

Historical, Architectural, Archaeological, and Cultural Resources

The Proposed Action would have no direct or indirect effect on historical, architectural, archaeological, and cultural resources, and impacts would be less than significant. The Area of Potential Effects for the construction of LP3, associated facilities, and Pasagshak Point Road upgrades would be primarily confined to the actual footprints of the planned structures and roads, as well as those immediately adjacent areas that would be used for equipment access and construction staging. No archeological resources are documented near proposed construction activities. The Alaska State Historic Preservation Officer (SHPO) provided concurrence with a finding of "No Historic Properties Affected" on July l8, 2012.

During the public comment period for the 2014 Draft EA, the SHPO and the Alutiiq Museum & Archaeological Repository in Kodiak notified the FAA and AAC about the potential for the presence of previously unidentified buried archeological resources at the KLC, including in the area of direct impact from the Proposed Action. Because there is a very low probability of locating intact archaeological deposits that date to the terminal Pleistocene-era, the FAA concluded that the effects finding for the Undertaking remains as *no historic properties affected*, pursuant to CFR 800.5(b). However, considering there is a potential to encounter significant archaeological resources within the area of proposed construction and the geological characteristics of the location, the FAA has determined it would be appropriate and feasible to conduct identification efforts in advance of construction. Thus, the FAA would ensure the development of a testing plan for the site, which would be prepared in consultation with the SHPO and the Alutiiq Museum, prior to the commencement of any construction activities, and a testing program would be initiated. Additionally, in consultation with the SHPO and FAA, AAC would have a monitoring and unanticipated discovery plan prepared by a professionally qualified archaeologist, and approved by the SHPO and FAA prior to any ground disturbance during construction. This plan would be prepared, and the requirements followed, during all ground-disturbing activities, regardless of the results of the pre-construction archaeological testing.

Light Emissions and Visual Effects

Impacts to light emissions and visual resources are expected to be less than significant. The Proposed Action would not increase the number of annual launches at KLC and additional light emission effects are not anticipated. The viewshed of the KLC complex would change to a minor degree after construction of LP3 and associated facilities, but the proposed instillations would be consistent with the existing visual landscape.

Natural Resource and Energy Supply

The Proposed Action is expected to have a negligible effect on the existing Kodiak energy supply during peak launch activities, and no measurable effect when averaged over time. Additional proposed facilities would increase the overall electrical demand at the KLC to 4 megawatt-hours, but this added use would not exceed the current design load for the KLC. Increased electrical demands are within the capacity of Kodiak Electric Association to accommodate.

The Proposed Action would require the use of additional liquid fuels and would constitute a notable fuel consumption increase at the facility; however, fuel consumption would be minimized to the maximum extent practicable to achieve vehicle launch in compliance with Executive Order 13123, *Greening the Government through Efficient Energy Management*.

Each liquid-propellant launch at LP3 would require an additional 50,000 gallons of deluge water; however, this incremental use of water for liquid-propellant launches at LP3 would not put a large demand on groundwater supply. The KLC currently uses approximately 110,000 gallons per year of the authorized 335,627 gallons; therefore, launch operations associated with the Proposed Action would not exceed authorized water quantities.

Noise

The Proposed Action is not anticipated to result in any significant changes in the overall noise environment within the affected area. Construction noise would be temporary and would not impact areas beyond the KLC. Noise effects from launching medium-lift rockets would be comparable to effects associated with small-lift rockets, which were determined to be less than significant. There would be a slight increase in the maximum noise levels to the west and southwest of the KLC during launches of medium-lift vehicles from LP3. Launch noise levels would return back to the existing ambient levels within 2 minutes after launch. Sonic booms generated by the Proposed Action would impact the ocean's surface beyond the edge of the Outer Continental Shelf.

Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks

The Proposed Action is expected to have negligible socioeconomic effects and would have no high, adverse impact on any resource category, and therefore no disproportionately high and adverse human health or environmental effects on minority and low-income populations or children would be expected. Construction operations associated with the Proposed Action would require a temporary workforce and would be expected to have a minor positive impact to the area's economy. Safety zone closures resulting from launch operations would have the potential to adversely affect local sport, subsistence, and commercial fisherman for up to eight hours on launch days. However, launch operations would only interrupt fishing activities 9 days a year, so these impacts would be less than significant. Traffic disruptions would be limited to approximately one per launch mission for a maximum of 9 times a year; therefore, there would be a minor impact on traffic. Tourism is unlikely to be affected by the Proposed Action.

Water Quality

The Proposed Action would not be expected to result in significant impacts to water quality. Construction activities would not directly affect surface waters, as there are no surface waters within or adjacent to the footprints of the proposed facilities and road improvements. The primary water quality concerns are the potential changes in pH to streams and lakes from acid deposition (HCl) and the potential for accumulation of combustion byproducts (aluminum oxide) in localized surface waters. Accumulation and potential water quality effects from aluminum oxide are only possible under certain environmental conditions and specific pH ranges, and therefore are not anticipated. The release of HCl released as a result of solid rocket launches would not result in measurable degradation of surface water quality because the exhaust and associated chemical compounds would be dispersed over a large area and immediately diluted and/or neutralized by receiving waters. Emission quantity from medium-lift rockets may be slighter greater, but the amount of acid deposition is not anticipated to exceed previous amounts enough to affect localized water quality. Deluge water would be captured in a containment pond at the end of the flame trench providing an area for the water to evaporate or be drained into the surrounding area after testing the water to verify no presence of harmful material. No measurable effect to marine waters

is expected from launch operations, and ejected materials (rocket casings) represent no substantial threat to ocean water quality.

Wetlands

The Proposed Action is expected to have a negligible effect on Narrow Cape wetlands. Construction activities associated with the Proposed Action would disturb meadow-like upland areas; however, the proposed road leading to LP3 has been plotted to minimize the amount of wetland that would be filled to construct the road. The impacted wetlands would consist of saturated/seasonally flooded emergent meadows (PEM1B/C). This type of wetland is the dominant form of wetland at the KLC, and the area to be filled is small enough to have a minimal impact on the overall ecology. The proposed flame trench associated with LP3 would be oriented to minimize surface water effects. The trench would direct launch emissions towards a large valley where exhaust could dissipate prior to reaching ground surface. The valley contains wetlands, but neither the wetland's structure nor inherent functions would be affected by the Proposed Action.

Please refer to Chapter 4 of the Final EA for a full discussion of the determination for each environmental impact category. Chapter 4 of the Final EA also provides an analysis of the potential cumulative impacts of the Proposed Action when added to other past, present, and reasonably foreseeable future actions. The FAA has determined that the Proposed Action would not result in significant cumulative impacts related to Air Quality, Climate (GHG emissions), and Noise.

CONDITIONS AND MITIGATION

As prescribed by 40 CFR § 1505.3, the FAA shall take steps as appropriate to the action, through mechanisms such as the enforcement of licensing conditions, and shall monitor these as necessary to ensure that AAC implements measures with respect to mitigation and/or avoidance of impacts as set forth in Chapter 4 of the Final EA under the various impact categories. These mitigation and avoidance measures include:

- At least six months prior to the start of construction AAC will hire a Secretary of the Interior-qualified professional archaeologist. With input from geologist, Gary Carver (or another qualified geologist, if necessary), who is the lead author of the "Active Faults on Northwestern Kodiak Island, Alaska" paper on active faults on northwestern Kodiak Island, the area of direct impact for all proposed construction would be overlaid onto a sensitivity map that identifies the locations of the prehistoric beach sites. Using this exhibit, in consultation with the SHPO and FAA, the archaeologist would prepare a survey methodology and testing plan (Testing Plan) that identifies appropriate locations for approximately one-meter-deep back-hoe trenches where beaches and construction activities overlap. The Testing Plan would also include protective measures should deposits be encountered. Upon the SHPO's and FAA's approval of the plan, testing may be undertaken and would commence at least three months prior to construction.
- A research design/data recovery plan would not be prepared unless resources are encountered. Should resources be encountered, they would be protected by measures specified in the Testing Plan. A data recovery plan and a research design would be prepared by AAC within 15 days of the discovery, in consultation with the SHPO and FAA, following the Archaeological Research Designs guidance that is part of the *Office of History and Archaeology, Alaska Department of Natural Resources' Historic Preservation Series* (2003), as well as the Secretary of the Interior's guidelines, and the *Advisory Council on Historic Preservation's Treatment of Archaeological*

Properties: A Handbook. Curation of artifacts would be included in the research design. The plan would be approved by the SHPO and FAA, and all prescribed fieldwork would be completed prior to any construction activities. Additionally, in consultation with the SHPO and FAA, AAC would have a monitoring and unanticipated discovery plan prepared by a professionally qualified archaeologist, and approved by the SHPO and FAA prior to any ground disturbance during construction. This plan would be prepared, and the requirements followed, during all ground-disturbing activities, regardless of the results of the pre-construction archaeological testing.

- Marine mammals would be monitored and reported in accordance with the Final Rule issued by NMFS (50 CFR Part 217) that governs the unintentional taking of marine mammals incidental to rocket launch operations at KLC. Under the Final Rule, which covers the period from 2011 to 2016, NMFS issues annual LOAs with specific monitoring and reporting requirements. The current LOA issued to AAC is valid from August 1, 2015 to March 22, 2016, and requires AAC to conduct quarterly marine mammal surveys, launch-specific video monitoring of a haulout on Ugak Island, and prepare launch-specific and annual reports. The quarterly surveys count the number of harbor seals and Steller sea lions that are hauled out on Ugak Island, which is three miles south of Narrow Cape. Other marine mammal species are noted if observed during these surveys. Reported information is reviewed prior to issuance of an annual LOA and upon renewal of the Final Rule (every five years). AAC is in the process of renewing the documentation.

DECISION CONSIDERATIONS

The FAA decision in this FONSI/ROD is based on a comparative examination of environmental impacts for each of the alternatives studied during the environmental review process. The EA discloses the potential environmental impacts for each of the alternatives and provides a full and fair discussion of those impacts. There would be no significant impacts, including no significant cumulative impacts, to the natural environment or surrounding population as a result of the Proposed Action.

After careful and thorough consideration of the facts contained herein, I find the proposed Federal action is consistent with existing national environmental policies and objectives as set forth in Section 101 of NEPA and other applicable environmental requirements and will not significantly affect the quality of the human environment or otherwise include any condition requiring consultation pursuant to Section 102(2)(c) of NEPA. As a result, the FAA will not prepare an EIS for this action.

APPROVED:

April 8, 2016

Dr. George C. Nield
Associate Administrator for
Commercial Space Transportation

Date

RECORD OF DECISION AND ORDER

Kodiak Launch Complex, Kodiak, Alaska

The FAA recognizes its responsibilities under NEPA, CEQ regulations, and its own directives. Recognizing these responsibilities, the FAA has carefully considered the objectives of the proposed modification of AAC's LSOL to include medium-lift launch capability at the KLC, in relation to environmental factors. Based upon the above analysis, the FAA has determined that the Proposed Action meets the purpose and need of the proposed project.

Having carefully considered the public safety and operational objectives of the project, as well as being properly advised as to the anticipated environmental impacts of the proposal, under the authority delegated by the Administrator of the FAA, we find that the project is reasonably supported.

Therefore, we direct that the following action be taken under the authority of 51 U.S.C. §§ 50901 *et seq.* and 49 U.S.C. §§ 47101 *et seq.*):

- Federal environmental approval for the modification of AAC's LSOL for the operation of a commercial space launch site at the KLC to include medium-lift launch capability, with the addition of new infrastructure necessary to support these types of launches. This environmental approval is subject to the environmental mitigation/avoidance measures identified in this above FONSI/ROD.

This Decision does not in any way constitute a decision to grant modification of the LSOL. Additional non-environmental statutory, regulatory, and administrative findings are needed to approve modification of such licenses. This Decision represents only a determination that the environmental prerequisites of the Proposed Action have been met.

Issued on: April 8, 2016

Dr. George C. Nield

Associate Administrator for
Commercial Space Transportation

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FINAL ENVIRONMENTAL ASSESSMENT

Kodiak Launch Complex Launch Pad 3

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ACRONYMS AND ABBREVIATIONS

AAC	Alaska Aerospace Corporation
ABR	ABR, Inc.
ADCCED	Alaska Department of Commerce, Community, and Economic Development
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
AHRS	Alaska Heritage Resources Survey
ANILCA	Alaska National Interest Lands Conservation Act
APE	Area of Potential Effect
BMPs	Best Management Practices
BO	Biological Opinion
CAA	Clean Air Act
CDP	Census Demographic Profile
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESQG	Conditionally Exempt Small Quantity Generator
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CWA	Federal Clean Water Act
dB	Decibel
dBA	A-weighted Decibel
DNL	Day-Night Average Sound Level
DoD	Department of Defense
DODM	Department of Defense Manual
DOT&PF	Alaska Department of Transportation and Public Facilities
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ENRI	Environmental and Natural Resources Institute
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESP	Explosive Site Plan
FAA	Federal Aviation Administration
FONSI	Finding of No Significant Impact

FWCA	Fish and Wildlife Coordination Act
GSO	Ground Safety Officer
HC	Hazard Class
HCl	Hydrogen Chloride
HD	Hazard Division
HMTA	Hazardous Materials Transportation Act
HTPB	Hydroxl-terminated polybutadiene
ILMA	Interagency Land Management Assignment
IPF	Integration and Processing Facility
KEA	Kodiak Electric Association
Kg	Kilograms
KIB	Kodiak Island Borough
KLC	Kodiak Launch Complex
LCC	Launch Control Center
LFF	Liquid Fuel Facility
LOA	Letter of Authorization
LOX/LO_2	Liquid Oxygen
LP1	Launch Pad 1 (orbital)
LP2	Launch Pad 2 (suborbital)
LP3	Launch Pad 3
LSO	Launch Site Operator License
LSS	Launch Service Structure
MBTA	Migratory Bird Treaty Act
MCC	Mission Control Center
MDA	Missile Defense Agency
MMPA	Marine Mammal Protection Act
MP	Milepost
MSF	Maintenance Support Facility
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NE	Northeast
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration

NOx	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPS	Non-Point Source
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
OHA	Office of History and Archeology
OSHA	Occupational Safety and Health Administration
PAEL	Pre-Approved Emission Limits
PBAN	Polybutadiene acrylonitrile
pH	Solvated Hydrogen
PM10	Particulate Matter
PPF	Payload Processing Facility
PWS	Public Water System
QD	Explosive Quantity Distance
R&M	R&M Consultants, Inc.
RCRA	Resource Conservation and Recovery Act
RMSF	Rocket Motor Storage Facility
ROD	Record of Decision
RP1	Rocket Propellant One
RSF	Rocket Staging Facility
RSRM	Reusable Solid Rocket Motor
SE	Southeast
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SMC	U.S. Air Force Space and Missile Systems Center
SPCC	Spill Prevention, Control, and Countermeasure
SW	Southwest
SWPPP	Stormwater Pollution Prevention Plan
TSCA	Toxic Substances Control Act
U.S.	United States
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
USCB	U.S. Census Bureau
USCG	United States Coast Guard
USDA	U.S. Department of Agriculture

USDHS	U.S. Department of Homeland Security
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UST	Underground Storage Tank
VAFB	Vandenberg Air Force Base
VPF	Vehicle Processing Facility
WRCC	Western Regional Climate Center
WWII	World War 2

FINAL ENVIRONMENTAL ASSESSMENT

Kodiak Launch Complex Launch Pad 3

1 INTRODUCTION

Alaska Aerospace Corporation (AAC) is proposing to expand the launch capabilities of the Kodiak Launch Complex (KLC)[2], a commercial launch site currently operated under a Federal Aviation Administration (FAA) Launch Site Operator License (LSO-03-008). The existing license authorizes small-lift operations. The FAA Office of Commercial Space Transportation (AST) would have to modify the current license to include AAC's proposed expanded launch capabilities. The expansion would include medium-lift launch capability at KLC and the addition of new infrastructure to support these launches, including the construction of an additional launch pad and associated facilities (See Section 2.1 for a more detailed description of the Proposed Action).

Modifying a Launch Site Operator License is considered a major Federal action subject to environmental review under the National Environmental Policy Act of 1969, as amended (NEPA; 42 United States Code [U.S.C.] 4321, et seq.). The FAA/AST is the lead agency responsible for preparing this Final Environmental Assessment (EA) in accordance with NEPA, Council on Environmental Quality (CEQ) NEPA implementing regulations (40 Code of Federal Regulations [CFR] Parts 1500 to 1508), and FAA Order 1050.1E, Environmental Impacts: Policies and Procedures, Change 1.[3]

The National Oceanic and Atmospheric Administration (NOAA), the Missile Defense Agency (MDA), the National Aeronautics and Space Administration (NASA), and the U.S. Air Force Space and Missile System Center (SMC) are cooperating agencies on this EA. NOAA is serving as a cooperating agency on this EA due to special expertise and jurisdiction on marine resources near KLC, while MDA, NASA, and SMC are serving as cooperating agencies owing to special expertise related to launch operations.

NOAA Fisheries has jurisdiction over the marine resources surrounding the KLC and is providing special expertise regarding the potential effects of the Proposed Action on the federally-listed species and marine mammals addressed in the existing Biological Opinion and Letters of Authorization for launch operations at KLC.

The MDA and SMC are participating as cooperating agencies due to related program experience, the similarity of the Proposed Action to actions taken by the MDA and SMC, as well as their possible use of the KLC as a launch site.

NASA is participating as a cooperating agency as a result of its related program experience and special expertise with respect to space launch vehicles, launch operations, and potential environmental impacts from launch operations. Additionally, it is possible that in the future, a NASA-sponsored payload or technology demonstration could be flown from the KLC.

[2] On April 6, 2015, AAC notified the FAA to change the name of the Kodiak Launch Complex to the Pacific Spaceport Complex Alaska, effective April 21, 2015. The FAA responded on April 13, 2015 and updated the launch site operator license accordingly. This Final EA keeps the name as Kodiak Launch Complex for continuity and ease of the reviewer.

[3] On July 16, 2015, FAA Order 1050.1F became effective, updating and replacing Order 1050.1E. Because this Final EA was substantially drafted while Order 1050.1E was in effect, it would not be practicable to fully revise the document to follow the procedural structure of Order 1050.1F. See Order 1050.1F para. 1-9.

1.0 BACKGROUND

The KLC is a commercial launch site serving both government and commercial launch customers and is located on Narrow Cape on Alaska's Kodiak Island (Figure 1). Under the Proposed Action, the FAA would modify the existing license to include medium-lift launch capability at KLC with the addition of new infrastructure necessary to support these types of launches. As appropriate, this EA may also provide environmental documentation for launch vehicle license applications from vehicle operators at the KLC as well as for renewals of the KLC Launch Site Operator License and Launch Vehicle Licenses.

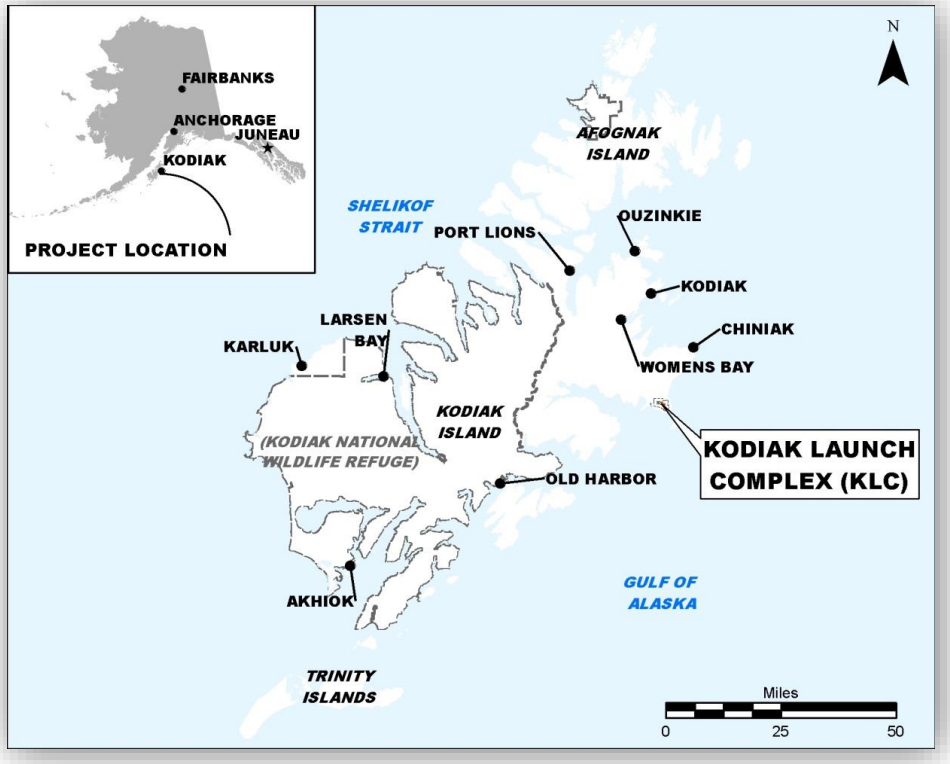

Figure 1: Kodiak Launch Complex: Location and Vicinity Map

Under 14 CFR Part 420, an applicant must provide enough information for the FAA to analyze the potential environmental impacts associated with the proposed modification of the KLC Launch Site Operator License. The information provided by an applicant must be sufficient to enable the FAA to comply with the requirements of NEPA. This EA is intended to fulfill NEPA requirements for analyzing the potential environmental impacts of modifying AAC's Launch Site Operator License for the KLC. The successful completion of the environmental review process does not guarantee that the FAA would modify the license. The project also must meet all FAA safety, risk, and financial responsibility requirements. Additional environmental analysis would be required for future proposed activities not addressed in this EA or in previous environmental analyses.

The environmental impacts of constructing and operating the KLC were initially analyzed in the FAA May 1996 *Environmental Assessment of the Kodiak Launch Complex* (1996 EA), based on which the FAA issued a *Finding of No Significant Impact* (FONSI). Since the 1996 EA, a number of NEPA documents have

been developed that analyze the existing small-lift facilities and operations at KLC; these are listed below. Medium-lift launch services have not been analyzed at the KLC.

Some of the existing NEPA documentation for the KLC includes the following[4]:

- Missile Defense Agency (MDA), 2003 Ground-Based Midcourse Defense Extended Test Range Final EIS and Record of Decision (ROD).
  - Action(s) Considered: Missile launch sites, sensors, and other test equipment associated with the Ground-Based Midcourse Defense system.
- SMC 2006 Orbital/Sub-Orbital Program EA and FONSI.
  - Action(s) Considered: Space launch and target vehicles using excess Minuteman II and Peacekeeper rocket motors.
- MDA 2005 Test Resources Mobile Sensors EA and FONSI.
  - Action(s) Considered: Use of mobile land-based sensors and the use of airborne sensor systems to support Ballistic Missile Defense System testing.
- MDA 2007 Flexible Target Family EA and FONSI.
  - Action(s) Considered: Development, preparation, assembly, integration, testing, and transportation of target rockets to support missile defense testing.
- MDA 2008 Ballistic Missile Defense System Programmatic EIS and ROD.
  - Action(s) Considered: Development, testing, deployment, and planning for decommissioning of the Ballistic Missile Defense System.
- NASA 2011 Launch of NASA Routine Payloads EA and FONSI.
  - Action(s) Considered: Launching NASA routine spacecraft as payloads on expendable rockets.

In addition to the NEPA documents listed above, the KLC environs and operations have been studied and documented in the following:

- A four-volume report on the environmental baseline of Narrow Cape prepared by the Environmental and Natural Resources Institute (ENRI) (ENRI 1995a, ENRI 1995b, ENRI 1995c, ENRI 1995d and ENRI 1998)
- Environmental monitoring events and launch effects studies, corresponding to each KLC launch made to date (ENRI 2002a, ENRI 2002b, ENRI 2002c, ENRI 2005a, ENRI 2005b, R&M 2006, R&M 2006b, R&M 2007, R&M 2007a, R&M 2007b, R&M 2008, R&M 2009, R&M 2011a, R&M 2011b, R&M 2014)
- Site-specific KLC wetlands and vegetation mapping (ENRI 2003, ENRI 2004)
- Quarterly aerial surveys of marine mammals near KLC (AER Sep 2012, AER Feb 2013, AER Sep 2013, AER Sep 2013)

[4] All MDA NEPA documents are available at: http://www.mda.mil/news/environmental_archive.html
The NASA Routine Payloads EA and FONSI are available at:
http://www.nasa.gov/agency/nepa/routinepayloadea.html

- Annual and five-year comprehensive analysis and summaries of marine mammal monitoring at KLC (ABR 2011, AAC 2012, AAC 2013)

Because the documents listed above were either prepared to comply with NEPA and/or characterize and analyze the environmental conditions at KLC, the information in these documents is relevant to the environmental analysis required for the FAA Proposed Action being considered in this EA. Therefore, this EA incorporates by reference[5] such information where it is relevant, applicable, and appropriate to use in support of the affected environment and environmental analyses.

1.1 Kodiak Launch Complex

Originally constructed in 1998, the KLC has hosted 17 solid-propellant launches to date, with an average of one launch annually. Two launches have occurred from KLC in the past five years, with the most recent launch occurring in August 2014. Both launches were conducted by government agencies and thus were not licensed by the FAA, as launches conducted by government agencies do not require a license from the FAA. The KLC provides a favorable location for space access into polar orbit (passing over or near both poles), sun synchronous orbit (tracking sun angle to continually pass over Earth's surface at a consistent time of day), and highly elliptical Molniya and Tundra orbits (suited to extended observation of high latitudes). The KLC offers downrange launch azimuths over the Pacific Ocean ranging from 110 to 220 degrees; it is the nation's highest latitude, full service launch complex (Figure 2 and Figure 3).

Figure 2: Existing Launch Pad Service Area

Figure 3: KLC Launch Azimuths

1.1.1 Existing KLC Facilities

Existing facilities at the KLC include seven primary installations with a network of supporting infrastructure. Figure 4 provides an overview of existing primary KLC installations. Supporting infrastructure for these facilities include: a site wide public water system, Pasagshak Point Road, several access roads leading from Pasagshak Point Road to the various installations, and other utilities.

[5] To ensure that the EA is both concise and clear about the bases for its conclusions, FAA may incorporate by reference other documents and analyses. An EA may incorporate by reference information or analysis that is reasonably available to the public, either in existing NEPA documents or in general background information, documents or studies prepared for other purposes (FAA Order 1050.1E, Change 1, Paragraph 404(d)).

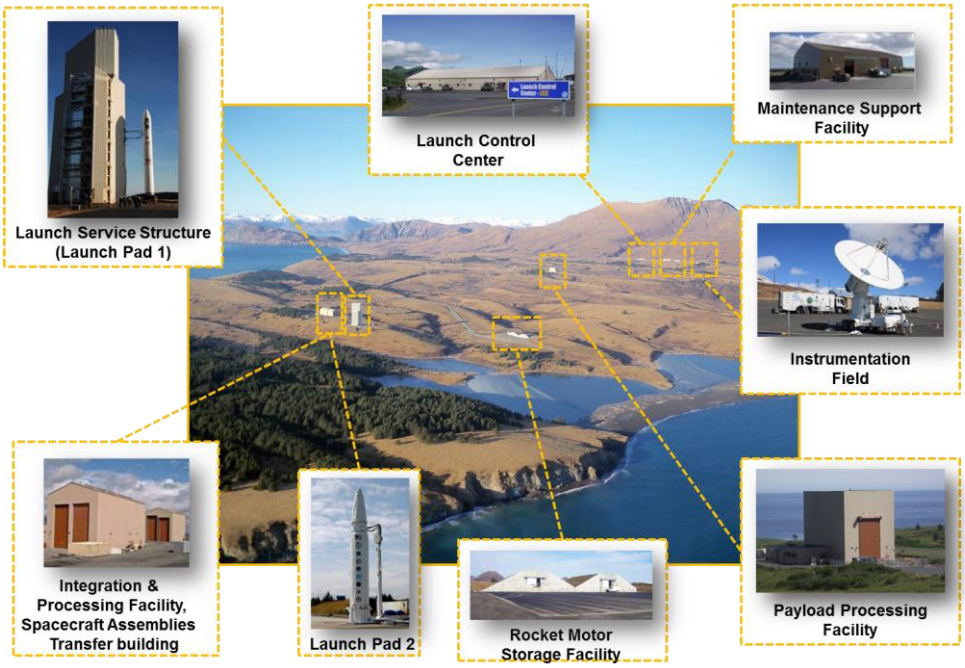

Figure 4: KLC Facility Overview

1.1.1.1 Launch Control Center

The Launch Control Center (LCC) is a 14,000 square-foot facility, which is the primary mission administration facility at KLC; containing customer offices and associated office equipment. It is the KLC communication center and the interface location for all fiber and copper connectivity range-wide. All site security including guards, camera monitoring, and secure storage are housed in or based from the LCC. The Launch Operations Control Center is KLC's launch control facility, which contains 49 console positions for the launch team, range control, and mission management. It is located within the LCC, approximately two miles from the existing launch pads and outside the pad area Explosive Safety Quantity Distance requirements.

1.1.1.2 Maintenance Support Facility

The Maintenance Support Facility (MSF) is a 19,000 square-foot building containing administrative office space for AAC staff, KLC maintenance shops, and storage bays for AAC's materials. Outside the MSF are two fabric buildings which serve as storage locations.

1.1.1.3 Instrumentation Field

The Instrumentation Field is a gravel pad area that accommodates a wide array of customer instrumentation equipment and antennas, as well as components of AAC's Range Safety and Telemetry System.

1.1.1.4 Payload Processing Facility

The Payload Processing Facility (PPF) is a 10,694 square-foot building which hosts general rocket payload processing operations, and also contains a clean room for specific operations. Its two 58-foot high bays are equipped with containment trenches to support hypergolic fueling. A breathing air system capable of supporting four personnel in Self Contained Atmospheric Protective Ensemble is internal to the PPF, along with a hazardous vapor detection system to support hypergolic fueling

1.1.1.5 Rocket Motor Storage Facility

The Rocket Motor Storage Facility (RMSF) is a set of Earth Covered Magazines (ECM), operating under an Explosive Site Plan (ESP) allowing storage of up to 250,000 pounds of Hazard Division 1.1 ordnance in each ECM. There are currently two ECMs at KLC which may be expanded to a total of five depending on customer requirements.

Prior environmental reviews have addressed the construction and operation of the RMSF with up to five ECMs. The July 2003 MDA *Ground-Based Midcourse Defense Extended Test Range Final Environmental Impact Statement* (2003 EIS) analyzed the construction and operation of the RMSF (referred to in the 2003 EIS as the Missile Storage Facility) at KLC. In 2009, AAC proposed to change the location of the RMSF to about a half mile southeast of the location identified in the 2003 EIS. The FAA conducted an environmental review of the change in the RMSF location in an internal document called a Written Re-evaluation, which analyzed the modification of AAC's Launch Site Operator License to include the RMSF at this new location[6]. The Written Re-evaluation evaluated the new location of the RMSF with up to five ECMs, and the FAA determined that modifying AAC's Launch Site Operator License conformed to prior environmental documentation, and the data and analyses contained in the 2003 EIS for the construction and operation of RMSF remained substantially valid. The FAA's environmental review concluded that the preparation of a supplemental or new environmental document was not necessary under NEPA to include the new location of the RMSF in the AAC Launch Site Operator License for KLC. Because of the prior environmental reviews for the RMSF with up to five ECMs, the potential impacts of constructing the additional three ECMs is not included as part of this EA's Proposed Action. Data and analyses are incorporated by reference from the 2003 EIS, as warranted.

1.1.1.6 Integration and Processing Facility

The Integration and Processing Facility (IPF) is a 7,010 square-foot, 50-foot high building for the processing of solid rocket motors before they are stacked on the launch pad. Processing includes activities such as receiving the motors, uncrating from shipping containers, removing packaging materials, inspecting the motors for serviceability, installing electrical components, installing flight termination pyrotechnics, installing and testing thrust vector systems, and preparation for stacking. The IPF is large enough to handle all small-lift solid-propellant vehicles. Solid motors can be processed on trailers or on a rail set. Transporter vehicles can interface with the rail set.

1.1.1.7 Launch Service Structure

The Launch Service Structure (LSS) is a 174-foot tall building housing Launch Pad 1 (LP1), which is used for orbital launches. The LSS is equipped with moveable work platforms and adjustable custom inserts that accommodate a variety of rocket diameters. LP1 is equipped with a mobile rail system for easy pullback of the structure. The launch tower is environmentally conditioned and enclosed for vehicle preparation during all seasons. The pad itself is flush with ground level, and equipped with a flame trench rated to 1.1 million pounds of thrust.

1.1.1.8 Spacecraft and Assemblies Transfer Building

The Spacecraft and Assemblies Transfer Building is a 3,558 square-foot, 50-foot-high, self-contained, environmentally controlled, rail-mounted rolling structure that is used to extend the work space in the IPF or LSS to create expanded all weather indoor work space for both facilities (Figure 4). It also houses KLC's sub-orbital launch pad, Launch Pad 2 (LP2). LP2 is located between the IPF and the LSS and is used for the launch of smaller sub-orbital rockets. The Spacecraft and Assemblies Transfer Building provides an environmental enclosure around LP2 for the erection and processing of sub-orbital rockets and its crane

[6] FAA Order 1050.1E, Change 1, *Environmental Impacts: Policies and Procedures*, paragraph 515.

is used to lift the rockets from the transporter-erector onto the launch stool. When final preparations are complete, the building is pulled clear of the launch area.

1.2 2014 Launch Failure

On August 25th, 2014, a military launch from LP-1 failed shortly after liftoff and resulted in structural damage to some KLC facilities. This launch was conducted by the U.S. Department of Defense (DoD) and was not licensed by the FAA because the FAA does not license launches conducted by the U.S. government or military agencies.

After the launch failure, AAC initiated all pre-approved applicable KLC Emergency Response Plans and procedures, including the Land and Shallow Water Impact Emergency Operations Procedures, which include responsibilities for the AAC and the launch customer in a launch failure scenario. The key steps addressed by the Land and Shallow Water Impact Emergency Operations Procedures are presented in Table 1 along with their current implementation status.

Launch Failure Response Process – Key Steps	Status
Determine the extent of the debris field and mark the field with temporary fencing.	Complete
Clear the debris field with qualified hazardous material trained personnel.	Complete
Conduct an environmental survey to determine the amount and extent of contamination, if any.	In Progress
Determine if the affected area is clear of hazards.	In Progress
Establish long term safety measures, if necessary.	Pending
Initiate environmental remediation, if necessary.	Pending

Table 1: Status of Key Steps in Response to the Launch Failure

The rocket malfunction resulted in pieces of solid propellant from the rocket, and other debris spreading over an area of the KLC. This affected area was fenced temporarily for public safety reasons. A hazardous-materials team performed a detailed search of the affected area to recover all debris, including the propellant. Additional teams completed follow-on searches to confirm removal of all hazardous materials.

The launch customer (the U.S. government) completed an environmental investigation and tested the waters and vegetation within the affected area to identify and quantify any potential contamination. The environmental investigation plan was developed, coordinated, and approved by the Alaska Department of Environmental Conservation and other agencies, as required, to comply with local, state, and federal rules and regulations, and included water and soil sampling. Results of the investigation indicated that the 2014 launch failure did not result in any contamination at the KLC that would require remediation. The DoD is coordinating the release of the environmental investigation report, which is expected to be publicly available in the near future. The report will also be submitted to ADEC to obtain their concurrence on the investigation's results.

1.3 Purpose of and Need for the Proposed Action

1.3.1 FAA's Purpose and Need

The *purpose* of the FAA's Proposed Action in this EA is to fulfill the FAA's responsibilities under the Commercial Space Launch Act, 51 U.S.C. Ch. 509, §§ 50901-23 (2011) for oversight of commercial space launch activities, including issuing launch site operator licenses for the operation of commercial space launch sites like the KLC. The Proposed Action would be consistent with the objectives of the Commercial Space Launch Act.

The *need* for the action results from the statutory direction from Congress under the Commercial Space Launch Act to protect the public health and safety, safety of property, and national security and foreign policy interest of the U.S. and to encourage, facilitate, and promote commercial space launch and reentry activities by the private sector in order to strengthen and expand U.S. space transportation infrastructure.

1.3.2 AAC's Purpose and Need

The *purpose* of the Alaska Aerospace Corporation's Proposed Action in this EA is to fulfill the AAC charter as stated in Alaska Statute 26.27.090 to lead the development and exploration of space in the State of Alaska by developing the launch infrastructure to support space launch activity.

The *need* for the action is based on potential business ventures that are considering the KLC as the site to launch medium-lift launch vehicles for a variety of commercial, civil, and defense payloads. Vandenberg Air Force Base, California, is the only launch site in the United States that can launch medium-lift launch vehicles into polar, sun synchronous, and highly elliptical orbits. Expanding the existing capabilities at the KLC would provide commercial and government missions schedule flexibility, cost competition, launch site resilience, and may keep space launch missions from going overseas.

1.4 Public Involvement

In June 2012, AAC sent a request for scoping comments to agencies for the proposed expansion of launch capabilities at the KLC (Appendix K). An agency scoping meeting for the EA was held on July 10, 2012, at the AAC conference room of the Alaska Energy Building, in Anchorage Alaska.

In accordance with NEPA, the CEQ Regulations, and FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures, Change 1*, the FAA published a Notice of Availability of the Draft EA in the *Federal Register* on September 15, 2014, which initiated a 30-day public review and comment period. The FAA mailed a copy of the Draft EA to the Alaska Department of Natural Resources (ADNR). An electronic version of the Draft EA was sent to interested parties on the distribution list and also made available on the FAA website. In addition, the FAA printed and mailed a copy of the Draft EA to the following libraries:

- Kodiak Public Library – 612 Egan Way, Kodiak, AK 99615
- UAA Kodiak Library – 117 Benny Benson Drive, Kodiak, AK 99615
- Anchorage Municipal Library – 3600 Denali Street, Anchorage, AK 99503

The FAA held an open house public meeting on October 7, 2014, from 5:00 p.m. to 8:00 p.m. in the Katurwik Room of the Best Western Kodiak Inn, Kodiak Harbor Convention Center, located at 236 E Rezanof Drive, Kodiak. Notification of the public meeting was provided on the FAA's website, in the *Federal Register* Notice of Availability and Request for Comments issued on September 15, 2014, and in The Kodiak Daily Mirror, The Alaska Dispatch News, and the Alaska Journal of Commerce. Notifications were also provided on the road-side marquee outside of the public meeting location. The Kodiak Daily Mirror ran a front page story about the public meeting on September 19, 2014. Poster displays located throughout the open house provided information about the Proposed Action, the environmental effects,

the role of the FAA, and how the public could participate in the NEPA process. In addition to poster displays, factsheets were provided. A stenographer was present to record verbal comments.

In response to public comments, the FAA extended the public comment period for the Draft EA to November 1, 2014. The FAA received 54 written comments and 26 oral comments on the Draft EA. All written and oral public comments received on the Draft EA, as well as the FAA's responses to these comments, can be found in Appendix R.

The FAA considered all public comments while preparing the Second Draft EA, and changes were made to the EA where warranted. After taking into consideration the nature of public comments received on the Draft EA, the FAA provided the public with an opportunity to review and comment on updates and clarification information that had been added to the EA in response to these public comments. Thus, the FAA issued the Second Draft EA for a 30-day public review and comment period on December 4, 2015. The FAA mailed a copy of the Second Draft EA to the ADNR. An electronic version of the Second Draft EA was sent to interested parties on the distribution list and also made available on the FAA website. In addition, the FAA mailed CDs of the Second Draft EA to four private individuals and two tribal entities that did not provide an email address.

The FAA printed and mailed a copy of the Second Draft EA to the following libraries:

- Kodiak Public Library – 612 Egan Way, Kodiak, AK 99615
- UAA Kodiak Library – 117 Benny Benson Drive, Kodiak, AK 99615
- Anchorage Municipal Library – 3600 Denali Street, Anchorage, AK 99503

Notification of the availability of the Second Draft EA and Request for Comments was provided on the FAA's website, in the *Federal Register* Notice of Availability and Request for Comments issued on December 7, 2015, and in The Kodiak Daily Mirror, The Alaska Dispatch News, and the Alaska Journal of Commerce. The FAA invited interested agencies, organizations, Native American tribes, and members of the public to submit comments on the Second Draft EA until January 11, 2016. The FAA received 4 written comments on the Second Draft EA. All written public comments received on the Second Draft EA, as well as the FAA's responses to these comments, can be found in Appendix T of the Final EA. The FAA considered all comments on the Second Draft EA in preparing this Final EA.

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2.0 PROPOSED ACTION AND NO ACTION ALTERNATIVE

2.1 Proposed Action

AAC proposes to expand the launch capabilities of the KLC, a commercial launch site currently operated under a FAA Launch Site Operator License (LSO-03-008). The expansion would include medium-lift launch capability at the KLC and the addition of new infrastructure to support these launches. To operate the KLC as a commercial launch site with expanded launch capabilities that include medium-lift launches in addition to the already authorized small-lift launches, AAC must obtain a modification to its existing Launch Site Operator License.

Under the Proposed Action, which is the preferred alternative, the FAA would modify AAC's Launch Site Operator License LSO-03-008 for the KLC to include medium-lift launch capability, with the addition of new infrastructure necessary to support those launches. The Proposed Action includes up to nine annual launches, including sub-orbital, small-lift orbital, and medium-lift orbital launches from the existing launch pads, LP1 and LP2, and the proposed Launch Pad 3 (LP3). To be conservative in the analysis of potential environmental impacts, this EA assumes that nine medium-lift launches per year would occur at the KLC. As part of the Proposed Action, AAC would make improvements to the KLC to add both solid- and liquid-propellant, medium-lift launch capability, and to operate the KLC in the future as a small-lift and medium-lift launch complex. The proposed site improvements (see Figure 5) associated with the license modification are listed below and detailed in Section 2.1.1.

Proposed construction includes the following six primary modifications to the KLC:

1. Launch Pad 3 (LP3): The launch stool, flame trench, a new access road, security gate and lighting, water deluge system (for liquid-propellant rockets only), and all related surface and subsurface construction. See Section 2.1.1.1.
2. Vehicle Processing Facility (VPF): A roller mounted, moveable rectangular tower where assembly of the solid rockets motors would take place on top of the pad. See Section 2.1.1.2.
3. Rocket Staging Facility (RSF): A rectangular building for the staging of solid rocket motors and the processing of liquid-propellant rockets. See Section 2.1.1.3.
4. Liquid Fuel Facility (LFF): On-site plant used to produce liquid oxygen (LOX) and liquid nitrogen. The liquid fueling facility would include holding tanks for LOX, liquid and gaseous nitrogen, gaseous helium, highly refined kerosene (called Rocket Propellant One or RP1), and piping to fuel the rocket. See Section 2.1.1.4.
5. Mission Control Center (MCC): A new control center in the vicinity of the current Launch Control Center. See Section 2.1.1.5.
6. Modifications to Pasagshak Point Road: Straightening the curves and flattening the dips of Pasagshak Point Road within the KLC. See Section 2.1.1.6.

The solid-propellant rockets would have nearly identical propellant composition to those previously launched from the KLC, but with differently configured engines. Solid-propellant medium-lift rockets proposed for launch from the KLC would use motors similar to the Reusable Solid Rocket Motors (RSRM) that were launched with the Space Shuttle. Liquid-propellant rockets have not been launched from KLC, and the proposed rockets would use a combination of RP1 and LOX, a stable conventional oxidizer used in many rockets around the world.

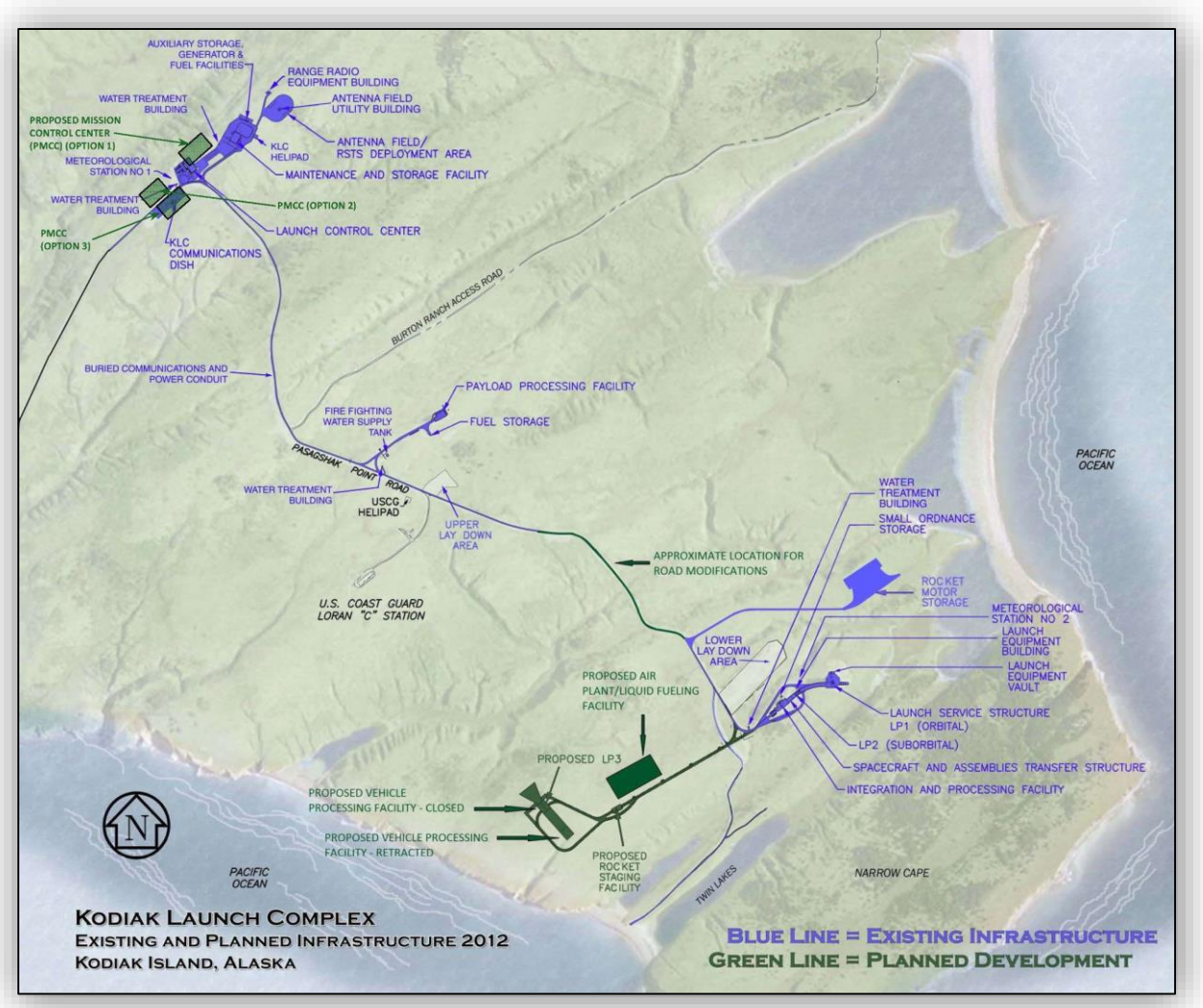

Figure 5: Existing and Proposed KLC Infrastructure

2.1.1 Site Improvements

Details of the specific site improvements under the Proposed Action are presented in Sections 2.1.1.1 through 2.1.1.6. The site improvements would take approximately three years to complete. Figure 6 shows the proposed design concept for Launch Pad 3, the Vehicle Processing Facility, Rocket Staging Facility, and the proposed new access roads.

2.1.1.1 Launch Pad 3

LP3 would be an entirely new launch pad capable of accommodating medium-lift rockets and would be located on the western side of the current launch range. LP3 would include the launch stool, flame trench, new access road, security gate and lighting, and connections for liquid-propellant fueling operations. The launch stool would be a steel structure that can support the weight of the entire vehicle, secure the base of the vehicle during build up, and allow the vehicle to lift off freely during launch. For solid-propellant vehicles, the stool would generally be solid steel. For liquid-propellant

Figure 6: Proposed Action Design Concept. From left to right are shown the Vehicle Assembly Building, Launch Pad 3 (with an Athena III), and the Rocket Staging Facility.

vehicles, there would be plumbing connections between the stool and the rocket to fuel the vehicle and there would be a hold down mechanism to keep the rocket in place as the engines throttle up. The flame trench would be a 50 foot hole under the launch stool that curves from vertical to horizontal and exits to the north side of the launch pad in a wide fan. The purpose of the flame trench is to allow the exhaust from the ignition of the rocket to vent away from the nozzle in order to prevent choking the rocket engine. There would be a liquid oxygen evaporation containment pond near the pad, and, if required, there would be a water deluge system to reduce the acoustical energy produced at ignition. Water for the deluge system would be extracted from the existing KLC well and stored in pressure vessels near the pad. Before launch, the water would be pressurized by an inert gas and released just prior to ignition. The water would flow down the trench into a containment pond where it would be tested after the launch, and treated if necessary, before being released or allowed to evaporate. Underground and to the side of the launch stool would be two equipment rooms that provide electrical power, communications, and conditioned air to the vehicle prior to launch. Above ground would be a 200 foot fixed umbilical tower with cables and hoses to connect the underground utilities to various levels of the vehicle. The access road would be a 2,000 foot road branching off the existing Pasagshak Point Road that leads to the proposed new facilities. The security gate would be located just before the new facilities to minimize the size of the fenced area. LP3 would be oriented so that the flame trench is directed away from surface waters and the seashore. Its location and orientation would meet proper explosive quantity distances (QDs) such that none of the unrelated facilities would be within the Inhabited Building Distance, thereby facilitating concurrent operations at LP1 or LP2.

2.1.1.2 Vehicle Processing Facility

The VPF would be required for processing solid-propellant and liquid-propellant medium-lift vehicles at KLC. The proposed VPF would be a rectangular structure approximately 300 feet tall, 140 feet long, and

110 feet wide, and would normally be located over LP3. It would be mounted on rollers so that it could be retracted to a safe distance for launches.

The VPF would support several different pre-flight processing operations. For processing of solid-propellant vehicles, each motor segment would be driven into the VPF where an overhead bridge crane would pick each motor, one at a time, rotate it from horizontal to vertical, and then place it in a build-up cell for inspections or directly on the launch stool as required. Interior platforms would be positioned to allow technicians to monitor the stacking of each motor and to complete assembly operations. For liquid-propellant vehicles, the empty liquid stages would also be picked by the bridge crane, rotated from horizontal to vertical, and be placed on the launch stool. Once all the motors are stacked and integrated, the encapsulated payload would be driven to the VPF in the vertical position, where it would be picked by the crane and placed on top of the rocket stack. In the event of an emergency or a mission delay, the payload and the rocket stages could be unstacked in reverse order.

2.1.1.3 Rocket Staging Facility

The RSF would be used for storage and assembly of rocket motors prior to movement to LP3. It would be comprised of a pre-fabricated metal building, approximately 120 feet long by 60 feet wide by 60 feet tall, roughly similar in size to the existing Integration Processing Facility. The RSF would be the reception area for medium-lift rocket components arriving at KLC. Rocket motors would be stored and inspected at the RSF prior to launch processing, due to the limited floor space available in the VPF. The RSF would also serve as the primary processing location for assembling liquid-propellant rockets prior to transport to LP3. The liquid-propellant medium-lift vehicles anticipated to be flown from KLC would be assembled in the horizontal position away from the launch pad.

2.1.1.4 Liquid Fuel Facility

The LFF would be located along the proposed new access road and would be accessible from LP3, facilitating fueling operations of a medium-lift, liquid-propellant vehicle. The LFF would be constructed near LP3 to produce and temporarily store LOX and liquid nitrogen on-site for the fueling processes. The LFF would consist of an industry standard air plant to extract oxygen and nitrogen from the air, and various storage tanks as detailed below. The LFF would occupy an area approximately 200 feet by 350 feet; the storage tanks would require small concrete pads to support their frame. The LFF would use existing power sources with a backup generator and be sited to allow Inhabited Building Distance QD requirements to be met on KLC. The ability to produce LOX and liquid nitrogen on-site would streamline fueling operations and would eliminate the need to ship those products to the site.

The LFF could include the following:

- One 28,000-gallon above-ground storage tank containing RP1.
- Two above-ground cryogenic storage tanks for LOX storage. One tank would have approximately 60,000 gallons of storage capacity; the second tank would hold approximately 1,500 gallons.
- One liquid nitrogen above-ground cryogenic storage tank (approximately 50,000 gallons). Liquid nitrogen would be used to cool the cryogenic systems as well as the LOX.
- Multiple high-pressure, above-ground steel tanks containing gaseous helium and nitrogen. Gaseous helium and nitrogen would be used for a variety of purposes, including pressurizing the fuel tanks. The exact number of tanks depends on the final design but could range from less than 10 large tanks to more than 40 smaller tanks.
- Support equipment would include vaporizers, valves, control systems, concrete pads, pedestals, piping, pumps, heat exchanger, and other miscellaneous equipment.

2.1.1.5 Mission Control Center

The MCC is a purpose built control center for medium-lift operations at KLC. The MCC would be a 14,000 square foot building similar in size and shape to the current LCC. The MCC would serve as the temporary administrative offices for launch teams and the operation control center during processing and the launch count down. It would be sized for a launch team of about 200 personnel and would have room for communication equipment, weather monitoring, security station, medical office, and a break room. The MCC would be located adjacent to the current LCC or in close proximity.

2.1.1.6 Pasagshak Point Road Improvements

Improvements to a section of Pasagshak Point Road are proposed within the KLC boundary. The vertical alignment of the existing section of road between the PPF and LSS would be corrected using excavated material from the proposed LP3 site. The curving road combined with a steep grade poses an elevated risk to the transportation of long rocket bodies that are extremely sensitive to torque and bending. Small bends in the flight hardware due to transportation over uneven roads can result in structural failure during flight, resulting in unsafe flight conditions and mission failure. Improving this section of the road would greatly increase the safety of rocket body transportation, facilitate access to LP3, and provide a location for disposal of excavated material. The improvement is anticipated to take 90,000 cubic yards of fill and require 4,000 square yards (0.83 acre) of new asphalt road paving. The fill area is 1.65 acres, of which 1.47 acres are delineated wetlands.

2.1.2 Launch Activities

Under the Proposed Action, it is assumed that a maximum of nine, including sub-orbital, small-lift orbital, and medium-lift orbital launches per year would occur from the KLC. With the Delta II medium-lift rocket no longer in production, three new medium-lift launch vehicle providers have entered the launch market. The Athena III is a solid-propellant medium-lift vehicle, using aluminum powder and ammonium perchlorate. The Antares and the Notional Launch Vehicle use liquid-propellant consisting of RP1 and LOX. AAC intends to design LP3 so that any of these new rockets could be accommodated. The effects of each medium-lift rocket have been analyzed, and in situations where one rocket has a larger impact than the other two, that rocket is used as the benchmark for the analysis. Spacecraft reentry is not anticipated from LP-3 launches. If a proposed future mission were to require reentry, it would need a specific launch license. The potential environmental impacts of that particular mission would be subsequently evaluated in the appropriate NEPA documentation for the granting of that launch license. Launches may be conducted during any time of the year and at any time of the day or night. Figure 7 presents the current and proposed rockets for the KLC.

Consistent with the maximum number of annual launches that would occur from the KLC under the Proposed Action, a two-mile radius safety area around the launch pad would continue to be closed 8 hours prior to a launch, and would involve closing the Pasagshak Point Road where it enters the KLC. These closures would not exceed nine per year and would be temporary (8 hours). During these brief closure periods, Fossil Beach, Surf Beach, Twin Lakes and other state land used for recreation on Narrow Cape would not be accessible to the public. Also, temporary safety closures to marine waters and airspace would continue to take place concurrently with the ground closures. During launch, Notice to Airmen and Notice to Mariners would be issued to keep aircraft and shipping outside of these areas and direct coordination with Air Traffic Control and the U.S. Coast Guard would be maintained to verify that there is no traffic in these areas. In addition, both marine waters and airspace would be monitored by AAC air and surface search radar during launch operations, as well as by U.S. Coast Guard C130. AAC would also continue to hire local fishing vessels to serve as boundary boats during the safety closure periods. These boats warn other mariners of the hazard area and notify AAC and the U.S. Coast Guard of

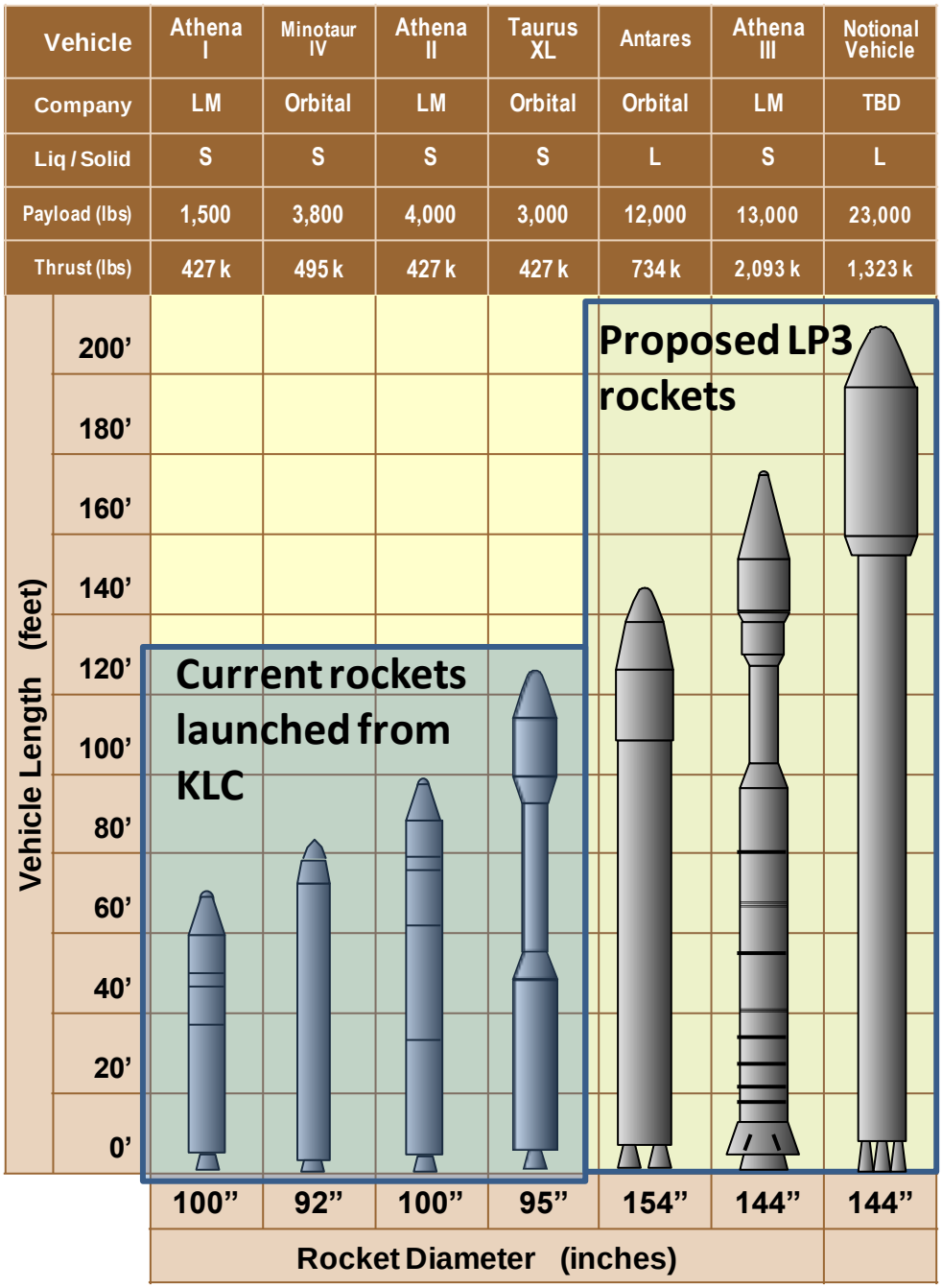

Figure 7: Kodiak Launch Complex- Current and Proposed Rockets

any craft within the hazard area. Land areas surrounding the complex would be monitored by AAC guards and contract surveillance helicopter.

Consistent with past and ongoing KLC operations, these locations, including Pasagshak Road, would remain open at all other times. In the event of an unusual safety concern, such as a rocket mishap, these areas might be controlled for longer periods of time.

2.1.2.1 Athena III Launch Vehicle

The Athena III is a three-stage solid-propellant rocket with a gross lift-off weight of up to 1,500,000 pounds. The first stage is based on the Reusable Solid Rocket Booster used by the Space Shuttle, the second stage is the commercial Castor 120 motor, and the third stage is the Castor 30. All three rocket motors are produced by ATK and the vehicle is integrated by Lockheed Martin. The Reusable Solid Rocket Booster solid motor propellant consists of three major components; aluminum powder (16%) as the fuel, ammonium perchlorate (~70%) as the oxidizer, and polybutadiene acrylic acid acrylonite (PBAN, ~12%) as a rubber-like binder. The second and third stages use the same fuel and oxidizer, but a different binder called hydroxyl-terminated polybutadiene (HTPB). Solid-propellant motors are referred to by the binder they use, either PBAN or HTPB, because the fuel and oxidizers are the same. Additional specifications can be found in Table 2. At the time of the publication of this document, the Athena III has not flown.

Proposed Launch Vehicle (Provider):	Athena III (Lockheed Martin)
Primary Propellant type:	TP-H1148, PBAN (1st stage) TP-H1246, HTPB (2nd stage) Modified TP-H8299, HTPB (3rd stage)
Primary Propellant mass:	up to 1,300,000 pounds
Other propellants:	Hypergolic fuels for spacecraft, up to 200 gallons
Vehicle height:	up to 240 feet
Maximum recorded sound pressure at 30 feet as provided by the manufacturer:	154 dB

Table 2: Athena III Specifications

Notes: db - Decibel

2.1.2.2 Antares Launch Vehicle

The Antares is typically a two-stage rocket with a gross lift-off weight of 640,000 pounds; however, an optional third stage can be added. Antares incorporates both solid and liquid stages; the first stage uses LOX and RP1 as the propellants, the second stage is a solid rocket motor (Castor 30 or Castor 30XL), and the optional third stage uses either nitrogen tetroxide and hydrazine, or a solid (Star 48) as propellant. The solid stages use aluminum powder as the fuel, ammonium perchlorate as the oxidizer, and HTPB as a rubber-like binder. Additional specification can be found in Table 3.

Proposed Launch Vehicle (Provider):	Antares (Orbital Sciences Corporation)
Primary Propellant type:	LOX, RP1 (1st stage)
Primary Propellant mass:	up to 400,000 pounds of LOX, up to 150,000 pounds of RP1
Other Propellants:	up to 80,000 pounds of HTPB (2nd stage) 4,500 pounds of HTPB (Optional 3rd stage) Hypergolic fuels for spacecraft, up to 200 gallons
Vehicle height:	up to 170 feet
Maximum recorded sound pressure at 50 feet as provided by the manufacturer:	151 dB

Table 3: Antares Specifications

Notes: dB = Decibel

2.1.2.3 Notional Liquid-Propellant Launch Vehicle

The Notional Liquid-Propellant Rocket is a two-stage rocket, with both stages using a RP1/LOX propellant. The rocket stands approximately 230 feet tall and has a gross lift-off weight of up to 1,115,000 pounds. Additional specifications can be found in Table 4. This vehicle is included to ensure its impacts are considered in the event that the vehicle operator decides to launch from KLC in the future.

Proposed Launch Vehicle (Provider):	TBD
Primary Propellant Type:	LOX, RP1 (1st stage, 2nd stage)
Primary Propellant Mass:	Up to 500,000 pounds of LOX, up to 225,000 pounds of RP1
Other Propellants:	Hypergolic fuels for spacecraft, up to 200 gallons
Vehicle Height:	Up to 227 feet
Maximum recorded sound pressure at 5000 feet as provided by the manufacturer:	123 dB

Table 4: Notional Liquid-Propellant Launch Vehicle Specifications

Notes: dB = Decibel

2.2 No Action Alternative

Under the No Action Alternative, the FAA would not modify the AAC's Launch Site Operator License for KLC to include medium-lift launch capability, and AAC would not proceed with the construction of medium-lift launch support infrastructure at KLC. Existing launch activities for up to nine small-lift orbital and suborbital class launches per year from the existing launch pads would continue.

NEPA requires agencies to compare the effects of the Proposed Action and alternative(s) to the effects of the No Action. Thus, the No Action Alternative serves as a baseline to compare the impacts of the Proposed Action. The No Action Alternative would not satisfy the purpose and need for the Proposed Action because it would not allow for operation of a commercial space launch site with expanded launch capabilities and thus would not facilitate or promote commercial space launch and reentry activities by the private sector.

2.3 Alternatives Considered

In considering the development of the Proposed Action, AAC considered five sites for LP3, including the proposed location Site C. Site C was the only site that met FAA siting requirements and KLC site constraints, and was also identified as the Preferred Alternative. The following section describes the FAA requirements, the KLC site constraints, and how they apply to the five potential sites.

2.3.1 FAA Siting Requirements

1. Launch pads must not be positioned so that the rocket launches fly over other facilities, regardless of who owns them. The purpose of this restriction is to prevent a launch failure from crashing into another structure, and the potential liability issues that result. The KLC launch azimuth is 110 to 220 degrees, SE to SW, which means that launch facilities need to be sited generally east to west to prevent overflight.
2. Launch pads must be outside of QD of other launch pads and processing facilities. QD varies by type and quantity of explosives/propellants. Current QD for the IPF and LP1 is 2,965 feet for 225,000 pounds of Hazard Class 1.1 explosives. Therefore, LP3 must be at least this far from the IPF and LP1 to allow concurrent operations at both sites.

3. Explosive operations at LP3 create a QD radius based on the amount of explosives anticipated. No non-related facilities, such as the decommissioned US Coast Guard Loran station, can be located within that circle. Anticipated amounts and the associated QD are presented in Table 5.

Launch Vehicle	Anticipated Net Explosive Weight (in pounds)	Hazard Class	Inhabited Building QD Radius (in feet)	Public Road QD Radius (in feet)
Athena III	1,242,397	1.3	860	860
Antares	159,449	1.1	2,431	1,458
Notional Launch Vehicle	119,064	1.1	2,054	1,232

Table 5: Explosive Quantity Distances

Note: All QD calculations are taken from DODM 6055.09-M-V5 (DoD Ammunition and Explosive Safety Standards) dated February 29, 2008 and incorporating change 1, September 2, 2011.

Note that the Athena III, while having more explosives, has a smaller QD because of the hazard classification. Also, the Antares and Notional Launch Vehicle use RP1 as a fuel and LOX as an oxidizer which are converted to a HC 1.1 equivalency using Table V5.E4.T5 from DODM 6055.09-M-V5. Exact explosive quantities may vary as these rockets mature.

2.3.2 KLC Site Specific Constraints

The KLC site-specific constraints are primarily based on the topography of Narrow Cape and the proximity of the decommissioned USCG (U.S. Coast Guard) Loran-C station.

1. No interference with the decommissioned Loran station:
2. Build on ridgeline: The ridgelines on Narrow Cape provide the best rock for structural support and avoid most of the wetland areas.
3. Build away from ocean cliffs: There is active erosion along the sea cliffs on Narrow Cape that are open to the Pacific Ocean. Therefore, it is best to build several hundred feet away from the cliffs.
4. Build close to existing road, but outside of the QD circle for public transportation routes: Building close to the road minimizes the environmental effect as well as the cost of building new roads. But the facilities must be outside of the Public Transportation Route QD distance (approximately 1,458 feet on either side of the road for the Antares rocket).
5. Maximize the distance away from the Launch Control Center: Although there is no exact criteria for the proper distance (other than QD), the further away LP3 is from the LCC the better the site, as it would provide standoff to protect personnel in the event of a launch failure.
6. Avoid crossing and minimize negative impacts to wetlands.

2.3.3 Analysis of Potential Sites for Launch Pad 3

The potential launch pad sites, with their primary requirements and constraints, are described below and depicted in Figure 8.

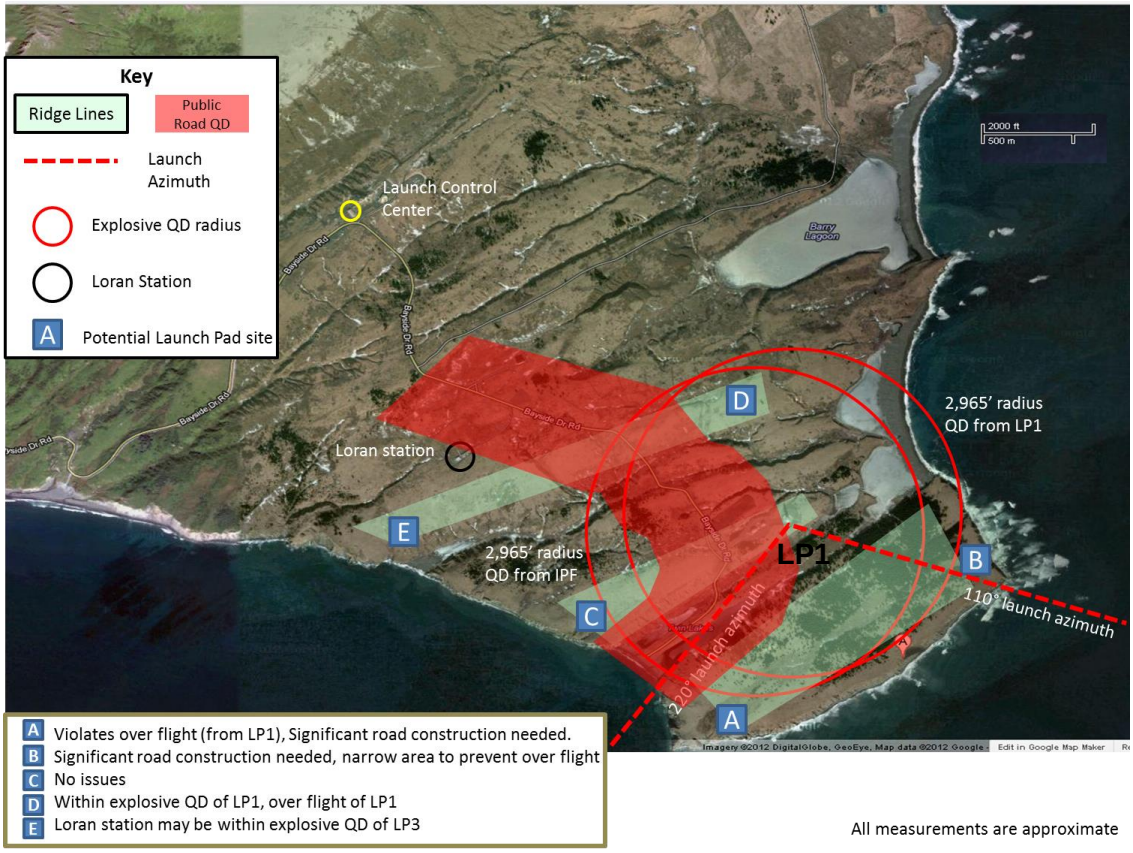

Figure 8: Constraint Analysis of Potential Launch Pad Sites at KLC

Site A. Site A is located on the southernmost ridgeline on Narrow Cape. This ridgeline presents three major issues. First, the majority of the ridge is located within the down range launch azimuth of LP1, which precludes operations at this site when there is a mission from LP1; this is an over flight issue. Secondly, the cost of cutting a road into this area would be extremely high because of the steep valley separating the LP1 ridge line from the southern ridge line and boggy terrain leading up to the site. There would need to be a significant amount of cut and fill to build a road capable of supporting the weight of a rocket motor. Third, there is a large area of wetlands that would have to be crossed to reach the site. These three issues make Site A unacceptable for the type of operations envisioned for LP3. Since Site A is inconsistent with the siting requirements, it is unreasonable and is eliminated from further study in this EA.

Site B. Site B is also located on the southernmost ridgeline on Narrow Cape. The eastern side is outside of the QD circle and above the launch azimuth of LP1. However, Site B would still require expensive road construction to reach the site, the most of all the sites under consideration, and it would cut through a very large bog, negatively affecting wetlands. These issues make Site B unacceptable for LP3. Since Site B is inconsistent with the siting requirements, it is unreasonable and is eliminated from further study in this EA.

Site C. Site C is located on the same ridge line as LP1, the second ridge line from the southern point of Narrow Cape. It is outside of the QD of LP1 and the launch azimuth. There are no unrelated facilities nearby and it is the closest site to the existing road, yet far enough away from the sea cliff that erosion is not an issue. Site C is outside of the Public Transportation Route QD radius for all potential rockets. There are no technical issues with Site C. Therefore, Site C is the preferred alternative and is carried forward for further analysis as the Proposed Action.

Site D. Site D is located on the eastern side of the third major ridge line from the southern point of Narrow Cape. It is within the QD of LP1. Rockets launched from Site D would also overfly LP1. Therefore, Site D is unacceptable for LP3. Since Site D is inconsistent with the siting requirements, it is unreasonable and is eliminated from further study in this EA.

Site E. Site E is located on the western side of the third major ridge line from the southern point of Narrow Cape. The ridge line runs NE to SW, therefore, Site E is nearly at the same latitude as LP1, thus preventing overflight issues between the sites. Site E is away from the cliffs and outside of the Public Transportation QD, but the QD circles of LP3 would encompass the Loran Station, which is not allowed. Therefore, Site E is unacceptable for LP3. Since Site E is inconsistent with the siting requirements, it is unreasonable and is eliminated from further study in this EA.

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3.0 AFFECTED ENVIRONMENT

This chapter provides a description of the existing environment of the Region of Influence (ROI), which is defined as Narrow Cape, offshore areas around Narrow Cape including Ugak Island, and the nearshore waters around the KLC and Ugak Island (Figure 9). The information presented herein serves as a baseline from which to identify and evaluate environmental effects resulting from activities associated with the Proposed Action. The environmental baseline for the potentially affected environment has been extensively evaluated and summarized in previous NEPA documents (Section 1.5). Existing information has been incorporated into this document by reference where appropriate. Data and observations from previous small-lift rocket launches at the KLC have been used to further characterize the existing facilities and environment at KLC.

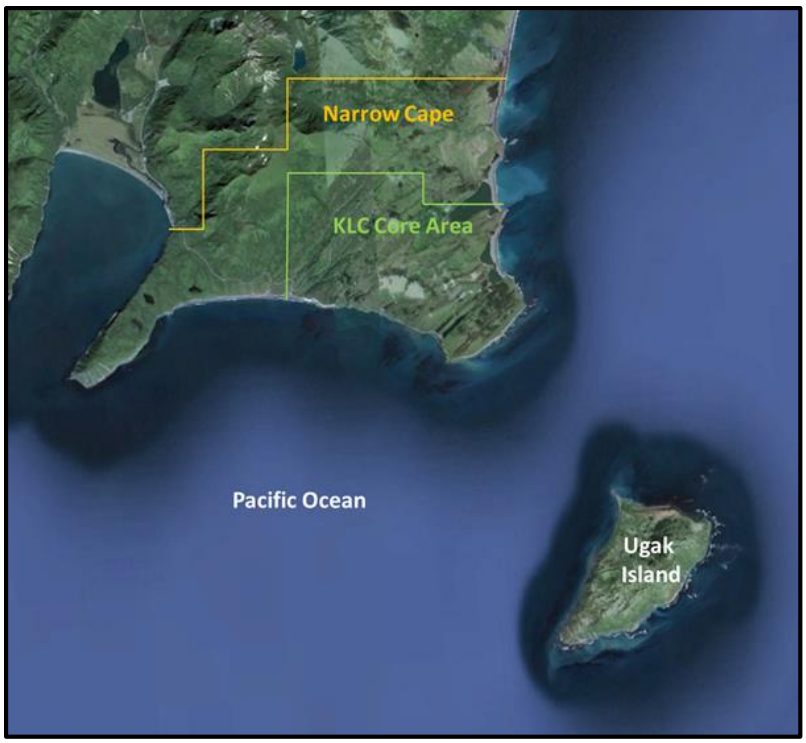

Figure 9: Region of Influence: Narrow Cape, Ugak Island, and Surrounding Waters

3.1 Air Quality

The air quality at Narrow Cape can be generally classified as unimpaired. Existing launch activities at the KLC, ranching, and occasional vehicular traffic are the only human activities within the vicinity of Narrow Cape that typically affect background air quality (North Pacific Targets Program EA, 2001).

3.1.1 Regulatory Framework

The Clean Air Act (CAA) authorizes the Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS), codified under 40 CFR 50. Based on measured ambient data for certain criteria pollutants, the EPA designates all areas of the United States as having air quality either better than (attainment) or worse than (nonattainment) the NAAQS. Former nonattainment areas that have attained the NAAQS are designated as maintenance areas. The CAA requires each state that contains a nonattainment or maintenance area develop a State Implementation Plan (SIP) which serves as its

primary mechanism for ensuring that the NAAQS are achieved and maintained within that state. The six criteria pollutants in the Alaska SIP are ozone, carbon monoxide (CO), nitrogen dioxide, sulfur dioxide, inhalable particulate matter (PM10), fine particulate matter (PM2.5), and lead. CO, PM2.5 and PM10 are specific pollutants of concern for Alaskan communities such as Anchorage and Fairbanks, with their larger populations, more automobiles, industries, and widespread use of wood heating.

The General Conformity Rule established under Section 176(c) of the CAA outlines procedures and criteria for identifying whether a Federal action conforms to State, Federal or Tribal air quality implementation plans; this rule applies only in areas that EPA has designated non-attainment or maintenance (previously designated as a non-attainment area). Kodiak Island is located within an air quality attainment area for all criteria pollutants; therefore, a General Conformity Review does not apply to the Proposed Action.

Air quality control regions are classified either as class I, II, or III to indicate the degree of air quality deterioration that the State/Federal government will allow while not exceeding NAAQS. ADEC classifies Kodiak Island as a class II area in attainment with the NAAQS (18 AAC 50.015). Kodiak's designation as a class II area means a moderate change in air quality would be allowed while still maintaining air quality that meets NAAQS. There are no air quality monitoring facilities in the vicinity of Narrow Cape and none on Kodiak Island.

3.1.2 Existing Emission Sources in the Project Area

Kodiak Electric Association provides power to the existing KLC facilities. Backup diesel generators are located at five installations at the KLC, the PPF, IPF, LCC, MSF, and RMSF (portable generator). The generators operate as backup for five hours during launches, one hour per week for testing during non-launch periods, and during commercial power outages (estimated maximum total 262 hours per year). The intermittent usage contributes to annual pollutant emissions of far less than the ADEC-regulated threshold of 100 tons.

Changes to the ADEC Air Quality Control Regulations (18 AAC 50) were adopted in October, 2004, which affected Pre Approved Emission Limits (PAELs). As of February 7, 2005, ADEC certified that the KLC was no longer subject to monitoring, record keeping, and reporting requirements established in their PAEL #00485. PAEL #00485 was rescinded at that time because stationary emission sources at the KLC were within ADEC-established thresholds. KLC is not currently required to operate under a PAEL or Minor Permit. There are low levels of emissions at and near KLC because of the sporadic use of generators, the low volume of vehicle traffic, and extremely sparse residential population, which generates low levels of emissions from building heating. There are no rocket engine static tests at KLC.

The launching of solid-propellant rockets produces emissions primarily of hydrogen chloride, carbon monoxide, carbon dioxide, nitrogen oxides (NOx), black carbon and aluminum oxide. Hydrogen chloride, NO_x, CO_2 and CO emissions are gaseous; aluminum oxide and black carbon are emitted as particulates as large as 4 millimeters (Dreschel and Hall, 1990). The primary emissions from liquid-propellant vehicles include carbon monoxide, carbon dioxide, hydrogen, water vapor and oxygen. Exhaust plumes are concentrated within the geographic area near the launch pad (known as the near field) where the ground cloud forms and begins its thermal rise process. The far field is considered to be the geographic area where the stabilized and neutrally buoyant cloud material mixes back to the ground. Because of the rapid acceleration of the rocket, the vast bulk of rocket exhaust products are expelled above the mixing layer where they disperse quickly, reducing ground-level impacts.

On a larger scale; the rocket emissions of CO_2 and black carbon are greenhouse gases contributing to global climate change and their emissions of HCl can cause short term localized damage to the stratospheric ozone layer. HCl emitted from launch vehicles remains in the stratosphere and is

transported throughout the Northern Hemisphere where it continues to destroy ozone for about 6 years (Brady et al., 1997).

3.1.3 Meteorology

Climatic conditions at Narrow Cape, primarily wind speed/direction and precipitation, affect the dissipation of exhaust plumes from rocket launching. The climate at Narrow Cape is characterized as maritime, with long, mild winters and short, cool summers. Throughout the year, the weather is affected by cool and humid air masses due to Narrow Cape's location on the Pacific Ocean. Average annual precipitation is high at approximately 77 inches. The monthly average of precipitation ranges from approximately four to nine inches. The highest averages typically occur between September and March. The average annual wind speed is 11 miles per hour with prevailing wind directions from the northeast and southwest (KLC, 2012). Wind speeds are greatest in the winter months, between November and March, and lowest May through September; however even during the summer months the mean wind speed is 5 mph or greater, which is sufficient for good dispersion of air pollutants (VE Energy LLC, 2007). A visual depiction of wind direction and velocity is shown in Figure 10.

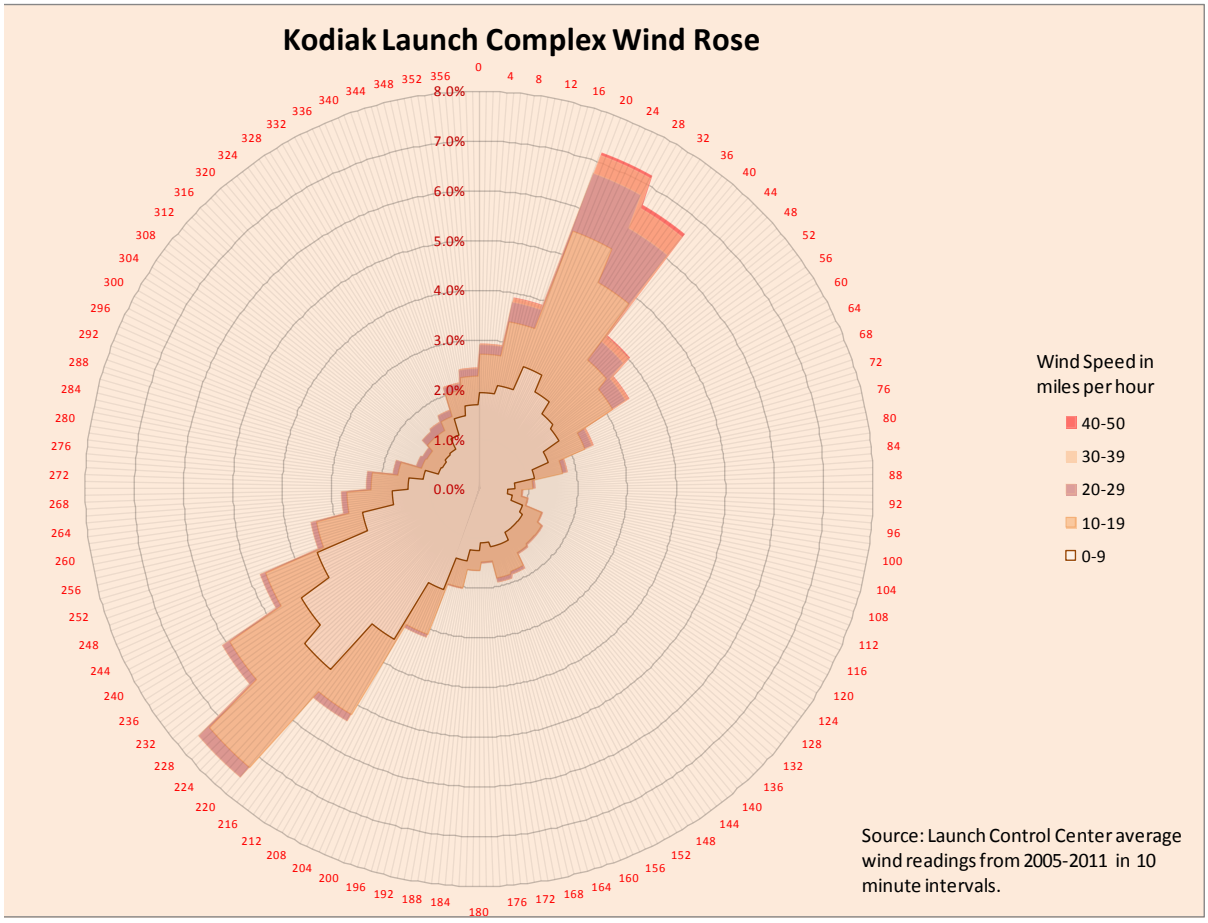

Figure 10: Wind model of wind speed and direction for Kodiak

3.2 Compatible Land Use

3.2.1 Regulatory Framework

FAA Order 1050.1E dictates that the compatibility of existing and planned land uses in the vicinity of the Proposed Action be assessed, particularly with respect to noise effects. The assessment of potential noise

effects to land use is codified in Aviation Safety and Noise Abatement Act of 1979, as amended (49 U.S.C. 47501-47507).

3.2.2 Land Use and Noise Effects (as related to Land Use)

The Kodiak Archipelago includes approximately 4.8 million acres (7,500 square miles) of land, generally divided in ownership as follows (Kodiak Chamber of Commerce, 2013):

- Federal: 3,400,000 acres (2,625 square miles)
- Native corporations: 675,000 acres (1,054 square miles)
- State of Alaska: 639,000 acres (998 square miles)
- Local governments: 70,000 acres (108 square miles)
- Private property: 16,000 acres (25 square miles)

Kodiak Island has an area of about 2.2 million acres (3,400 square miles). The core Kodiak Launch Complex consists of 3,717 acres of state land assigned to AAC by the ADNR under Interagency Land Management Assignment (ILMA) ADL226285. This ILMA also includes an additional 7,048 acres of outlying areas including Ugak Island, which may be closed to public access for limited periods during hazardous operations for safety reasons. Public access would not be restricted at other times. The areas of proposed improvements are within the boundaries of the existing core KLC. Lands assigned to KLC are co-occupied by the Burton Ranch, a commercial ranch, under a state-issued ranching lease (Figure 12). Narrow Cape is also the location of the decommissioned U.S. Coast Guard's (USCG) LORAN-C navigation transmitter station, which was decommissioned in 2010 (USDHS, 2012), and the 625 foot tall antenna was recently removed in July of 2012. Other man-made structures in the vicinity include the Kodiak Narrow Cape Lodge (a dedicated lodging facility to support KLC operations), a small number of ranch-related structures, two private homes and a business (Burton Ranch), a private residence that may be used as a church camp, and several WWII concrete bunkers (FAA, 1996). Both "grazing and missile launch activity" (Figure 11) are designated allowable uses within the KLC (Alaska Statute 41.23.250 Management).

Due to the short duration of the rocket launches, the noise has no effect on the DNL noise levels at any of the nearby noise sensitive properties (Minor, 2012). A complete report on the existing noise values and land use compatibility are presented in Appendix A.

Figure 11: Bison graze in a flowering meadow at the Payload Processing Facility.

3.3 Department of Transportation Act Section 4(f)

3.3.1 Regulatory Framework

The U.S. Department of Transportation (USDOT) regulation commonly referred to as "Section 4(f)" was originally established in the U.S. Department of Transportation Act of 1966 (49 United States Code [U.S.C.] Section 1653(f) and later recodified as 49 USC Section 303(c). Section 4(f) requires consideration of:

- Parks and recreational areas of national, state, or local significance that are both publicly owned and open to the public,
- Publicly owned wildlife and waterfowl refuges of national, state, or local significance that are open to the public to the extent that public access does not interfere with the primary purpose of the refuge, and
- Historic sites of national, state, or local significance in public or private ownership regardless of whether they are open to the public.

Any part of a Section 4(f) property is presumed to be significant unless the official with jurisdiction over the property concludes that the entire property is not significant.

Under Section 4(f) , the Secretary of Transportation will not approve a transportation program or project requiring the "use" of a Section 4(f) property unless there is no feasible and prudent alternative to using that land and the project includes all possible planning to minimize harm to the resource resulting from

the use. A "use" of Section 4(f) property occurs when the proposed action would result in a non-minimal, actual physical taking of land within a Section 4(f) property, or when there is a constructive use of a Section 4(f) property. A constructive use occurs when the transportation project does not incorporate land from a Section 4(f) property, but the project's proximity impacts are so severe that the protected activities, features, or attributes that qualify the property for protection under Section 4(f) are substantially impaired. Substantial impairment occurs only when the protected activities, features, or attributes of the property that contribute to its significance or enjoyment are substantially diminished. For purposes of NEPA, a significant impact to a Section 4(f) property occurs when a proposed action either involves more than a minimal physical use of a section 4(f) property or is deemed a "constructive use" substantially impairing the 4(f) property, and mitigation measures do not eliminate or reduce the effects of the use below the threshold of significance. To the extent relevant, the FAA may use as guidance the Federal Highway Administration's Federal Transit Administration's regulations regarding constructive use at 23 CFR Part 774.

3.3.2 Section 4(f) Resources

The 1996 EA for KLC did not include analysis of Section 4(f) resources specifically, though it did cover recreational resources. For this EA, therefore, a thorough review was conducted of online resources and maps – coupled with local knowledge of the authors of this EA – to document known and potential 4(f) resources in the ROI, as presented below.

The Pasagshak River State Recreation Site is a 4(f) resource located approximately 6 miles west of the proposed LP3 at the KLC (Figure 12). The recreation site comprises seven campsites, picnic areas, potable water, and one latrine, located on 20 acres of land. The Pasagshak River runs through the site, supporting runs of silver salmon and making the site a popular fishing destination during the summer and fall salmon runs. In recognition of the increase in visitation at the site since the opening of KLC and the improvements to the road system that have resulted, ADNR and AAC signed an agreement in 2007 to improve site maintenance and share operational costs of the site through an Adopt-A-Park type program. KLC agreed to the following actions (ADNR, 2007a):

1. To "Adopt" the site for the purposes of offsetting some of the operational costs of the park due to increased traffic flow and use of the park resulting from the development of the launch complex at Narrow Cape.
2. To communicate with and receive prior authorization first from any Kodiak Park representative regarding any activity that KLC might propose for the site.

The Kodiak National Wildlife Refuge is another 4(f) resource that occupies roughly the southwest half of Kodiak Island, but it is located approximately 30 miles to the west of KLC at its closest point (Figure 1 and Figure 9) and is therefore outside the ROI.

There are no other formally designated parks/recreational areas, wildlife or waterfowl refuges, or historic sites in the vicinity of the KLC. However, there are other resources of a recreational nature that deserve mention due to their presence within the boundaries of KLC. In addition, recreational activities in the waters adjacent to KLC are addressed. But, as subsequently discussed, the FAA has determined that these resources do not constitute Section 4(f) properties.

These resources are part of public lands (owned either by the State or Federal government) on Kodiak Island, which are generally open to recreational uses such as fishing, hunting, surfing, hiking, camping, boating, beachcombing, flightseeing, and wildlife and scenic viewing.

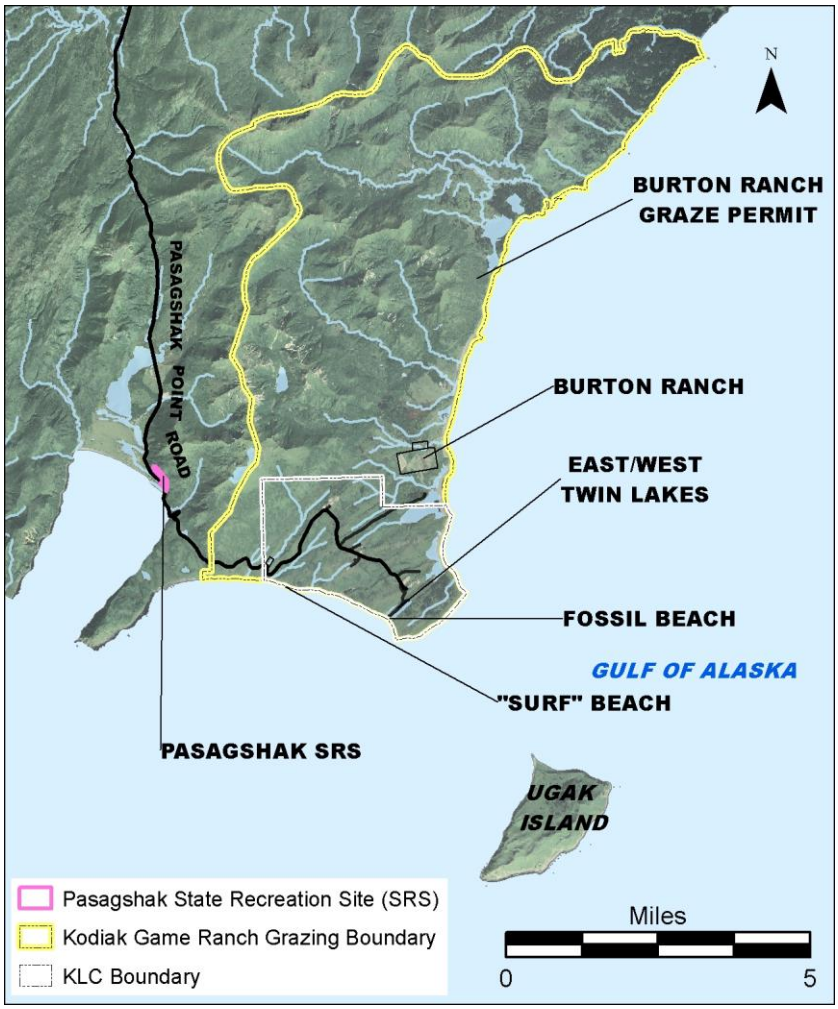

Figure 12: Section 4(f) Overview

Narrow Cape is surrounded by and comprised of State of Alaska Lands (KIB GIS Mapper, 2012). Specific resources of a recreational nature within and near KLC include:

East Twin Lake: Fishing is available at East Twin Lake (the southeastern most lake of the two adjacent Twin Lakes, both of which are located within the boundaries of KLC), which is stocked with rainbow trout (*Oncorhynchus mykiss*) (ADF&G, 2012), as described further in Section 3.4.2. This lake is located approximately 0.2 mile southeast of the proposed LP3 site.

Narrow Cape and KLC: Narrow Cape is easily accessed by the island's road network and offers recreational opportunities. The area includes sandy beaches on the eastern coast of Narrow Cape (~1.25 miles northeast of LP3), and Fossil Beach on the west (~0.2 mile southeast of LP3 and within KLC boundaries) where fossilized marine organisms can be dug from the cliffs or found on the beach. Additional activities in the area generally include beachcombing, surfing at Surf Beach (~2 miles west of LP3 and within KLC boundaries), picnicking, and wildlife sighting of whales, birds and harbor seals and occasionally sea lions and sea otters. Hunting in the Narrow Cape area focuses on Sitka black-tailed deer during the late summer and fall. In addition, Burton Ranch offers for-fee bison hunting, wild game hunting guide service, and horseback riding.

Waters Near Narrow Cape: Approximately three miles southeast of Narrow Cape, the area around Ugak Island is visited by sport fishing boats in pursuit of halibut, rock fish, and salmon.

Though these sites represent public land used for recreation, none of these properties is used primarily for recreation, and the FAA has determined that none of them are Section 4(f) properties. The FAA bases this determination on State of Alaska legislation regarding the management of these properties. As codified in Alaska Statute 41.23.250, Narrow Cape is managed as a public use area with primary allowable uses of grazing and missile launch activity. Also allowed as additional uses are the land-based recreational pursuits mentioned above. Though recreational pursuits do occur on the lands and water of Narrow Cape, these pursuits are not primary uses, and the lands are not managed specifically for that purpose. In addition, Alaska Statute 41.23.250(e) states that the commissioner may not manage the Kodiak Narrow Cape Public Use Area as a unit of the state park system.

Additionally, as described in Appendix H, the Alaska Department of Natural Resources determined that KLC (which encompasses East Twin Lake, Fossil Beach, and Surf Beach) does not meet the requirements to be considered a 4(f) property according to the definition in the U.S. Department of Transportation Act of 1966 (ADNR, 2013). Based on the foregoing, only the Pasagshak State Recreation Site is analyzed in this EA as a 4(f) resource close enough to the Proposed Action to be analyzed. In addition, potential impacts on additional Narrow Cape recreational opportunities are also discussed.

3.4 Fish and Wildlife

3.4.1 Regulatory Framework

Many statutes, regulations, and Executive Orders protect biotic resources, including the Endangered Species Act (ESA), Migratory Bird Treaty Act (MBTA), Fish and Wildlife Coordination Act (FWCA), Marine Mammal Protection Act (MMPA), Magnuson-Stevens Fishery Conservation and Management Act, and the Bald and Golden Eagle Protection Act.

3.4.2 Fish

There are no fish-bearing streams at any existing or proposed facility at KLC. Streams and lakes within the KLC are relatively small and shallow, limiting freshwater fishery resources. As discussed below, limited resident fish populations may include stickleback (*Gasterosteus aculeatus* or *Pungitius pungitius)*, Dolly Varden char (*Salvelinus malma)*, rainbow trout, and sculpin (*Cottus sp*.) (ENRI, 1995c).

AAC contracted ENRI to conduct baseline natural resource inventories for the originally proposed KLC site. ENRI was established by the Alaska state legislature in 1973 to provide information and data without advocacy to citizens and government agencies. As part of the resource inventory, ENRI conducted a baseline fish survey in 1994. Based on ENRI's survey and information from the Alaska Department of Fish and Game (ADF&G) Fish Resource Monitor, there are three anadromous streams in the vicinity of the KLC: 259-41-10004 (unnamed), 259-41-10005 (unnamed), and 259-30-10060 (Burton Creek) (Figure 13) (ADF&G, 2012a). The ENRI survey documented Dolly Varden char in all three streams, coho salmon (*Oncorhynchus kisutch*) juveniles in streams 259-41-10004 and 259-41-10005, sculpin in stream 259-41-10004, and stickleback in Burton Creek and in East Twin Lake (ENRI, 1995b). ADF&G added spawning coho salmon in 2004 to all three streams and spawning, rearing, and present pink salmon (*Oncorhynchus gorbuscha*) to Burton Creek in 2009 (ADF&G, 2012a).

Stream 259-41-10004 crosses Pasagshak Point Road near the western boundary of the KLC and passes behind the proposed MCC sites and the existing MSF and LCC. Fish traps were set by ENRI upstream as far as the LCC; however, beaver dams located approximately 1,500 feet north of the road preclude upstream salmon access. Therefore, the closest proposed facility is over one mile northeast of the anadromous reach of stream 259-41-10004. Stream 259-41-1005 is outside of the KLC boundary and

approximately 1.25 miles southwest of the nearest proposed LP3 facility (the MCC). Burton Creek is also located outside of the KLC boundary and is over 1.5 miles northeast of the nearest proposed LP3 facility (the MCC).

As stated in Section 3.3.2, ADF&G Sport Fish Division stocks East Twin Lake – which lies within the KLC boundary – with rainbow trout (Figure 14). The lake is currently scheduled for annual stocking of 4,000 sterile rainbow trout fingerlings from 2009-2014 (ADF&G, 2012b). East Twin Lake must be stocked on an annual basis as there is no overwinter survival due to oxygen depletion of this very shallow lake. The fish stocking occurs – as in many road-accessible Kodiak lakes – to provide an opportunity for sport fishing.

Additionally, numerous species of fish and invertebrates inhabit nearshore and offshore waters around Kodiak Island. The most common marine fish are salmon, flounder, sole, pollock, skate, cod, and halibut. Other marine organisms that inhabit the shallow continental shelf water around Kodiak Island are crabs (king, tanner, Dungeness, kelp, rock, and hermit), scallops, octopus, shrimp, cockles, razor and butter clams, sea anemones, chitons, jellyfish, sea urchins, limpets, snails, mussels, sea cucumber, starfish, and barnacles (ENRI 1995c). Fish inhabiting waters in the immediate area of the proposed KLC are typical of those in the waters of Kodiak Island as a whole (FAA, 1996).

According to the National Oceanic and Atmospheric Administration's National Marine Fisheries Service, Essential Fish Habitat (EFH) for all lifestages (marine immature and maturing adults, and marine juvenile) of chinook, chum, coho, pink, and sockeye salmon is present in marine waters up to the shoreline around Narrow Cape and portions of anadromous streams on Narrow Cape (NOAA, 2012). In addition, EFH for all lifestages (larvae, late juvenile, and mature) of over fifteen species of groundfish is present in marine waters up to the shoreline around Narrow Cape (Figure 14).

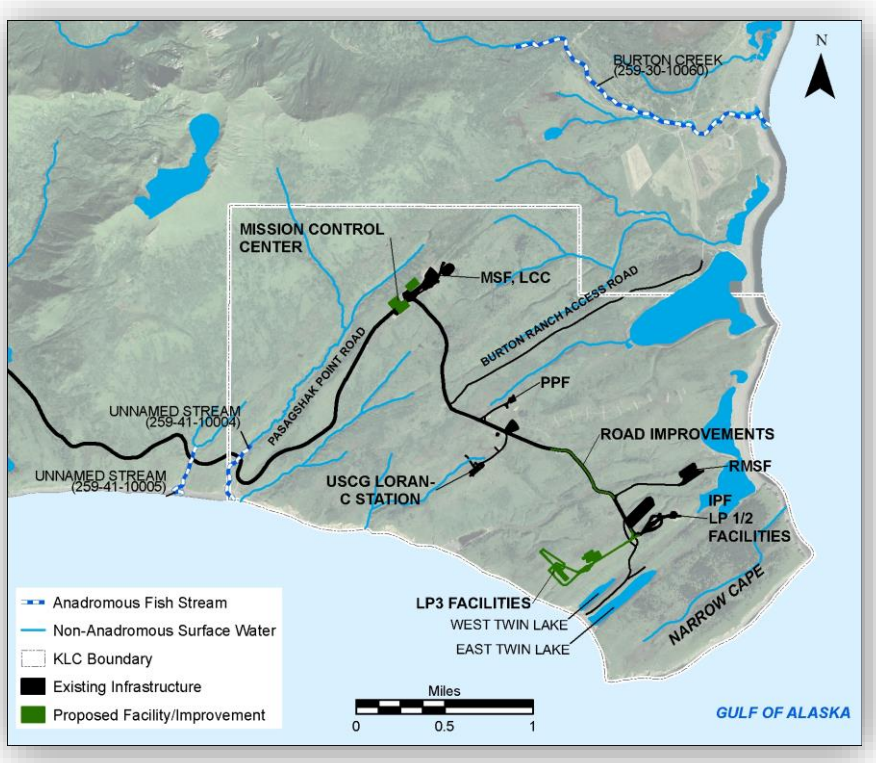

Figure 13: Fish Bearing Waters near the KLC

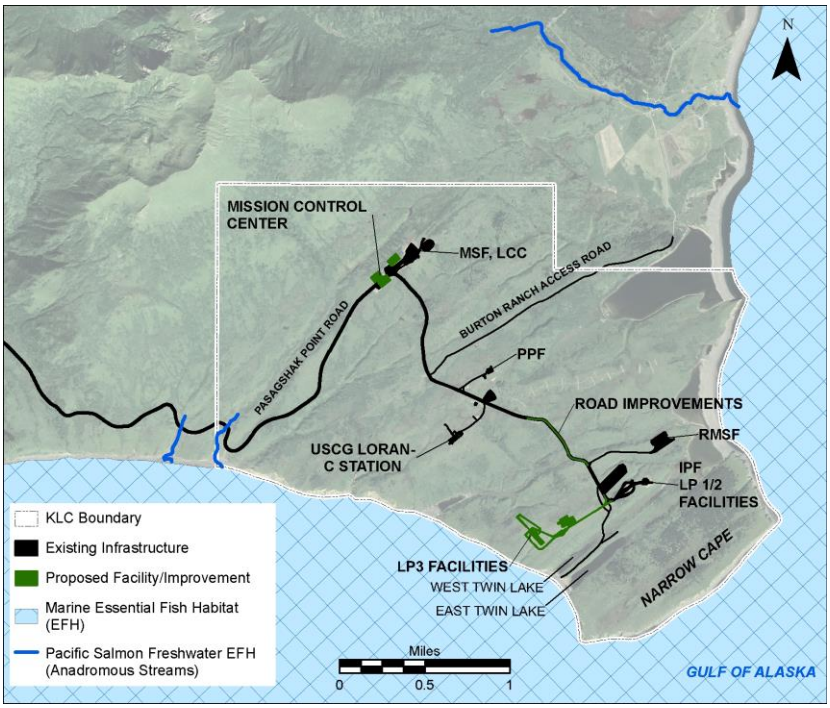

Figure 14: Essential Fish Habitat

3.4.3 Birds

Kodiak Island provides habitat for 221 documented bird species (ENRI, 1995c), and 237 species have been recorded in the Kodiak archipelago (MacIntosh, 1998). ENRI conducted extensive bird surveys within the KLC and adjacent on and off-shore locations in 1994, which revealed that the KLC provides seasonal habitat for approximately 143 species of terrestrial and marine-oriented birds (ENRI, 1995c). During the offshore surveys conducted in 1994, 38 different species were observed in June and July. Detailed survey results and species descriptions are presented in the 1996 EA (see Section 3.5.1.2 of the 1996 EA) and are incorporated by reference (FAA, 1996). Habitats and environmental quality have remained stable over time limiting potential for changes in the avifauna. The distribution, abundance, and species composition of birds using the Narrow Cape area remains comparable to the baseline surveys performed in 1994. Although no more recent formal bird surveys have been conducted specific to Narrow Cape or KLC, there are multiple citizen science forums for documenting bird presence and abundance, namely eBird and the National Audubon Society Christmas Bird Count (ebird, 2012; Audubon, 2010). These resources reveal anticipated fluctuations in species occurrence, but no obvious differences in population trends.

The bald eagle, which is protected by the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act, is common throughout the year on Kodiak Island and is often seen in the Narrow Cape area. Aerial surveys were conducted in the spring of 1999, 2000, and 2001 to document bald eagle nesting activities near the KLC. During the surveys, eagles were observed in the Narrow Cape area, and three nests were identified within 5 miles of the KLC (ENRI, 2002a). Nest sites were monitored during the first five launches from KLC in accordance with the Environmental Monitoring Plan developed with U.S. Fish and Wildlife Service (USFWS) input. Bald eagles continued to successfully use the sites during the period of observation, and the USFWS removed the monitoring requirement.

In response to AAC's current proposal, the USFWS performed an aerial nesting bald eagle survey, included as Appendix E, on 10 May 2013 in the area surrounding the KLC to provide current nesting information (USFWS, 2013). The survey area (approximately 10 square miles) included all suitable habitats that could be affected by construction of the proposed Launch Pad 3 and associated infrastructure. A total of seven bald eagles (six adult and one subadult) and three nests were recorded. The three nests were located on KLC property, approximately 1.3, 1.4, and 1.9 miles from the proposed site for Launch Pad 3 (see Figure 15).

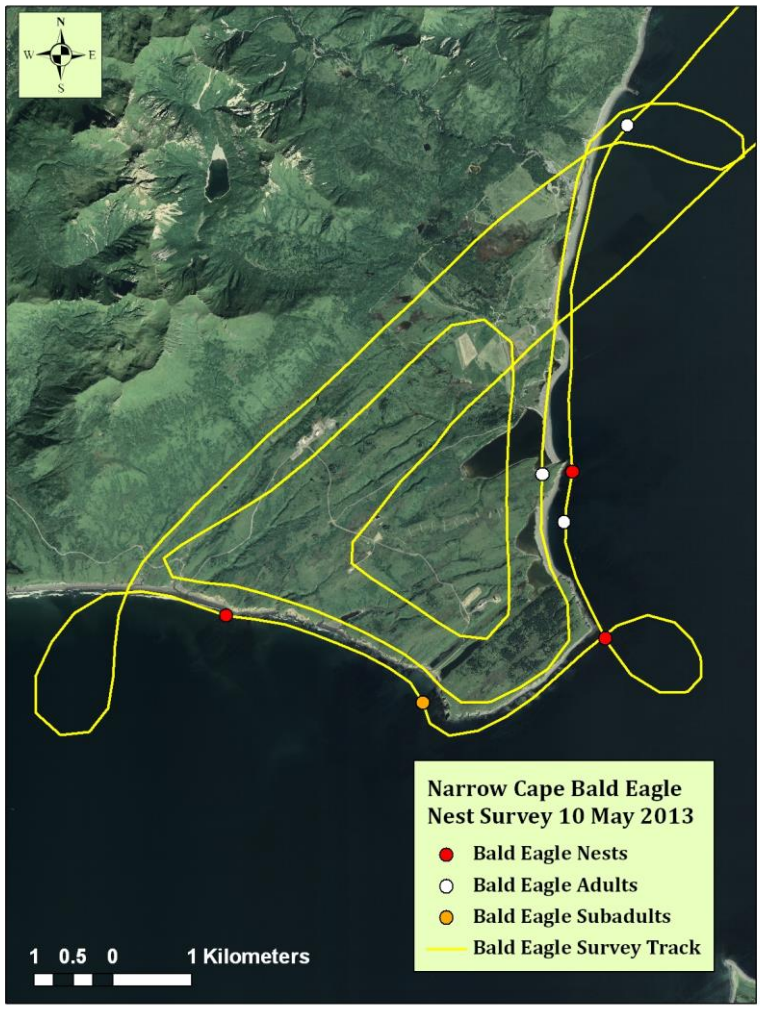

Figure 15: Location of Bald Eagle Nests at the KLC

3.4.4 Mammals

Terrestrial Mammals

The Narrow Cape area supports 12 species of terrestrial mammals, six native and six introduced (ENRI, 1995c) (Table 6). During a 1994 survey by ENRI, 11 of the 12 terrestrial species were observed in the proposed KLC area. Although the mountain goat was not observed, this species has been observed by others in the vicinity of Shaft Peak, approximately two and a half miles northwest of the proposed KLC site boundary (ENRI, 1995c). Horses, cattle, and bison graze nearby under lease to a local ranch. A seven-foot chain link fence surrounds each of the structures at KLC to prevent animals from wandering onto the

launch complex. The fence and nearby steep topography keep grazing animals away from the existing launch pads. The 1996 EA presents a more detailed description of typical mammal occurrence on and near the KLC (see Section 3.5.1.3 of the 1996 EA).

Common Name:	Scientific Name:
Little brown bat	*Myotis lucifugus*
Snowshoe hare[a]	*Lepus americanus*
Red squirrel[a]	*Tamiasciurus hudsonicus*
Tundra vole	*Microtus oeconomus*
Muskrat[a]	*Ondatra zibethicus*
Beaver[a]	*Castor canadensis*
Red fox	*Vulpes vulpes*
Brown bear	*Ursus arctos*
Short-tailed weasel	*Mustela ermine*
River otter	*Lutra canadensis*
Sitka black-tailed deer[a]	*Odocoileus hemionus*
Mountain goat[a]	*Oreamnos americanus*

[a.] Introduced to Kodiak Island.

Table 6: Terrestrial Mammals of Narrow Cape

Marine Mammals

Marine mammals that occur in the vicinity of KLC include the Steller sea lion, harbor seal, gray whale, humpback whale, northern sea otter, northern fur seal, and a number of other cetacean species including Dall's and harbor porpoise, and orcas (NASA, 2011). Although seven species of whales can be found in the waters of the Kodiak Archipelago, only the gray and humpback whale use the nearshore waters of Narrow Cape and Ugak Island on a regular basis (ENRI, 1995c). Detailed marine mammal studies conducted prior to construction of the KLC are presented in the 1996 EA (see Section 3.5.2.3 of the 1996 EA), and are incorporated by reference. Monitoring and survey activities specific to marine mammals have been ongoing since operational activities began at the KLC.

The harbor seal is widely distributed in the Gulf of Alaska, an area that includes Narrow Cape. Harbor seals are the most abundant year-round marine mammal species found near the KLC, as determined during the ENRI baseline survey and confirmed during AAC monitoring activities. Harbor seals are not listed as threatened or endangered under the ESA or as depleted under the MMPA. Based on the AAC's aerial survey counts from launch monitoring reports conducted since January 2006, approximately 97 percent of all observed harbor seals are found on the eastern shore of Ugak Island, approximately five miles from the launch pad complex (Figure 16). The eastern shore is backed by high steep cliffs that reach up to 1,000 feet above sea level. Because physical access to Ugak Island harbor seal haulouts is difficult and dangerous, the only abundance and behavior data of these seals have been derived from aerial surveys conducted by the AAC. Harbor seals generally breed and molt where they haul out, so it is assumed that both of these activities take place on Ugak Island, and young seals have routinely been seen there during launch-related aerial surveys. Pupping in Alaska takes place generally in the May to June time frame; molting occurs generally from June to October. Both periods contain peaks in haulout attendance. Total

counts on Ugak Island have increased steadily since the 1990s from several hundred (ENRI 1995–1998) up to an average of about 1,500 today (R&M 2007a, 2007b, 2008, 2009, AER 2012a, 2012b, 2013a, 2013b).

Figure 16: Harbor Seals on the southeast shore of Ugak Island (Source: AAC, 2012)

Marine Mammal Protection Act

All marine mammals are protected under the MMPA and therefore coordination with the NMFS (or USFWS in the case of the northern sea otter) is required (marine mammal species that are also protected under the ESA are further discussed in Section 3.4.5). In 2011, NMFS issued their Final Rule (50 CFR Part 217) governing the unintentional taking of marine mammals incidental to rocket launch operations at KLC. The Final Rule covers the period from 2011 to 2016. Under the rule, NMFS issues annual Letters of Authorization (LOAs) with specific monitoring and reporting requirements. The current LOA was issued to AAC on August 1, 2015 and expires March 22, 2016 (Appendix M). The LOA covers the taking of Steller sea lions and Pacific harbor seals incidental to a maximum of twelve rocket launches during the effective period of the LOA, however, note that launch operations from KLC would not exceed the maximum of 9 launches authorized annually. Further, certain mitigation, monitoring, and reporting requirements need to be undertaken as required by the regulations and the LOA. In addition, the AAC must cooperate with any federal, state, or local agency monitoring the impacts of KLC activities, and submit a draft report to the NMFS no later than 90 days prior to expiration of the LOA. The LOA requires AAC to conduct quarterly marine mammal surveys, launch-specific video monitoring of a haulout on Ugak Island, and prepare launch-specific and annual reports. The quarterly surveys count the number of harbor seals and Steller sea lions that are hauled out on Ugak Island, which is three miles south of Narrow Cape. Other marine

mammal species are noted if observed during these surveys. Reported information is reviewed prior to issuance of an annual LOA and upon renewal of the Final Rule (every five years).

The Final Rule also addressed three additional marine mammals potentially in the defined action area: gray whales, humpback whales, and sea otters. NMFS did not anticipate take of the whales incidental to the specified launch activity, and sea otters are managed by the USFWS; therefore, only Steller sea lions and harbor seals are included in the LOA. In 2011, USFWS was contacted to determine if an Incidental Harassment Authorization was required under the MMPA for the northern sea otter. USFWS determined that authorization for incidental take under the MMPA would not be required (USFWS, 2011b) due to the infrequency of the launches and the temporary disturbances.

3.4.5 Threatened and Endangered Species

There are no federally-listed threatened, endangered, or candidate *plant or terrestrial animal* species within the vicinity of Narrow Cape or within the KLC (USFWS, 2011a). However, there are several threatened, endangered, and candidate *avian and marine mammal* species that may inhabit or transit the waters and nearshore environment of Narrow Cape and Ugak Island (Table 7). Although candidate species are provided, they have no statutory protection under the ESA. They are species for which there is sufficient information to support a proposal to list as endangered or threatened, and therefore may be listed in the future.

Species	Status	Managing Federal Agency
Fin whale (*Balaenoptera physalus*)	Endangered	NMFS
Humpback whale (*Megaptera novaeangliae*)	Endangered	NMFS
Kittlitz's murrelet (*Brachyramphus brevirostris*)	Candidate	USFWS
North Pacific right whale (*Eubalaena japonica*)	Endangered	NMFS
Northern sea otter (*Enhydra lutris*)	Threatened	USFWS
Short-tailed albatross (*Phoebastria albatrus*)	Endangered	USFWS
Steller's eider (*Polysticta stelleri*)	Threatened	USFWS
Steller sea lion (*Eumetopias jubatus*)	Endangered	NMFS
Yellow-billed loon (*Gavia adamsii*).	Candidate	USFWS

Table 7: Special status species near the KLC (USFWS 2011, NMFS 2011)

Critical Habitat

The waters off of Narrow Cape – up to the mean high tide (MHT) line – are designated critical habitat for the Southwest Alaska distinct population segment of the Northern sea otter. Steller sea lion critical habitat includes the offshore areas up to MHT surrounding Narrow Cape including Ugak Island. The critical habitat also includes an air zone that extends 3,000 feet above the terrestrial zone (area extending 3,000 feet landward from the base point of a haulout) of the Ugak Island haulout (50 CFR 226.202). The proposed LP3 footprint is located approximately 0.2 mile inland from the nearest coastline – designated critical habitat areas – and over 100 feet higher in elevation than MHT.

Consultation History - USFWS

FAA and AAC (as the designated non-Federal representative) have consulted with the USFWS on multiple occasions in the past when projects have been proposed at KLC with the potential to impact federally-

listed threatened or endangered species or designated critical habitat. The following paragraphs summarize USFWS consultation history for KLC to date.

In a 2004 USFWS letter to FAA and AAC (consultation number 2004-093), the USFWS addressed threatened and endangered species for the ongoing and proposed activities at KLC. The letter specifically responded to numerous documents related to federally-listed species around KLC, which included:

- Final EIS/ROD for the Ground-Based Midcourse Defense Extended Test Range, July 2003;
- Report of the Environmental Monitoring Studies for the QRLV-2 Launch, conducted by the Environmental and Natural Resources Institute (ENRI), July 2002;
- Summary Findings of Environmental Monitoring Studies for the Kodiak Launch Complex, 1998-2001 (ENRI), April 2002;
- Biological Assessment for the Kodiak Launch Complex (ENRI), 1998: and
- Environmental Monitoring Plan, included as Appendix B in the Natural Resources Management Plan for the Kodiak Launch Complex, June 1998.

The USFWS determined that the endangered short-tailed albatross and the threatened Alaska-breeding population of Steller's eider could occur in the vicinity of KLC, and concurred with the FAA determination that the noise associated with launching rockets was ***not likely to adversely affect*** these species.

In response to the listing of the Northern sea otter as threatened in 2005, AAC reinitiated consultation with USFWS on potential effects of ongoing operations at KLC, specifically rocket launches. The USFWS responded with a letter (consultation number 2006-065) that addressed all federally-listed species that could be in the vicinity of KLC. The USFWS determined that the threatened Steller's eider and threatened Northern sea otter could occur in the vicinity of KLC, and concurred that the launch of rockets from KLC was ***not likely to adversely affect*** these species. The USFWS letter did not mention the endangered short-tailed albatross during this consultation. The FAA reinitiated consultation with the USFWS during the scoping phase in June, 2012 for the Proposed Action. On September 27, 2012, the USFWS concurred with the proposed list of ESA species under their jurisdiction (Table 77) that could potentially occur in the action area. Additional consultation with the USFWS provided the basis for the effect determinations presented in Section 4.1.4.4 as they pertain to the Proposed Action (consultation number 2012-0127).

Consultation History - NMFS

The KLC currently operates in accordance with the NMFS's Biological Opinion (BO) (issued March 18, 2011; ESA compliance) and regulations (issued March 23, 2011; MMPA compliance) both of which are valid for five years from the date of issuance (see Appendix G). AAC is currently in the process of renewing the documentation.

Because the Steller sea lion is listed as endangered under ESA, the takings (under MMPA) required authorization under the ESA. As a result of the NMFS's proposed action of issuing regulations and subsequent LOAs for the takings under the MMPA, NMFS conducted internal formal consultation and prepared the necessary BO to meet their obligations under the ESA for the take of Steller sea lions.

The BO analyzed rocket noise impacts to Steller sea lions based on 45 launches over the 5-year period with an average of 9 launches per year. For 42 of these launches, the small-lift Castor 120 rocket engine was the loudest engine covered in the BO. The BO also considered 3 launches from the medium-lift class of rockets, specifically the liquid-propelled Taurus II (synonymous with the Antares that is currently described in Section 2.1.2.2). The BO concluded that the proposed action would ***not likely jeopardize*** the continued existence of the species or adversely modify its critical habitat. Three additional endangered

species were considered in the BO with the potential to occur within the defined action area: fin whale, humpback whale, and North Pacific right whale. However, NMFS determined that these species were ***not likely to be adversely affected*** by launch operations because they are not in the area (fin whale and North Pacific right whale) or would be below the surface of the water (humpback whale), and therefore not likely to be exposed to launch noise that would significantly disrupt normal behavioral patterns.

The FAA consulted with NMFS in 2013 to determine if the Proposed Action is beyond the scope identified in the BO (see Section 4.1.4.4 for the conclusions).

Monitoring Efforts

In addition to initial baseline avian and marine mammal surveys of the Narrow Cape area, specific monitoring efforts were conducted for the first five launches from KLC. Avian surveys continued for the following two launches (through 2004). Launch-specific aerial marine mammal surveys continued through 2010 as mandated by NMFS. Since that time, non-launch specific aerial marine mammal surveys have been conducted quarterly. Although the marine mammal surveys focus on Steller sea lions and harbor seals, the presence and abundance of northern sea otters was documented during each launch-specific survey. Similarly, although Steller's eiders were the primary focus for the avian surveys, all species of birds identified during the surveys were documented.

Marine Mammal Species

Steller Sea Lion

The Stellar sea lions western distinct population segment near Kodiak Island was included in the population classified as endangered in 1997. There are two major rookeries (breeding grounds) in the Kodiak Archipelago and fourteen sea lion haulouts on Kodiak Island (50 CFR 226.202). Three of these haulouts, Cape Chiniak, Ugak Island, and Gull Point, occur within 15.5 miles of the proposed KLC site. Ugak Island, approximately three miles southeast of the KLC, is the closest haulout. No Stellar sea lion rookeries occur within the six-mile anticipated effects radius that was established through reviewing agency input to the 1996 EA (FAA, 1996). Based on the noise analysis for medium-lift rockets, the established six-mile radius is still valid and applicable to the Proposed Action (see Appendix A).

Northern Sea Otter

The southwest Alaska population of the Northern sea otter was listed as a threatened species in 2005; its critical habitat was designated in 2009. Sea otters are generally common in Alaskan waters and account for a large percentage of the world total; however, sea otter populations near Narrow Cape have been historically low. AAC voluntarily conducted one sea otter-specific aerial survey during the FT-04-1 launch campaign to close the administrative consultation record. Small numbers of sea otters (maximum count = 8 sea otters) were seen on that survey (R&M, 2006). Aerial sea otter surveys were discontinued after that launch.

Launch-specific and quarterly marine mammal monitoring surveys have only identified small numbers of otters, generally zero to 3 individuals. A higher peak was recorded in 2001, when as many as 95 otters were counted collectively over four surveys in March of that year, though over an area stretching from Lone Point (north of Narrow Cape), south to include Ugak Island, and west to include Pasagshak Bay (ENRI, 2005). The reason for this temporary peak is not known, but it was not seen in prior years (back to 1997 when marine mammal observations started) and has not been seen since. The presence of sea otters in the vicinity of the KLC is sporadic based on multiple years of survey and monitoring efforts. Pre- and post-launch counts of otters are comparable and do not indicate that rocket launch noise has been affecting otters.

In summary, marine mammal surveys have generally identified small numbers of otters within the vicinity of KLC; maximum otter counts ranged between zero and eight individuals in all but one aerial survey (ENRI, 2005; ABR, 2011). The few otters that were observed seem to prefer the waters around Ugak Island or Long Island near Pasagshak Bay, rather than the cliffs of Narrow Cape.

Whales

Humpback whales move north to the Gulf of Alaska in the summer and appear to have a high affinity for nearshore waters. In summer months, humpbacks can generally be found in the nearshore areas of Kodiak Island, Prince William Sound, and in southeastern Alaska. Groups of humpback whales are occasionally observed in the Narrow Cape and Ugak Island area in the late spring, summer, and fall (FAA, 1996).

The North Pacific right whale is a rare, large, baleen whale found in the Gulf of Alaska in addition to the southern Bering Sea and Aleutian Islands (ENRI, 1995c). Within the Gulf of Alaska, this species is primarily found in the shelf waters to the east and south of Kodiak Island. This species is rarely observed around Kodiak Island and has not been observed in waters near Ugak Bay (NMFS, 2011). Designated critical habitat for the North Pacific right whale is over 18 miles south of Narrow Cape (50 CFR Part 226).

Fin whales can be found in the Gulf of Alaska during the summer months in waters around Kodiak Island and south of Prince William Sound. These whales typically spend the winter in subtropical and temperate waters where they breed and calve before migrating north. Fin whale observations in waters near Ugak Bay are considered rare (NMFS, 2011).

Avian Species

Kittlitz's Murrelet

Kittlitz's murrelet was listed as a candidate species under the ESA in 2004. This species of seabird is an uncommon resident of Kodiak Island that is reported to be a rare visitor to the Narrow Cape area (ENRI, 1995c). It was observed in small numbers (less than five birds) in previous pre- and post-launch avian surveys; however, individuals were not observed in most of these surveys (ENRI, 2002a).

Steller's Eider

Steller's eiders occur in the Kodiak Island area primarily during the winter months (mid-October through March); however they are not common in the nearshore areas around Narrow Cape (FAA, 1996). Detailed, systematic aerial and shore-based point counts were conducted for seven launches from KLC. Small rafts[7] of Steller eiders were seen on two occasions totaling approximately 30-60 individuals. The pre- and post-launch monitoring studies for Steller's eiders determined that rocket launches did not result in large order (>50%) reductions in their numbers near Narrow Cape (ENRI, 2002c). In their summary document for the first five launches from KLC (ENRI 2002c), ENRI indicated that "it was apparent from the data that rocket launches were not affecting bird numbers to any significant degree, and certainly not to the degree attributable to natural factors such as weather." ENRI (1998) also cited studies indicating that responses of breeding birds to launches of space shuttle and Titan rockets (both much larger than previous or currently proposed rockets launched at KLC) were temporary, with the birds returning to their nests in 2 to 4 minutes. In 2004, the USFWS concluded that launch operations were *not likely to adversely affect* the Steller's eiders and ended the launch monitoring requirement (USFWS, 2004).

Short-tailed Albatross

The short-tailed albatross, which breeds on remote Japanese volcanic islands, was once a regular visitor to Alaskan waters (USFWS, 2006a). Sightings of single individuals happen occasionally in the pelagic

[7] An aggregation of animals (such as waterfowl) resting on the water.

waters of the North Pacific Ocean; however, there have been no documented sightings of this seabird in either the baseline avian surveys or in the seven subsequent launch-specific avian surveys of the Narrow Cape area.

Yellow-billed Loons

Yellow-billed loons were listed as a candidate species under the ESA in 2009 throughout their range (USFWS, 2009). This species' wintering range includes the KLC, however no sightings are known in the Narrow Cape area. This species of loon was not identified in any of the baseline avian surveys or in any subsequent launch-specific monitoring surveys through 2005.

3.5 Plants

Detailed vegetation studies are presented in the 1996 EA (see Section 3.5.1.1 of the 1996 EA) and are adopted by reference. Plant types and groundcover classifications presented in the Vegetation Inventory and Mapping report from November 1994 (ENRI, 1995b) and updated by ENRI in 2004 (ENRI 2004), continue to provide an accurate representation of conditions within the KLC. Hairgrass-mixed forb meadows represent the most prevalent plant communities at the KLC, while alder and mixed alder-willow shrublands, lupine meadow, and Palustrine wetlands are also present. The proposed facilities and road improvements would occur primarily within hairgrass-mixed forb meadows and closed mixed alder/willow shrubland plant communities (ENRI, 1995a). Small areas of saturated Palustrine wetlands also occur within the footprint of the proposed KLC improvements. There are several stands of spruce trees which have been used in monitoring studies (Section 4.1.5.1) of plant health within the KLC (ENRI, 2002b).

There are no plant species protected under the Endangered Species Act on or near the KLC.

During the public comment period for the Draft EA, a commenter notified the FAA that two rare plant species, the Oriental popcornflower (*Plagiobothrys orientalis*) and the mudwort (*Limosella aquatica*), have been documented on Fossil Beach. Based on the 1994 and 2003 Narrow Cape vegetation surveys performed by the University of Alaska, Anchorage Environment and Natural Resources Institute (ENRI), the FAA is not aware of these plants occurring in the area of proposed construction at the KLC under the Proposed Action.

3.6 Hazardous Materials, Pollution Prevention, and Solid Waste

Hazardous materials are substances defined as hazardous by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Toxic Substances Control Act (TSCA), and the Hazardous Materials Transportation Act (HMTA). In general, hazardous materials include substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristics, may present substantial danger to public health or welfare, or to the environment, when released. The FAA requires that each commercial launch site and each launch operation have a safety review that includes a complete disclosure of each hazardous material in the ground safety analysis report, as well as a hazardous materials management plan (FAA, 2009).

Management of hazardous waste must comply with the Resource Conservation and Recovery Act (RCRA), as amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA). The EPA administers RCRA, which requires that hazardous wastes be treated, stored, and disposed of to minimize the present and future threat to human health and the environment.

3.6.1 Hazardous Materials Management

Hazardous material use, storage, and disposal are managed in accordance with the KLC Safety Policy, the KLC Emergency Response Plan, the KLC General Compliance Plan for Emergency Planning and Community

Right to Know Act, AAC's Hazardous Communication Program, the Kodiak Area Emergency Operation Plan, the Explosive Site Plan (as required by 14 CFR Part 420), and applicable state and Federal environmental laws, in such a way as to minimize impacts to the environment. Hazardous material present at KLC is listed in the AAC Hazardous Communication Program by type. A record of specific quantities is maintained by the KLC Operations Manager. All mission specific hazardous waste, such as propellants and explosives, is removed at the end of the mission by the launch vehicle provider. Additionally, the KLC maintains a Spill Prevention, Control, and Countermeasure (SPCC) Plan covering the fuel/oil storage facilities (R&M, 2011) (Table 8).

The KLC Vice-President and General Manager serve as the point of contact for all matters pertaining to hazardous materials at KLC and AAC standard operating procedures requires notification before the arrival of any hazardous materials. All contractors provide hazardous materials information in the form of Material Safety Data Sheets labels and warning signs, and a plan indicating material handling/storage procedures, spill/release prevention measures, and emergency response protocol, including cleanup and disposal procedures and first aid/medical treatment procedures (NASA, 2011).

The KLC currently stores and uses over 18,000 gallons of petroleum products ranging from gasoline and lubricating fluids to diesel fuel.

Some rocket payloads, both small-lift and medium-lift, require hydrazine-based hypergolic fuels for maneuvering in space (not for rocket propellant). The KLC is equipped to store up to 550 gallons of hypergolic fuels during launch processing, and is approved by the Department of Defense Explosive Safety Board to store up to 1,190 gallons.

AAC is currently authorized to operate KLC as a Conditionally Exempt Small Quantity Generator (CESQG) regulated by 40 CFR 262 (USEPA Standards Applicable to Generation of Hazardous Wastes). With this designation, KLC can produce no more than 220 pounds of hazardous waste per month (NASA, 2011). This classification is applicable for both medium-lift and small-lift launches from KLC.

After the 2014 launch failure, AAC initiated all pre-approved applicable KLC Emergency Response Plans and procedures, including the Land and Shallow Water Impact Emergency Operations Procedures, which includes responsibilities for the AAC and the launch customer in a launch failure scenario. The launch failure resulted in pieces of solid propellant from the rocket, along with other debris, spreading over an area of the KLC. This affected area was fenced temporarily for public safety reasons and a hazardous materials team performed a detailed search of the affected area to recover all debris, including the propellant. Additional teams completed follow-on searches to confirm removal of all hazardous materials.

The launch customer (the U.S. government) completed an environmental investigation of the affected area to identify and quantify any potential contamination. The environmental investigation plan was developed, coordinated, and approved by the Alaska Department of Environmental Conservation and other agencies, as required, to comply with local, state, and federal rules and regulations, and included water and soil sampling. Results of the investigation indicated that the 2014 launch failure did not result in any contamination at the KLC that would require remediation.

Location	Storage Capacity (gal)	Content	Description
Stationary ASTs			
LCC	2,500	Diesel (Fuel Oil)	Saddle or skid mounted above-ground horizontal tank with double-wall secondary containment
LCC	150	Diesel (Fuel Oil)	Above-ground day tank with diked secondary containment
MSF (Dispensary)	2,000	Diesel	Saddle or skid mounted above-ground horizontal tank contained in sealed concrete vault
MSF (Heating)	3,000	Diesel (Fuel Oil)	Saddle or skid mounted above-ground horizontal tank contained in sealed concrete vault
MSF	1,000	Gasoline	Saddle or skid mounted above-ground horizontal tank contained in sealed concrete vault
MSF	350	Diesel/Fuel Oil	Two above-ground day tanks with diked secondary containment
PPF	2,500	Diesel (Fuel Oil)	Saddle or skid mounted above-ground horizontal tank with double-wall secondary containment
PPF	150	Diesel (Fuel Oil)	Above-ground day tank with diked secondary containment
RMSF	3,000	Diesel (Fuel Oil)	Saddle or skid mounted above-ground horizontal tank contained in sealed concrete vault
RMSF	50	Diesel (Fuel Oil)	Above-ground day tank with diked secondary containment
IPF	2,500	Diesel (Fuel Oil)	Saddle or skid mounted above-ground horizontal tank with double-wall secondary containment
IPF	150	Diesel (Fuel Oil)	Above-ground day tank with diked secondary containment
Portable Storage Tanks			
MSF	400	Diesel	100 and 300-gallon truck mounted tanks utilized as mobile refuelers
MSF	220	Assorted Lubricating Fluids	55-gallon dispensary storage drums situated on spill pallets
MSF	55	Used Oil	55-gallon used oil storage drum situated on spill pallet

Table 8: Facility Fuel/Oil Storage Summary

Source: KLC Spill Prevention, Control, and Countermeasure Plan (R&M, 2011).

3.6.2 Pollution Prevention

Pollution prevention, waste minimization and recycling procedures are defined in the KLC SPCC Plan, Emergency Response Plan and Contamination Control Procedures; all include best management practices (BMPs).

3.6.3 Solid Waste Management

Solid Wastes of a non-hazardous nature are containerized at the KLC and periodically picked up by approved carriers and disposed of at the Kodiak Island Borough Landfill.

3.6.4 Existing Environmental Contamination

No National Priorities List (NPL) site is listed for the Narrow Cape area in the EPA's CERCLA Information System database (NASA, 2011).

A search of the ADEC Contaminated Sites Database did not reveal any open or closed sites with known environmental contamination near existing KLC installations. The nearest "Active" site is located at the decommissioned USCG LORAN-C Station on Narrow Cape. The ADEC database does not provide a detailed location of the site, but the USCG LORAN-C Station is approximately 0.8 miles northwest of the proposed LP3 (Figure 4). Based on the ADEC site cleanup chronology, there were two known releases from an underground storage tank (UST) at the USCG LORAN-C facility; one spill of over 20,000 gallons of diesel in 1982 and another of approximately 8,000 gallons of diesel in 1987. The contamination was confirmed in 1995, and a site assessment and characterization report was conducted in 1998. According to ADEC, 402 tons of contaminated soils was excavated and treated in 2002 (ADEC, 2012a). Contamination remains under the USCG LORAN-C array, as the above-ground instrumentation could not be disturbed for excavation at the time. This site is under the regulatory oversight of the ADEC.

3.7 Historical, Architectural, Archaeological, and Cultural Resources

The National Historic Preservation Act of 1966, as amended (NHPA) established the National Register of Historic Places (NRHP). The NHPA established guidelines by which sites are evaluated for their archeological and historic value and integrity. Section 106 of the NHPA guides the process of research and evaluation to establish which sites are eligible for the NRHP. Any potentially historic properties (generally sites over 50 years of age and/or possessing unique significance) within a project's Area of Potential Effect (APE) are evaluated. For all prior work at the KLC, determinations of "No Historic Properties Affected" pursuant to Section 106 implementing regulations (36 CFR 800.4(d)(1)) have received concurrence from the State Historic Preservation Office (SHPO).

3.7.1 Historic and Cultural Resources

Kodiak Island has documented archaeological, historical, and cultural resources. Prior to its discovery by Russian explorers, Native settlements were transitory, moving in response to the availability of resources. As a result, archaeological and traditional use resource sites are fairly well distributed along the coastline but are concentrated along major bays and the mouths of fish streams. Historical sites on the island are often related to Russian occupation, the period of transition to American governance, and defense facilities built during World War II (FAA, 1996).

The APE for construction of the LP3 and associated facilities and Pasagshak Point Road upgrades is primarily confined to the actual footprints of the planned roads and structures, as well as those immediately adjacent areas that would be used for equipment access and construction staging (see Figure 25 in Section 4.1.7). A visual APE was not considered, as there are many existing similar structures present in the viewshed, and no archeological resources were observed in the APE during prior cultural resource surveys (ADNR, 1994 and 2005). The SHPO concurred with the APE (see Appendix F).

Cultural resources surveys were conducted by the Alaska Department of Natural Resources Office of History and Archeology (OHA) in 1994 on Narrow Cape and 2005 in the LP3 area. The OHA Alaska Heritage Resources Survey (AHRS) database was most recently reviewed in 2010 to support previous coordination and consultation efforts for development of the KLC and off-KLC Pasagshak Point Road improvements.

The 1994 survey included walking transects, excavating seven test pits, and examining disturbances that indicated subsurface deposits. A number of shovel probes were also excavated in several key areas across the KLC site, including at or near the improvements proposed for the LP3 project. In addition, OHA staff inspected numerous geotechnical test pits that were excavated at the time in the area of the currently proposed LP3. No evidence of cultural resources was found during any of these activities. However, two archaeological sites (KOD-81 and KOD-441) and one historic World War II era bunker complex (KOD-456) were identified within approximately one mile of the KLC (ADNR, 1994 and ENRI, 1995).

An additional OHA survey was conducted in 2005 to the west-northwest of the KLC, in association with Pasagshak Point Road Improvements (MP 0 – 13.75). That effort encountered no new archaeological resources (ADNR, 2005).

In 2010, the OHA AHRS database was reviewed for information pertinent to the development of the LP3 site. A thorough review of the AHRS database revealed no historic properties within an approximately 0.5-mile radius of the then-proposed LP3 location. Five known AHRS sites in the general vicinity of the proposed improvements were noted during that research; three previously identified sites (from the 1994 survey): KOD-81, KOD-441, KOD-456, and two new sites: an archeological site two miles from the LP3 site (KOD-66), and the USCG LORAN-C Station (KOD-75).

The archaeological sites are known and catalogued by the SHPO; however, their exact location and nature are maintained as confidential to prevent looting or unauthorized excavation. The World War II complex consists of reinforced concrete bunkers used as lookout posts during World War II. The USCG LORAN-C Station consists of 1970-1990s era communication equipment and buildings.

3.8 Light Emissions & Visual Impacts

There are no Federal statutory or regulatory requirements for classifying and assessing light emissions and visual impacts. For the majority of the year, light emissions from the KLC are minimal, primarily because most of the KLC installations are only in full operation during launch-related activities. There is no overhead street lighting at the KLC or other high-powered light sources used on a daily basis. Operational activity and the associated need for external lighting are minimal during idle (non-launch) periods at the KLC; security lighting is essentially the only source of light emissions during these times. Light emissions increase during launch preparation when portable, external, high-powered lights are required Figure 17). These external lights are used only at key installations on an as-needed basis for approximately four to five days surrounding a launch campaign.

Figure 17: Typical Launch-related Lighting

Scenic values in the vicinity of KLC at Narrow Cape are interpreted as high. Natural vistas dominate, with low, grass-covered mountains that level to flatlands or raised plateaus near the seashore. The mountains and plateaus are covered with wildflowers in season, with patches of Sitka spruce, alder and willow. Bedrock beaches border Narrow Cape, and barrier beaches and lagoon systems dominate the eastern shoreline. The pre-KLC visual setting is further described in the 1996 EA (FAA, 1996).

Structures near the KLC include the decommissioned USCG Loran-C Station and associated buildings. AAC currently has seven permanent buildings, several smaller support structures, an antenna field, access roads, a water tank, and related small infrastructure (utility vaults and the like) visible at the KLC; a state-owned highway also traverses the KLC. The Launch Service Structure, which is 174 feet in height, is visible over most of the cape and from offshore. The structures were painted in earth tones in an attempt to have them blend into the background when viewed from the most common viewing angles during the majority of the year when much of the vegetation is dormant Figure 18). Figure 19 shows the buildings during the growing season.

Figure 18: Visual Setting at Narrow Cape during the Dormant Season

Figure 19: Visual Setting at Narrow Cape During the Growing Season

3.9 Natural Resources and Energy Supply

3.9.1 Regulatory Framework

Potential impacts on supplies of energy and natural resources must be evaluated per CEQ NEPA implementing regulations (40 CFR 1502.16). It is also the policy of the FAA, consistent with NEPA and the CEQ regulations, to encourage the "development of facilities that exemplify the highest standards of design including principles of sustainability" (Order 1050.1E, Section 13.1b).

3.9.2 Energy Supply

The main energy supply for Narrow Cape and the KLC is provided by Kodiak Electric Association (KEA). The existing KLC facility was designed for a maximum electrical use of approximately two megawatt-hours per year with a design load of 1,570 kilowatts.

KEA operates an isolated grid system which currently derives approximately 93% of the local electricity supply from renewable sources. The main power source comes from two hydroelectric turbine generators at Terror Lake. KEA also operates four independent diesel power generation facilities. KEA added wind power in July 2009 with the completion of Phase I of the Pillar Mountain Wind Project. As of July 2012, KEA's power supply was approximately 85% hydroelectric power, 7.8% wind power, and 7.2% diesel. It is KEA's goal to produce 95% of its energy from renewable power solutions by 2020 (KEA, 2012). The KLC operates all site facilities using peak electricity up to nine times per year during launches, with lesser amounts of electricity used at the KLC year-round by support functions (30% to 50% less electricity on average).

Backup, on-site power generation at the KLC comes from diesel generators. Number 2 diesel fuel is stored within above-ground, self-diked storage tanks, and fuel piping is above ground. The generators generally operate as backup for approximately five hours during launches to assure the power supply is uninterrupted in the case of a power outage; for one hour per week for testing during non-launch periods; and during commercial power outages (estimated maximum total of 262 hours per year). Additionally, diesel fuel is used to heat the facilities. Current fuel storage onsite is detailed in Table 8 in Section 3.6.1.

3.9.3 Natural Resources

The KLC Non-Transient Non-Community "Class A" Public Water System (PWS) operates under PWSID #250655, issued by the Alaska Department of Environmental Conservation (see section 3.12.3 for additional information on the KLC water supply infrastructure and usage). AAC has secured its right to use of the groundwater with a Certificate of Appropriation from the State of Alaska Department of Natural Resources number LAS 24062, authorizing AAC to use 1.03 acre-feet (335,627 gallons) per year of groundwater (ADNR, 2007b). AAC currently uses approximately 0.34 acre-feet (110,000 gallons) annually. Groundwater at the KLC is used to fill a 150,000-gallon storage tank for emergency fire suppression activities, as well as supply the facilities with water "on-demand" as needed.

3.10 Noise

3.10.1 Regulatory Framework

Noise is usually defined as unwanted sound, and it is recognized as an environmental pollutant. The United States Secretary of Transportation is required to issue regulations establishing a system for measuring and assessing noise effects on individuals near FAA operations. The regulations must also identify land uses normally compatible with various exposures of individuals to noise. FAA published these regulations at 14 CFR Part 150. Noise can produce physiological or psychological damage and/or interfere with communication, work, rest, recreation, and sleep. In wildlife, it can interrupt normal use of habitat and

migration patterns. Sound pressure level is measured in units called decibels (dB). Detailed information on other noise measurement descriptors and how they are calculated can be found in Appendix A.

3.10.2 Existing Noise Analysis

A technical noise report has been prepared for this EA, the 2012 Noise Report; it is included as Appendix A. The following general discussion is excerpted from that document, and the reader is referred there for additional details.

Local noise sensitive areas include a private property and structures that may be occasionally used as a church camp, the Burton Ranch, several areas on Narrow Cape used for recreation, Pasagshak State Recreation Area, and private homes along Pasagshak Bay.

Noise levels near the KLC during most of the year are governed by noise from traffic along Pasagshak Point Road. Other local noise sources include local residences, ongoing activities at the KLC, animals, wind and rain. Non-local noise sources include boating activities and aircraft over-flights, (Minor, 2012). Detailed noise studies and existing conditions are presented in Appendix A.

Noise levels at the KLC vary greatly depending on the level of work happening at the facility. Launch related noise effects are infrequent (up to nine times per year) and short lived, with a return to ambient noise levels within one to two minutes of a launch (Minor, 2012). Based on measured data, and the level of activity at the KLC, noise levels at all noise sensitive properties are well below the FAA residential land use compatibility level of 65 dBA (A-weighted decibel) day-night average sound level (Minor, 2012).

3.11 Socio-Economic, Environmental Justice, and Children's Environmental Health and Safety Risk

3.11.1 Regulatory Framework

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* requires that Federal agencies identify and address, as appropriate, disproportionately high and adverse human health, or environmental effects of their activities on minority populations and low-income populations. An associated memorandum from President Clinton requires an environmental justice analysis of all environmental effects considered in NEPA documents, including human health, economic and social effects (EPA, 1994).

Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks* requires federal agencies to identify and assess environmental health and safety risks that may disproportionately affect children.

Section 810 of the Alaska National Interest Lands Conservation Act (ANILCA) requires Federal agencies to evaluate the potential effect that proposed actions may have on customary rural subsistence practices.

3.11.2 Environmental Justice

The population on Kodiak Island is concentrated primarily within the city of Kodiak and in other smaller population centers along the roadway on the northeastern portion of the island. Several small villages are located off the road system as well (see Figure 20). The rest of the island is largely uninhabited, with roughly two thirds of the western side being made up of the Kodiak National Wildlife Refuge (ENRI, 1995c). As shown in Table 9, the 2011 total estimated population for the Kodiak Island Borough was approximately 13,872. The most populous areas are Kodiak, with approximately 50 percent of the population, and the USCG Base, with about 13 percent of the total population (NASA, 2011).

Census Year	Kodiak Island Borough Population
1950	6,264
1960	7,174
1970	9,409
1980	9,939
1990	13,309
2000	13,913
2011	13,872*

*U.S. Census Bureau Estimate

(Source: USCB, 2012)

Table 9: Kodiak Island Borough Population Growth

Between 1980 and 1990, the Kodiak Island Borough population increased approximately 34 percent (Table 10). Between 1990 and 2000, growth in the Kodiak Island Borough continued, but at a much slower rate than seen between 1980 and 1990. Between 2000 and 2011, the population of the Kodiak Island Borough saw a minor decrease of approximately 41 people (USCB, 2012).

The year 2010 Census data was used by the Census Bureau to calculate estimated 2011 populations by race for the Kodiak Island Borough, which are presented in Table 10. This shows the Borough population as 48.2 percent minority.

Race	Kodiak Estimate	Alaska Estimate
White (Non-Hispanic)	51.8%	63.1%
Alaska Native or American Indian	13.4%	14.8%
Black	1.1%	3.7%
Asian	19.1%	5.7%
Hawaiian Native	0.8%	1.2%
Hispanic	7.9%	6.1%
Two or More Races	7.2%	7.1%
Total Minorities	48.2%	36.9%
Population in 2011	13,872*	730,307

*U.S. Census Bureau Estimate

(Source: USCB, 2012)

Table 10: Kodiak Island Borough Population Demographics

There are no population centers on Narrow Cape, where KLC is located. The closest communities are the mainly seasonal town of Pasagshak (about 50 people) four miles from Launch Pad 3, and 47 people in Chiniak, about 12 miles away. According to the 2010 Census, the Chiniak Census Demographic Profile, 43

residents are Non-Hispanic White, two are Alaska Native, and two identify by multiple races (USCB, 2012). There is no census information specific to the Pasagshak population.

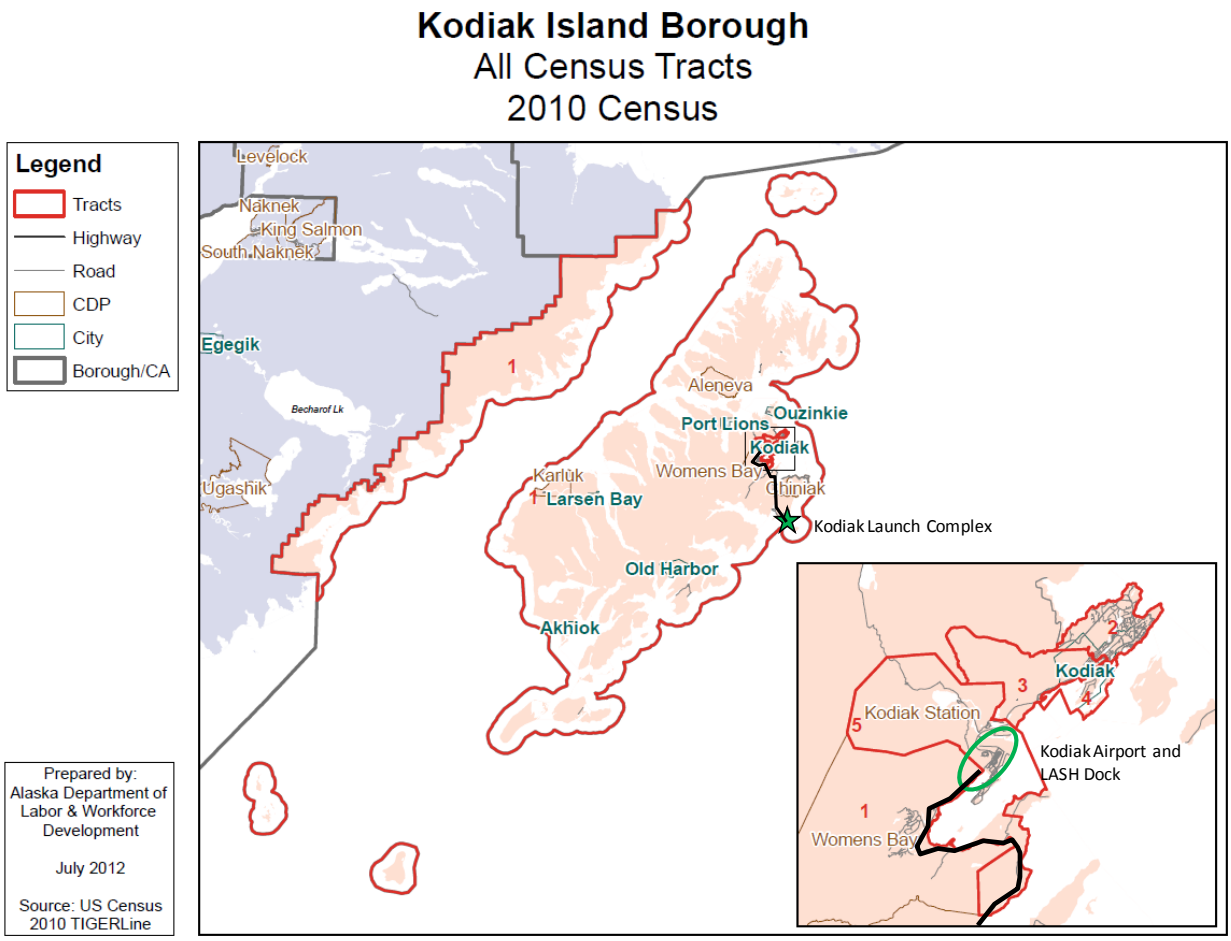

Figure 20: Kodiak Island Borough Census Tracts 2010

The area from the Kodiak Airport and LASH Corporation Dock (where rockets arrive) to KLC (not including Chiniak) is encompassed by Census Tract 5, Kodiak Island Borough, Census Demographic Profile (CDP) for Womens Bay, and Census Tract 1 (Figure 20). These areas may experience traffic delays up to nine times a year as rockets and payloads are transported from the airport and dock to KLC. In the 2010 census, 327 households were in Census Tract 5 with a median household income of $53,792, and there were 286 households were in Womens Bay with a median household income of $94,412. For the Borough as a whole in 2012, the median household income was $70,976 (when deflated at .95%, results in a median household income of $67,427 in 2010 for comparison to the other figures) (U.S. Census Bureau 2014a). The poverty threshold for a family of four in Alaska in 2012 is $28,820 (Federal Register, 2012). The demographics of Census Tract 5 and Women's Bay CDP are presented in Table 11.

Race	Tract 5	Womens Bay	Estimate
White	1,035	615	81.7%
Alaska Native or American Indian	10	34	2.2%
Black	30	2	1.6%
Asian	17	8	1.2%
Hawaiian Native	3	1	0.2%
Hispanic	127	7	6.6%
Two or More Races	79	59	6.8%
Total Minorities	266	111	18.7%
Population in 2010	1,301	719	2,020*

*U.S. Census Bureau Estimate

(Source: USCB, 2012)

Table 11: Kodiak Island Tract 5 and Womens Bay CDP Population Demographics

The demographic information for Tract 5 and Womens Bay populations indicate that it is a majority White population at 81.7% with the white non-hispanic population for Census Tract 5 at 75.3% and for Womens Bay CDP at 76.1% (U.S. Census Bureau 2014b; 2014c). The median income is 86% to 227% over the Alaska poverty level.

Additional information is not available about the race, ethnicity, or income of the communities that could experience interruptions in traffic when rockets are being transported to KLC. However, the racial, ethnic and income characteristics of populations affected by specific impacts (such as temporary road closures) are expected to be similar to those of the general population in the area.

The population density in the ROI is very low (Figure 21). There is one permanent residence at the Burton Ranch within the boundaries of the KLC. About four miles away is the village of Pasagshak. The population of Pasagshak is combined with Census Tract 1 of the Kodiak Borough and no official population records specific to Pasagshak can be found. Based on local employee knowledge, the permanent population of Pasagshak is about ten, with a seasonal population around 100. There are no other permanent residences between Pasagshak and Kalsin Bay and Chiniak, about 11 miles and further from the proposed launch pad.

3.11.3 Environmental Health and Safety Risks for Children

There are no playgrounds or schools within the KLC. A small church camp was previously identified in the 1996 EA, approximately two and a half miles west of LP1 along Pasagshak Point Road (FAA, 1996). The camp is located on private land within the KLC ILMA boundary and is used periodically. Families with children may travel to Surf Beach, Fossil Beach, Twin Lakes and other recreation areas near the KLC. Due to the KLC's distance from any population centers children are generally only present in the area if accompanied by an adult. No children are present within the KLC at the time of a launch when the facilities and surrounding areas are closed to the general public.

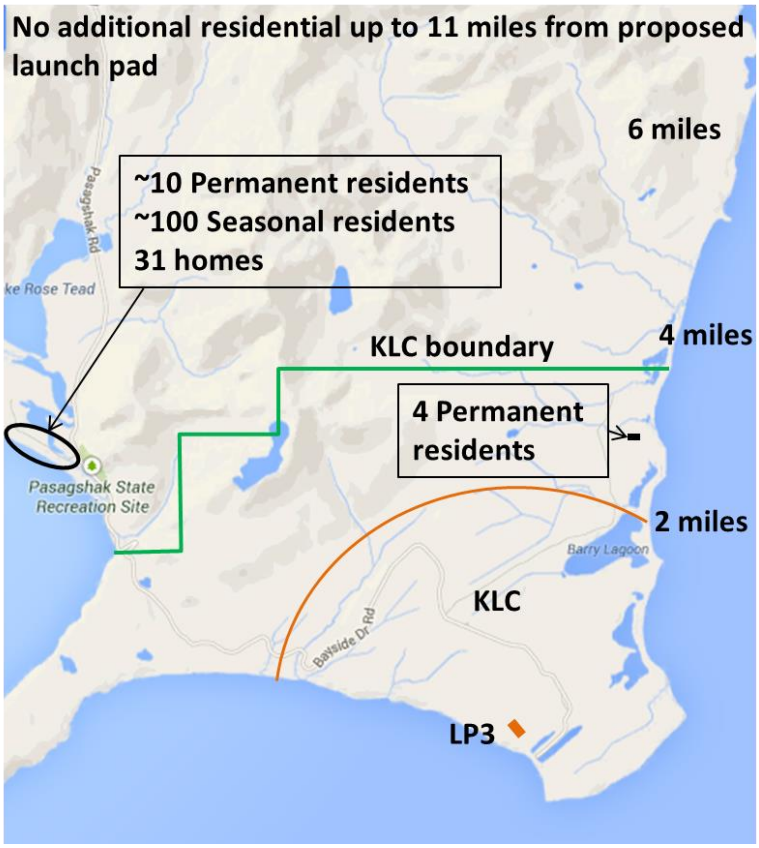

Figure 21: Population Density around KLC

3.11.4 Economy

Kodiak is one of the Nation's largest producers of seafood. The City of Kodiak has the largest and most diversified fishing port in Alaska and is consistently ranked in the top three largest fishing ports in the U.S. in terms of value landed (Kodiak, 2012). State commercial fisheries are located from shore to three nautical miles off of Kodiak, and Federal commercial fisheries extend from three to 200 nautical miles from Kodiak. The down range hazard areas during launch would encompass portions of these fisheries south of Kodiak. The dates that these fisheries are open vary each year.

Landings to the Port of Kodiak in 2010 were 313 million pounds, with a wholesale value of $132.3 million. Salmon is traditionally the largest fishery in Kodiak in terms of wholesale value. The closest salmon stream to Narrow Cape is the Pasagshak River (Figure 22) approximately six miles west of LP1/2, which has small commercial and subsistence salmon fisheries (ENRI, 1995c). Ground fish are becoming increasingly important. In 2010, the value of the ground fisheries accounted for 44% of the total wholesale (Kodiak, 2012).

Area residents hold 1,158 commercial fishing permits. Kodiak's processing plants employed approximately 1,598 people and had a combined payroll of over $68 million in 2010. Fishing seasons around Kodiak are presented in Table 12 (Kodiak, 2012).

Species	Opening Date	Length of Season
Tanner crab	January 15	3 weeks
Herring (food and bait)	August	Through February
Herring (roe)	April	Through June
Salmon	June	Through September
Dungeness crab	May	Through December
Sablefish	April	Through July
Halibut	March	Through November
Groundfish	January	Through December
Shrimp	June	Through February
Scallops	July	Through December
Cod	Variable	Variable

Table 12: Major Commercial Fisheries around Kodiak Island
(Source: FAA, 1996)

The Kodiak Chamber of Commerce calculated employment statistics based on available data in 2010. Based on this information, the U.S. Coast Guard and other government entities are the dominant industry in terms of employment, with 35% of the total. The seafood industry (includes fish harvesting and seafood processing) is the next largest employment sector, with 20% of the total. Retail trade/transportation/utilities accounted for about 10%, education/health 9%, financial/information/ professional & business 6%, leisure & hospitality 6%, natural resources/construction 4% and other services 3%. Unemployment fluctuates seasonally, but averaged around 7% in 2010.

Kodiak's employment varies throughout the year due to the seasonal nature of the fishing industry. Employment usually peaks during the months of July, August and September when fish harvesting is busiest, and declines in November and December as yearly fishing quotas are reached. For this reason, Kodiak is characterized by large swings in its monthly unemployment rate throughout the year, from as low as 5.4% to as high as 11.3% in 2009. The average annual unemployment rate for the Kodiak Island Borough in 2010 was 7.1%, almost the same as in 2009 (7.2%). In 2011, the unemployment rates went from a low of 5.5% in September to a high of 7.4% during June. In September of 2011, Kodiak's unemployment rate was significantly lower than the state (7.1%) and national unemployment rates (9.1%) (Kodiak, 2012).

3.11.5 Subsistence

Subsistence is an important aspect of social, cultural, and economic life on Kodiak Island, especially in the isolated traditional villages (Akhiok, Karluk, Larsen Bay, Old Harbor, Ouzinkie, and Port Lions) where for-cash employment opportunities are limited and populations are predominately Alaska Native. All of these communities are located on the coast, away from Kodiak Island's road-connected areas. Subsistence permits from the ADF&G are available to all Alaska residents, both Alaska Natives and non-Natives to participate in subsistence fishing (for salmon, halibut, and shellfish) in the Kodiak Management Area, which encompasses the waters of the Western Gulf of Alaska surrounding the Kodiak Archipelago and along that portion of the Alaska Peninsula that drains into Shelikof Strait, and subsistence hunting (except for marine mammals). Under the MMPA, only Alaska Natives who live on the coast of the North Pacific Ocean or the Arctic Ocean may harvest marine mammals for subsistence purposes (ADF&G, 2015).

According to subsistence use maps and surveys developed by the ADF&G Division of Subsistence, a small number of residents from Old Harbor (Figure 1) use the coastal and adjacent inland areas around Narrow Cape for subsistence. Maps showing the historical subsistence harvesting area for Old Harbor residents depict the area immediately offshore from Narrow Cape as being on the edge of the harvest area of marine resources. Resources typically harvested by these residents included salmon, halibut, crab, waterfowl, seal, sea lion, and deer (FAA, 1996). However, according to the ADF&G, this use pattern no longer occurs and subsistence use activities related to hunting and fishing in the Narrow Cape area are limited, with much of the subsistence hunting and fishing occurring in the Pasagshak River State Recreation area, which is located approximately 6 miles west of the KLC (ENRI, 1995b; Tracy- personal communication, 2015). The Narrow Cape marine waters are used more by sport fishing charter and non-charter boats and there is limited hunting of deer, mountain goats, and some small game on Narrow Cape. Thus, in general, there are limited subsistence- use activities related to hunting and fishing in the Narrow Cape land and marine areas respectively (Tracy- personal communication, 2015).The Narrow Cape area is currently used as a working ranch. As stated in Section 3.2.2, lands assigned to KLC are co-occupied by the Burton Ranch, a commercial ranch, under a state-issued ranching lease, which offers for-fee bison hunting and wild game hunting guide service. Approximately 160 acres have restricted access but the remaining Narrow Cape area is under a grazing lease and open to the public for recreation and aforementioned limited subsistence activities.

3.11.6 Other Socioeconomic Factors

During rocket launch preparation, rocket motors and other equipment are transported over-land from Womens Bay, (about 44 miles north of KLC) to the KLC. At the dock in Womens Bay, the motors can be rolled off the barge, or lifted by mobile cranes off of the barge and lowered onto a wheeled transporter on the dock. This process is considered a hazardous operation because it involves lifting explosives and transferring explosives from one mode of transportation (water) to another (land). The dock in Womens Bay is adjacent to Rezanof Road, the only road that connects the town of Kodiak with the surrounding population. This makes scheduling rocket shipments difficult as the road is shut down during hazardous operations, which may take several hours to perform. Once the motors are secured on the transporters the operation ceases to be classified as hazardous, and the convoy with flaggers escorts the motors down the dual lane road to KLC. The journey usually lasts about six hours, during which localized traffic on Rezanof Road is temporarily disrupted for typically less than an hour. This process usually occurs once or twice for each launch, depending on the number of rocket motors in one shipment. A similar process occurs when rocket equipment is transported to Kodiak Island by air via the Kodiak Airport. The airport is temporarily closed while the shipment is received and transitioned to a wheeled transporter for overland transport approximately 40 miles south to the KLC.

3.12 Water Quality

3.12.1 Regulatory Framework

The Federal Clean Water Act (CWA) establishes a comprehensive approach to maintaining the quality of the nation's surface waters. Under Section 402 of the CWA, the National Pollutant Discharge Elimination System (NPDES) regulates point source discharge of pollutants into waters of the United States. The CWA authorizes delegation of the NPDES permitting program to qualified states and federally recognized tribes; Alaska has been delegated NPDES permitting authority under the Alaska Pollutant Discharge Elimination System (APDES). Ground disturbing construction projects greater than 1 acre in size within Alaska must be authorized under the APDES Construction General Permit. The CWA, in Section 404, also creates a wetlands permitting program, which has been delegated by EPA to the U.S. Army Corps of Engineers. ADEC issues Section 401 Water Quality Certifications in conjunction with Section 404 permits. A related

statute, the Safe Drinking Water Act, establishes federally delegated state-implemented programs for regulating groundwater quality.

3.12.2 Surface Water Monitoring

Numerous streams and lakes are located on Kodiak Island and within the KLC (Figure 22). The principal streams on Kodiak Island flow from the mountains and hills into the steep-walled bays located along the irregular coastline. These streams are generally less than ten miles long and generally flow through fairly narrow, flat-bottomed valleys bordered by strips of rolling or hilly land (ENRI, 1995b). At the proposed LP3 site, the topography is a relatively flat upland plateau, with adjacent wetlands and incised drainages; the streams draining this area are generally less than two miles in length, small in size, and have an average discharge of less than 46 cubic feet per second (ENRI, 1995b).

Lakes located within the KLC boundary include West and East Twin Lakes, which are freshwater lakes, and Triple Lakes and Barry Lagoon, which are considered to be salt water-influenced lagoons (ENRI, 1995b) (Figure 13).

According to the ADEC-maintained List of Impaired Waters (Section 303(d) list), there are no listed impaired waterbodies located within the KLC (ADEC, 2012b). In 1994, baseline surface water quality assessments were conducted within the local vicinity of what is now the KLC (ENRI, 1995a; 1995b). Figure 22 depicts the surface water sampling locations including freshwater streams, West and East Twin Lakes, and Triple Lakes and Barry Lagoon. This baseline study determined that the specific conductivity, pH, dissolved oxygen, and alkalinity (measure of capacity to neutralize acid) of the surface water in the vicinity of the KLC were within typical ranges found throughout Kodiak Island (ENRI 1995a, 1995b). The specific conductivity, pH, and dissolved oxygen content of the surface waters near the KLC are suitable for a range of aquatic organisms. In addition, biological toxicity testing of sediments collected from these surface water sampling sites indicates that the sediments had no potential toxicity (ENRI, 1995a).

Additional analyses of surface water collected from East Twin Lake and Triple Lakes in 1994 showed that none of the following contaminants were detected (ENRI 1995b):

- Volatile organic compounds
- Pesticides/herbicides
- Polychlorinated biphenyls
- Nitrates or nitrites
- Gross alpha radioactivity
- Total cyanide
- Metals including barium, nickel, antimony, arsenic, chromium, mercury, selenium, thallium, and fluoride

More recent environmental monitoring for the KLC has focused on the lands and waters within a circular area having approximately a six-mile radius from the existing launch pads at KLC. This area was set in a September 1996 meeting of AAC with representatives of the USFWS, NMFS, U.S. Department of Transportation (USDOT), Federal Aviation Administration, and ENRI. Following this meeting, an Environmental Monitoring Plan was developed and attached to the KLC's site operator license (ENRI, 1998).

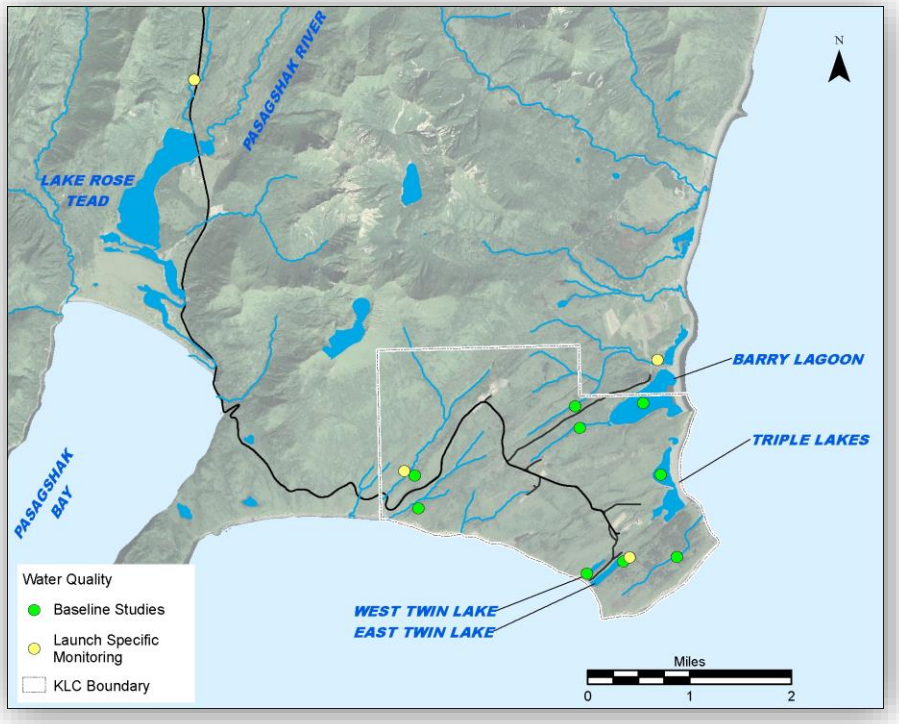

Figure 22: Surface Water Quality Sampling Locations

Surface water quality monitoring efforts have continued in conjunction with each rocket launch through August 2014. Four streams have been sampled prior to and soon after each launch (Figure 22). At each sampling location, surface water temperature, specific conductivity, and pH were measured in-situ and real-time. A requirement for detailed water chemistry analysis was added in January 2002 by the Alaska Division of Governmental Coordination, who in turn designated the Alaska Department of Environmental Conservation as the recipient of the data. Water samples beyond 2002 were collected to be laboratory-analyzed for perchlorate, total alkalinity, and aluminum.

In 2011, the Alaska Department of Environmental Conservation elected to end its imposed water quality monitoring program after long-term results showed that launch operations were having no effect on local water bodies; in all cases, water chemistry results pre- and post-launch were similar, allowing for seasonal and precipitation-induced variation. For reference, existing launch facilities (LP1/LP2) are closer to monitored surface waters than the proposed LP3 footprint.

3.12.3 Water Use

The KLC operates a site-wide public water system classified as Non-Transient Non-Community (Class A) by the ADEC, who has designated it PWSID #250655; it is currently supplied by a well located at the MSF. A back-up well at the LCC can be used to supply the water system if needed. Individual installations treat incoming water using a packaged domestic water system that provides bag filtration, disinfection by chlorination, and corrosion control. The 150,000-gallon fire suppression water tank near the PPF is also supplied by the public water system. The source of water for the public water system is classified as groundwater not under the influence of surface water. AAC has secured its right to use the groundwater with a Certificate of Appropriation from ADNR – LAS 24062 in May 2007 (ADNR, 2007b). AAC is currently entitled to use 335,627 gallons (1.03 acre feet) per year of groundwater.

3.13 Wetlands

3.13.1 Regulatory Framework

Wetlands are a natural resource protected by Executive Order 11990, *Protection of Wetlands* and the U.S. Department of Transportation (DOT) Order 5660.1A, *Preservation of the Nation's Wetlands.* Wetlands determined to be jurisdictional by the USACE are also protected under Section 404 of the Clean Water Act (CWA).

Three key attributes define a wetland: (1) the presence of wetland plants (hydrophytes), (2) the presence of wet soils (hydric soils), and (3) soil saturation or flooding (hydrology).

Once wetlands have been delineated, a determination is made on whether the wetlands fall under the jurisdiction of the USACE under Section 404 of the CWA, which regulates the dredging and filling of waters of the U.S. Waters of the U.S. are those waters (including wetlands) that are subject to the ebb and flow of the tide and/or are used, have been used in the past, or may be susceptible to use to transport interstate or foreign commerce, or are connected to a navigable water by a "significant nexus" (33 CFR Section 329.4). A USACE permit is required for any dredge or fill activity within jurisdictional wetlands. KLC wetlands have been previously defined as jurisdictional by the USACE. The most current jurisdictional determination for KLC wetlands was issued on April 6, 2009.

3.13.2 Wetland Assessment

Detailed hydrology, vegetation and soil assessment, and wetland delineation and mapping for Narrow Cape was conducted by ENRI in 1994 with the aid of a differential GPS (ENRI, 1995a). Wetlands were delineated and classified according to the *USFWS Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin, 1979). ENRI later expanded the initial mapping area and performed additional field delineation in 2002 and 2003 (ENRI, 2003), and digitized the wetlands and vegetation mapping into GIS in 2004 (ENRI, 2004) (see Figure 22). A detailed description of wetland vegetation types is outlined in the 1996 EA (see Section 3.5.1.1 and Appendix C of the 1996 EA) and is incorporated by reference (FAA, 1996). In addition to showing the ENRI-mapped wetlands, a map of the USFWS National Wetlands Inventory data is provided (Figure 23).

Discrete wetlands are scattered across the entire Narrow Cape area, and much of Kodiak Island. No rare, unique, or unusual Alaskan plant communities are found in the KLC area. Vegetated wetlands near the proposed KLC improvements are generally Palustrine wetlands (Figure 24). Small wetland areas made up of saturated/seasonally flooded emergent meadows (Cowardin classification: PEM1B/PEM1C) occur within the footprints of LP3 and the proposed road improvements. There are no wetlands within the footprint of the proposed MCC locations.

3.14 Resource Categories Excluded from Further Analysis

Several impact categories have been excluded from further detailed study, either due to no potential impacts to these resources, or as directed in the FAA Order 1050.1E. These impact categories include Coastal Resources, Wild and Scenic Rivers, Farmlands, and Floodplains.

3.14.1 Coastal Resources

There is no approved Coastal Zone Management Program in Alaska, nor are there coastal barrier resources or coral reefs. Therefore, projects in Alaska do not fall under the jurisdiction of the Coastal Zone Management Act. Nevertheless, the FAA has consulted with the appropriate state and federal agencies with jurisdiction over or expertise on potentially affected coastal resources (see Section 4.1.3 for recreational resources and Section 4.1.4 for fish and wildlife resources).

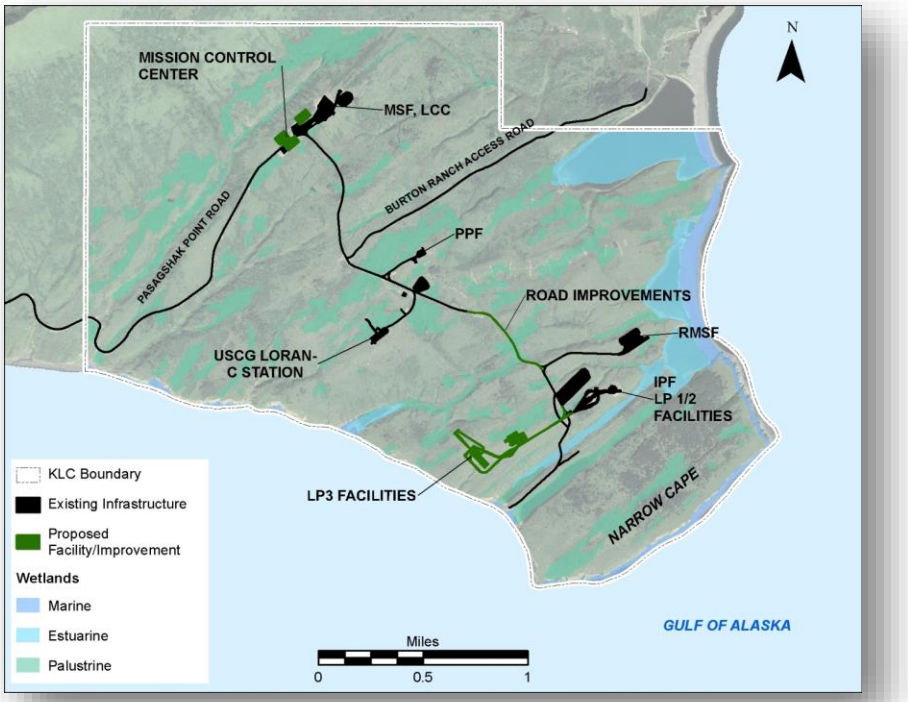

Figure 23: Wetlands within the KLC Boundary

Figure 24: Wetlands around the Proposed Action (USFWS 2014)

3.14.2 Wild and Scenic Rivers

The Wild and Scenic Rivers Act of 1968, defines "Wild and Scenic Rivers" as those rivers having remarkable scenic, recreational, geologic, fish, wildlife, historic, or cultural values. When a river is given "Wild and Scenic" status, it is added to a database maintained by the National Park Service. There are no rivers with this designation located on Kodiak Island. Therefore, "Wild and Scenic Rivers" need not be evaluated.

3.14.3 Farmlands

Prime and important farmland includes all land that is defined as prime, unique, or farmlands of statewide or local importance. There are no designated prime/unique farmlands or farmlands of local/statewide importance located on Kodiak Island. Therefore, "Farmland" under the jurisdiction of the Farmland Protection Policy Act need not be evaluated.

3.14.4 Floodplains

Executive Order 11988, *Floodplains Management* seeks to avoid impacts associated with the occupancy and modification of floodplains. Federal Emergency Management Agency Flood Insurance Rate Maps are not available for this area; however, localized studies were conducted by ENRI, and the coastal plateau of the proposed KLC LP3 and associated structures is not within a floodplain (ENRI, 1995). Therefore, "Floodplains" need not be evaluated.

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4.0 ENVIRONMENTAL CONSEQUENCES

This chapter describes potential environmental effects that would result from the Proposed Action and the No Action alternative. NEPA documentation for all currently authorized KLC launching activities has been previously completed and has been used to characterize the effects of and provide a baseline for the No Action alternative (Section 1.5). Direct and indirect effects analyzed below are solely a result of the action being evaluated and occur at the same time and place (direct effect) or at a later time or outside of the area directly affected (indirect effect) (40 CFR 1508.8).

The subsections in this chapter include a discussion of potential construction and operational effects. Construction effects, Secondary (induced) effects, and Cumulative Impacts are addressed specifically in sections 4.1.14, 4.1.15, and 4.1.16 respectively.

4.1 Proposed Action

4.1.1 Air Quality

4.1.1.1 Direct and Indirect Effects

The potential for air quality effects related to current launching activities at the KLC (and other similar facilities) has been evaluated in previous NEPA documents (Section 1.5). Permanent air quality effects due to rocket launches were not expected at the time of the 1996 EA and have not been documented as a result of the previous 16 rocket launches that have occurred at the KLC. Since 1996 a one-hour NAAQS for Nitrogen dioxide and annual and 24-hour standards for $PM_{2.5}$ have been established. Both NO_2 and $PM_{2.5}$ disperse readily; NO_2 is a gas and the tiny particles of $PM_{2.5}$ diffuse widely under the generally windy conditions present at KLC. Ground level concentrations of these two pollutants are not expected to approach or exceed the NAAQS at the KLC property lines due to the short period of time the rockets are close enough to the ground to emit these pollutants.

The emissions of concern from launching solid-propellant rockets are hydrogen chloride, carbon monoxide, nitrogen oxides, black carbon and aluminum oxide. Hydrogen chloride emissions are gaseous; aluminum oxide is emitted as a particulate (FAA, 1996). Hydrogen chloride combines with water in the atmosphere or from a deluge system to create hydrochloric acid (HCl) (FAA, 1996). No water deluge system has previously been used at the KLC and is not currently proposed for solid-propellant rockets. The omission of a water deluge system for solid rocket motors greatly reduces the amount of HCl that would contact the ground during a launch and minimizes associated environmental effects. Based on research performed for the U.S Air Force for the very large Titan IV rocket, concentrations of HCl would be less than 10 ppm for a rocket flyby of 2 minutes. The far smaller rockets (Athena III has 2.098 million pounds thrust compared to 3.85 million pounds for the Titan IV) planned for the KLC would have far smaller emissions and produce far lower concentrations of HCl (Commission on Life Sciences' Assessment of Exposure Response Functions for Rocket Emission Toxicants", 1998). HCl concentrations could briefly reach levels above the OSHA permissible exposure limit of 5 ppm but they would disperse rapidly after launch, returning to the OSHA permissible exposure limit of 5 ppm. The potential concentrations that the general public could experience would be much lower due to the large distances between the KLC and areas accessible to the general public; no individual may be within two miles of a launching rocket, and the general public are not allowed on the KLC until the launch has occurred and the launch pad area has been cleared for hazards by qualified personnel. The HCl emissions do create holes in the ozone layer, but these holes are filled in from the adjacent atmosphere. For the very large Titan IV rockets this repair may take "a few weeks" (Prof. Toohey, Atmospheric & Oceanic Science, Univ. of Colorado, 2009). For the much smaller rockets proposed for the KLC, the damage and repair time would be less. Further, HCl emitted from launch vehicles remains in the stratosphere and is transported throughout the Northern Hemisphere

where it continues to destroy ozone for about 6 years (Brady et al., 1997). However, based on the proposed launch vehicles and launch activity, the impact of the Proposed Action on stratospheric ozone concentrations would be relatively small.

Historic launches from the KLC have included solid-propellant rockets only. The chemical composition of the exhaust products from the proposed medium-lift solid-propellant rockets would be the same when compared to small-lift rockets previously launched from the KLC, however in larger quantities. Air quality effects from previous launches have been temporary and very localized. On-site personnel may safely return to the launch pad without air quality concerns as soon as the pad has been visually cleared by the pad safety officer, usually after 10 minutes. Security checkpoints on mission day prevent the general public from approaching the launch pad closer than two miles. Short-term effects within the area immediately surrounding the launch pad include high temperature exhaust gas mixture and elevated carbon monoxide concentrations (NASA, 2011). Previous observations indicate that ambient air temperature at the launch pad returns to pre-launch conditions within 10 minutes, and so would the pollutant concentrations. The exhaust clouds dissipate after each launch and are generally carried seaward by prevailing winds from the northwest (FAA, 1996). The nearest residential populations are two miles from LP3 and are unlikely to experience pollutant concentrations approaching or exceeding the NAAQS. Even people near the property-line fence or marine traffic directly offshore would be extremely unlikely to be subjected to pollutant concentrations exceeding the NAAQS. Launch-specific environmental monitoring studies have shown that chemical exhaust products are not accumulating in surface waters or affecting the localized environment (FAA, 1996; R&M, 2007a, 2007b; R&M 2008; R&M, 2009; R&M, 2011). Given that previous launches have had no measurable adverse effect on air quality, and considering the foregoing analysis, the launching of medium-lift solid-propellant rockets is not expected to produce pollutant concentrations approaching or exceeding the short-term NAAQS. Supporting this conclusion is the Supplemental Environmental Assessment for the California Spaceport at Vandenberg AFB (FAA August 2011), where a proposed launching of 24 Athena III rockets a year was found to produce 2.48 tons/ year of ozone precursors (NO_2). This quantity is well below the de minimis level of 100 tons that triggers a requirement for a Conformity analysis in non-attainment and maintenance areas. The nine launches a year at the KLC would produce less than 1 ton/year (i.e. 9/24x 2.48).

Even though the Proposed Action would increase total annual emissions compared to the current operations, the emissions from nine rocket launches a year would be separated in time and thus pollutant concentrations on an annual basis would not exceed the NAAQS.

The liquid-propellant rockets proposed for the KLC utilize a first stage propellant composed of RP1 and liquid oxygen. The primary chemical exhaust constituent of concern from a toxicity standpoint is carbon monoxide (ACTA, 2009). In the case of liquid-propellant rockets, a water deluge system is utilized to reduce the vibration loads experienced by the satellite on top of the rocket, as well as to reduce the acoustic reflections from the flame trench into the rocket. Deluge water also cools the exhaust plume and acts as an oxidizer by converting CO to CO2 in the plume while releasing hydrogen gas (ACTA, 2009). For liquid-propellant rockets, elevated ground level CO concentrations near the launch pad are estimated to be in the 4,000 to 20,000 ppm range; however these concentrations dissipate quickly and the effects are extremely localized. Peak instantaneous CO concentrations beyond the immediate vicinity of the launch pad are estimated at typically less than 1 ppm but have the potential to reach 20 ppm. These concentration levels would be well below the one-hour CO NAAQS of 35 ppm and the 8-hour NAAQS of 9 ppm.

The propellant formulation and pollutant composition are the same for medium and small-lift rocket launches; however, the medium-lift rockets would produce a greater quantity of pollutants. The vehicle is generally on the edge of the mixing layer within a minute or so of launch. Dispersion of the pollutants

would vary depending upon the local meteorological conditions of wind speed and mixing height. As a location, Kodiak Island is well suited to the dispersion of pollutants due to the prevailing wind conditions, as described previously (Section 3.1.3 Meteorology). No more than nine launches per year would occur at the KLC, as analyzed in previous NEPA documents (Section 1.5). The additional emissions would not have long-term negative atmospheric effects, particularly given the typical wind conditions and low occurrence of "calms" at the site.

A liquid fueled rocket would likely use cryogenic liquid oxygen and inert pressurizing gasses such as nitrogen and helium. The pressurizing gasses have no impact on air quality if released due to their inert nature. Under certain conditions, the liquid oxygen may be released into an evaporation containment pond where it would boil off into the atmosphere as gaseous oxygen. Gaseous oxygen would not impact air quality, but in high concentrations would cause safety concerns until the oxygen concentration dissipates. To ensure safety during LOX boil off, all ignition sources would be in a safe condition and there would be no access to the launch pad area until it is determined to be safe by the Ground Safety Officer.

The receipt and handling of hydrazine-based hypergolic fuels and oxidizers would occur only under controlled conditions and in accordance with established safety procedures (Section 3.6). The hydrazine is currently stored near the PPF in a secured vault in accordance with KLC's explosive site plan that has been approved by the Department of Defense Explosives Safety Board and the FAA. The amount of hydrazine that AAC is currently authorized to store on site (1,190 gallons) and specific handling procedures would not be changed. As demonstrated over previous launches from KLC, emissions of toxic air pollutants from handling of hypergolic fuels are not anticipated.

Additional portable and fixed back-up diesel generators would be installed to support the proposed MCC, LP3 (would also support LFF), and RSF facilities. Usage data for the existing generators indicates they are used on an infrequent, intermittent, and short-term basis. The levels of emissions emitted from this source under the Proposed Action would increase negligibly, and would remain far below levels requiring a permit; therefore this source is not anticipated to have a direct or indirect effect on air quality.

A temporary, localized degradation of air quality would occur from the increased airborne particulate levels and emissions from heavy equipment and dust during construction activities. Air impacts from construction are temporary and do not create a long term effect since they are small in quantity (about a dozen vehicles) and short duration (about two construction seasons). Ships and aircraft that deliver rocket motors and components to KLC would use existing cargo carriers on established routes to the extent possible, which would minimize the amount of vehicle emissions due to transportation. Additional emissions would be generated by truck traffic and marine freighters or barges bringing materials to the site. Given that the nearest residences are more than two miles away, there would be no pollutant levels that approach or exceed the NAAQS. People adjacent to the property-line and marine traffic directly offshore would be highly unlikely to experience pollutant concentrations exceeding the NAAQS.

4.1.1.2 Mitigation

Temporary air quality effects during proposed construction activities would be managed through regular equipment maintenance and implementing PM10 control measures such as watering the disturbed, trafficked areas.

4.1.2 Compatible Land Use

4.1.2.1 Direct and Indirect Effects

The Proposed Action is expected to have a negligible effect on compatible land use as there would be no change in land use, and a negligible increase in temporary noise effects when compared to the existing launch effects. See Appendix A for a detailed description of the noise effects.

The Proposed Action is within the boundaries of the existing KLC ILMA. As there would be no additional land acquisition or use conversions, no changes to the ILMA are proposed. Construction activities would result in temporary access restrictions to the immediate vicinity of the construction area, and temporary road delays that would impact public use of a small portion of Narrow Cape. However, Narrow Cape is a very important recreational area to the people of Kodiak, and the Proposed Action would not change the current policies for public use of Narrow Cape. See Section 4.1.3.1 for additional discussion of potential impacts on recreational resources.

As required by FAA Order 1050.1E, noise effects associated with the new class of rockets are analyzed in Section 4.1.10 and in Appendix A. There are "noise sensitive areas" including the KLC launch control operations, a private residence that may be used as a church camp, the Burton Ranch, several areas on Narrow Cape used for recreation, Pasagshak State Recreation Area, and private homes along Pasagshak Bay. As stated in Section 4.1.10, the projected noise increase associated with medium-lift rockets on local noise receptors would only represent a minor increase from the documented effects associated with small-lift rockets (Minor, 2012). DNL values at noise sensitive areas in the vicinity of the KLC and would have no change when averaged over time, except for the church camp which may experience an increase from 45 to 49 dBA, well below the 65 dBA threshold for residences. These values are compatible with all land uses. Appendix A provides additional detail.

4.1.2.2 Mitigation

Information about areas closed due to proposed construction activity, and times when road construction may result in temporary traffic delays, would be posted on the AAC website to keep the public informed about access to Narrow Cape.

4.1.3 Department of Transportation Act Section 4(f)

4.1.3.1 Direct and Indirect Effects

Section 4(f) Resources

Referring to Section 3.3.2, the only 4(f) resource that occurs in the vicinity of KLC is the Pasagshak State Recreation Site. No construction associated with LP3 would occur within or adjacent to this 4(f) resource therefore, no direct "use" of this 4(f) property (as defined in Section 3.3.1) would occur.

Proximity impacts leading to a "constructive use" (as defined in Section 3.3.1) of a 4(f) resource also must be considered. The Pasagshak State Recreation Site is 6 miles from the KLC. The Proposed Action would not involve an increase in launch frequency, and no additional KLC-related increases in visitation (and hence road traffic passing the recreation site) are anticipated. Launch noise would increase slightly at the Pasagshak State Recreation Site under the Proposed Action, as depicted in the noise level contour map in Appendix A (see Figure 11 of Appendix A). The 90 decibel (A-weighted) contour essentially grows slightly to encompass the Pasagshak State Recreation Site completely, whereas previously that contour included only part of the recreation site. Because noise impacts would be minor, temporary, and would only occur 9 times a year at a maximum (as under current conditions), the recreational value of the Pasagshak State Recreation Site would not be substantially impaired. Therefore, there would be no constructive use of this

4(f) resource. Because there would be no direct or constructive use of any 4(f) resource, there would be no significant impacts to 4(f) resources from the Proposed Action.

In a letter to ADNR dated October 15, 2014, the FAA requested concurrence with its determination that the Proposed Action would not constitute a constructive use of the Pasagshak State Recreation Site. On November 3, 2014, ADNR concurred with the FAA's determination that the operational activities associated with the proposed modifications to the KLC would not constitute a constructive use of the Pasagshak State Recreation Site (see Appendix L).

Though not considered 4(f) resources, the additional Narrow Cape area recreational opportunities mentioned in Section 3.3.2 are discussed here in terms of general effect on recreation. The Proposed Action is expected to have a minor effect on recreation, identical to what has occurred during previous KLC activities. For public safety, the Narrow Cape area is closed to the public immediately before and during launch activities but remains open for recreational activities at all other times. A two-mile radius safety area around the launch pad is closed 8 hours prior to a launch, which involves closing the Pasagshak Point Road where it enters the KLC. During these brief closure periods, Fossil Beach, Surf Beach, Twin Lakes and other state land used for recreation on Narrow Cape are not accessible to the public. In the event of an unusual safety concern, these areas might be controlled for longer periods of time.

Also, temporary safety closures to marine waters and airspace would continue to take place concurrently with the ground closures. These closures would be temporary (8 hours) and would not exceed 9 per year.

The construction-related effects on recreation in the area would be temporary and minor. Construction effects may involve traffic delays and temporary road closures as large construction equipment and supplies are transported to the KLC facility. Construction impacts would also involve temporary noise increases due to the operation of heavy equipment.

Temporary road closures during transport of rockets and other supplies to the KLC facility currently occur, and would continue prior to launches. These temporary road closures can result in a temporary delay to recreational traffic along Pasagshak Point Road.

KLC launch activity provides positive effects in the form of unique recreational opportunities, as there are relatively few places in the world where the public can witness rocket launches.

4.1.3.2 Mitigation

AAC would also continue to work with state and local recreation and tourism authorities to provide adequate advance notice and viewing opportunities for launches. Launches provide unique recreational opportunities, as there are relatively few places in the U.S. where the public can witness rocket launches. AAC, through consultation with ADNR, encourages public viewing of launches from the KLC at designated places.

4.1.4 Fish and Wildlife

4.1.4.1 Fish

4.1.4.1.1 Direct and Indirect Effects

The Proposed Action does not involve construction within any fish-bearing stream or water body and would not directly or indirectly affect fish populations. As described in Section 4.1.12, the Proposed Action would not result in measurable degradation of surface water quality or changes to macro-invertebrate availability and diversity. As a result, EFH and available food sources within surface waters near the KLC would not be compromised by the Proposed Action. Anadromous, fresh-water, and marine fish would not be affected by the proposed operational changes and construction activities at the KLC.

4.1.4.1.2 Mitigation

Mitigation is not required because there would be no impacts to mitigate.

4.1.4.2 Birds

This section discusses the potential effects on non-ESA-listed bird species. Threatened, endangered, and candidate species are covered in Section 4.1.4.4.

4.1.4.2.1 Direct and Indirect Effects

Terrestrial

Long-term adverse effects to land birds are not anticipated from the Proposed Action. The potential effect to land birds from launch-related noise and emissions associated with small-lift launch rockets at the KLC was evaluated in the 1996 EA (see Section 4.5.1.2 of the 1996 EA). Effects were determined to be minor and temporary within a 6-mile radius of the launch pad. During previous launches, birds were typically flushed from the area in response to the noise of the launch but returned within minutes. Monitoring studies of birds during the breeding season at the time of Space Shuttle launches also showed initial startle responses, but no long-term effects or nest abandonment were observed (USAF, 1994).

A noise report, Appendix A was prepared to analyze potential noise-related effects of the Proposed Action. The maximum projected noise levels associated with medium-lift rockets is slightly louder than the current small-lift rockets, and does not represent a significant increase over small-lift rockets (Minor, 2012). The anticipated increase in noise is 6 dBA (per launch using the maximum sound level, called Lmax). See Appendix A, Figure 12 and Table 7 for recorded small-lift noise and projected medium-lift noise. The extended duration over which the elevated noise levels occur would be minimal, about an additional 60 seconds. As such, additional noise-related effects on birds from launching medium-lift rockets are not anticipated.

As described in Section 4.1.1, the vehicle launch emission products of concern include hydrogen chloride, carbon monoxide, and aluminum oxide. Birds flying directly through the exhaust plume immediately post-launch could be exposed to minor concentrations of hydrochloric acid (HCl), which would irritate eye and respiratory tract membranes (FAA, 1996). Liquid fuels generate high concentrations of carbon monoxide near the launch pad. However, it is assumed that most birds would be frightened away by the noise of the launch and would not come into direct contact with the exhaust plume. Downwind HCl concentrations are expected to be benign and physiological effects to birds are not expected (FAA, 1996). Aluminum oxide is known to have a low toxicity for humans and would also not be expected to affect resident wildlife populations (USAF, 1989).

Vegetation clearing during proposed construction would result in a minor loss of habitat and foraging areas available to land birds. Construction activities would comply with the Migratory Bird Treaty Act "No Clearing" guidelines for the Kodiak Archipelago from April 15 through July 15, as applicable for vegetated areas. Approximately 22 acres would be disturbed, of which 16 acres would be replanted. The remaining six acres would contain the new construction, to include buildings, launch pad, roads, and utilities. The areas proposed to be cleared of vegetation consist primarily of hairgrass-mixed forb meadow. Optimal bird habitats on Narrow Cape are primarily found near lacustrine/fluvial waters, spruce forest, shrub thickets, wetlands, beaches/tidal float, and along rocky shores or coastal cliffs (FAA, 1996). Based on the large availability of remaining habitat, clearing activities would not have an adverse effect on local or regional bird populations (FAA, 1996).

Construction activities would include the use of heavy equipment and might increase traffic through the KLC and vicinity, which might have a temporary effect on birds. Construction-related effects on local bird

populations were evaluated in the 1996 EA, and it was determined that effects would be minor (habitat loss) and temporary (flushing effects from construction noise). Proposed construction activities are minimal when compared with original construction for the entire KLC facility. As a result, effects (if any) from the Proposed Action are anticipated to be temporary and minor.

Marine

The potential for rocket-launching activities to affect seabirds within the vicinity of the KLC was extensively analyzed in the 1996 EA (see Section 4.5.2.2 of the 1996 EA). In general, disturbances caused by a launch would be brief and would not be expected to have a measurable adverse effect (FAA, 1996). Under the Proposed Action, the total annual number of launches occurring at the KLC would remain the same. The projected increase in noise level associated with medium-lift rockets (6 dBA) would not represent a notable significant increase over small-lift rockets, and the extended duration over which the elevated noise levels occur would be minimal (Minor, 2012). Therefore, operational effects to marine birds are not anticipated. See Appendix A, Figure 12 and Table 7 for recorded small-lift noise and projected medium-lift noise.

Potential effects from construction activities at Narrow Cape were previously evaluated prior to construction of the KLC (FAA, 1996). Although noise levels in construction areas could be high, they are not expected to propagate far beyond the immediate boundaries of the construction site, about 1,000 feet. Construction noise may reach the ocean, but this noise is unlikely to disturb any seabirds due to the tall, sheer cliffs along Narrow Cape. Construction related noise would be temporary and only last the duration of construction. As such, anticipated construction would have little to no effect on marine birds.

Bald Eagles

Construction activities would comply with the Migratory Bird Treaty Act "No Clearing" guidelines for the Kodiak Archipelago from April 15 through July 15, as applicable for vegetated areas.

The eagle "take" permit regulation codified at 50 CFR 22.26 (effective 2009) defines one form of take as disturbance; "disturb" is defined as "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available: (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior." Launch activities have occurred at the KLC since 1998. Known nest sites were monitored during the first five launches from KLC in accordance with the Environmental Monitoring Plan developed with USFWS input (ENRI, 1998). Bald eagles continued to successfully use the sites during the period of observation and the USFWS concluded that launch operations were not likely to affect the species and ended the launch-specific monitoring requirement. As part of assessing potential impacts on bald eagles from AAC's current proposal, AAC requested from the USFWS recommendations to minimize potential impacts. Based on the available information, the USFWS stated it cannot predict how eagles might respond to noise levels associated with medium-lift rockets (see Appendix D). The USFWS's guidelines for protection of bald eagles recommend avoiding loud intermittent sounds within ½ mile of active nests (or within 1 mile in open areas). The closest eagle nest is located approximately 1.3 miles from the proposed site for Launch Pad 3. The best way to ensure nesting eagles are not disturbed is to avoid scheduling launches during the eagle nesting season, between February 1 and August 30. The USFWS stated a permit is not clearly necessary for medium-lift launches, but AAC may wish to apply for a permit to ensure AAC has appropriate protections in place if take were to occur.

4.1.4.2.2 Mitigation

There are no current monitoring requirements for bald eagles near the KLC. The expansion of KLC to medium lift is not anticipated to result in a take of a bald eagle, because there are no active nests within ½ mile of the proposed site for Launch Pad 3.

4.1.4.3 Mammals

This section discusses the potential effects on non-ESA-listed mammalian species. Threatened, endangered, and candidate species are covered in Section 4.1.4.4.

4.1.4.3.1 Direct and Indirect Effects

Terrestrial Mammals

Potential direct and indirect effects on terrestrial mammals, if any, would be minor and isolated. Wildlife generally exhibit a startle response to sudden loud, uncommon, short-term noise such as a rocket launch (AAC, 2010). Disturbances from rocket launches would be brief and are not expected to have a lasting adverse effect on wildlife. An eight foot security fence would surround the facility which would keep out large animals, such as the local buffalo and bears. There is a slight possibility that a small animal could be close enough to the launch pad at the time of launch to be harmed or killed; however, the likelihood is low. The Proposed Action is not anticipated to affect local mammal populations.

Marine Mammals

Potential noise effects to marine mammals could be physical – temporary or permanent auditory impairment – or behavioral. Based on previous rocket launches at the KLC, NMFS concluded that physical effects are not anticipated. Permanent hearing loss would not occur in pinnipeds on Ugak Island (50 CFR Part 217). Behavioral effects to pinnipeds are the primary concern with regard to rocket launches. Wildlife generally exhibit a startle response to sudden loud, uncommon, short-term noise such as a rocket launch (AAC, 2010). Marine mammal reactions to rocket launches are highly variable and may be attributable to the species type, age class, time of year, and potential habituation to noise. Noise levels above 100 dBA is the threshold at which pinnipeds are likely to demonstrate short-term behavioral responses (USAF, 1997), and the proposed injury threshold for pinnipeds on shore is 144 dB sound exposure level (SEL) in a 24-hour period (Southall et all, 2007). Noise levels from previous rocket launches at the KLC and anticipated noise levels from launching medium-lift rockets were estimated (Appendix A; Section 4.1.10). Increases in anticipated noise intensities and durations from the medium-lift rockets are small when compared to small-lift rockets (Minor, 2012; Appendix A, Addendum 1, Table A2), and do not exceed the 101.4 dBA level for which NMFS' analysis was based upon in its BO and LOA (Appendix A; Addendum 1, Table AD1-2). Therefore, no additional noise effects to marine mammals from the Proposed Action are anticipated.

Spent rocket motors would fall into the open ocean over deep water and could possibly injure a marine mammal (NASA, 2011). However, the probability of this occurring is very remote and potential impacts with marine wildlife do not pose a realistic threat. Further, for an annual launch rate of 18 launches at the Mid Atlantic Regional Spaceport, NMFS determined that no letter of incidental take was required because the probability of falling debris hitting marine mammals is extremely unlikely to occur (NMFS, 2009). Sonic booms would occur beyond the edge of the Outer Continental Shelf break over the deep ocean and would occur at a high altitude (several miles above the ocean depending on specific mission parameters) and far offshore, and thus would not adversely affect marine mammals (NASA, 2011).

In 2011, NMFS issued a final rule to address potential marine mammal effects resulting from rocket launches at the KLC for the 5-year period from 2011 to 2016 (50 CFR 217). LOAs mandated by the final

rule are issued annually within this 5-year period for the incidental take of marine mammals. The final rule concluded that rocket launches at KLC could result in the incidental take of a small number of marine mammals (Steller sea lions and harbor seals), but that the total taking would have a negligible impact on the species or stocks (76 FR 16311). NMFS did not include monitoring requirements for species other than harbor seals and Steller sea lions (50 CFR 217). In addition, the final rule determined that KLC launch activities would not reach the level of take for any cetaceans (whales and dolphins) and that any noise that could reach these species would be discountable (76 FR 16311). The potential for the Proposed Action to affect harbor seals is discussed below; Steller sea lions and threatened and endangered species of whales are discussed in Section 4.1.4.4.

Harbor Seal

Previous rocket launches from the KLC do not appear to be affecting harbor seals or influencing their use of haulouts near Narrow Cape (ABR, 2011). Harbor seal numbers in the waters around Narrow Cape have increased over time, indicating that rocket launch operations are not having long-term adverse effects on the species (AAC, 2010). Pre- and post-launch surveillance indicate that any disturbance from launch operations is of limited duration (AAC, 2010).

In addition to the medium-lift rocket already considered by NMFS (the Antares, aka Taurus II), the new rockets proposed to be launched from KLC include the Athena III and a Notional Liquid-Propellant Launch Vehicle.

Compared to the small-lift rockets launched at KLC, the medium-lift rockets produce slightly higher noise levels; however, the increase in noise between the two launch rockets is minimal. The analysis in Appendix A shows that the overall increase in noise levels over a typical launch day is small, and the increase in the average daily or annual noise levels is slight. As shown in Appendix A, Figures 8, 12, and Table 7, increases in anticipated noise intensities and durations from the medium-lift rockets would be 5 to 6 dBA (Lmax [maximum instantaneous sound pressure]) higher at Ugak Island when compared to small-lift rockets, which is a small increase (Minor, 2012). Elevated sound levels would last approximately 90 to 120 seconds after launch. No direct or indirect noise effects on harbor seals are anticipated from the Proposed Action.

Spent rocket motors would fall into the open ocean over deep water, far from known haulout locations, and do not pose a threat to harbor seals (NASA, 2011).

For airborne noise, currently NMFS uses an in-air noise disturbance threshold of 90 dB_{rms} re 20 µPa (unweighted) for harbor seals. Based on the rocket launch noise analysis for the Proposed Action, the maximum unweighted noise level at Ugak Island from a proposed medium-lift rocket launch would be 106 dB (the Athena III; see Table 6 in Appendix A). However, the highest noise level at Ugak Island from the entire sequence of a proposed medium-lift rocket launch would be a maximum sound exposure level of 93.4 dBA, or 8 dBA less than the 101.4 dBA maximum sound exposure level threshold used to calculate take in 50 CFR 217 Subpart H and associated LOAs. In addition, the Proposed Action would maintain the maximum allowance of nine vehicle launches per year at KLC. Therefore, the FAA believes 50 CFR 217 Subpart H and the current LOA remain valid for the Proposed Action. The FAA sent a letter (dated January 29, 2013; see Appendix I) to the NMFS stating the FAA believes 50 CFR 217 Subpart H and associated LOA remain valid for the Proposed Action and requested the NMFS to contact the FAA if the NMFS disagrees. NMFS has concurred with FAA's conclusion and no further consultation with the NMFS is necessary under the MMPA (Appendix N).

Gray Whale

The noise from rocket launching activities at the KLC does not appear to be affecting gray whales (AAC, 2010). Grey whales continue their twice yearly migration through the nearshore waters adjacent to KLC.

The total annual number of launches occurring at the KLC would remain the same. Future noise levels with the launches from Pad 3 are not predicted to be substantially different than current launches (Minor, 2012). Airborne noise is generally reflected at the sea surface outside of a 26 degree diameter cone extending downward from the ascending rocket (Richardson et al., 1995). Due to the great difference in acoustical properties, little sound energy passes into the sea across the air-water boundary (Richardson et al., 1995). Submerged animals would have to be directly underneath the rocket to hear it, and given the hypersonic velocity of rockets in the atmosphere, the duration of sounds reaching gray whales would be negligible (AAC, 2010). Given the limited ocean surface area exposed, the very short time a cetacean would be exposed to the noise, and the attenuation that occurs at the sea-air interface, gray whales would not be affected by launch operations (AAC, 2010). Furthermore, because the NMFS did not anticipate take of whales, whales are excluded from the LOAs.

4.1.4.3.2 Mitigation

An LOA must be acquired each year under the current NMFS Rule (50 CFR 217). The annual LOA prescribes a quarterly survey of seal and sea lion populations on Ugak Island, monitoring of the seal and sea lions during launch, and an annual report. The LOA authorizes incidental take with restrictions for the year in which it is issued. In addition, noise analysis including real-time sound pressure and sound exposure records is required whenever a new class of rocket is flown. This would be conducted the first time a medium-lift rocket is flown from the KLC, and subsequently thereafter whenever a new type of vehicle (e.g. liquid fuel) is flown. The current LOA for 2015–2016 can be found in Appendix M.

Regarding terrestrial mammals, fencing around the launch pad and nearby steep topography would provide deterrence, which would help minimize the already very low potential for wildlife mortality.

4.1.4.4 Threatened and Endangered Species

There are no federally-listed threatened, endangered, or candidate avian or terrestrial mammal species within the vicinity of the KLC (USFWS, 2011a). However, there are several federally-listed marine mammals present in waters offshore and on Ugak Island (see Section 3.4.5). Additionally, there are two bird species listed as threatened or endangered within the action area: Steller's eider and short-tailed albatross. Two candidate bird species could occur within the vicinity of Narrow Cape: Kittlitz's murrelet and yellow-billed loons. However, occurrences of these candidate species are uncommon or rare near Narrow Cape, and potential effects are anticipated to be negligible.

The USFWS stated in previous consultations that if future launches from KLC would include rockets larger than the small-lift Athena I were planned, then FAA would need to reinitiate consultation. The current proposal for Launch Pad 3 involves new construction, and launches of medium-lift rockets that are larger than the Athena I; in addition, liquid-propelled rockets are being proposed for the first time at KLC. Thus, the FAA reinitiated Section 7 consultation with the USFWS in October, 2012. Regarding ESA-listed species under NMFS jurisdiction (three whale species and Steller sea lion), the FAA sent a letter to NMFS on January 29, 2013 to determine if the Proposed Action (namely projected noise levels) falls within the scope of the NMFS BO.

The comprehensive noise analysis presented in Appendix A characterizes the anticipated increases in noise maximums and durations associated with medium-lift rockets when compared to small-lift rockets previously launched from the KLC. The maximum noise levels are predicted to increase by only 5 to 6 dBA Lmax (for a few seconds longer during each launch (Minor, 2012). Maximum noise levels would occur for 2 to 3 seconds per launch and existing ambient noise levels would be reached within 2 minutes after a launch (Minor, 2012). See Appendix A, Figure 12 and Table 7 for recorded small-lift noise and projected medium-lift noise.

Prior effect determinations (Section 3.4.5), information from site-specific launch-related avian and marine mammal surveys, and recent noise analysis provide the basis for the following determinations.

4.1.4.4.1 Direct and Indirect Effects

Marine Mammals

Steller Sea Lion

The noise from a rocket launch might induce a startle response in Steller sea lions. Reactions among individual sea lions would vary from no response to leaving haulouts for the water (AAC, 2010). However, pre- and post-launch counts of Steller sea lions indicate that disturbances from launch operations are of limited duration (AAC, 2010). Furthermore, based on noise analyses from previous launches, along with the infrequent and brief nature of the noise, rocket launches are not expected to affect the population dynamics of Steller sea lions which use Ugak Island as a haulout site (50 CFR Part 217). The projected noise levels associated with medium-lift rockets do not represent a significant increase over small-lift rockets, and the extended duration under which the elevated noise levels occur is minimal (Minor, 2012). Spent rocket motors would fall into the open ocean over deep water, far from known haulout locations, and do not pose a threat to Steller sea lions (NASA, 2011). Potential effects to the Steller sea lion would be temporary, consisting of brief behavioral reactions to noise.

For airborne noise, currently NMFS uses an in-air noise disturbance threshold of 100 dB_{rms} re 20 µPa (unweighted) for all pinnipeds except harbor seals. Based on the rocket launch noise analysis for the Proposed Action, the maximum unweighted noise level at Ugak Island from a proposed medium-lift rocket launch would be 106 dB (the Athena III; see Table 6 in Appendix A). However, the highest noise level at Ugak Island from the entire sequence of a proposed medium-lift rocket launch would be a maximum sound exposure level of 93.4 dBA, or 8 dBA less than the 101.4 dBA maximum sound exposure level threshold used to calculate take in the NMFS BO. In addition, the Proposed Action would maintain the maximum allowance of nine vehicle launches per year at KLC. Therefore, the FAA believes the BO remains valid for the Proposed Action. The FAA sent a letter (dated January 29, 2013; see Appendix I) to the NMFS stating the FAA believes the NMFS BO remains valid for the Proposed Action and requested the NMFS to contact the FAA if the NMFS disagrees. As seen in Appendix N, NMFS concurred with FAA's conclusion and no further consultation with the NMFS is necessary under the ESA.

Northern Sea Otter

Marine mammal surveys have generally identified small numbers of otters within the vicinity of KLC; maximum otter counts ranged between zero and eight individuals in all but one aerial survey (ENRI, 2005b; ABR, 2011). The few otters that have been seen seem to prefer the waters around Ugak Island or Long Island near Pasagshak Bay, rather than the cliffs of Narrow Cape. Considering that the number of annual launches would remain constant (not to exceed the currently authorized nine per year) and that the increase in noise associated with medium-lift rockets (compared to small-lift rockets) is small, the FAA determined the Proposed Action is ***not likely to adversely affect*** the Northern sea otter.

The proposed LP3 footprint is located approximately 0.2 mile inland from the nearest coastline – designated critical habitat area – and over 100 feet higher in elevation than MHT. Construction and operational activities associated with the Proposed Action would have ***no effect on designated critical habitat***. The USFWS concurred with these species and critical habitat determinations on December 14, 2012 (USFWS 2012; see Appendix C).

Whales

Noise associated with the proposed medium-lift rockets does not represent a significant increase over small-lift rockets, and the duration under which the elevated noise levels occur is minimal (Minor, 2012). As was previously discussed with respect to gray whales, direct or indirect noise effects to endangered cetaceans are not anticipated due to the limited surface area in which effects could occur, the very short time a cetacean might be exposed to noise, and the attenuation that occurs at the sea-air interface. In its 2011 BO, the NMFS determined that these whale species would be ***not likely to be adversely affected*** by the construction and operation of the KLC because the whales are not in the area (fin whale and North Pacific right whale) or would be below the surface of the water, and therefore not likely to be exposed to launch noise (humpback whale) that would significantly disrupt normal behavioral patterns.

Based on the rocket launch noise analysis for the Proposed Action, the highest noise levels at Ugak Island from the proposed medium-lift launches would be a maximum sound exposure level of 93.4 dBA, or 8 dBA less than the 101.4 dBA maximum sound exposure level threshold used to calculate take in the NMFS BO. In addition, the Proposed Action would maintain the maximum allowance of nine vehicle launches per year at KLC. Therefore, the FAA believes the NMFS BO remains valid for the Proposed Action and further consultation with the NMFS under the ESA for protected whales is not necessary. NMFS has concurred with FAA's conclusion and no further consultation with the NMFS is necessary under the ESA (Appendix N).

Avian Species

Kittlitz's Murrelet

Based on the infrequent nature of proposed rocket launches at the KLC and the very low probability of occurrence of this species, the FAA has determined that the Proposed Action would not adversely affect the Kittlitz's murrelet. Because this species is listed as a candidate species, it is provided no statutory protection under ESA and an official effect determination is not necessary. However, the FAA included the murrelet in its informal consultation with the USFWS for other listed species. Including this species in the informal consultation will simplify initiation of consultation should the species become listed in the future. The USFWS concurred with the FAA's determination on 14 December 2012 (USFWS 2012).

Steller's Eider/Short-tailed Albatross

The potential for effects from KLC small-lift rocket launches on the Steller's eider and short-tailed albatross was addressed in a Biological Opinion in 1998 (USFWS, 1998). USFWS determined that disturbances to wildlife from single launches would be brief and are not expected to have a lasting effect or measurable adverse effect on migratory bird populations. Typically, waterfowl driven from feeding areas by launch activities would return soon after the activity stops, as long as the disturbance is not severe or repeated (FAA, 1996).

The anticipated increase in noise from medium-lift rockets does not represent a severe or repeated disturbance. Although previous studies evaluated potential effects related to small-lift rocket launches, increases in anticipated noise intensities and durations from medium-lift rockets are small when compared to small-lift rockets (Minor, 2012). Based on the above information, the FAA determined the Proposed Action is ***not likely to adversely affect*** the Steller's eider. Similarly, based on the infrequent nature of proposed rocket launches at the KLC and the very low probability of occurrence of the short-tailed albatross within the vicinity of the KLC during a launch, the FAA determined the Proposed Action is ***not likely to adversely affect*** the short-tailed albatross. In its response on 14 December 2012, the USFWS determined the Proposed Action would have **no effect** on the short-tailed albatross. The USFWS concurred with the FAA's determination for the Steller's eider (USFWS 2012).

Yellow-Billed Loon

The Proposed Action would not affect the breeding range of the yellow-billed loon, and the probability of an individual being within close proximity to Narrow Cape at the time of a launch is extremely low. Additionally, noise increases associated with medium-lift rocket launches are anticipated to be small. Based on the above information, the FAA determined the Proposed Action would not adversely affect the Yellow-billed loon. Because this species is listed as a candidate species, it is provided no statutory protection under ESA and an official effect determination is not necessary. However, the FAA included the loon in its informal consultation with the USFWS for other listed species. Including this species in the informal consultation will simplify initiation of consultation should the species become listed in the future. The USFWS concurred with the FAA's determination on 14 December 2012 (USFWS 2012).

4.1.4.4.2 Mitigation

Marine mammal monitoring efforts would continue at the same frequency; quarterly and in support of specific launches. In addition, noise analysis including real-time sound pressure and sound exposure records is required whenever a new class of rocket is flown. This would be conducted the first time a medium-lift rocket is flown from the KLC, and subsequently thereafter whenever a new type of vehicle (e.g. liquid fuels) is flown.

4.1.5 Plants

4.1.5.1 Direct and Indirect Effects

Direct effects to plants by construction activities associated with the Proposed Action are anticipated. Proposed facility and road locations would be cleared and grubbed. Approximately 22 acres would be disturbed, of which 16 acres would be replanted. The remaining six acres would contain the new construction, to include buildings, launch pad, roads, and utilities. The majority of vegetated land to be disturbed includes meadows and some minor areas of wetlands (see Section 4.1.13 for additional information on wetlands). These plant communities are not unique or of high value (i.e., essential to survival) to other species in the area (FAA, 1996 and ENRI, 1995a). The vast majority of the KLC would remain vegetated post-construction. Direct effects to plants would be minor due to the limited area to be disturbed, and would not affect overall plant community composition or structure. Based on available data, the FAA is not aware of rare plants occurring in the area of proposed construction and thus direct effects to rare plants from proposed construction or modifications are not expected.

As discussed in Section 4.1.13, the flame trench has been sited to minimize surface water effects to East and West Twin Lakes. The trench directs launch emissions towards a relatively large valley where exhaust would have more time to dissipate prior to reaching the ground surface and vegetation, and the small wetland found there.

A principal product of potential concern from liquid-propellant rockets is carbon monoxide, which does not have an adverse effect on plants in the volumes present during a medium-lift rocket launch. Another principal product of potential concern resulting from launching solid-propellant rockets is hydrogen chloride, which combines with water or water vapor to form hydrochloric acid (HCl). HCl could adversely affect vegetation through periodic contact with plants; however, no such damage was seen following long-term monitoring near LP1. Acid effects are mitigated by frequent precipitation events.

To date, the KLC has conducted 17 launches of solid fuel, small-lift rockets from LP1/2. A study was conducted by ENRI during the first several launches at the complex, where epiphytic macrolichens and Sitka spruce were surveyed (ENRI, 2002a). Epiphytic macrolichens and spruce were chosen because they were known to be very sensitive to exhaust products. They were first measured and sampled at six sites near the KLC launch facility – including two plots directly adjacent to the LP1/2 installation – in 1998, prior

to the first launch. Selected branches were photographed to monitor changes in lichen cover, morphology, or needle loss following launches. Lichen cover was resampled in late June 1999 and again in early June 2002 (ENRI, 2002b). Statistical analyses showed no significant changes had occurred in lichen cover or spruce needle cover from the photo plots or in the measurements of lichen cover on branches. The impact area around LP3 for the medium-lift rockets is expected to be larger due to the greater quantity of fuel used during liftoff, but based on past studies, no long-term effects are anticipated.

The overall effects on plants remain the same under the Proposed Action as assessed in the 1996 EA. Minor permanent effects due to the loss of individual plants from vegetation clearing are anticipated. Temporary heat-related burns might occur to plants located near the launch pad and flame trench (FAA, 1996, and NASA, 1998 and 2009). Heat-related burns and small fires have been documented within 100 feet of the launch pad near the fence line during previous launches; effects on vegetation from scorching are considered minor and the vegetation would re-generate within a season. Similar effects and distances would be anticipated as a result of launching medium-lift rockets. No permanent adverse direct or indirect effects are anticipated in association with launch activities.

4.1.5.2 Mitigation

The construction footprint for LP3 has been aligned to minimize impacts to wetlands to mitigate disturbance effects, and construction effects to plants would be limited to the maximum extent practicable. Namely, areas of ground disturbance that are not permanently developed (such as slope embankments and vehicle/equipment staging areas) would be seeded and allowed to revegetate with native, weed-free seed mixtures in accordance with Executive Order 13112, *Invasive Species*.

No operational mitigation is required.

4.1.6 Hazardous Materials, Pollution Prevention, and Solid Waste

4.1.6.1 Direct and Indirect Effects

The 1996 EA assessed the effects of hazardous materials and solid waste generation associated with a maximum of nine rocket launches per year utilizing solid fuel sources (FAA, 1996). The Proposed Action would not increase the number of launches per year, but would require additional storage capacity for liquid fuels. The proposed liquid-propellants consist of a combination of RP1 and LOX. An estimated 30,000 gallons of RP1 would need to be stored onsite at the KLC at any given time to facilitate fueling of rockets. Further, large hydraulic rams may need to be installed to erect rockets from the horizontal to vertical positions. This would boost the aggregate petroleum product storage at the KLC to over 48,000 gallons. Based on the current Federal regulations promulgated by the U.S. Environmental Protection Agency (40 CFR 112 – Oil Pollution Prevention), the increase in storage would not by itself create any change in the way petroleum storage at the KLC is currently regulated. Namely, the KLC would need to amend and expand its existing Spill Prevention, Control, and Countermeasure (SPCC) Plan to include the new storage facilities and handling procedures. Other facility plans and/or documentation as set forth in Section 3.6.1 above may need to be updated as well to reflect changes in hazardous materials storage and hazardous waste management procedures. Specifically, the following plans, which are maintained at the KLC and in the AAC digital systems, would need to be updated: KLC Safety Policy, KLC Emergency Response Plan, Community Right to Know Act, AAC's Hazardous Communication Program, the Kodiak Area Emergency Operation Plan, Explosive Site Plan, KLC Industrial Safety Manual, Range User's Manual, and Range Safety Manual.

Direct and indirect effects to the environment would not occur as a direct result of increased petroleum product storage at the KLC. The increased volume of petroleum products stored at the KLC does not directly increase risk of a spill or leak. However, the RP1 storage tanks would be of a larger size than any

other current petroleum storage tank at the KLC, therefore the potential volume of a given spill could be greater.

The LFF near LP3 would include holding tanks for LOX, liquid and gaseous nitrogen, gaseous helium, RP1, and piping to fuel the rocket. LOX is a cryogenic liquid, and could present hazards such as extreme cold, overpressure, and fire hazards if not handled properly. Gaseous nitrogen and helium storage could also present high pressure hazards since they are stored between 2400 pounds per square inch (psi) to 6000 psi. However, all substances would be stored and handled in accordance with the SPCC Plan and according to existing procedures to avoid potential releases to the environment and any potential hazardous effects. In accordance with current procedures, hypergolic fuels (hydrazine), if required for satellite propulsion systems, would be stored within DOT-approved containers in a purpose-built vault near the launch facilities, similar to that used at the existing PPF. Previous small-lift payloads (namely satellites) from KLC have used hydrazine for on orbit maneuvering. In the 1996 EA, KLC indicated use for 100 gallons of hypergolic fuels. Medium-lift satellites would use larger quantities, up to 200 gallons, of hypergolic fuels. The current hypergolic fuel storage facility at KLC can store up to 550 gallons, and the KLC is approved by the Department of Defense Explosive Safety Board to store up to 1,190 gallons if required. Therefore, no increase of hypergolic fuel storage would be required at KLC to meet the requirements of medium-lift satellites. Hypergolic fuels are not stored long term at KLC; they are stored on shipment for launch support and residual amounts are back shipped as soon as practical. Because the approved quantities of hydrazine-based fuels would not increase and onsite handling procedures would not change, no additional effects (beyond those evaluated in the 1996 EA) are anticipated with regard to the storage and handling of hydrazine.

The proposed launching of medium lift rockets would not create an increase in the amount of solid waste generated at the KLC when compared to small lift launches. KLC generates an average of 2.6 tons of solid waste a month during non-launch activity, and approximately 50 tons a month during a launch campaign.

Construction of LP3 and the associated facilities would generate a relatively minor amount of construction debris and solid waste that would be disposed of accordingly. Solid Waste management would continue as is currently authorized with updates to relevant plans made as necessary.

Hazardous materials – including but not limited to diesel fuel, anti-freeze, lubricating oils, paints, and adhesives – would be used during construction of the new LP3 facilities and during launch activities. All hazardous material would be handled according to applicable Federal, state, and local laws and regulations. These activities are routine to the KLC upkeep and operation, and would not create any new environmental effects as a result of the Proposed Action.

4.1.6.2 Mitigation

All of the Hazardous Materials, Pollution Prevention, and Solid Waste plans associated with the KLC would be updated prior to operational activities at the site. The type and quantity of petroleum products or hazardous materials would be accounted for and incorporated into emergency planning to mitigate environmental effects in the event of a release.

The potential for spills from the new RP1 storage infrastructure would be analyzed using a risk-based approach in the KLC's SPCC Plan update as a result of the LP3 project. The RP1 storage vessel would be placed within a secondary containment unit – or would be constructed to incorporate integral double-walled secondary containment – to mitigate the potential for releases to the environment.

4.1.7 Historical, Architectural, Archaeological, and Cultural Resources

4.1.7.1 Direct and Indirect Effects

The Proposed Action would have no direct or indirect effect on historical, architectural, and cultural resources. SHPO provided concurrence with a finding of "No Historic Properties Affected" on July 18, 2012 (SHPO, 2012). See Appendix F and Appendix O for the SHPO consultation letters. The APE for the construction on LP3, associated facilities, and Pasagshak Point Road upgrades would be primarily confined to the actual footprints of the planned roads and structures, as well as those immediately adjacent areas that would be used for equipment access and construction staging (Figure 25). A visual APE was not considered, as there are many existing similar structures present in the viewshed, and no archeological resources are documented near proposed construction activities (ADNR, 1994 and 2005).

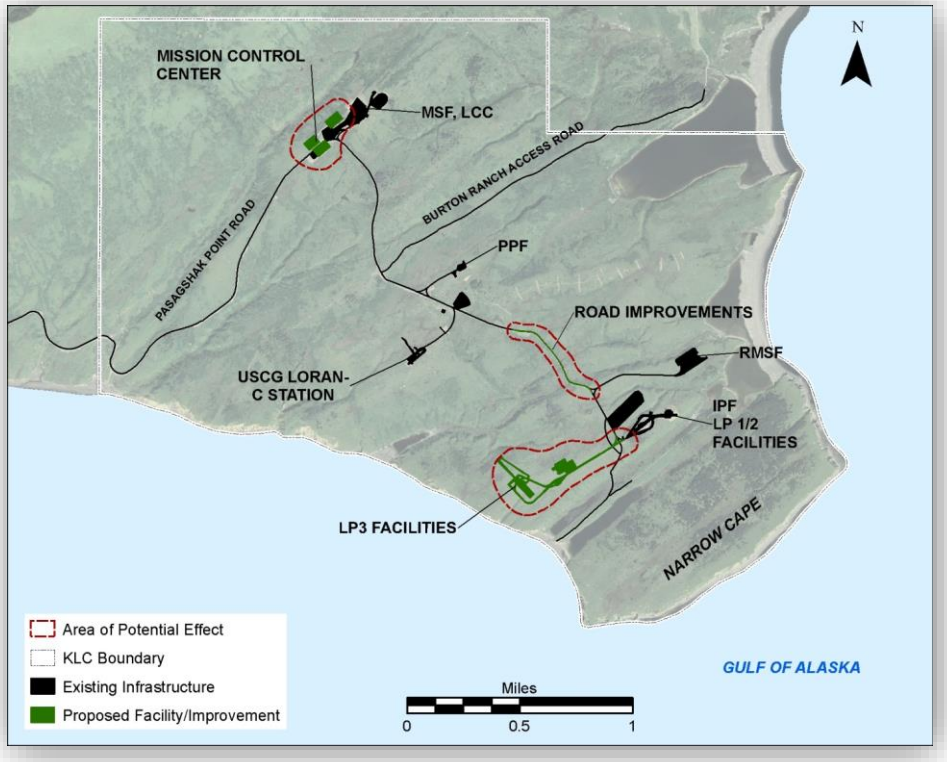

Figure 25: KLC Historic Area of Potential Effect

During the public comment period for the Draft EA, the SHPO and the Alutiiq Museum & Archaeological Repository in Kodiak notified the FAA and AAC about the potential for the presence of previously unidentified buried archeological resources at the KLC, including in the area of direct impact from the Proposed Action. The SHPO requested additional consultation with their office and other appropriate consulting parties to discuss the potential for impacts to significant and previously unidentified archaeological resources resulting from the Proposed Action. The FAA responded to the SHPO's request for additional consultation and concluded that because there is a very low probability of locating intact archaeological deposits that date to the terminal Pleistocene-era, the effects finding for the Undertaking remains as *no historic properties affected*, pursuant to CFR 800.5(b). However, considering there is a potential to encounter significant archaeological resources within the area of proposed construction and

the geological characteristics of the location, the FAA has determined it would be appropriate and feasible to conduct identification efforts in advance of construction. Thus, the FAA would ensure the development of a testing plan for the site, which would be prepared in consultation with the SHPO and the Alutiiq Museum, prior to the start of any construction activities, and a testing program would be initiated. Further detail regarding this additional consultation is provided in Appendix Q.

At least six months prior to the start of construction AAC will hire a Secretary of the Interior-qualified professional archaeologist. With input from geologist, Gary Carver(or another qualified geologist, if necessary), who is the lead author of the previously mentioned paper on active faults on northwestern Kodiak Island, the area of direct impact for all proposed construction would be overlaid onto a sensitivity map that identifies the locations of the prehistoric beach sites. Using this exhibit, in consultation with the SHPO and FAA, the archaeologist would prepare a survey methodology and testing plan (Testing Plan) that identifies appropriate locations for approximately one-meter-deep back-hoe trenches where beaches and construction activities overlap. The Testing Plan would also include protective measures should deposits be encountered. Upon the SHPO's and FAA's approval of the plan, testing may be undertaken and would commence at least three months prior to construction.

Because of the low potential for archaeological resources to be encountered, a research design/data recovery plan would not be prepared unless resources are encountered. Should resources be encountered, they would be protected by measures specified in the Testing Plan. A data recovery plan and a research design would be prepared by AAC within 15 days of the discovery, in consultation with the SHPO and FAA, following the Archaeological Research Designs guidance that is part of the *Office of History and Archaeology, Alaska Department of Natural Resources' Historic Preservation Series* (2003), as well as the Secretary of the Interior's guidelines, and the *Advisory Council on Historic Preservation's Treatment of Archaeological Properties: A Handbook.* Curation of artifacts would be included in the research design. The plan would be approved by the SHPO and FAA, and all prescribed fieldwork would be completed prior to any construction activities.

Additionally, in consultation with the SHPO and FAA, AAC would have a monitoring and unanticipated discovery plan prepared by a professionally qualified archaeologist, and approved by the SHPO and FAA prior to any ground disturbance during construction. This plan would be prepared, and the requirements followed, during all ground-disturbing activities, regardless of the results of the pre-construction archaeological testing. In a letter to the FAA, the SHPO expressed agreement with FAA's steps described above to address potential impacts to significant and previously unidentified buried prehistoric archaeological resources (Appendix Q).

The FAA sent letters (Appendix S) to contacts for each of the ten federally recognized tribes with interests in the Kodiak Island Borough County, providing them with a link to the Second Draft EA on the FAA's website, and the FAA's contact information to answer any questions on the proposed Project. All ten tribal contacts have also been added to the mailing list for the Final EA.

4.1.7.2 Mitigation

Should resources be encountered, they would be protected by measures specified in the Testing Plan as described above. A data recovery plan and a research design would be prepared by AAC within 15 days of the discovery, in consultation with the SHPO and FAA. Curation of artifacts would be included in the research design and all prescribed fieldwork would be completed prior to any construction activities. Additionally, in consultation with the SHPO and FAA, AAC would have a monitoring and unanticipated discovery plan prepared by a professionally qualified archaeologist, and approved by the SHPO and FAA prior to any ground disturbance during construction. This plan would be prepared, and the requirements

followed, during all ground-disturbing activities, regardless of the results of the pre-construction archaeological testing.

4.1.8 Light Emissions and Visual Effects

4.1.8.1 Direct and Indirect Effects

There are no Federal statutory or regulatory requirements for classifying and assessing light emissions and visual effects, and therefore, no established thresholds for significance. Due to the small number of launches that occur per year at KLC, any use of high-powered outdoor lighting associated with launches would be infrequent and short-lived. Previous environmental documentation (FAA, 1996) has assessed light emissions effects based on a maximum of nine launches per year. The Proposed Action would not increase the number of launches. The launch of medium-lift rockets would not result in notably increased light emissions compared to small-lift rockets. Therefore, additional light emissions effects are not anticipated.

The existing man-made structures and improvements at the KLC are now part of the existing landscape of Narrow Cape. Expansion of the KLC under the Proposed Action would add an additional four above-ground structures/installations (the MCC, the VPF, the RSF, and the LFF) and one launch pad (LP3) and flame trench to the facility, as well as the LP3 access road. All of the four planned structures and installations are consistent with the general industrial character of the existing facilities at the KLC. The VPF would be approximately 300 feet high, making it noticeably taller than existing structures.

Visual effects associated with construction of man-made features at Narrow Cape have already been incurred during original construction of the KLC and subsequent improvements. The VPF would be more prominently visible from the sea than existing structures. It would, however, be within the same viewshed and context as the surrounding KLC facilities. Though visual effects to the Narrow Cape area would occur, both from a land and sea perspective, because the proposed improvements would be consistent with the existing visual landscape, the effects would be minor.

4.1.8.2 Mitigation

New structures would be painted to blend with the surrounding environment to the extent possible.

4.1.9 Natural Resources and Energy Supply

4.1.9.1 Direct and Indirect Effects

The Proposed Action is expected to have a negligible effect on the existing Kodiak energy supply during peak launch operations, and no measurable effect when averaged over time. It is anticipated that annual electricity consumption would increase to 4 megawatt-hours, but would not exceed current design load. The majority of KLC facilities are only in full operation during launch-related activities, although some electricity is used at the KLC year-round for support functions. Additional facilities associated with the Proposed Action would increase the overall electrical demand at KLC; but would not surpass the maximum electrical usage/loads for the facility. Increased electrical demands are within the capacity of KEA to accommodate.

Diesel backup generators at existing and proposed KLC installations would not be expected to operate more than the currently estimated maximum of 262 hours per year (FAA, 1996). The LP3 facilities would require three additional generators. The increase in the number of generators operating during the estimated maximum of 262 hours per year would be minor, with no measureable effect over time due to the infrequency of use.

The Proposed Action would not increase the number of launches per year, but would require the additional use of liquid fuels (see Section 4.1.6). The KLC is currently authorized to store and use over 18,000 gallons of petroleum products ranging from gasoline and lubricating fluids to diesel, as detailed in the Affected Environment section of this EA. Up to 570,000 lbs of LOX (approximately 60,000 gallons), and up to 204,000 lbs (approximately 30,000 gallons) of RP1, would be required for the launch of each medium-lift liquid-propellant rocket. This would represent a marked fuel consumption increase at the facility. As no better alternative fuel exists for this purpose, the fuel consumption is unavoidable and has been minimized to the maximum extent practicable to achieve vehicle launch in compliance with Executive Order 13123. Fuel requirements are optimized during rocket design to minimize the total weight of the vehicle (including on-board fuel supply).

The short-term effect on water resources at the KLC would be driven by the use of an additional 50,000 gallons of deluge water per liquid-propellant launch at LP3 (Section 4.1.12). Water would be pumped from the KLC groundwater supply well and stored in the four tanks until needed. Storage tanks would be refilled over time between launches. This additional incremental use of water would not put a large demand on the groundwater supply. KLC currently uses approximately 110,000 gallons a year of the authorized 335,627 gallons, therefore LP3 can support four liquid fuel launches a year without exceeding the authorized water quantities. The Proposed Action is expected to have a negligible effect on the Narrow Cape groundwater supply during peak launch operations, and no measurable effect when averaged over time.

The demand for power and the infrastructure for delivery existed on Narrow Cape to support the USCG LORAN-C Station prior to KLC's construction in 1998. According to the Department of Homeland Security, the USCG LORAN-C Station was effectively closed in 2010 (USDHS, 2012). This decrease in energy demand on Narrow Cape may help offset the new energy demand for the Proposed Action. The Proposed Action's additional power demands would be an increase to what the KLC already requires of the local power supply. Any future expansion would also increase energy demand. In 2012, KEA added three new wind turbines with a power generating capacity of 1.5 Megawatts each, which brings its total generating capacity to 43.5 MW from renewable sources with a back-up diesel generating capacity of 33 MW (KEA, 2011). KEA is capable of accounting for any demand increase and meeting that demand with 93% or greater renewable energy.

4.1.9.2 Mitigation

Mitigation is not required.

4.1.10 Noise

4.1.10.1 Direct and Indirect Effects

This section addresses the noise impacts from a new class of rockets, such as the medium-lift rockets considered under the Proposed Action. The impact to compatible land use in the KLC area is discussed in section 4.1.2. The noise impact analysis in Appendix A was prepared to identify potential differences in the noise levels of medium-lift rockets compared to previously launched small-lift rockets from the KLC. Based on the conclusions of this analysis, the Proposed Action is not anticipated to result in any significant changes in the overall noise environment within the affected area.

The Noise Study presented in Appendix A used noise prediction methods based on the NASA Document NAS8-11217, Sonic and Vibration Environments for Ground Facilities – A Design Manual (NASA 1968) to calculate potential noise levels from medium-lift launches (specifically the Athena III) at noise-sensitive receptors (residences, Ugak Island, and Narrow Cape). The noise analysis (which was conducted without using a computer model) assumed a completely vertical trajectory for the Athena III rocket, which would

not be the actual trajectory of this rocket for a launch from KLC. However, it is not expected that this would make a notable difference in the predicted noise levels at the noise-sensitive receptors. The noise analysis did not analyze the potential for a sonic boom to impact a land surface. The original NEPA analysis (FAA 1996) for construction and operation of the KLC estimated that a sonic boom generated during a launch would impact the ocean's surface approximately 21 to 35 miles down range. Sonic booms were generated from previous small-lift launches at KLC and were not problematic. The current version of the EA concludes the same – a sonic boom would impact the ocean's surface beyond the edge of the Outer Continental Shelf. The FAA Office of Environment and Energy has approved the noise modeling method for the Proposed Action (see Appendix J).

Noise effects from launching medium-lift rockets would be comparable to effects associated with small-lift rockets. There would be a slight increase in the maximum noise levels to the west and southwest of the KLC during launches of medium-lift vehicles from LP3; however, the overall increase in the daily or annual averages would only be measurable at one of the nearby noise-sensitive properties (an increase from 45 to 49 dBA, which is well below the 65 dBA threshold for residences). Launch noise levels would return back to the existing ambient levels within 2 minutes after a launch. Because the KLC is located in a rural area, there are few sensitive receivers near the complex, and all residences are far enough away from the proposed LP3 as not to be affected from launch operations.

The Proposed Action includes up to nine rocket launches per year consisting of a combination of small and medium-lift vehicles. Medium-lift vehicles produce slightly higher maximum noise levels than generated by small lift vehicles. The noise analysis assumed that all nine launches would be medium-lift rockets to maintain a conservative projection. Using this assumption, noise levels at sensitive properties surrounding the KLC would remain below the FAA's 65 dBA DNL criterion.

Based on low ambient noise levels, construction noise may be audible within 1,000 feet from the work area. Construction noise would be temporary and would not affect noise receivers beyond the KLC.

4.1.10.2 Mitigation

Because there are no currently developed areas outside of the KLC that were identified with noise effects, no mitigation measures are required. However, noise analysis including real-time sound pressure and sound exposure level measurements are required whenever a new class of rocket is flown (50 CFR 217). This would be conducted the first time a medium-lift rocket is flown from the KLC, and subsequently whenever a new type of vehicle (e.g. liquid fuels) is flown.

4.1.11 Socio-Economic, Environmental Justice, and Children's Environmental Health and Safety Risk

4.1.11.1 Direct and Indirect Effects

The Proposed Action is consistent with Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* and Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks.* As documented throughout Section 4.1, the Proposed Action would have no high and adverse impacts to any resource category; therefore no disproportionately high and adverse human health or environmental effect on minority and low-income populations would be expected. Potential effects from the Proposed Action would have the same social effects regardless of race or income level; therefore minority or low-income populations would not be disproportionately affected.

For the reasons outlined in Section 3.11.3, unaccompanied children are not likely to be present during typical operations at the KLC. No children would be allowed within the KLC at the time of a launch when

the facilities and surrounding areas are closed to the general public. As such, there would be no additional risk to children's environmental health and safety.

The Proposed Action is expected to have negligible socio-economic effects, as detailed below. Safety zone closures to air and water, similar to those that already occur during small-lift rocket launches, would have minor temporary effects on local populations seeking access to these areas during launch activities. As discussed in 3.11.5, Narrow Cape is not a primary location for subsistence resource gathering, so these closures would have negligible impact on subsistence activities. Commercial fishing activities could be temporarily disrupted during launch activities as marine vessel restrictions are issued prior to all launches. The Notice to Mariners establishes a closed "safety zone" near the launch complex and Ugak Island, as well as establishes a larger "hazard zone" to the southeast where mariners are discouraged from entering. The Notice to Mariners is issued for a window of time in which a launch may take place (such as from 7:40am to 10:00am daily, September 27 to October 3) and remains in effect until canceled or expired. These closures have the potential to adversely affect local sport, subsistence and commercial fisherman for up to eight hours on the launch day. Any effects would depend on which fishery was open at the time and where those fishing grounds are located (see Table 12). Kodiak Fish and Game is not aware of any significant fishing activity in the down range hazard areas. Closures are dependent on the launch window for the particular mission, without regard to fishing seasons. These closures are in effect under the current license. AAC would work with commercial and sports fishermen on a case-by-case basis to minimize the impact of sea lane closure during launch operations.

A Notice to Airmen is concurrently issued with the Notice to Mariners, imposing flight restrictions in the overhead safety and hazard zones. These closures would temporarily affect private pilots and air taxi companies serving both tourism and air travel needs, who wish to transit the Narrow Cape area. Effects could include longer flight paths (to avoid KLC), scheduled flight delays, and increased use of fuel in aircraft. These effects would be temporary and would not differ from those already permitted at the KLC and documented in the 1996 EA, as the number of launches and corresponding closures would not increase from the maximum of 9 per year. The potential effect would be to adjust trans-oceanic flights from the West Coast to Asia about 50 miles north or south to avoid hazard areas. More specific effects are difficult to quantify, because each rocket and each trajectory have their own specific hazard areas, and trans-oceanic flights adjust their flight path daily based on the jet stream and other weather conditions.

Stage separation during the rocket fly out would result in spent rocket stages falling into the ocean to the south of Kodiak Island. The zones where these stages would impact the water would vary depending on the rocket and the mission, but for each launch, a flight safety analysis would be performed and downrange hazard areas established. The KLC launch azimuth (110° to 220° true) would keep these hazard areas over the ocean. During launch, Notice to Airmen and Notice to Mariners would be issued to keep aircraft and shipping outside of these areas and direct coordination with Air Traffic Control and the U.S. Coast Guard would be maintained to verify that there is no traffic in these areas.

Traffic on Rezanof Drive between the LASH Dock and KLC may experience temporary disruptions lasting up to one hour while rocket motors and payloads are transported to KLC. The transportation schedules would attempt to avoid prime commuting hours to minimize impacts to local travel, but the schedules are also dependent on the tide tables for off loading. Traffic disruptions may increase as more missions are launched from KLC. However, as stated in Section 3.11.2, they would be limited to approximately one per launch mission for a maximum of 9 times per year; therefore, there would be minor impacts on traffic. Further, traffic disruptions would only affect populations south of the dock in Census Track 5 and Womens Bay for a total of 1,650 people.

The Proposed Action would provide a temporary positive effect to the area's economy. Construction of the proposed LP3 and associated infrastructure is estimated to cost more than $125 million dollars and would require a temporary workforce to complete. These expenditures would help to stimulate the Kodiak Island construction industry as well as support additional indirect jobs in other local business sectors. Benefits associated with these expenditures include wages paid to local residents (since this money would be spent in the local area), and goods purchased on the island. An analysis of economic impact showed that Kodiak would have a total output (direct and induced labor income, goods, and services) of approximately $36 million dollars from construction alone (Northern Economics, 2012).

AAC would contract the construction of LP3 and encourage local hires. The 2010 Census indicates that there are 287 construction workers on Kodiak (USCB, 2012). The increase in demand for construction workers would be temporary, approximately two to three years, and existing facilities and resources, including housing resources should be sufficient to satisfy the need. The island's population is somewhat transient due to the seasonal nature of the commercial fishing industry, changes in personnel at the U.S. Coast Guard station, seasonal tourism, and launch activity. As a result, island residents are accustomed to and able to adapt to temporary increases in employment and population. Construction activity would bring about 200 temporary workers to Kodiak in addition to local labor, and launch missions would bring about 100 temporary workers per mission (Northern Economics, 2012). In comparison, Kodiak receives approximately 40,000 tourists a year. The Proposed Action and its related construction are not large enough to create a change in this dynamic, and therefore would have no effect on Kodiak community resources or infrastructure.

As noted in Section 3.11, tourism is a major component of Kodiak Island's economy with over 40,000 visitors per year. Larger rockets may attract more tourists. Due to the remoteness of Kodiak, it is unlikely that many people would make a visit to Kodiak just to see a rocket launch, especially since they can be delayed without notice. However, AAC has designated viewing areas and webcasts public launches. Further, the road closure would only impacts access to Fossil Beach, which is a local attraction more than a tourist attraction. Tourism is unlikely to be affected by the Proposed Action, as the frequency of launches would not change from that analyzed previously in the other NEPA documents.

Customary rural subsistence practices would generally be unaffected. The availability of species commonly harvested for subsistence purposes (Section 3.11.5) would not be affected by the Proposed Action. Safety zone closures may have a temporary effect on subsistence fishing during a launch, but would be negligible. There would be no change in the frequency or length of closures under the Proposed Action when compared to conditions under the current Launch Site Operator License. The issuance of the current Launch Site Operator License was analyzed in the 1996 EA and found to have no significant impacts.

4.1.11.2 Mitigation

Only temporary and minor adverse effects may occur due to safety zone closures, which are mitigated to the maximum extent possible by issuing advance notices to all potentially affected parties. Initial coordination with Mariners and Airmen begins six months before a proposed launch.

To help offset any lost fishing revenue during the closure, AAC would continue (as they have previously) to hire local fishing vessels to serve as boundary boats during the safety closure periods. These boats warn other mariners of the hazard area and notify AAC and the USCG of any craft within the hazard area.

4.1.12 Water Quality

4.1.12.1 Direct and Indirect Effects

Potential changes in pH to area streams and lakes from acid deposition (HCl) and the potential for accumulation of combustion byproducts (aluminum oxide) in localized surface waters is the primary water quality concern. The accumulation and potential water quality effects from aluminum oxide are only possible under certain environmental conditions and specific pH ranges, and therefore are not anticipated (FAA, 1996). Preliminary assessments prior to construction of the KLC indicated that quantities of HCl that would be released by combustion of solid fuels would not result in measurable degradation of surface water quality, because the exhaust and associated chemical compounds would be dispersed over a large area and immediately diluted and/or neutralized by receiving waters (FAA, 1996). Surface waters at KLC have very high natural buffering capacity which naturally mitigates acid deposition. In addition, local topography – directing the flame duct towards a relatively large valley where the ground cloud exhaust would have more time to dissipate prior to reaching the surface – would also mitigate possible effects of acid deposition from rocket combustion products. This original assessment has been supported by 17 launch-specific water quality monitoring efforts at the KLC (Section 3.12). Water chemistry parameters (temperature, pH, and specific conductivity) indicate that no adverse water quality effects from rocket launches are occurring (R&M, 2007; R&M 2008; R&M, 2009; R&M, 2011; R&M, 2014). Furthermore, all water samples to date have not detected ammonium perchlorate, which was expected because this oxidizer is completely consumed during the launch process. Aluminum levels are within normal ranges for Kodiak Island (R&M, 2007; R&M 2008; R&M, 2009; R&M, 2011; R&M, 2014).

The proposed location for LP3 is farther from surface water monitoring sites than LP1/2. Rocket launching from LP1/2 has potential for affecting the Twin Lakes valley whereas LP3 has the potential for affecting the small wetland to the north that drains over the cliff to the sea due to the northerly orientation of the flame trench in the proposed design. Under northerly wind conditions, some of the plume may drift over the Twin Lakes valley. Water quality monitoring in this wetlands is not necessary as it is well demonstrated that waters within KLC are well buffered and there are no fish present due to lack of habitat. The ground cloud produced by a medium lift motor would be somewhat larger than that from a small-lift motor, however the flame trench at LP3 exhausts above the valley with the previously mentioned wetland. The proximity of LP3 to surface waters is not anticipated to have an increase in effects to surface water quality.

Emission quantity and duration may be slightly greater for launching medium-lift rockets; however, the amount of acid deposition from proposed medium-lift, solid-propellant rockets is not anticipated to exceed previous amounts (from launching small-lift rockets) to a degree at which the localized water quality might be affected. The chemical composition of the solid fuel and the total number (nine) of authorized launches per year are the same as previously assessed in the 1996 EA. The intermittent and transitory nature of launch operations, the demonstrated capacities of local streams and lakes to buffer acid inputs from natural and man-made sources, and the high levels of local precipitation minimize the potential for changes in pH and water quality effects (FAA, 1996). The flame trench has been sited to minimize surface water effects and is directed towards the north side of the launch pad away from Twin Lakes. This flame duct direction is towards a relatively large valley where the ground cloud exhaust would have more time to dissipate prior to reaching the surface.

The primary chemical exhaust constituent of concern from launching liquid-propellant rockets is carbon monoxide, which does not directly or indirectly affect water quality. Launching liquid-propellant rockets requires a deluge system which consists of multiple large pressure vessels, totaling about 50,000 gallons of water. A suite of water nozzles distribute water directly into the rocket exhaust stream to immediately dampen vibrations after initial ignition and subsequent protection against reflected vibrations as the rocket lifts off from the launch pad. The expected duration of the water deluge system is 3–4 seconds.

Deluge water would be captured in a containment pond at the end of the flame trench providing an area for the water to evaporate or be drained into the surrounding area after testing the water to verify no presence of harmful material. Rockets are designed to optimize their fuel and oxidizer mixture to burn all fuel in order to maximize thrust, however, there is a potential for unburned rocket fuel (RP1) to be present.

No measurable effect to marine waters (Gulf of Alaska/Pacific Ocean) is expected from launches (FAA, 1996). Rocket casings are made of inert materials which represent no threat to the ocean water quality, and therefore, no effect would result from spent rocket cases landing in the ocean after burning all propellants. Spent motor casings are designed to rapidly sink upon contact with the ocean. Early termination of a flight, however, would result in some amount of solid-propellant remaining in the rocket case (or released as free solid-propellant) when it landed in the ocean. Due to the low toxicity of ammonium perchlorate and its rapid dissociation on contact with water, toxic concentrations would be short term and rapidly diluted (FAA, 1996). Liquid propellant vehicles may have several hundred pounds of residual fuel (RP1) and oxidizer (LOX) in their tanks, which would generally rupture upon contact with the ocean and sink. Further, the propellant would quickly be diluted due to the volatile nature of the fuel and the large volume of receiving waters.

Construction activities would not directly affect surface waters, as there are no surface waters within or adjacent to the footprints of the proposed facilities and road improvements. During construction, the potential effects to water quality from sediment transport via stormwater or fugitive dust would be minor and temporary.

Water use would increase during normal operations to accommodate the proposed launch pad infrastructure. As previously mentioned, 50,000 gallons of water is needed for the deluge system associated with launching a liquid-propellant rocket. The current design concept calls for four additional water storage tanks at the LFF. Each tank would contain 12,500 gallons of water and would be pressurized with liquid nitrogen for rapid delivery during launches (approximately 50,000 gallons delivered in 3 to 5 seconds). Storage tanks would be refilled as needed prior to liquid-propellant launches. Total water usage at the KLC is not anticipated to increase above the previously authorized amount of withdrawal (Section 3.12), and therefore no effects to the local groundwater supply are anticipated.

4.1.12.2 Mitigation

Minimization and mitigation of any potential water quality effects from proposed construction activities would be accomplished by adhering to a site-specific Stormwater Pollution Prevention Plan (SWPPP). The SWPPP would identify ways to minimize erosion of soils, sedimentation of nearby waters, and potential pollutant discharge via stormwater, thus reducing or eliminating surface water quality effects. The SWPPP would incorporate the guidelines from the *Alaska Storm Water Guide,* published by the Alaska Department of Environmental Conservation in December 2011. Best management practices for the Kodiak environment would be used, such as preserving natural vegetation, silt fence, and rolled erosion control products may also be used depending on the final construction design.

4.1.13 Wetlands

4.1.13.1 Direct and Indirect Effects

The Proposed Action is expected to have a negligible effect on Narrow Cape wetlands. Wetland impacts have been minimized to the maximum extent practicable during project planning. Construction activity for the Proposed Action would disturb meadow-like upland areas. Minor wetland impacts are anticipated at the Pasagshak Point Road improvements and along the LP3 access road near where it intersects Pasagshak Point Road (Figure 23 and Table 13). The proposed road improvement is located to minimize

the amount of wetlands to be filled in order to provide safe access to the LP3 area for personnel and aerospace cargo. Impacted wetlands would consist of saturated/seasonally flooded emergent meadows (PEM1B/C). The saturated/seasonally flooded emergent meadows is the dominant form of wetland at KLC, and the area to be filled is small enough to have a minimal impact on the overall ecology. The area to be filled is adjacent to existing road fill, and is expanding this fill to create safer driving conditions for people and aerospace equipment to access the proposed LP3 facilities. The specific saturated/seasonally flooded emergent meadow to be filled does not provide a significant or unique habitat or a significant hydrologic resource, nor does it impact the water quality. See photos of the area in Figure 26 below.

Pasagshak Point Road Improvements	1.47 acres
LP3 Access Road	0.7 acre

Table 13: Wetland Impacts

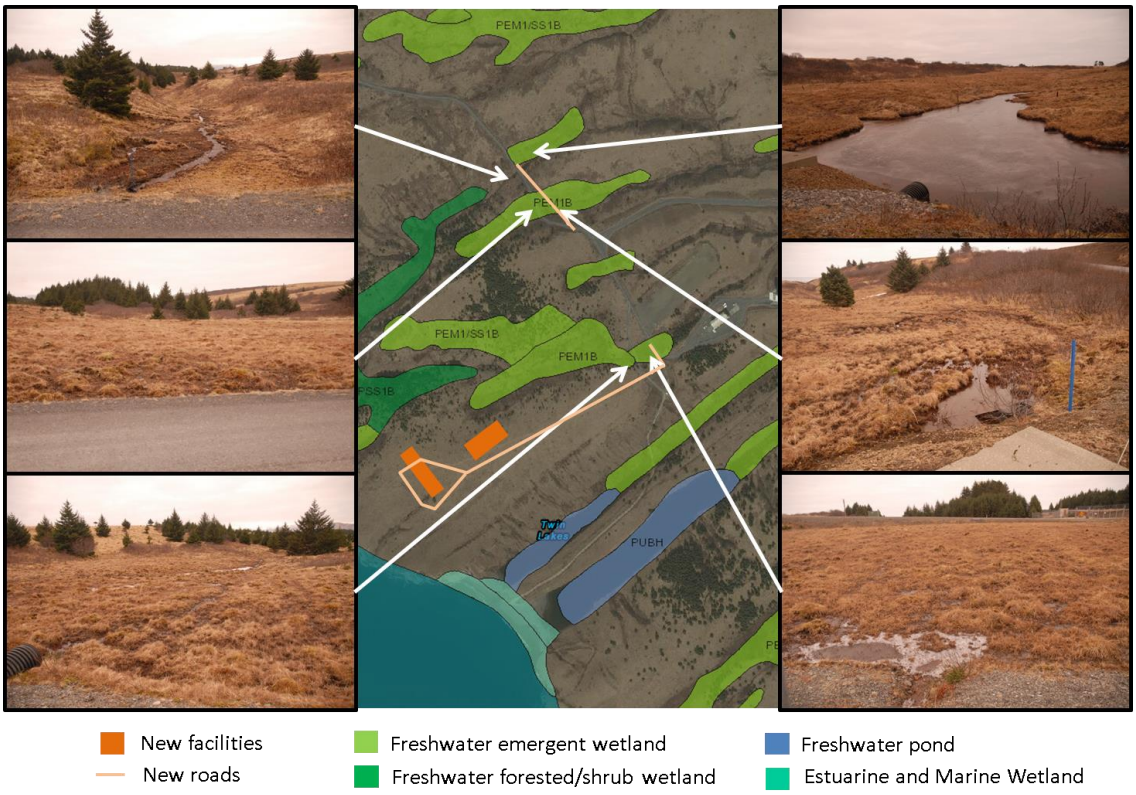

Figure 26: Wetlands along Proposed Road Improvement (USFWS 2014)

Any effect from launch operations would occur only during launches (up to nine per year) as a result of rocket exhaust product deposition. As discussed in Section 4.1.12, the flame trench has been sited to minimize surface water effects and is located on the north side of the launch pad to direct hot exhaust gases away from surface waters (Twin Lakes) and the coast. The trench directs launch emissions toward a relatively large valley where exhaust would have time to dissipate prior to reaching the ground surface. This orientation would minimize effects to vegetation through scorching. The valley does contain areas of wetlands; however, effects to vegetation would be minimal due to the shape and orientation of the flame trench, which would direct exhaust well above the small wetland areas. The exhaust is not anticipated to affect the wetland structure or its inherent functions such as filtration (see Section 4.1.5 for additional

information on the effects of rocket exhaust on plants). Overall, the FAA has determined there is no practicable alternative that would avoid wetlands, and that all practicable measures to minimize harm to wetlands would be included in project planning (See Section 4.1.13.3).

4.1.13.2 Mitigation

AAC would obtain necessary permits, including Section 404 permits for all proposed construction that would affect wetlands. Mitigation in conjunction with permitting would likely include fee-in-lieu payment to a wetland bank or conservation organization.

The construction footprint would be aligned to reduce effects to wetlands to the maximum extent practicable. Land clearing associated with construction would be carefully planned and conducted according to BMPs to minimize erosion and soil loss, and to prevent effects to nearby wetlands.

4.1.14 Construction Effects

Under the Proposed Action, construction of the LP3 facilities and improvements to Pasagshak Point Road would occur (Section 1.2). The construction-related environmental effects would be minor and temporary in nature. Construction effects have been evaluated under each resource category and proposed mitigation is included following each summary of effect. Refer to the following sections for a summary of direct and indirect effects for each resource area.

- 4.1.1 Air Quality
- 4.1.2 Compatible Land Use
- 4.1.3 Department of Transportation Act Section 4(f) and Recreation
- 4.1.4 Fish and Wildlife
- 4.1.5 Plants
- 4.1.6 Hazardous Materials, Pollution Prevention, and Solid Waste
- 4.1.7 Historical, Architectural, Archaeological, and Cultural Resources
- 4.1.8 Light Emissions and Visual Effects
- 4.1.9 Natural resources and Energy Supply
- 4.1.10 Noise
- 4.1.11 Socio-Economic, Environmental Justice, and Children's Environmental Health and Safety Risk
- 4.1.12 Water Quality
- 4.1.13 Wetlands

4.1.15 Secondary (Induced) Effects

Secondary or induced environmental effects go beyond the extents of cumulative effects, and represent potential effects on surrounding communities from the Proposed Action. Examples of such effects could include: adjustments in established population movement and growth patterns, changes in public service demands, or notable differences to business and economic activity beyond the localized area directly influenced by the Proposed Action.

Expanding the launching capabilities at the KLC would incur minor and temporary socio-economic effects due to construction, and may induce a long-term positive socio-economic effect. Launch activities increase the demand for transportation, hospitality, food services, and tourism as launch customers deploy to Kodiak for several weeks or months to support each mission. No substantial direct, indirect, or cumulative effects to other resource categories have been identified and therefore no associat ed secondary effects are anticipated from the Proposed Action.

4.1.16 Cumulative Impacts

Cumulative impacts are defined by the CEQ in 40 CFR 1508.7 as:

> Impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions.

The CEQ regulations further require that NEPA environmental analyses address connected, cumulative, and similar actions in the same document (40 CFR 1508.25). Additionally, the CEQ further explained in Considering Cumulative Effects Under the National Environmental Policy Act (CEQ 1997b) that "each resource, ecosystem and human community must be analyzed in terms of its ability to accommodate additional effects, based on its own time and space parameters." Therefore, a cumulative effects analysis normally will encompass geographic boundaries beyond the immediate area of the Proposed Action, and a time frame, including past actions and foreseeable future actions, in order to capture these additional effects.

Past, present, and reasonably foreseeable future actions at the KLC include the potential reconstruction of LP1 as a medium-lift launch pad. LP1 is located on the other side of Pasagshak Road from the proposed LP3. It is flush with ground level and housed in the Launch Service Structure and currently supports small-lift launch vehicle operations. However, the AAC has informed the FAA that there is a possibility that LP1 could be modified in the future to accommodate medium-lift launch vehicles. Such modifications could include changing the interior structure, replacing the launch stool, adding a liquid fueling system, and changing the environmental control system. If LP1 is reconstructed as a medium-lift launch pad, authorized launches at the KLC would still be limited to a maximum of nine launches per year. This action, considered in conjunction with the Proposed Action, formed the basis for the cumulative impacts analysis.

In accordance with FAA Order 1050.1E, Environmental Impacts: Policies and Procedures, Change 1, and the CEQ NEPA implementing regulations, the FAA analyzed the potential cumulative impacts. Based on the findings and potential impacts described in this Chapter 4, the cumulative impacts analysis focuses on air quality and noise, which are expected to be most affected. The FAA has determined that the potential impacts for all other resource areas described in Chapter 4 would not meaningfully interact in time and space with the potential effects of other past, present, and reasonably foreseeable future actions. Therefore, minor cumulative impacts are anticipated for resource areas other than air quality, climate, and noise.

4.1.16.1 Air Quality

Temporary air emissions from the limited construction for the Proposed Action would be negligible and would not be cumulative with emissions from reconstruction of LP1. LP1 construction impacts are not expected to overlap in time with the Proposed Action, and thus cumulative construction air quality impacts are not anticipated.

Emissions from rocket launches dissipate after each launch and short-term effects are minor and temporary in nature.

Operations under the Proposed Action would result in an increase in total annual emissions compared to the current operations, but would not exceed NAAQS. Annual emissions would be additive and cumulative with air emissions from other past, present and reasonably foreseeable future actions that generate construction and launch operations; however, launch operations from KLC would not exceed the maximum of 9 launches authorized annually. Because Kodiak Island is in attainment for NAAQS, this cumulative impact would not be significant.

4.1.16.2 Climate: GHG Emissions

Launch vehicle operations would result in GHG emissions. In CEQ's December 2014 Revised Draft Guidance for Greenhouse Gas Emissions and Climate Change Impacts CEQ provides a reference point of 25,000 metric tons of CO_2-equivalent emissions on an annual basis below which "a GHG emissions quantitative analysis is not warranted unless quantification below that reference point is easily accomplished." (CEQ 2014) Proposed launch operations would slightly increase CO_2 emissions compared to the No Action Alternative due to the larger rockets that would be launched. However, the increase in emissions would be only about 407 metric tons of CO_2 per year. Therefore, the Proposed Action would not be expected to result in a significant contribution to global climate change.

4.1.16.3 Noise

The Proposed Action would not increase the total number of launches per year or substantially affect the overall noise environment. As stated in the noise analysis, when considering a maximum of 9 medium-lift launch operations from the KLC, noise levels at sensitive properties surrounding the KLC would remain below the FAA's 65 dBA DNL criterion. Further, the highest noise level at Ugak Island from the entire sequence of a proposed medium-lift rocket launch would be 8 dBA less than the 101.4 dBA maximum sound exposure level threshold used to calculate take in the NMFS BO. As a result, significant cumulative impacts to seals and sea lions are not anticipated. Thus, no significant cumulative impacts related to noise would be expected.

4.2 No Action Alternative

Under the No Action alternative, the existing Kodiak Launch Complex would continue to operate under AAC's Launch Site Operator License as it is currently issued. Existing launch activities – consisting of a maximum of nine small-lift rocket launches per year – would continue. Proposed road modifications to Pasagshak Point Road, and construction of an additional launch pad facility and associated facilities would not proceed. Environmental and socio-economic effects resulting from existing operations at the KLC were evaluated and presented in the 1996 EA and are not discussed in detail below; only new potential effects resulting from the No Action alternative are included in the following analysis.

The purpose and need for the Proposed Action would not be fulfilled under the No Action alternative. The No Action alternative would not follow the direction from Congress under the Commercial Space Launch Act to encourage, facilitate, and promote commercial space launches and reentries by the private sector and facilitate the strengthening and expansion of the U.S. space transportation infrastructure, in accordance with the applicable requirements. Additionally, the No Action alternative would not meet the State of Alaska's mandate to AAC to develop and expand aerospace-related industry, research, educational, and technical opportunities.

4.2.1 Air Quality

Under the No Action alternative, launch activities would continue as currently permitted. There would be no new effects from the No Action alternative.

4.2.2 Compatible Land Use

The No Action alternative would not have an effect on compatible land use, as there would be no land acquisition, use conversion, or changes to the ILMA and no increase in temporary noise effects.

4.2.3 Department of Transportation Act Section 4(f) and Recreation

There would be no new direct or indirect recreational effects under the No Action alternative. The KLC would continue safety closures during launches which would temporarily restrict recreational activities requiring access through the KLC or in marine areas located within established safety zones (FAA, 1996).

4.2.4 Fish and Wildlife

Under the No Action alternative, launch activities would continue as currently authorized and there would be no new effects on fish and wildlife species.

4.2.5 Plants

There would be no new effects on plants and vegetation at the KLC under the No Action alternative as no construction or vegetation clearing would be required.

4.2.6 Hazardous Materials, Pollution Prevention, and Solid Waste

The use, management, and disposal of petroleum products would be handled in accordance with the existing SPCC plan so that potential environmental effects are avoided (FAA, 1996). The quantities and types of materials stored at the KLC would not change and there would be no new effects resulting from the No Action alternative.

4.2.7 Historical, Architectural, Archaeological, and Cultural Resources

There would be no new effects to historical, architectural, or archaeological resources under the No Action alternative, as no construction or ground-disturbing activities would be required.

4.2.8 Light Emissions and Visual Effects

There would be no new effects to the visual landscape or light emissions under the No Action alternative.

4.2.9 Natural Resources and Energy Supply

There would be no increase in the amount of natural resources and electricity required for currently authorized launching activities. Thus, there would be no new effects resulting from the No Action alternative.

4.2.10 Noise

There would be no new noise effects resulting from the No Action alternative.

4.2.11 Socio-Economic, Environmental Justice, and Children's Environmental Health and Safety Risk

The No Action alternative would have no new effects on socioeconomic, environmental justice, or children's environmental health and safety risk issues related to currently authorized launch activities at the KLC.

4.2.12 Water Quality

The existing water quality of Narrow Cape would remain unchanged with the No Action alternative. The No Action alternative would not result in surface or ground water quality effects.

4.2.13 Wetlands

No fill or dredging activities in wetlands would be required under the No Action alternative. The No Action alternative would not result in any new effects on wetlands.

4.2.14 Secondary (Induced) Effects

The No Action alternative could have secondary socio-economic effects. If additional launch contracts are not secured, subsequent changes to the KLC workforce (decrease in employees) may have a secondary socio-economic effect. In August 2012, AAC reduced the KLC workforce by 20% due to lack of launch contracts. The No Action alternative would likely result in a continuation of the historical launch rate of one mission a year.

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