FINAL ENVIRONMENTAL ASSESSMENT
AND
FINDING OF NO SIGNIFICANT IMPACT/RECORD OF DECISION

Causey Aviation Unmanned, Inc.
Drone Package Delivery Operations in
Granbury and Rowlett, Texas

Prepared by:

United States Department of Transportation
Federal Aviation Administration

Washington, D.C.

August 2023

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DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
Washington, D.C.

Notice of Availability of the Final Environmental Assessment and Finding of No Significant Impact/Record of Decision for Causey Aviation Unmanned, Inc.'s Drone Package Delivery Operations in Granbury and Rowlett, Texas

The Federal Aviation Administration (FAA) hereby gives Notice of Availability (NOA) for this Final Environmental Assessment (EA) and Finding of No Significant Impact/Record of Decision (FONSI/ROD) following the FAA's evaluation of the potential environmental effects of the FAA decision to authorize Causey Aviation Unmanned, Inc. (Causey), to conduct unmanned aircraft (UA) commercial package delivery operations from distribution centers located in Granbury and Rowlett, Texas.

Causey seeks to amend its air carrier Operations Specifications (OpSpecs) and other FAA approvals necessary to begin unmanned aircraft (UA) commercial package delivery operations in two locations outside of Dallas/Fort Worth, Texas—Granbury and Rowlett. The federal action subject to this EA is the requested FAA approval of Causey's OpSpecs to include a paragraph with descriptive language about the operating area boundaries, which includes the specific locations and operational profiles in Causey's request.

The Final EA has been prepared in accordance with the requirements set forth in the Council on Environmental Quality (CEQ) regulations at Title 40, Code of Federal Regulations (CFR), parts 1500-1508, *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act* and FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures.* The Final EA reflects the consideration of comments received during the public comment period for this EA, which was open from May 25, 2023, through June 24, 2023.

The Final EA and FONSI/ROD are available to view/download electronically at: https://www.faa.gov/uas/advanced_operations/nepa_and_drones/

Contact Information: For any questions or to request a copy of the EA, please e-mail 9-FAA-Drone-Environmental@faa.gov.

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DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
Finding of No Significant Impact/Record of Decision
for
Final Environmental Assessment for Causey Aviation Unmanned, Inc.
Drone Package Delivery Operations
Granbury and Rowlett, Texas

INTRODUCTION

The Federal Aviation Administration (FAA) prepared the attached Environmental Assessment (EA) to analyze the potential environmental impacts that may result from FAA's approval of the Part 135 air carrier Operations Specifications (OpSpecs) amendments and other approvals requested by Causey Aviation Unmanned, Inc. (Causey) to begin commercial package delivery operations (described in more detail in the Proposed Action section below) in Granbury and Rowlett, Texas. The requested approvals would, among other things, add descriptive language to Causey's OpSpecs about specific locations for the operating area boundaries. This approval would enable Causey to begin unmanned aircraft (UA) commercial package delivery operations in Granbury and Rowlett. Operating boundaries are depicted in **Figure 1** of the EA. The approval of Causey's OpSpec amendments to include these new operating areas and the other FAA approvals that are necessary for these operations are considered a major federal action subject to National Environmental Policy Act (NEPA) review requirements.

The FAA prepared the EA in accordance with the National Environmental Policy Act of 1969, as amended (42 United States Code [U.S.C.] § 4321 et seq.); Council on Environmental Quality's NEPA implementing regulations (40 Code of Federal Regulations [CFR] parts 1500 to 1508); FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*; and FAA Order 1050.1F Desk Reference.

After completing the EA and reviewing and analyzing available data and information on existing conditions and potential impacts, the FAA has determined the proposed action will not significantly affect the quality of the human environment. Therefore, the preparation of an Environmental Impact Statement is not required, and the FAA is issuing this Finding of No Significant Impact (FONSI) and Record of Decision (ROD). The FAA has made this determination in accordance with applicable environmental laws and regulations. The EA is incorporated by reference into and supports this FONSI/ROD.

PURPOSE AND NEED

The FAA has multiple approvals associated with Causey's proposed initiation of commercial delivery operations in Granbury and Rowlett, Texas. The FAA amendment of Causey's OpSpecs to add new operation areas (as depicted in **Figure 1** of the EA) is the approval that will ultimately enable UA commercial delivery operations in Granbury and Rowlett. Causey's request for OpSpec amendments to add new areas of operations requires FAA review and approval. The FAA has a statutory obligation to review Causey's request to approve the OpSpecs and determine whether the issuance would affect safety in air transportation or air commerce and whether the public interest requires the amendment. After making this determination, the FAA must take an action on the OpSpecs amendment.

The purpose of Causey's request is to begin UA BVLOS commercial package delivery service in the two areas in Texas, which, in its business judgment, Causey has determined are appropriate markets for operations. In other parts of the country, such as North Carolina, Causey has obtained the FAA's

approval for initial commercial delivery operations. The approvals would offer Causey an opportunity to further assess the viability of the UA commercial delivery option under real world conditions and demonstrate that it can conduct operations safely and meet its compliance obligations. The approval could also help Causey gauge public demand for UA commercial delivery services and evaluate whether scalable and cost-effective UA BVLOS delivery expansion is possible in these areas. In addition, the approvals could provide an opportunity to assess communities' response to commercial delivery operations in these areas. See **Section 1.3** of the EA for further information on the purpose and need.

PROPOSED ACTION

For Causey to be issued the amended OpSpecs under its Part 135 air carrier certificate, it must receive a number of approvals from the FAA, such as a waiver of 14 CFR 91.113(b) to enable beyond visual line of sight (BVLOS) operations and a Certificate of Waiver or Authorization (COA). Causey has requested that the FAA amend the OpSpecs in its Part 135 air carrier certificate; this is the FAA approval that ultimately would enable commercial delivery operations in Granbury and Rowlett, Texas. The Proposed Action is the FAA approval of an amendment to Causey's B050 OpSpec, *Authorized Areas of En Route Operations, Limitations, and Provisions*, specifically a reference section titled Limitation, Provisions, and Special Requirements. The approval would include a paragraph with descriptive language about the operating area boundaries (depicted in **Figure 1** of the attached EA), including the specific location and operational profile proposed in Causey's request. The operating areas are also the study area for the EA.

Causey anticipates operating an average 77 delivery flights per operating day from the Granbury distribution center (DC) and 71 delivery flights per operating day from the Rowlett DC. Causey plans to conduct deliveries to customers in 11 delivery zones in the Granbury operating area and 9 delivery zones in Rowlett operating area. The delivery zones are shown in **Figures 2 and 3** of the attached EA. The Granbury DC operating area is a 16.6-square-mile circular area centered on a DC in the town of Granbury, Texas, within Hood County. The Rowlett DC operating area is a 16.6-square-mile circular area centered on a distribution site in the town of Rowlett, Texas, within Dallas County. The proposed operations would occur between 8:00 a.m. and 10:00 p.m. up to seven days per week.

The amended OpSpecs would restrict Causey to the operating areas identified in **Figure 1** of the EA. Any future expansion beyond the authorization and limitations for the areas of operations described in the B050 OpSpec, or beyond the current 1:1 pilot to aircraft ratio described in Causey's A003 OpSpec, *Airplane/Aircraft Authorization*, would require additional OpSpec amendments from the FAA and would receive appropriate NEPA review at that time.

See **Section 2.1** of the attached EA for further information.

ALTERNATIVES

Alternatives analyzed in detail in the EA include the Proposed Action and the No Action Alternative. Under the No Action Alternative, Causey would still be authorized to conduct package delivery flights under Part 107 operating authorities and waivers although these existing operations are limited in that they could only occur within visual line of site, so visual observers would be required. This alternative does not support the stated purpose and need.

See **Sections 2.1** and **2.2** of the attached EA for further information.

ENVIRONMENTAL IMPACTS

The potential environmental impacts from the Proposed Action and No Action Alternative were evaluated in the attached EA for each of the environmental impact categories identified in FAA Order 1050.1.F. **Section 3.0** of the attached EA describes the physical, natural, and human environment within the project study area, and 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 Air Quality and Climate; Coastal Resources; Farmlands; Hazardous Materials, Solid Waste, and Pollution Prevention; Land Use; Natural Resources and Energy Supply; Socioeconomic Impacts and Children's Environmental Health and Safety Risks; Visual Effects (Light Emissions Only); Water Resources (Wetlands, Floodplains, Groundwater, and Wild and Scenic Rivers).

Section 3.0 of the attached EA also provides detailed evaluations of the potential 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. A summary of the documented findings for each category, including requisite findings with respect to relevant special purpose laws, regulations, and executive orders, is presented below:

- **Biological Resources (including Fish, Wildlife, and Plants), EA Section 3.2.** Biological resources include plant and animal species and their habitats, including special status species (federally listed or state-listed threatened or endangered species, species proposed for listing, species that are candidates for federal listing, marine mammals, and migratory birds) and environmentally sensitive or critical habitat. The Endangered Species Act (ESA) of 1973 requires the evaluation of all federal actions to determine whether a proposed action is likely to jeopardize any proposed, threatened, or endangered species or proposed or designated critical habitat. Federal agencies are responsible for determining if an action "may affect" listed species or critical habitat, which determines whether formal or informal consultation with the U.S. Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service (NMFS) is needed. If the FAA determines that the action will have no effect on listed species, consultation is not required. If the FAA determines that the action may affect listed species, consultation with the USFWS must be initiated.

  The Migratory Bird Treaty Act of 1918 protects migratory birds, including their nests, eggs, and parts, from possession, sale, purchase, barter, transport, import, export, and take. The USFWS is the federal agency responsible for the management of migratory birds as they spend time in habitats of the U.S. The Bald and Golden Eagle Protection Act of 1940 prohibits anyone from "taking" a bald or golden eagle, including their parts, nests, or eggs, without a permit issued by the USFWS. The USFWS National Bald Eagle Management Guidelines, provide for additional protections against "disturbances." Similar to take, "disturb" means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, injury to an eagle or causes either a decrease in its productivity or nest abandonment due to a substantial interference with breeding, feeding, or sheltering.

  The State of Texas maintains a list of fish and wildlife that are protected under the Texas Parks and Wildlife Code. This list includes all species that the director of the Texas Parks and Wildlife Department (TPWD) deems threatened with statewide extinction (Title 31, Part 2, Chapter 65, Subchapter G RULE, § 65.176). In addition, a species that is indigenous to the State of Texas and

listed by the federal government as endangered automatically receives state protection as an endangered species. Species on this list are protected under state law. The Texas Parks and Wildlife Code (§ 68.015, Prohibited Acts) states that "no person may capture, trap, take, or kill, or attempt to capture, trap, take, or kill, endangered fish or wildlife." Additionally, the Texas Administrative Code (Title 31, Part 2, Chapter 65, Subchapter G RULE, § 65.171 states that "no person may: (1) take, possess, propagate, transport, export, sell or offer for sale, or ship any species of fish or wildlife listed by the department as endangered; or (2) take, possess, propagate, transport, import, export, sell, or offer for sale any species of fish or wildlife listed in this subchapter as threatened."

The DCs are in commercial areas. No ground construction or habitat modification would be associated with the Proposed Action. Therefore, neither alternative would result in any physical disturbance to habitat. Causey's aircraft would not touch the ground in any other place than the DC (except during emergency landings) since it remains airborne while conducting deliveries.

Flight operations would take place within airspace and typically well above the tree line and away from sensitive habitats. With a multi-rotor design, the UA can take off and descend vertically, as well as hover. Normal cruising speeds are expected to be approximately 29 knots. Typical flights begin with the UA departing from a DC and ascending vertically to 230 feet above ground level (AGL). The UA then flies a pre-determined route at 230 feet AGL to the delivery point. Upon arrival at the delivery point, the UA descends vertically to the deliver hover altitude of 82 feet AGL and waits for the customer to accept the package through a user interface application. If the delivery is not accepted within 15 seconds, the UA returns to the DC with the package. If the delivery is accepted, the UA lowers the package to the ground using a tethered mechanism and then returns to the DC. Upon arrival at the DC, the UA descends vertically from 230 feet AGL to the ground for landing. As a result, the duration of exposure by most wildlife on the ground to the visual or noise impacts from the UA would be of very short duration (less than a minute).

UA noise levels would not be expected to cause significant disturbance or behavioral response in wildlife due to the location of the DC sites and low noise levels of the vehicle en route. The highest SELs would be for a receiver directly underneath the UA with 0 feet between the recipient and the UA during delivery (81.0 dB) and for takeoff activities at the DCs (75.0 dB). For context, the noise level of a diesel truck is estimated at 84 dBA. Given the locations of the DCs in pre-existing commercial areas and the delivery zones in suburban, developed areas, this is typical of the kind of noise already present. Any wildlife present in these settings is likely to be habituated to this type of disturbance.

Species outside the immediate proximity of the DC sites and delivery locations would experience lower noise levels. SEL during en route operations is expected to be less than 66.5 dB, which is comparable to the sound of an air conditioning unit at 100 feet (60 dBA), a noise level typical of the suburban locations where deliveries would be expected to occur. As a result, the low number of daily operations and nature of the flights are not expected to significantly affect wildlife behavior in the action area.

Flying species are expected to be most sensitive to disturbance from drones. The attached EA identifies species that could be present in the study area, including the tri-colored bat, golden-cheeked warbler, piping plover, red know, and whooping crane (see the U.S. Fish and Wildlife Service Information for Planning and Consultation report, or IPaC report, in **Appendix A** of the attached EA). If the drone operator identifies a bald eagle nest or is notified of the presence of a nest by a state or federal regulator or other natural resource stakeholder, Causey has agreed to establish an avoidance area to provide a 1,000-foot vertical and horizontal separation distance between the vehicle's flight path and the DCs. This avoidance area will be maintained until the end of breeding season (December 1 through August 31 in the study area) or until a qualified biologist indicates the nest has been vacated.

The Proposed Action would not involve ground construction or habitat modification, and no impacts to fish, plants, reptiles, or terrestrial mammal species are expected. The Proposed Action would not result in extirpation of a species from the study area; adverse impacts to special status species or their habitats; substantial loss, reduction, degradation, disturbance, or fragmentation of native species' habitats or their populations; or adverse impacts on any species' reproductive success rates, natural mortality rates, non-natural mortality rates, or ability to sustain the minimum population levels required. The FAA's analysis finds that the Proposed Action is not expected to cause any significant impacts to biological resources.

- **Noise and Noise-Compatible Land Use, EA Section 3.3 and Appendix B.** The FAA has issued requirements for assessing aircraft noise in FAA Order 1050.1F, Appendix B. The FAA's required noise metric for aviation noise analysis is the yearly Day-Night Average Sound Level (DNL) metric. A significant noise impact is defined in Order 1050.1F as an increase in noise of DNL 1.5 decibel (dB) or more at or above DNL 65 dB DNL noise exposure or a noise exposure at or above the 65 dB level due to a DNL 1.5 dB or greater increase. The compatibility of existing and planned land uses with an aviation proposal is usually associated with noise impacts.

  The Proposed Action is not anticipated to result in any significant changes in the overall noise environment within the study area. No ground construction would occur as part of the Proposed Action; therefore, no construction noise would result from the Proposed Action. A portion of the Granbury Regional Airport is located within the Granbury operating area (see **Figure 2** of the attached EA). Causey follows detailed processes and procedures to avoid conflict with other aircraft, which include routes planned with consideration of airport locations to maintain a set distance from airports. Any noise from Causey's operations would not be expected to add to the cumulative noise exposure around airports in the study area.

  The maximum noise exposure levels within the operating area will occur at the DC locations, where noise levels at or above DNL 45 dB could occur (see **Figures 5 and 6** of the attached EA). Noise levels at or above DNL 45 dB would extend radially from the DC out to 150 feet. Based on these dimensions, DNL 45 dB noise exposure would remain almost entirely within the vicinity of the DC infrastructure for the Granbury and Rowlett operating areas. Noise levels would be well below the threshold of DNL 65 dB for compatible land use.

  Based on FAA's noise analysis, the Proposed Action would not have a significant noise impact.

- **Historical, Architectural, Archaeological, and Cultural Resources, EA Section 3.4.** Section 106 of the National Historic Preservation Act (NHPA) of 1966 [54 U.S.C. § 306108] requires federal agencies to consider the effects of their undertakings on properties listed or eligible for listing in the National Register of Historic Places (NRHP). This includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization that meets the NRHP criteria. Compliance with Section 106 requires consultation with the State Historic Preservation Officer (SHPO) and applicable other parties, including Indian tribes. The FAA identified historic sites that were listed on the National Archives and Records Administration (NARA) website. The 80 NRHP-listed properties identified within the APE include 76 structures, one campus, and three historic districts.

  The FAA consulted with the Texas SHPO and tribes that may potentially attach religious or cultural significance to resources in the APE. The FAA sent consultation letters to the Texas SHPO on October 27, 2022, requesting concurrence with the FAA's determination that no historic properties would be affected by the Proposed Action. The SHPO concurred with this finding on November 8, 2022 (see **Appendix A** of the attached EA).

  The FAA also consulted with the Apache Tribe of Oklahoma, the Cherokee Nation, the Comanche Nation, the Coushatta Tribe of Louisiana, the Tonkawa Tribe of Indians of Oklahoma, and the Wichita and Affiliated Tribes. One response from the Cherokee Nation Tribal Historic Preservation Officer (THPO) was received. The Cherokee Nation indicated no objection to the project proceeding as long as they are contacted if conditions change and/or items of cultural significance are discovered. The Cherokee Nation also requested that the FAA conduct appropriate inquiries with other pertinent Tribes regarding historic and prehistoric resources, which the FAA has done through tribal consultation with the above-listed Tribes. (See **Appendix A** of the attached EA).

  Based on the nature of potential UA effects on historic properties—namely limited to non-physical, reversible impacts—the limited number of daily flights proposed by Causey, and the distribution of flights among various delivery zones, in conjunction with the FAA's noise exposure analysis discussed in **Section 3.3** and **Appendix B** of the attached EA, the FAA has determined that no historic properties would be affected by the Proposed Action (see **Appendix A** of the attached EA).

- **Department of Transportation (DOT) Act, Section 4(f) Resources, EA Section 3.5.** Section 4(f) of the DOT Act protects significant publicly owned parks, recreational areas, wildlife and waterfowl refuges, and public and private historic sites. Section 4(f) states that, subject to exceptions for de minimis impacts: "The Secretary may approve a transportation program or project requiring the use of [4(f) resources]…only if—(1) there is no prudent and feasible alternative to using that land; and (2) the program or project includes all possible planning to minimize harm to the park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use." The term "use" includes both direct or physical and indirect or "constructive" impacts to Section 4(f) resources.

  The FAA identified properties that could meet the definition of a Section 4(f) resource within the operating areas, including public parks and historic sites. Section 4(f) resources within the Granbury study area include Granbury City Beach Park, Granbury Skatepark, Granbury Disc Golf Course, Granbury Bark Park, Hewlett Park, Shanley Park, and Historic Granbury Square.

Section 4(f) resources within the Rowlett study area include the Katy Railroad Park, Paddle Point Park, Rowlett Creek – Dallas County Nature Preserve, and Rowlett Nature Trail. No wildlife or waterfowl refuges exist within the operating areas.

There would be no physical use of Section 4(f) resources under the Proposed Action. The FAA has determined that infrequent UA overflights as described in the Proposed Action would not cause substantial impairment to Section 4(f) resources in the operating areas, and therefore would not be considered a constructive use of any Section 4(f) resource. As described in the **Section 3.3** of the attached EA and the Noise Analysis Report (see **Appendix B** of the attached EA), noise and visual effects from Causey's occasional overflights are not expected to diminish the activities, features, or attributes that contribute to their significance or enjoyment.

Additionally, Causey identifies areas where open air gatherings of people typically occur, such as open air concert venues and school yards, and avoids these properties through the creation of static keep-out areas via Causey's route planning software, which prepares an optimized flight path from the DC to each designated delivery site. The software ensures that each route integrates and respects all restrictions entered in the database, and includes Section 4(f) properties, which can be automatically avoided based on the time of day and other factors. The FAA has determined that there would be no significant impacts to Section 4(f) resources as a result of the Proposed Action.

- **Environmental Justice, EA Section 3.6.** Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*, Section 1-101 requires all federal agencies to the greatest extent practicable and permitted by law, to make achieving environmental justice (EJ) part of its mission by identifying and addressing disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations.

  Minority and/or low-income populations in each operating area were compared to Reference Communities to determine whether minority or low-income populations would be disproportionately impacted by the Proposed Action. For this analysis, Hood County was used as the Reference Community for the Granbury DC. The Rowlett DC analysis used the combined Dallas and Rockwall Counties as the Reference Community. Although the study area is located entirely within Dallas County, Rockwall County was included as part of the Reference Community because it better reflects the suburban nature of Rowlett compared to using only Dallas County, which is largely urban. The aggregated demographic characteristics of the Reference Communities were then compared to each individual constituent Census Block/Block Group's demographic characteristics to determine whether a specific Census Block/Block Group's EJ population exceeds that of the Reference Community as a whole.

  Communities (i.e., Census Blocks or Block Groups) where the racial/ethnic demographics or poverty status of the population exceed those of the Reference Community as a whole, by a "meaningfully greater" amount, are considered areas of EJ concern. To ensure that any potential EJ communities were included in the analysis, a threshold value of 0 percent or greater than the average of the Reference Community as a whole was selected to define the "meaningfully greater" amount. As a result, any Census Block or Block Group whose percentage of minority populations or households below the poverty threshold is higher than that of the Reference

Community would be considered a minority or low-income community for the purpose of this EJ analysis.

In addition, communities where EJ populations predominate (i.e., the population is equal to or greater than 50 percent) are also considered areas of EJ concern. Reviews of the racial/ethnic demographics of Census Blocks and the poverty status of Census Block Groups were made to assess whether EJ populations make up the majority of the Census Block or Block Group. For the Granbury operating area, a total of 68 Census Blocks (out of 355 populated Census Blocks) are comprised of predominately (50% or greater) minority populations. No Census Block Groups within the operating area are comprised of predominately (50% or greater) low-income populations.

For the Rowlett operating area, a total of 238 Census Blocks are comprised of predominately (50% or greater) minority populations. No Census Block Groups within the operating area are comprised of predominately (50% or greater) low-income populations.

The Proposed Action would not result in adverse impacts in any environmental resource category. In particular, as noted in **Section 3.3** and **Appendix B** of the attached EA, the drone's noise emissions could be perceptible in areas within the study area but would stay well below the level determined to constitute a significant impact. Since implementation of the Proposed Action would not create impacts exceeding thresholds of significance in other environmental impacts, and since it also would not generate impacts on the physical or natural environment that affect an EJ population in a way that the FAA determines are unique to the EJ population and significant to that population, the likelihood of significant impacts is remote.

Additionally, due to the large size of the areas, the low number daily operations, and the dispersal of minority and low-income populations, it is unlikely that EJ populations would be disparately impacted by the Proposed Action.

The FAA determined that the Proposed Action would not result in disproportionately high and adverse human health or environmental effects on a minority or low-income population.

- **Visual Effects (Visual Resources and Visual Character), EA Section 3.7.** Visual resources and visual character impacts deal with the extent to which the Proposed Action would result in visual impacts to resources in the study area. Visual impacts can be difficult to define and evaluate because the analysis is generally subjective but are normally related to the extent that the Proposed Action would contrast with, or detract from, the visual resources and/or the visual character of the existing environment. In this case, visual effects would be limited to the introduction of a visual intrusion—a UA in flight—which could be out of character with the suburban or natural landscapes.

  The Proposed Action would not change any landforms or land uses; therefore, there would be no effect on the visual character of the area. The operations would happen in airspace only. The FAA estimates that at typical operating altitude and speeds, the UA en route would be observable for approximately eight seconds by an observer on the ground. The Proposed Action would involve airspace operations that are unlikely to result in visual impacts anywhere in the study area, including sensitive areas such as Section 4(f) properties where the visual setting is an important resource of the property. This is due in part to Causey's flight planning system which prepares an

optimized flight path from the DC to each designated delivery site. The software ensures that each route integrates and respects all restrictions entered into the database, including Section 4(f) properties, which can be automatically avoided based on the time of day and other factors. Additionally, the short duration that each drone flight could be seen from any resource in the study area, approximately eight seconds in total, and the low number of proposed flights per day spread throughout the 16.6-square-mile operating areas, would minimize any potential for significant visual impacts at any location in the operating areas. Any visual effects are expected to be similar to existing air traffic in the operating areas.

The FAA has determined that any potential impacts of the Proposed Action on visual resources and visual character would not be significant.

- **Water Resources (Surface Waters), EA Section 3.8.** Surface water resources generally consist of oceans, wetlands, lakes, rivers, and streams. The Clean Water Act (CWA) established the National Pollutant Discharge Elimination System (NPDES) program, which regulates the discharge of point sources of water pollution into waters of the United States and requires a permit under Section 402 of the CWA. Waters of the United States are defined by the CWA and are protected by various regulations and permitting programs administered by the U.S. Environmental Protection Agency (USEPA) and the U.S. Army Corps of Engineers.

  Approximately 2.64 square miles of surface waters occur within the Granbury operating area, or approximately 15.8 percent of the operating area (see **Figure 3** of the attached EA). Approximately 2.21 square miles of surface waters occur within the Rowlett operating area, or about 13.2 percent of the operating area. Notable surface waters in the Granbury operating area include the Brazos River and Lake Granbury. Notable surface waters in the Rowlett operating area include Lake Ray Hubbard. Causey's operations would not require an NPDES permit or any other authorization under the CWA.

  The Proposed Action would not be expected to result in significant impacts to surface waters. No construction activities would occur under the Proposed Action. The Proposed Action would not have the potential to adversely affect natural and beneficial water resource values to a degree that substantially diminishes or destroys such values, or to adversely affect surface waters such that the beneficial uses and values of such waters are appreciably diminished or can no longer be maintained and such impairment cannot be avoided or satisfactorily mitigated. The potential likely source of surface water contamination on the UA, the aircraft's Lithium-ion battery packs, are not expected to detach from the aircraft. Further, the UA is not expected to become lost in the event of a water landing as Causey is required to locate and secure any downed aircraft. For these reasons, the Proposed Action would not have the potential to exceed water quality standards established by federal, state, local, and tribal regulatory agencies, nor would it have the potential to contaminate public drinking water supply such that public health may be adversely affected.

PUBLIC INVOLVEMENT AND COORDINATION

The Draft EA was made available for public review. The public Notice of Availability (NOA) was distributed on May 25, 2023, to local interest groups, government officials, community points of contact, the USFWS, the SHPO, and tribes (see **Section 5.0** of the attached EA). The Draft EA was available on the FAA's website and was open for comment from May 25, 2023, through June 24, 2023. The FAA received

two comments during the comment period for this EA. **Appendix D** of the attached EA contains the FAA's summary and response to timely comments.

FINDING

The FAA finding 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. Based on FAA's review and analysis and consideration of comments, it has determined that there would be no significant impacts to the natural environment or surrounding population as a result of the Proposed Action.

The FAA believes the Proposed Action best fulfills the purpose and need identified in the EA. In contrast, the No Action Alternative fails to meet the purpose and need identified in the EA. An FAA decision to take the required actions and approvals is consistent with its statutory mission and policies supported by the findings and conclusions reflected in the environmental documentation and this FONSI.

After careful and thorough consideration of the facts contained herein and following consideration of the environmental impacts described, the undersigned finds that the proposed federal action is consistent with existing national environmental policies and objectives as set forth in section 101(a) of the National Environmental Policy Act of 1969 (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.

DECISION AND ORDER

The FAA recognizes its responsibilities under NEPA, CEQ regulations, and its own directives. Recognizing these responsibilities, I have carefully considered the FAA's goals and objectives in reviewing the environmental aspects of the proposed action to approve Causey's request to begin its UA commercial package delivery operations in Granbury and Rowlett, Texas. Based upon the above analysis, the FAA has determined that the Proposed Action meets the purpose and need.

The environmental review included the purpose and need to be served by the Proposed Action, alternatives to achieving them, the environmental impacts of these alternatives, and conditions to preserve and enhance the human environment. This decision is based on a comparative examination of the environmental impacts for each of these alternatives. The attached EA provides a fair and full discussion of the impacts of the Proposed Action. The NEPA process included appropriate consideration for avoidance and minimization of impacts, as required by NEPA, the CEQ regulations, and other special purpose environmental laws, and appropriate FAA environmental orders and guidance.

The FAA has determined that environmental concerns presented by interested agencies and the general public have been addressed in the EA. The FAA believes that, with respect to the Proposed Action, the NEPA requirements have been met. FAA approval of this environmental review document indicates that applicable federal requirements for environmental review of the proposed action have been met.

Having carefully considered and being properly advised as to the anticipated environmental impacts of the proposal as described in the EA and the FONSI, under the authority delegated by the Administrator of the FAA, I find the OpSpec amendment, and other approvals necessary to enable Causey's requested operations in Granbury and Rowlett, Texas, 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.

I further find that the action is the type of action that does not require an Environmental Impact Statement under NEPA.

Issued on: 8/9/23

DAVID M MENZIMER

Digitally signed by DAVID M MENZIMER
Date: 2023.08.09 08:54:05 -07'00'

David Menzimer
Aviation Safety
Manager, General Aviation Operations Branch
General Aviation and Commercial Division
Office of Safety Standards, Flight Standards Service

RIGHT OF APPEAL

This FONSI/ROD constitutes a final agency action and a final order taken pursuant to 49 U.S.C. §§ 40101 et seq., and constitutes a final order of the FAA Administrator which is subject to exclusive judicial review by the Courts of Appeals of the United States in accordance with the provisions of 49 U.S.C. § 46110. Any party having substantial interest in this order may apply for a review of the decision by filing a petition for review in the appropriate U.S. Court of Appeals no later than 60 days after the order is issued in accordance with the provisions of 49 U.S.C. § 46110.

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List of Acronyms and Abbreviations

ACS	American Community Survey
AGL	Above Ground Level
APE	Area of Potential Effects
BCC	Birds of Conservation Concern
BVLOS	Beyond Visual Line of Sight
Causey	Causey Aviation Unmanned, Inc.
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
COA	Certificate of Waiver or Authorization
CWA	Clean Water Act
dB	Decibel
DC	Distribution Center
DNL	Day-Night Average Sound Level
DNR	Department of Natural Resources
DOT	Department of Transportation
EA	Environmental Assessment
EJ	Environmental Justice
EO	Executive Order
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
IPaC	Information for Planning and Consultation
IPP	UAS Integration Pilot Program
NAS	National Airspace System
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act

NMFS	National Marine Fisheries Service
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRHP	National Register of Historic Places
NRI	Nationwide Rivers Inventory
NTSB	National Transportation Safety Board
OpSpecs	Operations Specifications
PSP	Partnership for Safety Program
RPIC	Remote Pilot in Command
SEL	Sound Exposure Level
SHPO	State Historic Preservation Office(r)
THPO	Tribal Historic Preservation Office(r)
U.S.C.	United States Code
UA	Unmanned Aircraft
UAS	Unmanned Aircraft Systems
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WSRS	National Wild and Scenic Rivers System

1.0 PURPOSE AND NEED

1.1 Introduction

Causey Aviation Unmanned, Inc. (Causey) seeks to amend its air carrier Operations Specifications (OpSpecs) and other Federal Aviation Administration (FAA) approvals necessary to begin unmanned aircraft (UA) commercial package delivery operations in two locations outside of Dallas/Fort Worth, Texas—Granbury and Rowlett—using the 33-pound Flytrex FTX-M600P UA. Causey will operate from distribution centers (DC) in Granbury and Rowlett, Texas, that serve as central hubs of operations. The radius for each of the operating areas will extend for two nautical miles (NM) from each DC, as shown on **Figure 1**.

Both operating areas, shown on **Figure 1**, are approximately 16.6 square miles. The Granbury operating area is located entirely within Hood County, Texas, and the Rowlett operating area is located entirely in Dallas County, Texas. Causey plans to fly 7 days per week, including holidays, between the hours of 8 a.m. and 10 p.m.

Based upon the scope of the Proposed Action, which is described in **Section 2.1**, Causey projects that it will operate a maximum of approximately 77 delivery flights per operating day from the Granbury DC and a maximum of approximately 71 delivery flights per operating day from the Rowlett DC. A "delivery flight" is considered a round-trip flight that includes delivery to the recipient and return to the DC.

The approval of Causey's amended OpSpecs to include these two operating areas would be considered a major federal action that is subject to environmental review requirements. The FAA prepared this Environmental Assessment (EA) to evaluate the potential environmental impacts that may result from the FAA's approval of the Proposed Action, which would enable UA commercial delivery operations from DCs located in Granbury and Rowlett.

The FAA prepared this EA pursuant to the National Environmental Policy Act of 1969 (NEPA) [42 United States Code (U.S.C.) § 4321 et seq.] and its implementing regulations (40 Code of Federal Regulations (CFR) §§ 1500-1508)). Under NEPA, federal agencies are required to consider the environmental effects of proposed federal actions and to disclose to decision-makers and the interested public a clear and accurate description of the potential environmental impacts of proposed major federal actions. Additionally, under NEPA, federal agencies are required to consider the environmental effects of a Proposed Action, reasonable alternatives to the Proposed Action, and a No Action Alternative (assessing the potential environmental effects of not implementing the Proposed Action). The FAA has established a process to ensure compliance with the provisions of NEPA through FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*.

1.2 Background and Location

In 2012, Congress first charged the FAA with integrating unmanned aircraft systems (UAS) into the National Airspace System (NAS).[1] The FAA has engaged in a phased, incremental approach to integrating UAS into the NAS and continues to work toward full integration of UAS into the NAS. Part of that approach involves providing safety review and oversight of proposed operations to begin commercial UA delivery in the NAS.[2]

[1] 49 U.S.C. 44802; FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, Sec. 332. 126 Stat. 11, 73 (2012).
[2] The terms UA and drone may be used interchangeably.

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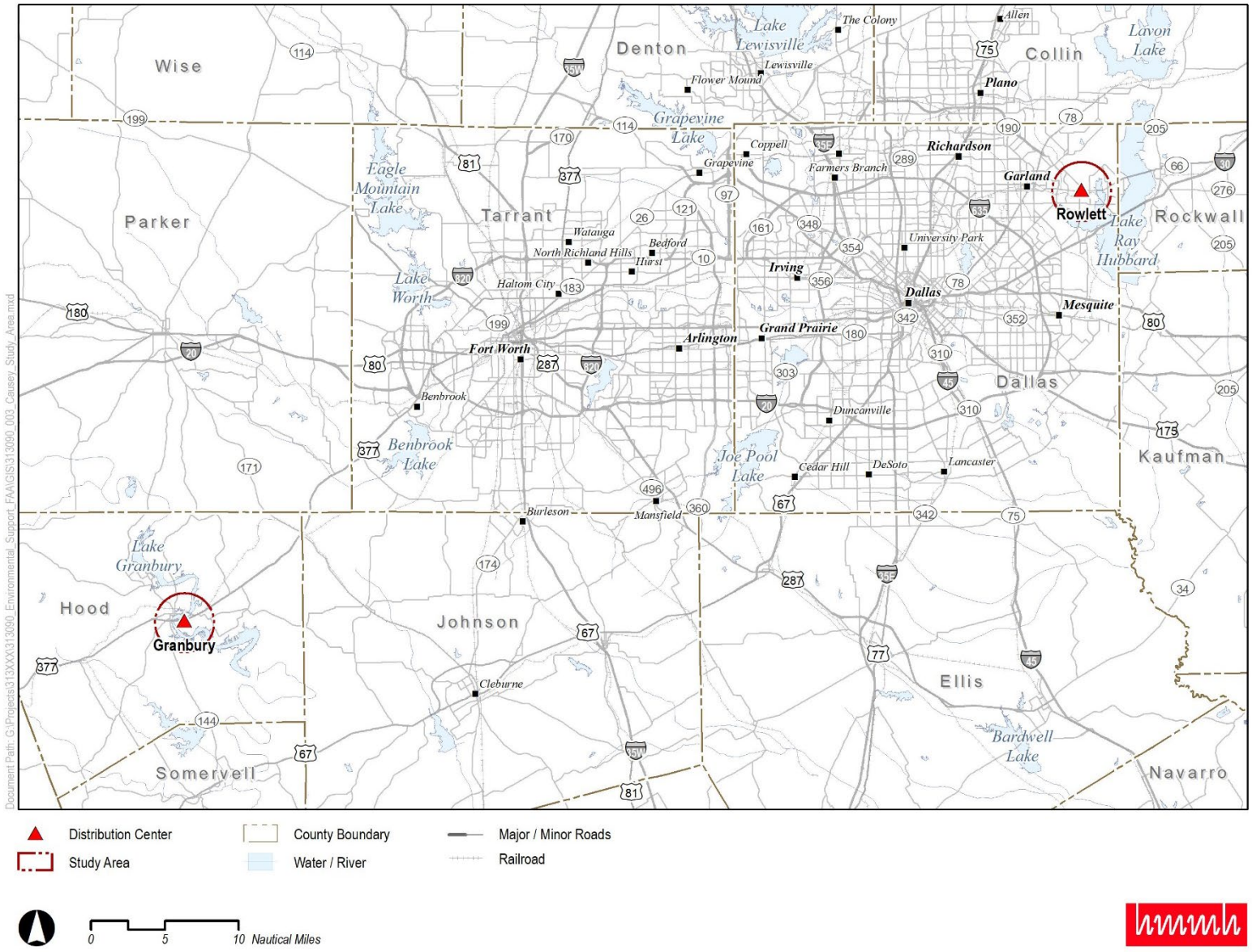

Figure 1: Granbury and Rowlett Operating Areas/Study Areas

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Over the past several years, Causey has partnered with Flytrex under FAA programs, including the UAS Integration Pilot Program (IPP)[3] and the BEYOND program,[4] as well as the FAA's established processes to bring certificated commerical UA delivery into practice. Participants in these programs are among the first to prove their concepts, including package delivery by UA, through the use of current regulations and exemptions and waivers from some of these regulatory requirements.

Causey received a Part 135 air carrier operating certificate from the FAA in January 2023, which allows Causey to carry the property of another for compensation or hire beyond visual line of sight (BVLOS). This certificate contains a stipulation that operations must be conducted in accordance with the provisions and limitations specified in its OpSpecs. Causey's current request for OpSpecs to specify an area of operations, in conjunction with other related FAA approvals, such as a waiver of 14 CFR § 91.113(b) to enable BVLOS operations and a Certificate of Waiver or Authorization (COA), would enable commercial delivery operations in the operating areas.

1.2.1 Operating Area Locations

Causey proposes to conduct consumer package deliveries to vetted delivery locations such as residential properties and healthcare facilities within 2 NM from each DC.[5] The two operating areas are shown in **Figure 1**, with each area outlined in red. Each operating area, in the shape of a circle with a 2 NM radius centered around the DC, is approximately 16.6 square miles. The areas within the operating area boundaries are also considered the two study areas for this Draft EA. Causey has designated delivery zones within each operating area.[6] Those delivery zones, labeled in purple on **Figures 2 and 3**, may not cover the entire operating area.

The Granbury DC is located at Cinergy Cinemas, 1201 Water's Edge Drive, Granbury, Texas 76048. The property is zoned for commercial use. The DC is approximately 46 NM southwest of Dallas-Fort Worth International Airport, well outside of any controlled or restricted airspace. A closer view of the Granbury operating area, including its proposed delivery zones, is shown on **Figure 2**. There are no heliports or seaplane bases located within the Granbury operating area. The easternmost portion of the Granbury Regional Airport (a public use uncontrolled airport) is located within the operating area but outside of the delivery zones of the Granbury DC. The Nassau Bay Airport (a private use airport) is located within a 5 NM radius (which is outside of the operating area) of the Granbury DC.

The Rowlett DC is located near the Timberlake Shopping Center at 3805 Industrial Street, Rowlett, Texas 75088. The property is zoned for commercial use. The DC is approximately 23 NM east of Dallas-Fort Worth International Airport, below the outer shelf of the Dallas-Fort Worth Class B airspace, which has a floor of 4,000 feet. A closer view of the Rowlett operating area, including its proposed delivery zones, is shown on **Figure 3**.

1.3 Purpose and Need

As described in FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, the Purpose and Need section of an EA briefly describes the underlying purpose and need for the proposed federal action. It presents the problem that would be addressed and describes what the FAA is trying to achieve with the Proposed Action.

[3] The UAS IPP was announced on October 25, 2017, via a Presidential Memorandum, which has the force and effect of law on executive agencies. https://www.faa.gov/uas/programs_partnerships/completed/integration_pilot_program/
[4] https://www.faa.gov/uas/programs_partnerships/beyond/
[5] Each delivery site is pre-approved by Causey to ensure that the site is capable of receiving deliveries.
[6] The letters shown in the delivery zones are Causey's method of identifying the individual delivery zones.

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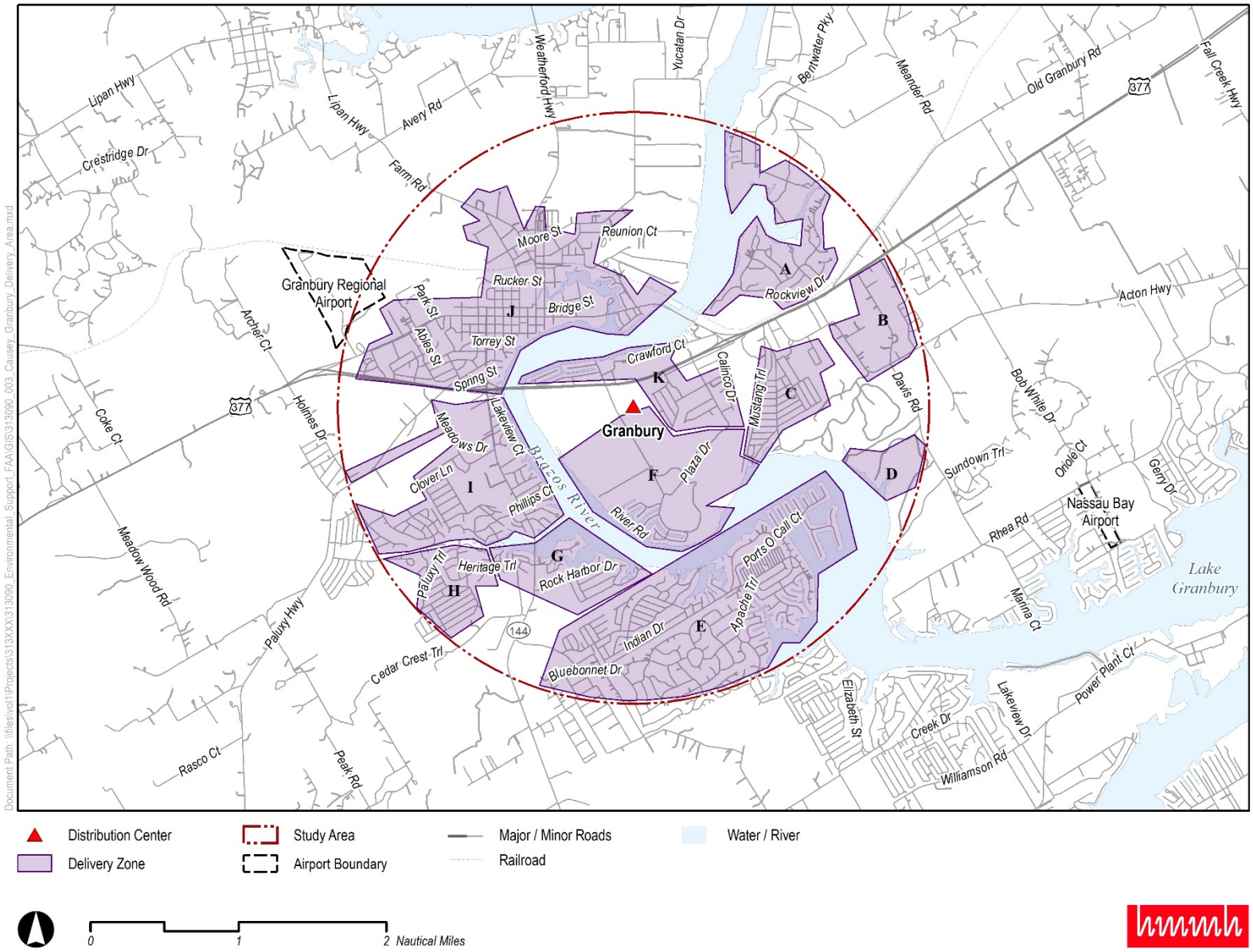

Figure 2: Granbury DC and Delivery Zones

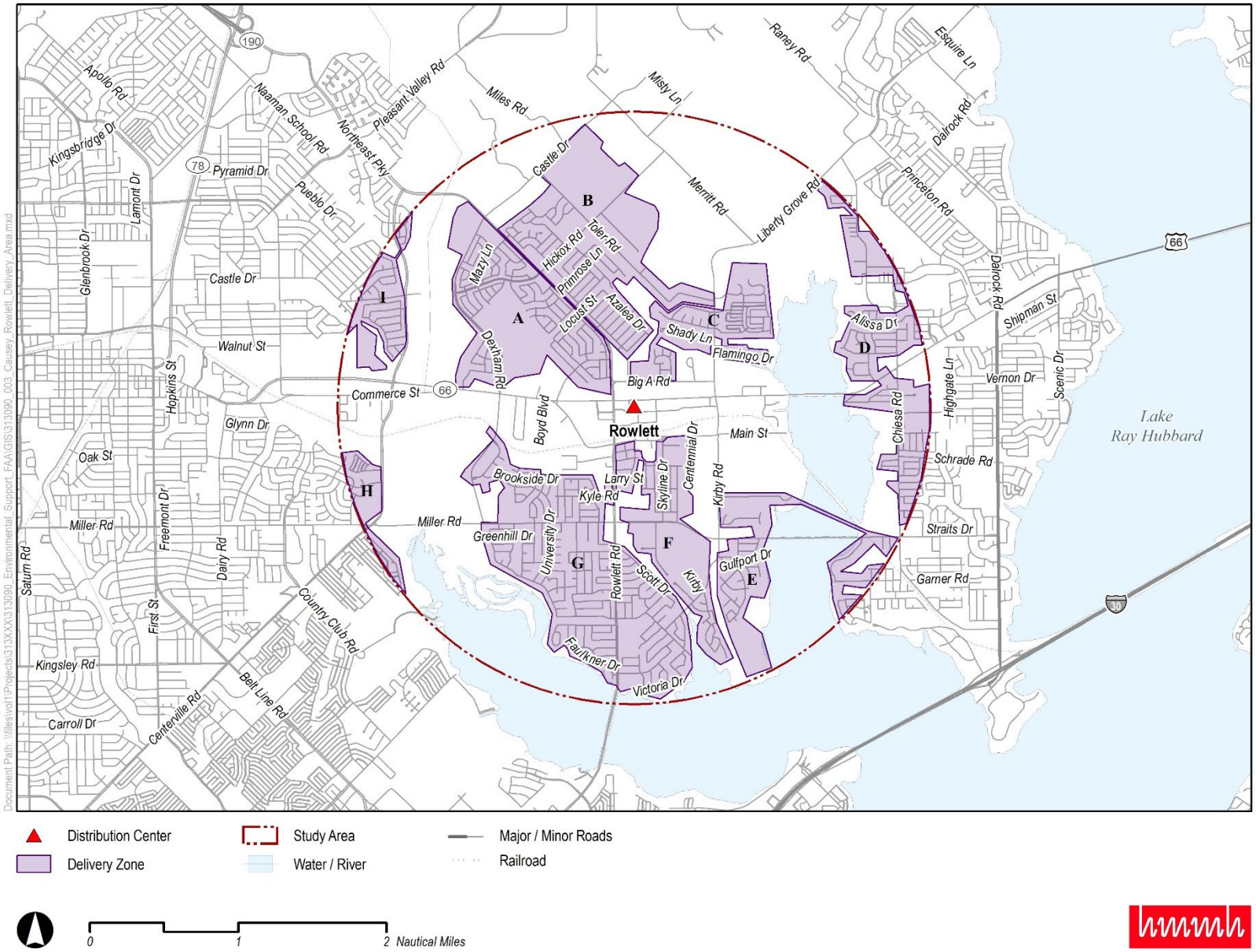

Figure 3: Rowlett DC and Delivery Zones

1.3.1 FAA's Purpose and Need

Causey seeks its Part 135 Air Carrier Operating Certificate and the necessary OpSpecs and other FAA approvals necessary to begin UA BVLOS commercial package delivery operations for the Granbury and Rowlett locations. The FAA has multiple approvals—such as a waiver of 14 CFR § 91.113(b) to enable BVLOS operations and a COA associated with the Proposed Action; however, the FAA's issuance of the OpSpecs is the approval that would ultimately enable UA commercial delivery operations in these areas. Causey's request for OpSpecs to contain areas of operations is an action that requires FAA review and approval.

The FAA has a statutory obligation to review Causey's request to issue the OpSpecs and determine whether the approvals would affect safety in air transportation or air commerce and the public interest.[7] In general, Congress has charged the FAA with the safety of air commerce in the United States and to encourage the development of civil aeronautics. 49 U.S.C. § 40104.

In addition, the FAA has specific statutory and regulatory obligations related to its issuance of a Part 135 certificate and the related OpSpecs. The FAA is required to issue an operating certificate to an air carrier when it "finds, after investigation, that the person properly and adequately is equipped and able to operate safely under this part and regulations and standards prescribed under this part." 49 U.S.C. § 44705. An operating certificate also specifies "terms necessary to ensure safety in air transportation; and (2)…the places to and from which, and the airways of the United States over which, a person may operate as an air carrier." *Id*. Also included in air carrier certificate is a stipulation that the air carrier's operations must be conducted in accordance with the provisions and limitations specified in OpSpecs. 14 CFR § 119.5 (g), (l). The regulations also specify that a Part 135 certificate holder may not operate in a geographical area unless its OpSpecs specifically authorize the certificate holder to operate in that area. 14 CFR § 119.5(j). The regulations implementing Section 44705 specify that an air carrier's approved OpSpecs must include, among other things, "authorization and limitations for routes and areas of operations." 14 CFR § 119.49(a)(6).

1.3.2 Causey's Purpose and Need

The purpose of Causey's request is to begin UA BVLOS commercial package delivery service in the two areas in Texas, which, in its business judgment, Causey has determined are appropriate markets for operations. In other parts of the country, such as North Carolina, Causey has obtained the FAA's approval for initial commercial delivery operations. The approvals would offer Causey an opportunity to further assess the viability of the UA commercial delivery option under real world conditions and demonstrate that it can conduct operations safely and meet its compliance obligations. The approval could also help Causey gauge public demand for UA commercial delivery services and evaluate whether scalable and cost-effective UA BVLOS delivery expansion is possible in these areas. In addition, the approvals could provide an opportunity to assess communities' response to commercial delivery operations in these areas.

1.4 Public Involvement

The FAA will create a Notice of Availability (NOA) with information about the EA and provide it to local interest groups, local government officials, public park authorities, the National Park Service, the Texas State Historic Preservation Officer (SHPO), and tribes discussed in this EA, and make the EA available to the general public on the FAA website. The NOA will provide information about the Proposed Action

[7] See, e.g., 49 U.S.C. §§ 41102 and 41109(a)(2)(A); 49 U.S.C. § 44705.

and request review and comments on this EA, which will be published on the FAA website in May 2023 for a 14-day comment period. Interested parties are invited to submit comments on any environmental concerns related to the Proposed Action.

2.0 PROPOSED ACTION AND ALTERNATIVES

FAA Order 1050.1F, Paragraph 6-2.1(d) states that, "[a]n EA may limit the range of alternatives to the proposed action and no action alternative when there are no unresolved conflicts concerning alternative uses of available resources." The FAA has not identified any unresolved conflicts concerning alternative uses of available resources associated with Causey's proposal. Therefore, this EA only considers the Proposed Action and the No Action Alternative.

2.1 Proposed Action

In order for Causey to conduct UA BVLOS commercial package deliveries in the two operating areas, it must receive a number of approvals from FAA in addition to its OpSpecs, such as a waiver of 14 CFR § 91.113(b) to enable BVLOS operations and a COA. Causey has requested the FAA to approve its OpSpecs so that they can transition to UA BVLOS commercial delivery operations in Texas under their Part 135 air carrier certificate. The OpSpec approvals are the FAA actions that would ultimately enable commercial delivery operations in the operating areas in Granbury and Rowlett, Texas.

The B050 OpSpec, *Authorized Areas of En Route Operations, Limitations, and Provisions*, includes a reference section titled Limitations, Provisions, and Special Requirements. The FAA's approval of this OpSpec – including the paragraph in the OpSpec's reference section with descriptive language about the operating area boundaries, which includes the specific locations and operational profiles proposed in Causey's request – is the proposed federal action for this EA. The OpSpecs would restrict Causey to these particular locations; any future expansion beyond the authorization and limitations for the area of operations described in the B050 OpSpec, or beyond the current 1:1 pilot to aircraft ratio described in Causey's A003 OpSpec, *Airplane/Aircraft Authorization*, would require additional OpSpec amendments from the FAA and would receive appropriate NEPA review at that time.

Causey would use the Flytrex drone delivery system (see **Figure 4**). The Flytrex FTX-M600P UA has a maximum takeoff weight of 33.4 pounds, and the maximum allowable package weight is 6.6 pounds. The UA features a multi-rotor design with six propellers mounted on equally spaced arms extending horizontally from a center frame. The system's computers and package containers are mounted on the underside of the airframe. The multi-copter drone uses electric power from rechargeable lithim ion batteries and includes a parachute safety system that can be deployed in cases of emergency.

Packages are loaded into the UA at the DC. The UA then launches to perform aerial deliveries. With a multi-rotor design, the UA can take off and descend vertically, as well as hover. Normal cruising speeds are expected to be approximately 29 knots. Typical flights begin with the UA departing from a DC and ascending vertically to 230 feet above ground level (AGL). The UA then flies a pre-determined route at 230 feet AGL to the delivery point. Upon arrival at the delivery point, the UA descends vertically to the deliver hover altitude of 82 feet AGL and waits for the customer to accept the package through a user interface application. If the delivery is not accepted within 15 seconds, the UA returns to the DC with the package. If the delivery is accepted, the UA lowers the package to the ground using a tethered mechanism and then returns to the DC. Upon arrival at the DC, the UA descends vertically from 230 feet AGL to the ground for landing. Causey's aircraft does not touch the ground in any place other than the DC (except during emergency landings), since it remains airborne while conducting deliveries.

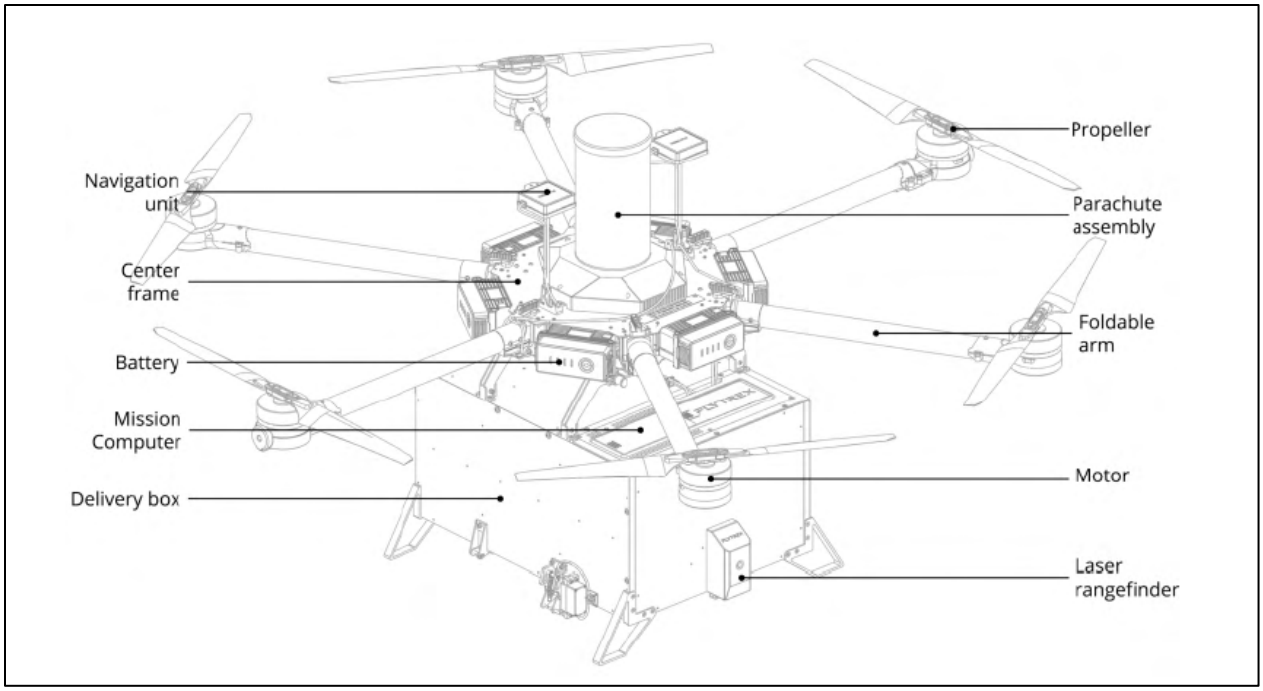

Figure 4. Flytrex FTX-M600P UA Diagram

Table 1 displays Causey's projections for its maximum number of delivery flights operating day from the each DC based on the scope of the Proposed Action, for both 12 months and 24 months after the start of commercial package delivery. The operations would occur between 8:00 a.m. and 10:00 p.m. up to seven days per week. The anticipated distribution of delivery operations among the delivery zones is shown in **Table 2**.

Table 1. Causey's Anticipated Maximum Operational Volumes

Operating Area	Average Daily Operations: 12 Months	Average Daily Operations: 24 Months
Granbury	**57**	**77**
Rowlett	**52**	**71**

Table 2. Daily UA Delivery Operations per Delivery Zone

Granbury				**Rowlett**			
Delivery Zone	Daily Operations	Delivery Zone	Daily Operations	Delivery Zone	Daily Operations	Delivery Zone	Daily Operations
A	**4**	G	**3**	A	**11**	F	**7**
B	**1**	H	**4**	B	**9**	G	**21**
C	**4**	I	**5**	C	**6**	H	**2**
D	**1**	J	**18**	D	**6**	I	**4**
E	**27**	K	**1**	E	**5**		
F	**9**						
		Total	**77**			Total	**71**

2.2 No Action Alternative

The alternative to the Proposed Action is the No Action Alternative, in which the FAA would not issue the approvals necessary to enable Causey to conduct UA commercial package delivery operations in the study area. CEQ regulations at 40 CFR § 1502.14(c) require agencies to consider a No Action Alternative in their NEPA analyses. Under the No Action Alternative, Causey would still be authorized to conduct package delivery flights under Part 107 operating authorities and waivers although these existing operations are limited in that they could only occur within visual line of site, so visual observers would be required. Causey began conducting validation, calibration, and demonstration flights under its Part 107 waiver from the Granbury DC in March 2022. At the time this EA was prepared, Causey had not begun operations from the Rowlett DC.

Under the No Action Alternative, Causey anticipates that the number of daily operations and delivery zones would be the same as those projected for the Proposed Action (see **Tables 1 and 2**). However, under the No Action Alternative, visual observers placed in vehicles along the delivery route to maintain line of sight would still be required.

The No Action Alternative does not support the stated purpose and need.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section provides a description of the environmental resources that would be affected by the Proposed Action, as required by the CEQ regulations and FAA Order 1050.1F. The level of detail provided in this section is commensurate with the importance of the impact on these resources (40 CFR § 1502.15). The study areas for each resource are the entire areas within the red dashed lined study areas shown on **Figure 1**. As required by FAA Order 1050.1F, this EA presents an evaluation of impacts for the environmental impact categories listed below.

- Air Quality
- Biological Resources (including Fish, Wildlife, and Plants)
- Climate
- Coastal Resources
- Department of Transportation Act, Section 4(f) Resources
- Farmlands
- Hazardous Materials, Solid Waste, and Pollution Prevention
- Historical, Architectural, Archaeological, and Cultural Resources
- Land Use
- Natural Resources and Energy Supply
- Noise and Noise-Compatible Land Use
- Socioeconomic, Environmental Justice, and Children's Environmental Health and Safety Risks
- Visual Effects (Light Emissions)
- Water Resources (including Wetlands, Floodplains, Surface Waters, Groundwater, and Wild and Scenic Rivers)

For each of the resources covered in this section, the following information is provided:

- Regulatory Setting
- Affected Environment
- Environmental Consequences

3.1 Resources Not Analyzed in Detail

This EA does not analyze potential impacts on the following environmental impact categories in detail, for the reasons explained below:

- **Air Quality and Climate** – The drone is battery-powered and would not generate emissions that could result in air quality impacts or climate impacts. Electricity consumed for battery charging at the DC and for overall DC operation would be minimal, especially for the limited scope of these operations. Electricity consumed for the No Action Alternative and the Proposed Action would come from the power grid with backup generators on-site in the event of an emergency. It should be noted that the No Action Alternative would generate higher vehicle emissions because visual observers placed in vehicles would be required along the flight path to maintain line of sight. These emissions would be minimal and are not expected to contribute to any exceedance of National Ambient Air Quality Standards. Visual observers would not be required under the Proposed Action.
- **Coastal Resources** – The No Action Alternative and the Proposed Action would not directly affect any shorelines, change the use of shoreline zones, or be inconsistent with any National Oceanic and Atmospheric Administration (NOAA)-approved state Coastal Zone Management Plan since there are no coastal zones or shorelines in the operating areas.

- **Farmlands** – The No Action Alternative and the Proposed Action would not involve the development or disturbance of any land regardless of use, nor would they have the potential to convert any farmland to non-agricultural uses.
- **Hazardous Materials, Solid Waste, and Pollution Prevention** – The No Action Alternative and the Proposed Action would not result in any construction or development or any physical disturbances of the ground. Additionally, each Causey UA is made from recoverable materials and would be properly managed at the end of its operating life in accordance with 14 CFR Part 43. No Superfund sites were identified in the operating areas.[8]
- **Land Use** – The No Action Alternative and the Proposed Action would not involve any changes to existing, planned, or future land uses within the area of operations.
- **Natural Resources and Energy Supply –** The No Action Alternative and the Proposed Action would not require the need for unusual natural resources and materials, or those in short supply. Causey's UA would be battery powered and would not directly consume fuel resources.
- **Socioeconomic Impacts and Children's Environmental Health and Safety Risks** – The No Action Alternative and the Proposed Action would not involve acquisition of real estate, relocation of residents or community businesses, disruption of local traffic patterns, loss in community tax base, or changes to the fabric of the community. Executive Order (EO) 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, requires federal agencies to ensure that children do not suffer disproportionately from environmental or safety risks. Neither alternative would affect products or substances that a child would be likely to come into contact with, ingest, use, or be exposed to, and would not result in environmental health and safety risks that could disproportionately affect children. Additionally, Causey's proposal includes avoiding operations near schools (Monday through Friday), which would help reduce the potential for environmental health or safety impacts to children.
- **Visual Effects (Light Emissions Only)** – The No Action Alternative and the Proposed Action would not result in significant light emission impacts because most flights would be conducted during the daytime. Because of the overall small average of daily operations within an operating area and the even smaller number of operations likely to be conducted between twilight and 10:00 p.m., neither alternative would result in substantial visual impacts due to light emissions.
- **Water Resources (Wetlands, Floodplains, Groundwater, and Wild and Scenic Rivers)** – The No Action Alternative and the Proposed Action would not result in the construction of facilities and would therefore not encroach upon areas designated as navigable waters or directly impact wetlands. Neither alternative would encroach upon areas designated as a 100-year flood event area as described by the Federal Emergency Management Agency (FEMA). Neither alternative would result in any changes to existing discharges to water bodies, create a new discharge that would result in impacts to surface waters, or modify a water body. The No Action Alternative and the Proposed Action would not involve land acquisition or ground-disturbing activities that would withdraw groundwater from underground aquifers or reduce infiltration or recharge to ground water resources through the introduction of new impervious surfaces. No National River Inventory (NRI) river segments exist within the operating areas.[9] No Wild and Scenic River segments occur within the operating areas.[10] Therefore, neither alternative would impact and Wild and Scenic Rivers or NRI river segments.

[8] USEPA Superfund National Priorities List Where You Live Map. Available: https://epa.maps.arcgis.com/apps/webappviewer/index.html?id=33cebcdfdd1b4c3a8b51d416956c41f1. Accessed November 17, 2022.
[9] National Park Service Nationwide Rivers Inventory (NRI) Interactive Map. Available: https://www.nps.gov/maps/full.html?mapId=8adbe798-0d7e-40fb-bd48-225513d64977. Accessed: November 16, 2022.
[10] National Wild and Scenic Rivers System. Available: https://www.nps.gov/subjects/rivers/texas.htm. Accessed: November 16, 2022.

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

3.2.1 Regulatory Setting

Biological resources include plant and animal species and their habitats, including special status species (federally-listed or state-listed threatened or endangered species, species proposed for listing, species that are candidates for federal listing, marine mammals, and migratory birds) and environmentally sensitive or critical habitat. In addition to their intrinsic values, biological resources provide aesthetic, recreational, and economic benefits to society.

Threatened and Endangered Species

The Endangered Species Act (ESA) of 1973 (16 U.S.C. § 1531 et seq.) requires the evaluation of all federal actions to determine whether an action is likely to jeopardize any proposed, threatened, or endangered species or proposed or designated critical habitat. Critical habitat includes areas that will contribute to the recovery or survival of a listed species. Federal agencies are responsible for determining if an action "may affect" listed species, which determines whether formal or informal consultation with the U.S. Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service (NMFS) is needed. If the FAA determines that the action will have no effect on listed species, consultation is not required. If the FAA determines that the action may affect listed species, consultation with the USFWS must be initiated.

A significant impact to federally-listed threatened and endangered species would occur when the USFWS or NMFS determines that an action would be likely to jeopardize the continued existence of a federally-listed threatened or endangered species, or would be likely to result in the destruction or adverse modification of federally-designated critical habitat. An action need not involve a threat of extinction to federally-listed species to meet the NEPA standard of significance. Lesser impacts, including impacts on non-listed or special status species, could also constitute a significant impact.

Migratory Birds

The Migratory Bird Treaty Act (16 U.S.C. §§ 703-712) protects migratory birds, including their nests, eggs, and parts, from possession, sale, purchase, barter, transport, import, export, and take. The USFWS is the federal agency responsible for the management of migratory birds as they spend time in habitats of the U.S. For purposes of the Migratory Bird Treaty Act, "take" is defined as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect" (50 CFR § 10.12). The Migratory Bird Treaty Act applies to migratory birds identified in 50 CFR § 10.13 (defined hereafter as "migratory birds").

Bald and Golden Eagles

The Bald and Golden Eagle Protection Act prohibits anyone from "taking" a bald or golden eagle, including their parts, nests, or eggs, without a permit issued by the USFWS. Implementing regulations (50 CFR Part 22), and USFWS guidelines as published in the National Bald Eagle Management Guidelines, provide for additional protections against "disturbances." Similar to take, "disturb" means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, injury to an eagle or causes either a decrease in its productivity or nest abandonment due to a substantial interference with breeding, feeding, or sheltering. A permitting process provides limited exceptions to the Bald and Golden Eagle Protection Act's prohibitions. The USFWS has issued regulations for the permitting process in 50 CFR Part 22, which include permits for the incidental take of Bald Eagles. Such permits are only needed when avoidance of incidental take is not possible. According to federal guidelines, if conservation

measures can be implemented such that no aircraft are flown within 1,000 feet of a nest, incidental take of Bald Eagles is unlikely to occur, and no permit is needed.[11]

3.2.2 Affected Environment

This section describes the existing biological environment of the operating areas. As shown on **Figure 1**, there are two operating areas associated with the No Action Alternative and the Proposed Action. The Granbury DC operating area is a 16.6-square-mile circular area centered on a DC in the town of Granbury, Texas, within Hood County. The Rowlett DC operating area is a 16.6-square-mile circular area centered on a distribution site in the town of Rowlett, Texas, within Dallas County.

The developed land uses, upland habitats, and wetland or waterway habitats in both operating areas support a variety of insects, reptiles, amphibians, mammals, and birds. Several aquatic habitats and natural areas occur. Lake Granbury is a dammed portion of the Brazos River which runs through the Granbury operating area flowing from the north to south with an oxbow (curvature) in the center of the operating area. The operating area overlaps approximately 1,700 acres of open water habitat within Lake Granbury. At its closest point, Lake Granbury is approximately 0.5 mile from the Granbury DC.[12]

A portion of the Rowlett DC operating area overlaps the central and western portions of Lake Ray Hubbard, located over 1 mile southwest and northeast of the launch site.[13] Lake Ray Hubbard is a dammed reservoir that contains approximately 24,000 acres of open water habitat. The lake is heavily used by recreational boaters and fisherman. The Rowlett Creek-Dallas County Nature Preserve is located west of the Rowlett DC. This 97-acre preserve is located along Rowlett Creek and is a multi-use, public access county park. The preserve is mainly wooded riparian and upland habitat along Rowlett Creek which is a tributary to Lake Ray Hubbard. The entirety of the preserve is located with the Rowlett operating area, approximately 1.6 miles southwest of the DC.[14,15] Additional Lake Ray Hubbard tributaries within the operating area include Muddy Creek and Lang Branch Creek. Both are primarily wooded waterways surrounded by residential and other urban development.

Both operating areas consist of urban and rural residential areas, agricultural land uses, natural areas, commercial land uses, and industrial land uses. Urban areas provide habitat for species such as great-tailed grackle, house finches, rodents, songbirds, and waterfowl. Non-urban land uses provide habitat for many common wildlife species in the region, including mammals such as Virginia opossums, squirrels, rabbits, raccoons, bats, mice, voles, coyote, foxes, America beaver, Northern American river otters, skunks, bobcat, white-tailed deer, and birds (including songbirds, waterfowl, raptors, wading birds, and shorebirds), reptiles (including green anoles, Texas spiny lizards, common snapping turtle, and common garter snakes), amphibians (including numerous species of frogs, toads, newts, and salamanders), and insects (including honey bees, butterflies, dragonflies, beetles, and skippers).[16]

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[11] U.S. Fish and Wildlife Service. 2007. National Bald Eagle Management guidelines. Available: https://www.fws.gov/media/national-bald-eagle-management-guidelines. Accessed: September 7, 2022.

[12] Brazos River Authority. The Brazos River. Available: https://brazos.org/About-Us/About-the-BRA/About-the-Brazos-River. Accessed October 17, 2022.
WACO History. Brazo River. Available: https://wacohistory.org/items/show/128. Accessed October 17, 2022.

[13] Texas Water Development Board. Lake Ray Hubbard (Trinity River Basin). Available: https://www.twdb.texas.gov/surfacewater/rivers/reservoirs/ray_hubbard/index.asp. Accessed October 17, 2022.
Texas Parks & Wildlife. Lake Ray Hubbard. Available: https://tpwd.texas.gov/fishboat/fish/recreational/lakes/ray_hubbard/. Accessed October 17, 2022.

[14] Dallas County Texas. Rowlett Creek Preserve. Available: https://www.dallascounty.org/departments/plandev/openspaces/locations/05-rowlett-creek.php. Accessed October 17, 2022.

[15] Causey will try to avoid flight paths that fly over nature preserves, parklands, and recreation areas. See Appendix D.

[16] iNaturalist. Dallas County, US, TX. Available: https://www.inaturalist.org/places/dallas-county#taxon=47158. Accessed February 26, 2023.

Special Status Species

Federally-Listed Species

For the purpose of Section 7 consultation, the action area is defined as Causey's proposed operating areas which are shown on **Figure 1**. The FAA obtained the Official Species List from the USFWS Information for Planning and Consultation (IPaC) online system to identify ESA-listed species and designated critical habitat in the action area (see **Appendix A**). **Table 3** provides the list of ESA-listed and candidate species that may be present in the action area. The action area does not contain any designated or proposed critical habitat.

Table 3. ESA-Listed and Candidate Species Potentially Present in the Action Area

Common Name	Scientific Name	ESA Status
Mammals		
Tricolored Bat	*Perimyotis subflavus*	Proposed Endangered
Birds		
Golden-cheeked Warbler	*Setophaga chrysoparia*	Endangered
Piping Plover	*Charadrius melodus*	Threatened
Red Knot	*Calidris canutus rufa*	Threatened
Whooping Crane	*Grus americana*	Endangered
Clams		
Texas Fawnsfoot	*Truncilla macrodon*	Proposed Threatened
Insects		
Monarch Butterfly	*Danaus plexippus*	Candidate

The Official Species List states that the piping plover and red knot only need to be considered for wind energy projects. Since the action is not a wind energy project, these two species are not considered further in this EA. Additional information on each of the other species listed in **Table 3** is provided in the USFWS Section 7 Consultation Letter dated February 2, 2023, which is included in **Appendix A**.

State Species of Concern

The State of Texas maintains a list of fish and wildlife that are protected under the Texas Parks and Wildlife Code. This list includes all species that the director of the Texas Parks and Wildlife Department (TPWD) deems threatened with statewide extinction (Title 31, Part 2, Chapter 65, Subchapter G RULE, § 65.176).[17] In addition, a species that is indigenous to the State of Texas and listed by the federal government as endangered automatically receives state protection as an endangered species. Species on this list are protected under state law. The Texas Parks and Wildlife Code (§ 68.015, Prohibited Acts) states that "no person may capture, trap, take, or kill, or attempt to capture, trap, take, or kill, endangered fish or wildlife."[18] Additionally, the Texas Administrative Code (Title 31, Part 2, Chapter 65, Subchapter G RULE, § 65.171 states that "no person may: (1) take, possess, propagate, transport, export, sell or offer for sale, or ship any species of fish or wildlife listed by the department as endangered; or (2) take, possess,

[17] Texas Endangered Species List. Available: https://texreg.sos.state.tx.us/fids/202001043-2.pdf. Accessed February 26, 2023.
[18] Texas Parks and Wildlife Code, § 68.015 Prohibited Acts. Under the Federal ESA, the term "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect. Available: https://texas.public.law/statutes/tex._parks_and_wild._code_section_68.015. Accessed February 26, 2023.

propagate, transport, import, export, sell, or offer for sale any species of fish or wildlife listed in this subchapter as threatened."[19]

The state-protected species that may occur in Hood and Dallas Counties are displayed in **Table 4**. All of the species listed in **Table 4** are also listed as Species of Greatest Conservation Need as defined in the 2012 Texas Conservation Action Plan.[20] While these species are listed for Hood and Dallas Counties, it does not automatically mean that they have the potential to occur in the operating areas. Federally-listed species are not included in **Table 4** because they are addressed in **Table 3** above, and state regulations do not provide increased protection beyond the ESA regulations for federally-listed species.

Table 4. State-Listed Wildlife Species for Hood and Dallas Counties, Texas

Common Name	Scientific Name	State Listing Status*	Hood County, Granbury DC	Dallas County, Rowlett DC
Birds				
White-faced ibis	*Plegadis chihi*	ST	X	X
Black rail	*Laterallus jamaicensis*	ST	X	X
Wood stork	*Mycteria americana*	ST		X
Reptiles				
Texas horned lizard	*Phrynosoma cornutum*	ST	X	X
Brazos water snake	*Nerodia harteri*	ST	X	
Alligator snapping turtle	*Macrochelys temminckii*	ST		X
Mollusks				
Brazos heelsplitter	*Potamilus streckersoni*	ST	X	X
Sandbank pocketbook	*Lampsilis satura*	ST		X
Louisiana pigtoe	*Pleurobema riddellii*	ST		X
Trinity pigtoe	*Fusconaia chunii*	ST		X

* ST= State Threatened

Source: Texas Parks & Wildlife. Rare, Threatened, and Endangered Species of Texas by County. Available: https://tpwd.texas.gov/gis/rtest/. Accessed November 18, 2022.

Migratory Birds

Migratory bird species found within the operating areas vary throughout the year. During certain weeks in the spring and fall, hundreds of species of songbirds, raptors, and waterfowl may potentially pass through the study areas. Both operating areas are part of the Central Migratory Flyway where millions of birds, including songbirds, grassland birds, waterfowl, shorebirds, and raptors, move north and south during spring and fall migration. Some of these species migrate overland while others fly across the Gulf of Mexico. Migratory birds use rivers, mountain ranges, and other major landscape navigation points to

[19] Texas Administrative Code Title 31 Part 2 Chapter 65 Subchapter G RULE § 65.171. Available: https://texreg.sos.state.tx.us/public/readtac$ext.TacPage?sl=R&app=9&p_dir=&p_rloc=&p_tloc=&p_ploc=&pg=1&p_tac=&ti=31&pt=2&ch=65&rl=171. Accessed February 26, 2023.

[20] Texas Parks and Wildlife Department, Wildlife Division, Diversity and Habitat Assessment Programs. TPWD County Lists of Protected Species and Species of Greatest Conservation Need. Available: https://tpwd.texas.gov/gis/rtest/. Accessed February 26, 2023.

aid their navigation when migrating and use a variety of habitat types for resting and feeding during migration.[21]

The Birds of Conservation Concern (BCC) list identifies migratory and non-migratory bird species that represent the USFWS' highest conservation priority. Established through the 1988 amendment to the Fish and Wildlife Conservation Act (16 U.S.C. §§ 661-667d), the USFWS maintains this list "to stimulate coordinated, collaborative and proactive conservation actions among international, federal, state, tribal and private partners."[22] The Official Species List identifies species on the BCC that could occur in the operating areas, along with information on the likelihood that they may be nesting in the area. The lists for Granbury DC and Rowlett DC include 6 and 8 BCC species, respectively. (See **Appendix A** for the list of BBC bird species for both operating areas). Habitat used by BCC species listed in the operating areas occurs in aquatic, wetland, forested, agricultural, and urban environments. No regulations or protections are associated with species listed on the BCC unless they are protected or regulated by other federal, state, or local rules.

The bald eagle (*Haliaeetus leucocephalus)* is identified on the Official Species List as a BCC species with the potential to occur in both operating areas. While the BCC listing provides no regulatory protections, the bald eagle is protected under the Bald and Golden Eagle Protection Act. Bald eagles could nest near bodies of water such as lakes or rivers. The National Bald Eagle Management Guidelines state that aircraft should stay at least 1,000 feet from bald eagle nests during the breeding season unless the aircraft is operated by a trained wildlife biologist or where eagles have demonstrated tolerance for such activity.[23]

3.2.3 Environmental Consequences

Potential impacts to biological resources associated with the No Action Alternative and the Proposed Action were considered in the operating areas where drones may operate (launch, fly, and drop packages). As discussed in **Section 2.0**, the anticipated number of package delivery flights and delivery zones would be the same under the No Action Alternative and the Proposed Action. No ground construction or habitat modification would occur as part of the No Action Alternative or the Proposed Action. Therefore, neither alternative would result in any physical disturbance to habitat.

UA noise and the potential for airborne strikes with flying species are the action's potential stressors or threats to ESA-listed species. The FAA evaluated the potential for Causey's operations to affect ESA-listed species. Based upon the FAA's evaluation contained in **Appendix A**, the FAA determined that the action associated with the No Action Alternative and the Proposed Action may affect, but is not likely to adversely affect, the tricolored bat, golden-cheeked warbler, and whooping crane.[24] The FAA also determined that the action would have no effect on the Texas fawnsfoot. By letter dated March 3, 2023, the USFWS concurred with these final impact determinations. See **Appendix A** for more details on the analysis and for copies of the Section 7 consultation letters.

[21] Texas Parks & Wildlife. Migratory Flyways of North America. Available at: https://tpwd.texas.gov/huntwild/wild/birding/migration/flyways/central/. Accessed October 20, 2022. Audubon. The Flyways-Central Flyway. Available at: https://www.audubon.org/central-flyway. Accessed October 20, 2022.

[22] U.S. Fish and Wildlife Service. 2021. Birds of Conservation Concern 2021. Migratory Bird Program. Available: https://www.fws.gov/sites/default/files/documents/birds-of-conservation-concern-2021.pdf. Accessed: October 10, 2022.

[23] U.S. Fish and Wildlife Service. 2007. National Bald Eagle Management Guidelines. Available: https://www.fws.gov/media/national-bald-eagle-management-guidelines. Accessed: September 7, 2022.

[24] Causey will endeavor to report bird interactions to the Texas Parks & Wildlife Department and USFWS on an annual basis if interactions occur. See Appendix D.

State Species of Concern

State-listed bird species may display disturbance behaviors toward drones, such as fleeing or attacking maneuvers or potential strikes; however, due to the limited scale of operations—a maximum of 77 and 71 flights per day at Granbury DC and Rowlett DC, respectively, over a distributed area—the altitude of overflights (cruising at approximately 230 feet AGL), and minimal anticipated noise and visual impacts from the action, no significant impacts to state protected bird species are expected.

Neither the No Action Alternative nor the Proposed Action would include ground disturbance or impacts to upland or wetland habitats. Therefore, no impacts are anticipated for state-listed reptile or mollusk species.

Migratory Birds and Birds of Conservation Concern

Migratory and BBC bird species may display disturbance behaviors towards drones, such as fleeing or attacking maneuvers; however, due to the limited scale of operations, the altitude of overflights (cruising at approximately 230 feet AGL), and minimal anticipated noise and visual impacts from the action, no significant impacts to migratory bird species or BCCs are expected under the No Action Alternative or Proposed Action.

Bald Eagles

No bald eagle nests have been documented by state or local resource agencies within the operating area. However, bald eagles have been observed and documented in online resources such as iNaturalist.[25] Bald eagles were documented in flight and perching in both operating areas. If the drone operator identifies a bald eagle nest or is notified of the presence of a nest by a state or federal regulator or other natural resource stakeholder, Causey will establish an avoidance area to provide a 1,000-foot vertical and horizontal separation distance between the vehicle's flight path and the nest. This avoidance area will be maintained until the end of the breeding season (December 1 through August 31 in the study areas) or until a qualified biologist indicates the nest has been vacated.[26,27]

Our analysis finds that the No Action Alternative and the Proposed Action are not expected to cause any of the following impacts:

- A long-term or permanent loss of unlisted plant or wildlife species, (i.e., extirpation of the species from a large project area);
- Adverse impacts to special status species (e.g., federally-listed species, state species of concern, species proposed for listing, migratory birds, bald and golden eagles) or their habitats;
- Substantial loss, reduction, degradation, disturbance, or fragmentation of native species' habitats or their populations; or

[25] iNaturalist. Nature in my backyard on Lake Ray Hubbard. Available: https://www.inaturalist.org/projects/nature-in-my-backyard-on-lake-ray-hubbard?tab=species. Accessed October 17, 2022.
[26] See Official Species List in Appendix A for Bald Eagle breeding dates in the study area.
[27] Causey will report any bald eagle nests and/or mitigative efforts to the USFWS Region 2 Migratory Bird Permit Office if a nest is observed. See Appendix D.

- Adverse impacts on a species' reproductive success rates, natural mortality rates, non-natural mortality (e.g., road kills and hunting), or ability to sustain the minimum population levels required.

3.3 Noise and Noise-Compatible Land Use

3.3.1 Regulatory Setting

Aircraft noise is often the most noticeable environmental effect associated with any aviation project. Several federal laws, including the Aviation Safety and Noise Abatement Act of 1979, as amended (49 U.S.C. §§ 47501-47507) regulate aircraft noise. Through 14 CFR Part 36, the FAA regulates noise from aircraft.

FAA Order 1050.1F, Appendix B, Paragraph B-1.3 requires the FAA to identify the location and number of noise sensitive areas that could be significantly impacted by noise. As defined in FAA Order 1050.1F, Paragraph 11-5b, a noise sensitive area is "[a]n area where noise interferes with normal activities associated with its use. Normally, noise sensitive areas include residential, educational, health, and religious structures and sites, and parks, recreational areas, areas with wilderness characteristics, wildlife refuges, and cultural and historical sites."

Sound is measured in terms of the decibel (dB), which is the ratio between the sound pressure of the sound source and 20 micropascals, which is nominally the threshold of human hearing. Various weighting schemes have been developed to collapse a frequency spectrum into a single dB value. The A-weighted decibel, or dBA, corresponds to human hearing accounting for the higher sensitivity in the mid-range frequencies.

To comply with NEPA requirements, the FAA has issued requirements for assessing aircraft noise in FAA Order 1050.1F, Appendix B. FAA's primary noise metric for aviation noise analysis is the yearly Day-Night Average Sound Level (DNL) metric. The DNL metric is a single value representing the logarithmically average aircraft sound level at a location over a 24-hour period, with a 10 dB adjustment added to thoise noise events occuring from 10:00 p.m. and up to 7:00 a.m. the following morning. A significant noise impact is defined in Order 1050.1F as an increase in noise of DNL 1.5 dB or more at or above DNL 65 dB noise exposure or a noise exposure at or above the 65 dB level due to a DNL 1.5 dB or greater increase.

3.3.2 Affected Environment

The operating areas for both sites are approximately 16.6 square miles (see **Figures 1 and 2**). At Rowlett, the estimated population within the operating area is roughly 15,000 with a population density of approximately 900 persons per square mile. The Granbury site has an estimated population of 35,000 within the operating area and a population density of approximately 2,090 persons per square mile.

3.3.3 Environmental Consequences

Human perception of noise depends on a number of factors, including overall noise level, number of noise events, the extent of audibility above the background ambient noise level, and acoustic frequency content (pitch). UA noise generally has high acoustic frequency content, which can often be more discernable from other typical noise sources.

To ensure that noise would not cause a significant impact to any residential land use or noise sensitive resource within the operating areas, the FAA initiated an analysis of the potential noise exposure in the study areas that could result from implementation of the No Action Alternative or the Proposed Action.

As discussed in **Section 2.0**, the anticipated number of package delivery flights and delivery zones would be the same under the No Action and Proposed Action Alternatives; therefore, there would be no discernable difference in noise levels between the No Action Alternative and the Proposed Action. Away from the actual DC properties, the closest neighborhoods surrounding the DC locations are likely to experience the highest noise levels as a result of the No Action Alternative or the Proposed Action. This is due to noise from the lower altitudes that the UA would fly in these locations during launch and recovery.

Noise Exposure

Utilizing the operational projections defined in **Sections 1.0** and **2.0** of this EA, the noise analysis methodology detailed in **Appendix B** was then used to estimate the DNL levels for the proposed Causey operations. Noise levels were calculated for each flight phase and are presented in the following three sub-sections:

- Noise Exposure for Operations at the Distribution Centers
- Noise Exposure for En Route Operations
- Noise Exposure for Delivery Operations

Noise Exposure for DC Operations

Based on the anticipated average daily maximum number of deliveries provided by Causey, the extent of DNL 45 dB associated with DC operations are shown in **Figures 5 and 6**. The noise area was derived based on the total number of deliveries at each site using the noise level information presented in Table 6 of **Appendix B**.

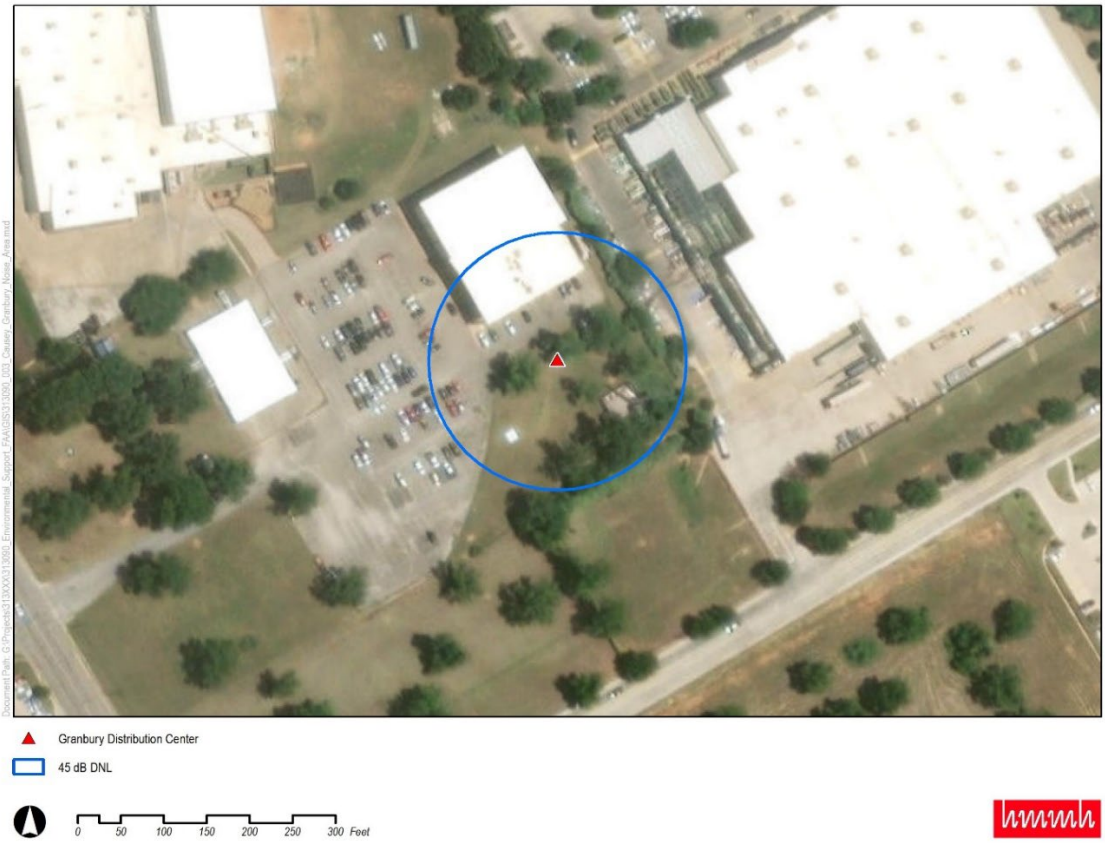

Figure 5: DNL 45 dB or Greater Noise Exposure at Granbury DC

Figure 6: DNL 45 dB or Greater Noise Exposure at Rowlett DC

Noise Exposure for En Route Operations

Based on the information provided by Causey, it is anticipated that the UA will cruise at altitudes of approximately 230 feet AGL at an airspeed of 29 knots during en route flight from each of the DCs. Assuming this altitude and airspeed, the en route noise exposure can be determined by referencing Table 7 of **Appendix B**. This analysis shows that en route noise levels would not exceed DNL 45 dB in any location within the operating areas.

Noise Exposure for Delivery Operations

Due to the inherent uncertainty of where UA package deliveries will occur, the exact delivery site locations and characteristics for individual deliveries are not known. However, Causey has provided expected operations distributions for the delivery zones within each operating area as shown in **Figures 2 and 3**.

The UA delivery noise has been assessed for each of these delivery zones but uses the conservative assumption that noise from the total number of deliveries to a zone could occur at any single delivery location within each delivery zone. **Table 2** in **Section 2.1** provides a summary of the total number of delivery operations to each delivery zone within the two operating areas, which is used to determine delivery noise levels based on the information presented in **Tables 8 and 9** of **Appendix C.**

Additionally, en route noise from the UA arriving to and departing from the delivery zones is added to the delivery noise. Due to uncertainty in the number of en route overflights that could occur over each delivery zone, the total operations associated with each operating area were included in the calculation of delivery noise.

At these operational levels, and assuming that Causey will operate seven days per week including holidays, the noise analysis determined that total delivery noise levels would not exceed DNL 45 dB in any delivery zone within the Rowlett operating area. In the Granbury operating area, in Delivery Zone E near the Chippewa Trail, delivery noise up to DNL 46.0 dB could occur. All other sites within the Granbury operating area would not exceed DNL 45 dB.

Total Noise Exposure Results

The maximum noise exposure levels within the operating area will occur at the DC locations, where noise levels at or above DNL 45 dB could occur as shown in **Figures 5 and 6**. Noise levels at or above DNL 45 dB would extend radially from the disribution center out to 150 feet. Based on these dimensions, DNL 45 dB noise exposure would remain almost entirely within the vicinity of the DC infrastructure for the Granbury and Rowlett operating areas.

En route noise would not exceed DNL 45 dB in either operating area; and delivery noise would only exceed DNL 45 dB near the Chippewa Trail of the Granbury DC operating area.

In all areas of both operating areas, noise levels would be well below the threshold of DNL 65 dB for compatible land use.

As shown on **Figure 2**, a portion of the Granbury Regional Airport is located in the Granbury operating area. However, Causey follows detailed processes and procedures to avoid conflict with other aircraft, which include routes planned with consideration of airport locations to maintain a set distance from airports. Any noise from Causey's operations would not be expected to add to the cumulative noise exposure around airports in or around the operating areas.

Based on the FAA's noise analysis, the No Action Alternative and the Proposed Action would not have a significant impact.

3.4 Historical, Architectural, Archaeological, and Cultural Resources

3.4.1 Regulatory Setting

Section 106 of the National Historic Preservation Act (NHPA) of 1966 [54 U.S.C. § 306108] requires federal agencies to consider the effects of their undertakings on properties listed or eligible for listing in the National Register of Historic Places (NRHP). This includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization that meets the NRHP criteria. Regulations related to this process are contained in 36 CFR Part 800, Protection of Historic Properties. Compliance with Section 106 requires consultation with the State Historic Preservation Officer (SHPO) and applicable other parties, including Indian tribes.

Major steps in the Section 106 process include identifying the Area of Potential Effects (APE), identifying historic and cultural resources within the APE, consulting with the SHPO and any tribe or THPO that is identified as potentially having traditional cultural interests in the area, and determining the potential impacts to historic properties as a result of the action.

The FAA has not established a significance threshold for this impact category; however, the FAA has identified a factor to consider when evaluating the context and intensity of potential environmental

impacts for historical, architectural, archeological, and cultural resources. A factor to consider in assessing significant impact is when an action would result in a finding of adverse effect through the Section 106 process. However, under 36 CFR § 800.8(a), a finding of adverse effect on a historic property does not necessarily result in a significance finding under NEPA.

3.4.2 Affected Environment

The APE for the No Action Alternative and the Proposed Action is the entire operating area where Causey plans to conduct UA package deliveries, as shown on **Figure 1**. The FAA identified historic sites that were listed on the National Archives and Records Administration (NARA) website.[28] The 80 NRHP-listed properties identified within the APE include 76 structures, one campus, and three historic districts.

3.4.3 Environmental Consequences

The nature of UA effects on historic properties is limited to non-physical, reversible impacts (i.e., the introduction of audible and/or visual elements). The limited number of daily flights that Causey is proposing—57 and 52 delivery operations per day in the first year of operations and 77 and 71 delivery operations per day in the second year from the Granbury and Rowlett DCs, respectively—and the distribution of flights among various delivery zones means that any historic or cultural resource would be subject to only a small number of overflights per day, if any. This would be the same for both the No Action and the Proposed Action Alternatives.

Additionally, the FAA's noise exposure analysis concluded that noise levels would not exceed DNL 45 dB in any location within the operating areas other than at the DCs. Based on a review of the information available, and the FAA's knowledge with respect to the level of environmental impacts from UAS operations, the FAA has determined that no historic properties would be affected by the No Action Alternative or the Proposed Action.

In accordance with 36 CFR § 800.4(a)(1), the FAA consulted with the Texas SHPO and tribes that may potentially attach religious or cultural significance to resources in the APE. The FAA sent consultation letters to the Texas SHPO on October 27, 2022, requesting concurrence with the FAA's determination that no historic properties would be affected by the Proposed Action. The SHPO concurred with this finding on November 8, 2022.

The FAA also consulted with the Apache Tribe of Oklahoma, the Cherokee Nation, the Comanche Nation, the Coushatta Tribe of Louisiana, the Tonkawa Tribe of Indians of Oklahoma, and the Wichita and Affiliated Tribes. As of the date of this EA, one response from the Cherokee Nation Tribal Historic Preservation Officer (THPO) has been received. The Cherokee Nation indicated no objection to the project proceeding as long as they are contacted if conditions change and/or items of cultural significance are discovered. The Cherokee Nation also requested that the FAA conduct appropriate inquiries with other pertinent Tribes regarding historic and prehistoric resources, which the FAA has done through tribal consultation with the above-listed Tribes.

The FAA's historic and tribal outreach letters are included in **Appendix A**.

3.5 Department of Transportation Act, Section 4(f) Resources

3.5.1 Regulatory Setting

Section 4(f) of the Department of Transportation (DOT) Act [codified at 49 U.S.C. § 303(c)] protects significant publicly owned parks, recreational areas, wildlife and waterfowl refuges, and public and

[28] NARA, National Archives Catalog. Available: National Register of Historic Places and National Historic Landmarks Program Records: Texas (archives.gov). Accessed October 20, 2022.

private historic sites. Section 4(f) states[29] that, subject to exceptions for de minimis impacts: "The Secretary may approve a transportation program or project requiring the use of [4(f) resources]…only if—(1) there is no prudent and feasible alternative to using that land; and (2) the program or project includes all possible planning to minimize harm to the park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use."

The term "use" includes both direct or physical and indirect or "constructive" impacts to Section 4(f) resources. Direct use is the physical occupation or alteration of a Section 4(f) property or any portion of a Section 4(f) property. A constructive use does not require direct physical impacts or occupation of a Section 4(f) resource. A constructive use would occur when a Proposed Action would result in substantial impairment of a resource to the degree that the protected activities, features, or attributes of the resource that contribute to its significance or enjoyment are substantially diminished. The determination of use must consider the entire property and not simply the portion of the property used for a proposed project.[30]

Section 4(f) resources where a quiet setting is a generally recognized feature or attribute receive special consideration. Parks, recreation areas, and wildlife and waterfowl refuges that are privately owned are not subject to Section 4(f) provisions.

A significant impact would occur pursuant to NEPA when a Proposed Action either involves more than a minimal physical use of a section 4(f) property or is deemed a "constructive use" based on an FAA determination that the Proposed Action would substantially impair the 4(f) property, and mitigation measures do not eliminate or reduce the effects of the use below the threshold of significance.

3.5.2 Affected Environment

The FAA identified properties that could meet the definition of a Section 4(f) resource within the operating areas, including public parks and historic sites. Section 4(f) resources within the Granbury study area include Granbury City Beach Park, Granbury Skatepark, Granbury Disc Golf Course, Granbury Bark Park, Hewlett Park, Shanley Park, and Historic Granbury Square. Section 4(f) resources within the Rowlett study area include the Katy Railroad Park, Paddle Point Park, Rowlett Creek – Dallas County Nature Preserve, and Rowlett Nature Trail. No wildlife or waterfowl refuges exist within the operating areas.

As discussed in **Section 3.4**, numerous historic sites listed are located within the opearting area; however, most of these properties are considered for architectural or other purposes that are not typically affected by UA operations. Also, the FAA consulted with the Texas SHPO for Causey's proposed operations to determine whether historic and traditional cultural properties would be affected.

3.5.3 Environmental Consequences

There would be no physical use of Section 4(f) resources because there would be no construction on any Section 4(f) resource. The FAA has determined that infrequent UAS overflights as described in the No Action Alternative and the Proposed Action are not considered a constructive use of any Section 4(f) resource and would not cause substantial impairment to any of the Section 4(f) resources in the operating areas. As described in **Section 3.3** and **Appendix B**, the proposed operations would not result in

[29] The FAA may make a *de minimis* impact determination with respect to a physical use of Section 4(f) property if, after taking into account any measures to minimize harm, the result is either: (1) a determination that the project would not adversely affect the activities, features, or attributes qualifying a park, recreation area, or wildlife or waterfowl refuge for protection under Section 4(f); or (2) a Section 106 finding of no adverse effect or no historic properties affected. See 1050.1F Desk Reference, Paragraph 5.3.3.

[30] Federal Highway Administration (FHWA) Section 4(f) Policy Paper. (Note: FHWA regulations are not binding on the FAA; however, the FAA may use them as guidance to the extent relevant to aviation projects.) Available: https://www.environment.fhwa.dot.gov/legislation/section4f/4fpolicy.pdf. Accessed: February 2, 2021

significant noise levels at any location in the operating areas. Noise and visual effects from Causey's occasional overflights are not expected to diminish the activities, features, or attributes of the resources that contribute to their significance or enjoyment.

Additionally, Causey identifies areas where open air gatherings of people typically occur, such as open air concert venues and school yards, and avoids these properties through the creation of static keep-out areas via Causey's route planning software, which prepares an optimized flight path from the DC to each designated delivery site. The software ensures that each route integrates and respects all of the restrictions entered into the database, and including Section 4(f) properties, which can be automatically avoided based on the time of day and other factors. The FAA has determined that there would be no significant impacts to Section 4(f) resources as a result of the No Action Alternative or the Proposed Action.

3.6 Environmental Justice

3.6.1 Regulatory Setting

Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*, Section 1-101 requires all federal agencies to the greatest extent practicable and permitted by law, to make achieving environmental justice (EJ) part of its mission by identifying and addressing disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations.

DOT Order 5610.2C defines a minority person as a person who is Black; Hispanic or Latino; Asian American; American Indian and Alaskan Native; or Native Hawaiian and other Pacific Islander. A minority population is any readily identifiable group of minority persons who live in geographic proximity, and if circumstances warrant, geographically dispersed/transient persons (such as migrant workers or Native Americans) who will be similarly affected by a proposed DOT program, policy, or activity.

DOT Order 5610.2C defines a low-income person as a person whose median household income is at or below the Department of Health and Human Services poverty guidelines. A low-income population is any readily identifiable group of low-income persons who live in geographic proximity, and, if circumstances warrant, geographically dispersed/transient persons (such as migrant workers or Native Americans) who will be similarly affected by a proposed DOT program, policy, or activity.

The FAA has not established a significance threshold for EJ. FAA Order 1050.1F indicates that factors that the FAA should consider in evaluating significance includes whether the action would have the potential to lead to a disproportionately high and adverse impact on the environmental justice population (i.e., a low-income or minority population) due to: significant impacts in other environmental impact categories; or impacts on the physical or natural environment that affect an EJ population in a way that the FAA determines are unique to the EJ population and significant to that population. If a significant impact would affect low income or minority populations at a disproportionately higher level than it would other population segments, an EJ issue is likely.

A disproportionately high and adverse effect on minority or low-income populations means an adverse effect that:

1. Is predominately borne by a minority population and/or a low-income population; or
2. Will be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than adverse effects that will be suffered by the non-minority population and/or non-low-income population.

3.6.2 Affected Environment

Minority populations, both racial and ethnic, were mapped using the Decennial Census down to the Census Block. At the Census Block level, separate data is provided for racial minority and Hispanic populations; therefore, this analysis addresses these populations separately. DOT Order 5610.2C accounts for both of these populations in addressing EJ impacts. Low-income populations were mapped at the Census Block Group level using 2020 American Community Survey (ACS) 5-year estimates from the U.S. Census Bureau. (A Census Block Group consists of one or more Census Blocks). The ACS 5-year estimates were compared to the Department of Health and Human Services (HHS) "poverty guidelines" to calculate the percentage of households below the poverty threshold for each Census Block Group.

A "Reference Community" was selected for each site to determine an initial benchmark for identifying areas of EJ concern within the operating areas. This allows the demographics of localized populations (i.e., individual Census Blocks or Block Groups) to be compared to the aggregate population within the overall operating areas. For this analysis, Hood County was used as the Reference Community for the Granbury DC. The Rowlett DC analysis used the combined Dallas and Rockwall Counties as the Reference Community. Although the study area is located entirely within Dallas County, Rockwall County was included as part of the Reference Community because it better reflects the suburban nature of Rowlett compared to using only Dallas County, which is largely urban. The aggregated demographic characteristics of the Reference Communities were then compared to each individual constituent Census Block/Block Group's demographic characteristics to determine whether a specific Census Block/Block Group's EJ population exceeds that of the Reference Community as a whole.

Communities (i.e., Census Blocks or Block Groups) where the racial/ethnic demographics or poverty status of the population exceed those of the Reference Community as a whole, by a "meaningfully greater" amount, are considered areas of EJ concern. To ensure that any potential EJ communities were included in the analysis, a threshold value of 0 percent or greater than the average of the Reference Community as a whole was selected to define the "meaningfully greater" amount. As a result, any Census Block or Block Group whose percentage of minority populations or households below the poverty threshold is higher than that of the Reference Community would be considered a minority or low-income community for the purpose of this EJ analysis. Identifying these areas of EJ concern involves a comparison of specific Census Blocks and Block Groups to the Reference Community to assess whether the Census Block or Block Group's EJ population is "meaningfully greater" than that of the Reference Community as a whole. In addition, communities where EJ populations predominate (i.e., the population is equal to or greater than 50 percent) are also considered areas of EJ concern. Reviews of the racial/ethnic demographics of Census Blocks and the poverty status of Census Block Groups were made to assess whether EJ populations make up the majority of the Census Block or Block Group.

Granbury DC

For the Granbury operating area, a total of 68 Census Blocks (out of 355 populated Census Blocks) are comprised of predominately (50% or greater) minority populations. No Census Block Groups within the operating area are comprised of predominately (50% or greater) low-income populations.

Tables 4 and 5 show the demographic information of the Granbury Reference Community, as well as other geographies for context. The percentage of racial minorities, collected by the Census as "All Other Races," residing within Hood County at the Census Block level is approximately **16.1 percent**. This is substantially lower than that of the state of Texas and the national average. The percentage of ethnic minorities, those identifying as Hispanic, is **12.9 percent** which, like the racial demographics, is substantially lower than the state average but only slightly lower than that of the nation. For purposes of identifying a "meaningfully greater" threshold, any Census Block whose percentage of All Other Races

equals or exceeds 16.1 percent or whose percentage of Hispanic population equals or exceeds 12.9 percent was identified as an area of EJ concern.

Table 5 presents the income and poverty data for each geography. Based on HHS guidelines, the poverty threshold is proportional to the household size, also presented in **Table 4**. Overall, Hood County had a poverty level of **10.0 percent**, a value lower than both the state and national levels. Similar to what was done for race and ethnicity, a 0 percent threshold was used to identify low-income populations in order to assess the potential for effects that may be disproportionate, or appreciably more severe or greater in magnitude, or which disproportionately fall on a low-income population. Therefore, any Census Block Group whose percentage of households below poverty equals or exceeds 10.0 percent was identified as an area of EJ concern.

Figure 7 shows the 490 Census Blocks in the Granbury operating area, 247 of which have populations that would be considered areas of EJ concern with respect to racial minorities, ethnic minorities, or both as shown in **Table 4**. A total population of approximately 17,000 people live within the operating area, approximately 2,700 of whom are racial minorities and approximately 2,100 of whom are Hispanic or ethnic minorities.

Figure 8 shows the 15 Census Block Groups, 8 of which would be considered areas of EJ concern with respect to poverty, as shown in **Table 5**. The operating area contains about 9,700 housing units, approximately 950 of which have incomes below the poverty threshold for their Census Block Group.

Rowlett DC

For the Rowlett operating area, a total of 238 Census Blocks are comprised of predominately (50% or greater) minority populations. No Census Block Groups within the operating area are comprised of predominately (50% or greater) low-income populations.

Tables 6 and 7 show the demographic information of the Rowlett Reference Community, as well as other geographies for context. The percentage of racial minorities, collected by the Census as "All Other Races," residing within Dallas and Rockwall Counties at the Census Block level is approximately **63.3 percent**. This is slightly higher than that of the state of Texas and substantially higher than the national average. The percentage of ethnic minorities, those identifying as Hispanic, is **39.6 percent** which is similar to the state average and higher than that of the nation. For purposes of identifying a "meaningfully greater" threshold, any Census Block whose percentage of Hispanic population equals or exceeds 39.6 percent was identified as an area of EJ concern. As the percentage of All Other Races exceeds **50 percent**, identifying areas with predominately minority populations would also include the proposed "meaningfully greater" threshold of 63.3 percent. Therefore, any Census Block whose percentage of All Other Races exceeds 50 percent was also identified as an area of EJ concern.

Table 7 presents the income and poverty data for each geography. Based on HHS guidelines, the poverty threshold is proportional to the household size, also presented in **Table 6**. Overall, Dallas and Rockwall Counties had a poverty level of **13.4 percent**, a value similar to both the state and national levels. Similar to what was done for race and ethnicity, a 0 percent threshold was used to identify low-income populations in order to assess the potential for effects that may be disproportionate, or appreciably more severe or greater in magnitude, or which disproportionately fall on a low-income population. Therefore, any Census Block Group whose percentage of households below poverty equals or exceeds 13.4 percent was identified as an area of EJ concern.

Figure 9 shows the 573 Census Blocks in the Rowlett operating area, 247 of which have populations that would be considered areas of EJ concern with respect to racial minorities, ethnic minorities, or both as

shown in **Table 6**. A total population of approximately 43,400 people live within the operating area, approximately 22,100 of whom are racial minorities and approximately 10,100 of whom are Hispanic or ethnic minorities.

Figure 10 shows the 30 Census Block Groups, 8 of which would be considered areas of EJ concern with respect to poverty, as shown in **Table 7**. The operating area contains about 21,500 housing units, approximately 1,300 of which have incomes below the poverty threshold for their Census Block Group.

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Table 5. Selected Demographic Characteristics (Race/Ethnicity) for Granbury DC

Census Geography	Total Population	White	% White	All Other Races	% All Other Races	Hispanic	% Hispanic	Non-Hispanic	% Non-Hispanic
United States	331,449,281	204,277,273	61.6%	127,172,008	38.4%	62,080,044	18.7%	269,369,237	81.3%
Texas	29,145,505	14,609,365	50.1%	14,536,140	49.9%	11,441,717	39.3%	17,703,788	60.7%
Hood County	61,598	51,678	83.9%	9,920	16.1%	7,958	12.9%	53,640	87.1%
Study Area	17,046	14,385	84.4%	2,661	15.6%	2,149	12.6%	14,897	87.4%
*Reference Community (shaded) – Threshold Values are enclosed in box									

Source: USBC 2020 Decennial Census

Table 6. Selected Demographic Characteristics (Poverty) for Granbury DC

Census Geography	# of Households	Average Household Size	Average Household Income	2020 HHS Poverty Guideline	# Households Below Poverty	% Households Below Poverty
United States	122,354,219	2.6	$79,890.53	$19,928	17,123,637	14.0%
Texas	9,906,070	2.8	$78,994	$20,824	1,448,951	14.6%
Hood County	23,215	2.6	$83,604	$19,928	2,333	10.0%
Study Area	9,727	2.4	$77,922	$22,616	948	9.7%
*Reference Community (shaded) – Threshold Values are enclosed in box						

Source: HMMH 2022; HHS 2020; USCB 2020 ACS

Note: Poverty guidelines are rounded up to the nearest interval (income band) in the Census data (e.g., $29,999 or $34,999) at which household income is reported to estimate the number of households below the poverty level.

Table 7. Selected Demographic Characteristics (Race/Ethnicity) for Rowlett DC

Census Geography	Total Population	White	% White	All Other Races	% All Other Races	Hispanic	% Hispanic	Non-Hispanic	% Non-Hispanic
United States	331,449,281	204,277,273	61.6%	127,172,008	38.4%	62,080,044	18.7%	269,369,237	81.3%
Texas	29,145,505	14,609,365	50.1%	14,536,140	49.9%	11,441,717	39.3%	17,703,788	60.7%
Dallas County	2,613,539	924,283	35.4%	1,689,256	64.6%	1,057,835	40.5%	1,555,704	59.5%
Rockwall County	107,819	74,913	69.5%	32,906	30.5%	20,560	19.1%	87,259	80.9%
Combined Counties	2,721,358	999,196	36.7%	1,722,162	63.3%	1,078,395	39.6%	1,642,963	60.4%
Study Area	43,397	21,316	49.1%	22,081	50.9%	10,129	23.3%	33,268	76.7%

*Reference Community (shaded) – Threshold Values are enclosed in box

Source: USBC 2020 Decennial Census

Note: Since the All Other Races population of the Reference Community is 63.3%, thus exceeding the 50% "predominantly borne" test, identifying all Census Blocks whose populations are greater than 63.3% All Other Races would also necessarily identify any Census Blocks whose populations are greater than the 50% threshold of the Reference Community. Any Census Block whose Hispanic population exceeded that of the Reference Community (39.6%) was also identified.

Table 8. Selected Demographic Characteristics (Poverty) for Rowlett DC

Census Geography	# of Households	Average Household Size	Average Household Income	2020 HHS Poverty Guideline	# Households Below Poverty	% Households Below Poverty
United States	122,354,219	2.6	$79,891	$19,928	17,123,637	14.0%
Texas	9,906,070	2.8	$78,994	$20,824	1,448,951	14.6%
Dallas County	945,996	2.8	$77,495	$20,824	129,368	13.7%
Rockwall County	34,457	2.9	$112,305	$21,272	1,683	4.9%
Combined Counties	980,453	2.8	$78,719	$20,824	131,051	13.4%
Study Area	21,509	3.0	$101,586	$21,720	1,327	6.2%

*Reference Community (shaded) – Threshold Values are enclosed in box

Source: HMMH 2022; HHS 2020; USCB 2020 ACS

Note: Poverty guidelines are rounded up to the nearest interval (income band) in the Census data (e.g., $29,999 or $34,999) at which household income is reported to estimate the number of households below the poverty level.

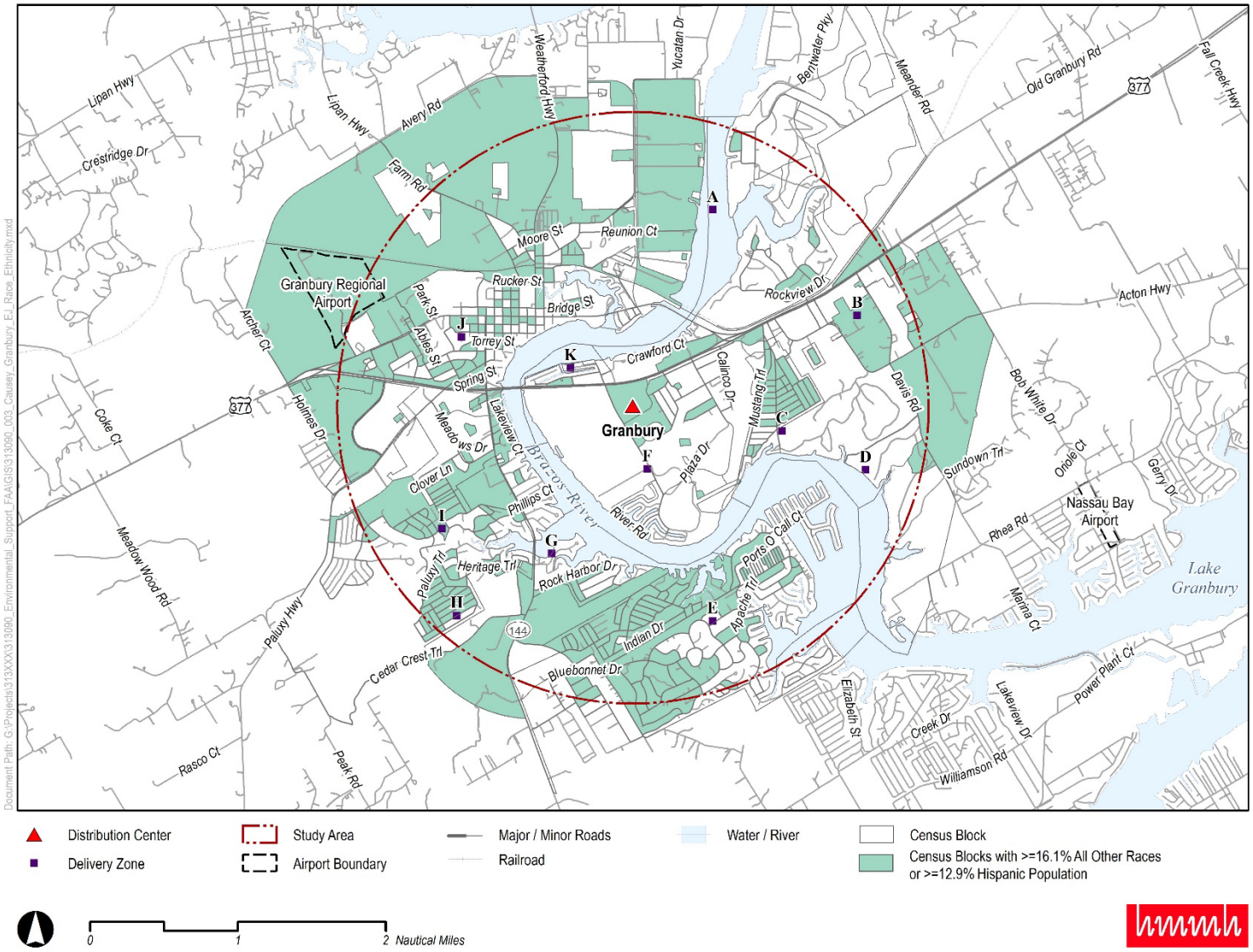

Figure 7: Census Blocks of Potential EJ Concern with Respect to Race or Ethnicity – Granbury

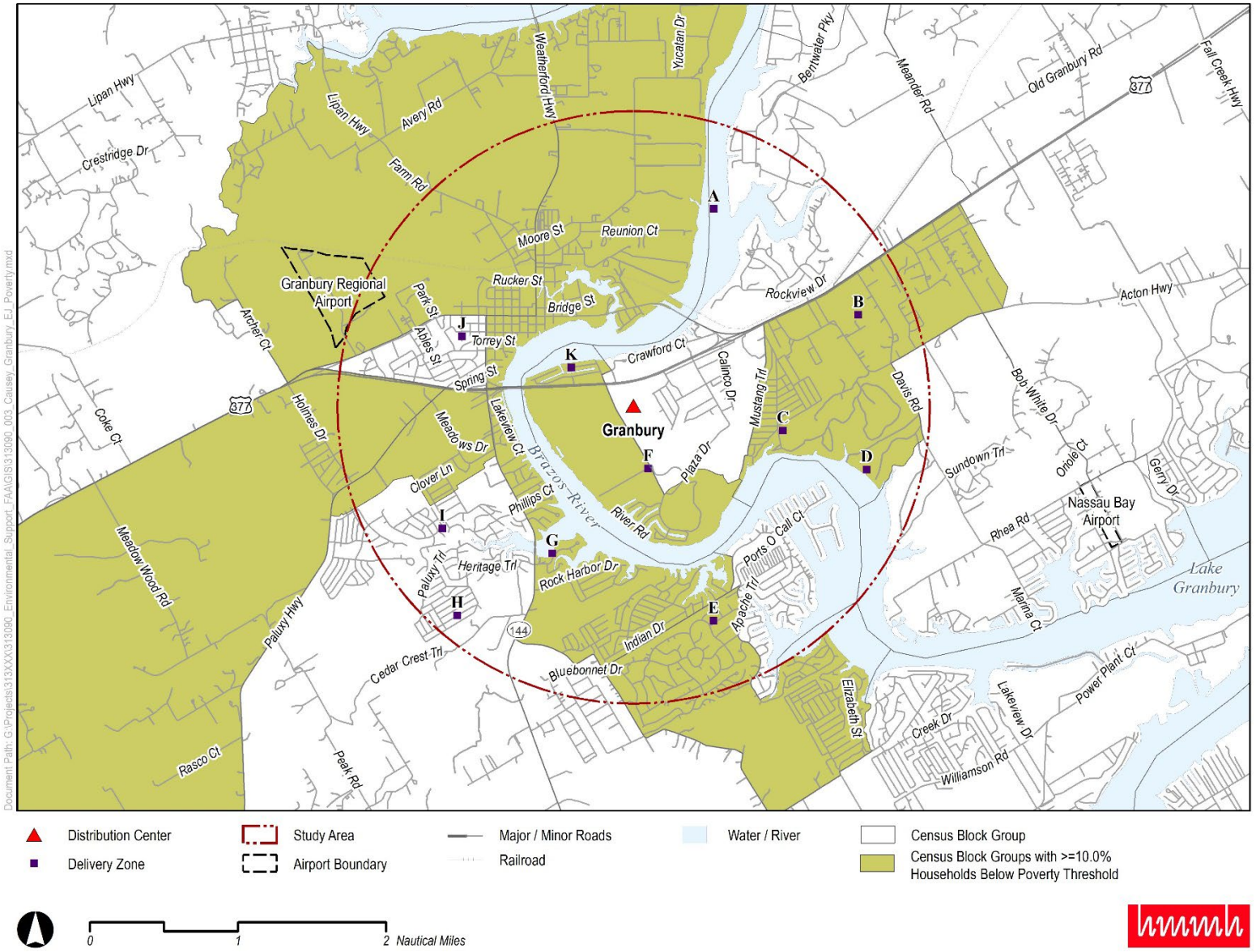

Figure 8: Census Block Groups of Potential EJ Concern with Respect to Poverty – Granbury

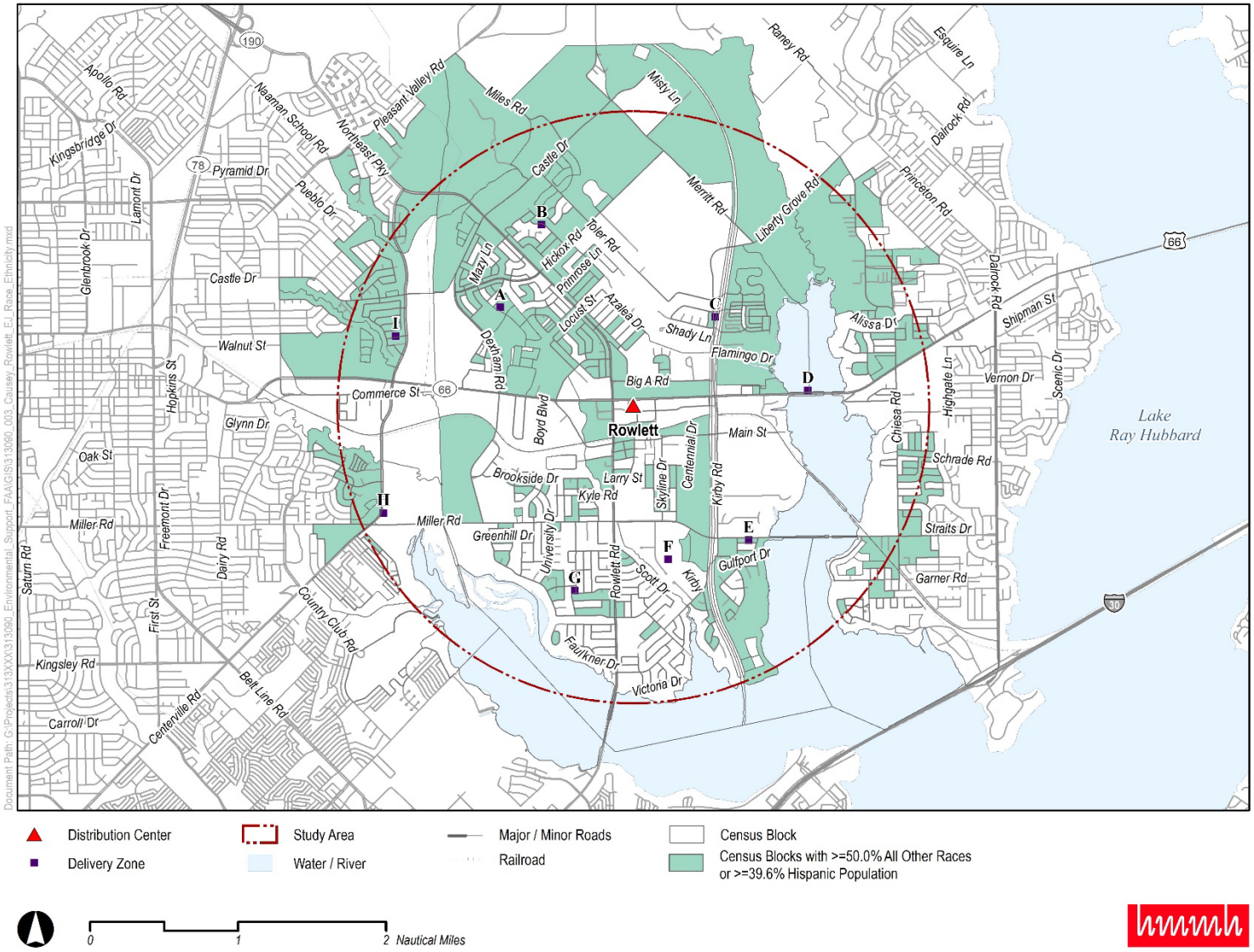

Figure 9: Census Blocks of Potential EJ Concern with Respect to Race or Ethnicity – Rowlett

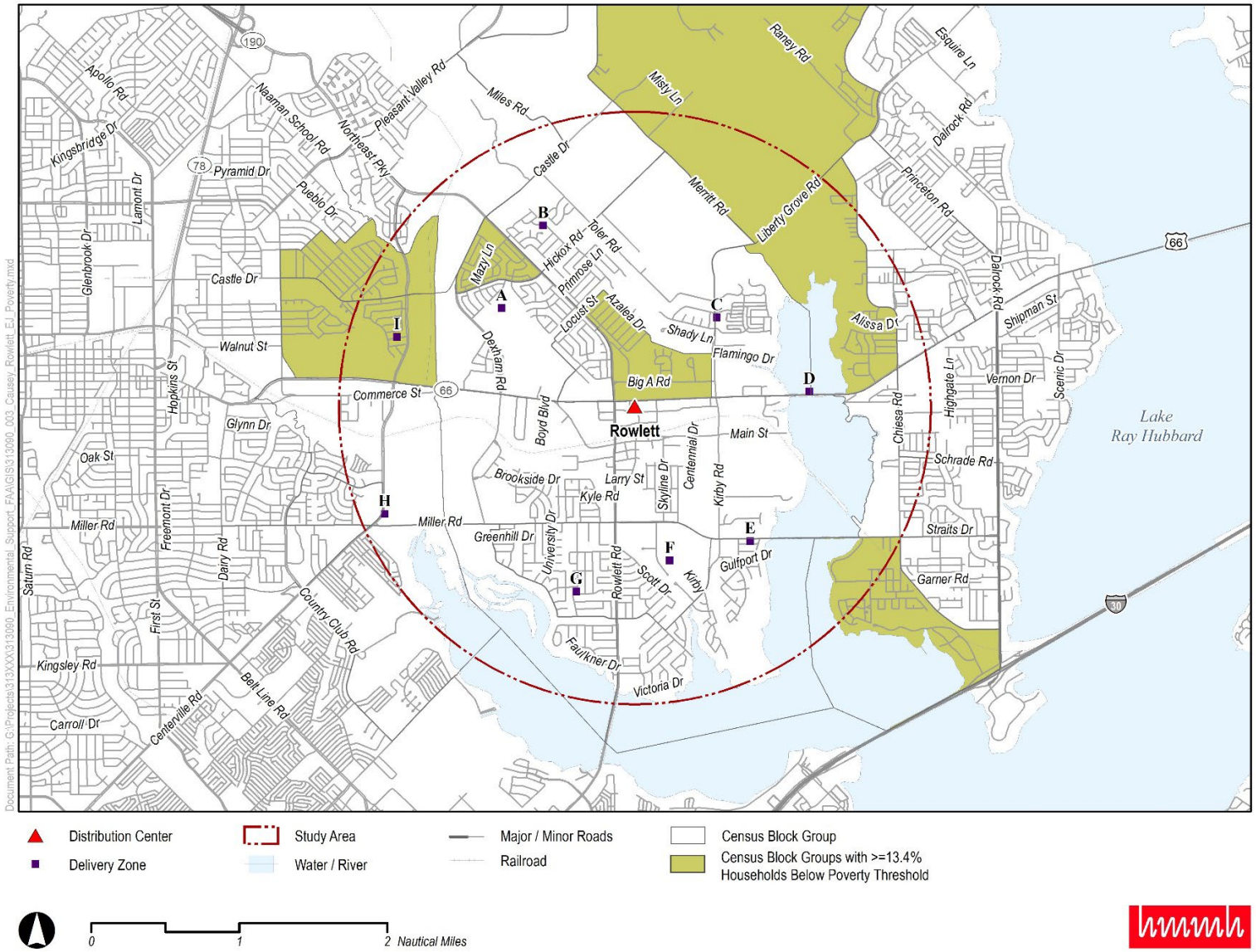

Figure 10: Census Block Groups of Potential EJ Concern with Respect to Poverty – Rowlett

3.6.3 Environmental Consequences

Neither the No Action Alternative nor the Proposed Action would result in adverse or significant impacts in any environmental resource category. As noted in **Section 3.3** and **Appendix B**, the UA's noise emissions could be perceptible at locations within the operating areas but would stay well below the level determined to constitute a significant impact. Since implementation of the No Action Alternative or the Proposed Action would not create impacts exceeding thresholds of significance in other environmental impacts, and since they would not generate impacts on the physical or natural environment that affect an EJ population in a way that the FAA determines are unique to the EJ population and significant to that population, the likelihood of significant impacts is remote.

Additionally, due to the large size of the areas, the low number daily operations, and the dispersal of minority and low-income populations, it is unlikely that EJ populations would be disparately impacted by the No Action Alternative or the Proposed Action. The FAA determined that neither the No Action Alternative nor the Proposed Action would result in disproportionately high and adverse human health or environmental effects on a minority or low-income population.

3.7 Visual Effects (Visual Resources and Visual Character)

3.7.1 Regulatory Setting

Visual resources and visual character impacts deal with the extent to which the No Action Alternative or the Proposed Action would result in visual impacts to resources in the operating areas. Visual impacts can be difficult to define and evaluate because the analysis is generally subjective but are normally related to the extent that the No Action Alternative or the Proposed Action would contrast with, or detract from, the visual resources and/or the visual character of the existing environment. In this case, visual effects would be limited to the introduction of a visual intrusion – a UA in flight – which could be out of character with the suburban or natural landscapes.

The FAA has not developed a visual effects threshold of significance similar to noise impacts. Factors the FAA considers in assessing significant impacts include the degree to which the action would have the potential to: (1) affect the nature of the visual character of the area, including the importance, uniqueness, and aesthetic value of the affected visual resources; (2) contrast with the visual resources and/or visual character in the study area; or (3) block or obstruct the views of visual resources, including whether these resources would still be viewable from other locations.

3.7.2 Affected Environment

Drone package delivery flights under the No Action Alternative or the Proposed Action would take place over suburban residential areas and commercially-developed properties. As noted in **Section 3.5**, there are some public parks that could be valued for aesthetic attributes within the operating areas. Causey's proposal is to avoid overflights of large open-air gatherings of people under the No Action Alternative or the Proposed Action, which includes public parks and other public properties that may be covered under Section 4(f).

3.7.3 Environmental Consequences

Changes to any landforms or land uses would not occur under the No Action Alternative or the Proposed Action; therefore, there would be no effect to the visual character of the area. The operations would occur in airspace only. The FAA estimates that at typical operating altitude and speeds the UA en route would be observable for approximately eight seconds by an observer on the ground. Both the No Action Alternative and the Proposed Action would involve airspace operations that are unlikely to result in visual impacts anywhere in the operating areas, including sensitive areas such as Section 4(f)

properties where the visual setting is an important resource of the property. This is due in part to Causey's flight planning system discussed above. Additionally, the short duration that each drone flight could be seen from any resource in the study area, approximately eight seconds in total, and the low number of proposed flights per day spread throughout the 16.6-square-mile operating areas, would minimize any potential for significant visual impacts at any location in the operating areas. Any visual effects are expected to be similar to existing air traffic in the vicinity of the operating areas.

3.8 Water Resources - Surface Waters

3.8.1 Regulatory Setting

Surface water resources generally consist of oceans, wetlands, lakes, rivers, and streams. Surface water is important for its contribution to the economic, ecological, recreational, and human health of a community. The Clean Water Act (CWA) established the National Pollutant Discharge Elimination System (NPDES) program, which regulates the discharge of point sources of water pollution into Waters of the United States (U.S.) and requires a permit under Section 402 of the CWA. Waters of the U.S. are defined by the CWA and are protected by various regulations and permitting programs administered by the U.S. Environmental Protection Agency (USEPA) and the U.S. Army Corps of Engineers. An action would be considered significant to surface waters when it would: (1) exceed water quality standards established by federal, state, local, and tribal regulatory agencies; or (2) contaminate public drinking water supply such that public health may be adversely affected.

3.8.2 Affected Environment

Approximately 2.64 square miles of surface waters occur within the Granbury operating area, or about 15.8 percent of the operating area (see **Figure 2**). Approximately 2.21 square miles of surface waters occur within the Rowlett operating area, or about 13.2 percent of the operating area (see **Figure 3**). Notable surface waters in the Granbury operating area include the Brazos River and Lake Granbury. Notable surface waters in the Rowlett operating area include Lake Ray Hubbard. Causey's operations would not require an NPDES permit or any other authorization under the CWA.

3.8.3 Environmental Consequences

While it is highly unlikely for one of Causey's aircraft to crash, and even less likely for a crash to happen within a surface water, this EA considers the potential effects of a UA crashing into surface waters covered by the CWA.

Causey would be a certificated air carrier and must comply with all applicable regulatory requirements. This includes compliance with requirements to notify the FAA and/or National Transportation Safety Board (NTSB) in accordance with regulatory requirements in the event of an aircraft accident. Causey's FAA-accepted checklists include procedures to notify local emergency services in the event of an accident or incident. In accordance with 14 CFR § 135.23(d), Causey is required to locate and secure any downed aircraft pending guidance from the FAA or NTSB.

In the event of an in-flight malfunction or deviation, the Remote Pilot-in-Command (RPIC) can initiate three commands: initiate a hold pattern, return to the distribution center, or terminate the flight via the emergency parachute system, which may also automatically deploy if the Causey UA detects a critical failure necessitating a flight termination. In addition, the Lithium-ion battery packs are well-secured within the aircraft and are not expected to detach from the aircraft or become lost in the event of an incident.

No construction activities would be associated with the No Action Alternative or the Proposed Action. Neither the No Action Alternative nor the Proposed Action would have the potential to adversely affect natural and beneficial water resource values to a degree that substantially diminishes or destroys such values, or to adversely affect surface waters such that the beneficial uses and values of such waters are appreciably diminished or can no longer be maintained and such impairment cannot be avoided or satisfactorily mitigated. Neither alternative would cause an exceedance of water quality standards established by federal, state, local, and tribal regulatory agencies, and neither alternative would contaminate public drinking water supply such that public health may be adversely affected.

3.9 Cumulative Impacts

Consideration of cumulative impacts applies to the impacts resulting from the implementation of the Proposed Action with other actions. CEQ regulations define cumulative impact as "an impact on the environment which results 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 regulations also state that cumulative impacts can result from individually minor, but collectively significant actions that take place over a period of time.

Because these are the first commercial package delivery operations by drone within the operating areas, and due to airspace safety constraints that will limit the number of package delivery drones operating within the same airspace without further environmental review, neither the No Action Alternative nor the Proposed Action would be anticipated to result in cumulative impacts to environmental resources within the operating areas.

4.0 LIST OF PREPARERS AND CONTRIBUTORS

Table 8 lists the principal preparers, reviewers, and contributors to this EA.

Table 9. List of Preparers and Contributors

FAA Contributors	Years of Industry Experience	EA Responsibility
Mike Millard, Flight Standards, FAA Aviation Safety	41	Flight Standards Environmental Specialist and Document Review
Christopher Couture, FAA Aviation Safety	16	Program Management, Environmental Science, and Document Review
Shawna Barry, FAA Office of Environment and Energy	16	NEPA Subject Matter Expert, Biological Resources, and Document Review
Adam Scholten, FAA Office of Environment and Energy	11	Noise Analysis and Document Review

Contractor Contributors	Years of Industry Experience	EA Responsibility
Kurt M. Hellauer, Federal Programs, HMMH, Inc.	35	Program Management, NEPA Subject Matter Expert, Airspace Analysis, Environmental Justice Analysis, and Document Review
Jason R. Stoddard, Federal Programs, HMMH, Inc.	14	Project Management, Airspace Analysis
Brandon L. Robinette, Federal Programs, HMMH, Inc.	18	Noise Analysis Subject Matter Expert
Christopher P. Emma, Federal Programs, HMMH, Inc.	3	Noise and Environmental Justice Analyst
Avery J. Pecci, Aviation Environmental Services, HMMH, Inc.	1	GIS Specialist
Missi Shumer, Federal Programs, HMMH, Inc.	22	NEPA Subject Matter Expert, Section 4(f) Analysis, Water Resources, and Document Preparation/Review
Sarah Brammell, NEPA/Environmental Specialist, Blue Wing Environmental, LLC	20	NEPA Subject Matter Expert, Biological Resources
Jackie Tyson, Cultural Resources Specialist, New South Associates, Inc.	12	Cultural Resources Specialist, Document Review

5.0 LIST OF AGENCIES CONSULTED

Federal Agencies

U.S. Fish and Wildlife Service, Arlington (Texas) Ecological Field Services Office

State Agencies

Texas Historical Commission, State Historic Preservation Office

Tribes

Apache Tribe of Oklahoma

Cherokee Nation

Comanche Nation

Coushatta Tribe of Louisiana

Tonkawa Tribe of Indians of Oklahoma

Wichita and Affiliated Tribes

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APPENDICES

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APPENDIX A

Agency Coordination

USFWS Coordination

United States Department of the Interior

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Arlington, Texas, Ecological Services Field Office
501 West Felix Street, Suite 1105
Fort Worth, TX 76115

In Reply Refer To:
2023-0017513

March 3, 2023

Dave Menzimer
Manager, General Aviation Operations Section
General Aviation and Commercial Division
Office of Safety Standards, Flight Standards Service
800 Independence Ave., SW.
Washington, DC 20591

RE: Endangered Species Act Section 7 Consultation for Unmanned Aircraft Commercial Package Delivery Operations in Granbury and Rowlett, Texas

Dear Mr. Menzimer,

This responds to the Federal Aviation Administration's (FAA) February 2, 2023 letter requesting consultation pursuant to section 7 of the Endangered Species Act of 1973 as amended (16 U.S.C. 1531-1544) (Act). Your letter includes a Biological Evaluation (BE) of the proposed unmanned aircraft (UA) commercial package delivery operations from two distribution centers in Dallas and Hood Counties, Texas. Additional information regarding the action area was received via electronic correspondence on February 14, 2023. You concluded that the proposed action would have no effect on the Texas fawnsfoot (*Truncilla macrodon*) and monarch butterfly (*Danaus plexippus*), and may affect, but is not likely to adversely affect the tricolored bat (*Perimyotis subflavus*), golden-cheeked warbler (*Setophaga chrysoparia*), and whooping crane (*Grus americana*). The piping plover (*Charadrius melodus*) and red knot (*Calidris canutus rufa*) were not considered, as consultation is only recommended for wind energy projects.

The purpose of the proposed action is to "conduct deliveries from [distribution centers] located in Granbury and Rowlett to vetted delivery sites, such as residential properties and healthcare facilities, within 2 nautical miles of each DC [Distribution Center]." However, for the FAA's contractor, Causey, "to conduct UA BVLOS [beyond visual line of sight] commercial package deliveries, it must receive a number of approvals from the FAA, such as a waiver of 14 CFR § 91.113(b) [Right-of-way rules]. Causey has requested the FAA to amend its Operations Specifications so that Causey can begin UA BVLOS commercial delivery operations in the Granbury and Rowlett, Texas areas. The FAA's approval of this Operations Specification amendment is the federal action." The specific UA to be used, Flytrex, Inc.'s Model FTX-

M600P, has a maximum takeoff weight of 33.4 pounds, and a maximum allowable package weight of 6.6 pounds. Actions included in the proposed project that could affect listed species include the following:

- Unmanned aircraft flight operations within a network of defined flight paths between distribution centers and delivery sites, which include:
    - Takeoff and climb
    - En route flight outbound
    - Delivery
    - En route flight inbound
    - Descent and landing

The action area will consist of two 2 nautical mile (nm) buffers surrounding distribution centers in Granbury, Hood County, Texas and Rowlett, Dallas County, Texas. The action area does not contain any designated or proposed critical habitat. Both distribution centers are in primarily urban and suburban areas and are adjacent to Waters of the United States (WOTUS). The Granbury DC is situation on the shores of Lake Granbury, an impounded portion of the Brazos River (Figure 1). The 2-nm buffer overlaps approximately 1,700 acres of open water habitat within Lake Granbury. At its closest point, Lake Granbury is approximately 0.5 mile from the Granbury DC. A portion of the Rowlett DC 2-nm buffer overlaps the central and western portions of Lake Ray Hubbard, located more than one mile southwest and northeast of the launch site (Figure 2). Lake Ray Hubbard is a reservoir that contains approximately 24,000 acres of open water habitat. The lake is used heavily by recreational boaters and fisherman. The Rowlett Creek-Dallas County Nature Preserve is located west of the Rowlett DC. This 97-acre preserve is located along Rowlett Creek and is a multi-use, public access county park. The preserve is mainly wooded riparian and upland habitat along Rowlett Creek which is a tributary to Lake Ray Hubbard. The entirety of the preserve is located within the Rowlett study area, approximately 1.6 miles southwest of the DC. Additional Lake Ray Hubbard tributaries within the study area include Muddy Creek and Lang Branch Creek. Both are primarily wooded waterways surrounded by residential and other urban development.

GRANBURY CINERGY

Granbury Cinergy Delivery Zones

Figure 1. Delivery routes for Granbury distribution center. From February 14, 2023 email from Mr. Millard.

ROWLETT TIMBERLAKE

Rowlett Timberlake Delivery Zones

Figure 2. Delivery routes for the Rowlett distribution center. From February 14, 2023 email from Mr. Millard.

The federally-listed, proposed listed, and candidate species known to occur in Dallas and Hood Counties are the threatened piping plover (*Charadrius melodus*) and red knot (*Calidris canutus rufa*), the endangered golden-cheeked warbler (*Setophaga chrysoparia*) and whooping crane (*Grus americana*), the proposed threatened Texas fawnsfoot (*truncilla macrodon*), the proposed endangered tricolored bat (*Perimyotis subflavis*), and the candidate monarch butterfly (*Danaus plexippus*). Currently, the Service recommends the piping plover and red knot be evaluated only for wind energy projects in these counties; therefore, no consultation is necessary regarding those species. Proposed species are not currently protected under the Act; however, conferencing is necessary if it is determined a federal action is likely to jeopardize the continued existence of a proposed species. Your BE does not indicate the need for conference on the proposed species. Furthermore, candidate species are not afforded protection under the Act, but we do suggest consideration of candidate species in project planning for the purpose of reducing impacts. We recommend you maintain the information used to make these determinations (evaluations, photos, habitat descriptions, etc.) with your project file.

The golden-cheeked warbler is a small, insectivorous neo-tropical songbird. The breeding range for the species encompasses central Texas from Dallas, Palo Pinto, and Bosque counties south through the eastern and south-central portions of the Edwards Plateau. Golden-cheeked warblers breed exclusively in the mixed Ashe juniper/deciduous woodlands. These songbirds require the shredding bark produced by mature Ashe junipers (*Juniperus ashei*) for nest material. Breeding habitat has diminished due to juniper eradication programs and continuing urbanization in central Texas. The species suffers from cowbird parasitism, which may be increasing as habitat becomes fragmented. Human presence may deter warblers from utilizing adjacent habitat, cause them to abandon habitat, or otherwise disrupt normal breeding, feeding, or sheltering activities during the breeding season, thereby degrading suitable habitat. Studies of the possible effects of construction activities have demonstrated that construction noise, much louder than that produced by the proposed action has no effect on warbler pairing success, territory placement, or productivity. Based on the absence of ground, vegetation, or hydrological disturbance, the limited maximum number of daily flights, the above-treetop operating altitude, minimal noise disturbance, and low likelihood of a midair strike, the FAA has determined that the action may affect, but is not likely to adversely affect, the golden-cheeked warbler. Any effects would be discountable (extremely unlikely to occur) or insignificant (not able to be meaningfully measured, detected, or evaluated).

Whooping cranes currently exist in three wild populations and in captivity at 12 sites. There is only one self-sustaining wild population, the Aransas-Wood Buffalo National Park population, which nests in Wood Buffalo National Park and adjacent areas in Canada, and winters in coastal marshes in Texas. The migratory corridor runs in an approximately straight line from northwest Canada through the Great Plains to overwinter on the Gulf Coast. The whooping crane breeds, migrates, winters, and forages in a variety of wetland and other habitats, including coastal marshes and estuaries, inland marshes, lakes, ponds, wet meadows and rivers, and agricultural fields. The largest amount of stopover foraging time is spent feeding in harvested grain fields. While cranes generally avoid areas with human activity present (e.g., roads, neighborhoods, etc.), suitable stopover habitat for the species may be present in the proposed project areas.

Based on the absence of ground, vegetation, or hydrological disturbance, the limited maximum number of daily flights, the above-treetop operating altitude, minimal noise disturbance, and low likelihood of a midair strike, the FAA has determined that the action may affect, but is not likely to adversely affect, the whooping crane. Any effects would be discountable (extremely unlikely to occur) or insignificant (not able to be meaningfully measured, detected, or evaluated).

Based on the information provided within the BE and later correspondence, we concur with your determination that the project, as proposed may affect, but is not likely to adversely affect the golden-cheeked warbler and whooping crane pursuant to section 7 of the Act. Therefore, no further section 7 consultation will be required unless: 1) the identified action is subsequently modified in a manner that causes an effect on a listed species or designated critical habitat; 2) new information reveals the identified action may affect federally listed species or designated critical habitat in a manner or to an extent not previously considered; or 3) a new species is listed or a critical habitat is designated under the Act that may be affected by the identified action. If new effects are identified in the future, section 7 consultation may need to be reinitiated.

Please note that this guidance does not authorize bird mortality for species that are protected under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. sec.703-712). If you believe migratory birds will be affected by this activity, we recommend you contact our Migratory Bird Permit Office at P.O. Box 709, Albuquerque, NM 87103, (505) 248-7882.

Thank you for the opportunity to review and provide information on the proposed project. If you have any questions, please contact Melissa Althouse of my staff at melissa_althouse@fws.gov.

Sincerely,

Omar Bocanegra
Acting Field Supervisor

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U.S. Department of Transportation
Federal Aviation Administration

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Field Office Supervisor
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Submitted to: arles@fws.gov

SUBJECT: Endangered Species Act Section 7 Consultation for Unmanned Aircraft Commercial Package Delivery Operations in Granbury and Rowlett, Texas

In accordance with Section 7 of the Endangered Species Act (ESA), the Federal Aviation Administration (FAA) is requesting U.S. Fish and Wildlife Service (USFWS) concurrence that the FAA's action of authorizing Causey Aviation Unmanned, Inc. (Causey) to conduct limited unmanned aircraft (UA)[1] commercial package delivery operations from one distribution center (DC) in Granbury, Texas, and one DC in Rowlett, Texas, ***may affect, but is not likely to adversely affect***, the tricolored bat (*Perimyotis subflavus*), golden-cheeked warbler (*Setophaga chrysoparia*), and whooping crane (*Grus americana*). A brief background, project description, identification of the action area, and a discussion of potential effects to ESA-listed species is provided below.

Background

Over the past several years, Causey has been working under various FAA programs, including the Unmanned Aircraft Systems Integration Pilot Program and the BEYOND program, as well as the FAA's established processes to bring certificated commercial UA delivery into practice. Participants in these programs are among the first to prove their concepts—including package delivery by UA—using current regulations and exemptions and waivers from some of the regulatory requirements.

Causey currently operates under 14 Code of Federal Regulations (CFR) Part 107 and an associated Part 107 waiver from the Granbury DC. The waiver limits Causey's operations to those that are not conducted for compensation or hire. Causey began conducting validation, calibration, and demonstration flights from the Granbury DC in March 2022.

Causey has a Part 135 Air Carrier Operating Certificate from the FAA, which allows it to carry the property of another for compensation or hire beyond visual line of sight (BVLOS) in North Carolina. The certificate contains a stipulation that operations must be conducted in accordance with the provisions and limitations specified in the carrier's Operations Specifications. Causey is applying to the FAA to add the Granbury and Rowlett operating areas described below to its Operations Specifications.

[1] Unmanned aircraft are commonly referred to as drones.

Project Description

For Causey to conduct UA BVLOS commercial package deliveries, it must receive a number of approvals from the FAA, such as a waiver of 14 CFR § 91.113(b). Causey has requested the FAA to amend its Operations Specifications so that Causey can begin UA BVLOS commercial delivery operations in the Granbury and Rowlett, Texas areas. The FAA's approval of this Operations Specification amendment is the federal action.

Causey proposes to conduct deliveries from DCs located in Granbury and Rowlett to vetted delivery sites, such as residential properties and healthcare facilities, within 2 nautical miles of each DC (see **Figure 1** attached to this letter). The Granbury DC is located at Cinergy Cinemas, 1201 Water's Edge Drive, Granbury, Texas 67048 (see **Figure 2** attached to this letter). The Rowlett DC is located near the Timberlake Shopping Center at 3805 Industrial Street, Rowlett, Texas 75088 (see **Figure 3** attached to this letter). Both DCs are located on properties zoned for commercial use. No ground construction or habitat modification would occur as part of the action.

Causey anticipates operating an average of 77 delivery flights per day from the Granbury DC and 71 delivery flights per day from the Rowlett DC. The operations would occur between 8:00 a.m. and 10:00 p.m. up to seven days per week. **Table 1** shows the anticipated distribution of delivery operations among the delivery zones from each DC. Refer to Figures 2 and 3 for the locations of the delivery zones referenced in Table 1.

Table 1: Daily UA Delivery Operations per Delivery Zone

Granbury Distribution Center				Rowlett Distribution Center			
Delivery Zone	**Daily Operations**	**Delivery Zone**	**Daily Operations**	**Delivery Zone**	**Daily Operations**	**Delivery Zone**	**Daily Operations**
A	4	G	3	A	11	G	21
B	1	H	4	B	9	H	2
C	4	I	5	C	6	I	4
D	1	J	18	D	6		
E	27	K	1	E	5		
F	9			F	7		
Total Daily Operations			**77**	**Total Daily Operations**			**71**

Source: Causey 2022

Unmanned Aircraft

The aircraft is Flytrex, Inc.'s Model FTX-M600P UA (see **Figure 4** attached to this letter). The UA has a maximum takeoff weight of 33.4 pounds, and the maximum allowable package weight is 6.6 pounds. It is approximately 53 inches in width, 53 inches in length, and 31 inches in height. The UA features a multi-rotor design with six propellers mounted on equally spaced arms extending horizontally from a center frame. The system's computers and packages are mounted on the underside of the airframe. The multi-copter drone uses electric power from rechargeable lithium-ion batteries and includes a parachute safety system that can be deployed in cases of emergency.

Flight Operations

The UA would fly a network of defined flight paths between the DC and delivery sites. Flight operations would take place within airspace, typically well above the tree line and away from sensitive habitats. With a multi-rotor design, the UA can take off and descend vertically, as well as hover. After takeoff, the

UA would use defined flight paths to navigate on both the outbound (DC to delivery site) and inbound (post-delivery to recovery) legs. The UA uses the U.S. Global Positioning System for navigation.

A typical flight profile for Causey's UA operations can be broken into five phases, which are described below: takeoff and climb, en route outbound, delivery, en route inbound, and descent and landing.

Takeoff and Climb

The takeoff and climb phase is defined as the portion of flight in which a fully loaded UA takes off from its launch pad at a DC and climbs vertically to 33 feet above ground level (AGL). The UA then conducts various systems checks in a hover at 33 feet AGL over the course of three seconds. Once the UA passes its systems checks, the UA then climbs vertically from 33 feet AGL to 230 feet AGL over five seconds.

En Route Outbound

The en route outbound phase is defined as the part of flight in which the fully loaded UA transits from the DC to delivery points on a pre-defined network of flight paths. During this flight phase, the UA will typically operate at an altitude of 230 feet AGL and a typical airspeed of 29 knots. However, the UA may operate within a corridor with altitudes as low as 171 feet AGL or as high as 289 feet AGL as needed due to obstructions and operational conditions.

Delivery

The delivery phase is defined by descent from the en route outbound phase to a delivery point to deliver a package. The delivery point is a minimum 10-foot by 10-foot square area open to the sky and clear of obstacles, which is coordinated with the property owner and validated by Causey.

During the delivery phase, the aircraft descends vertically from the en route altitude to 82 feet AGL. The UA then hovers at 82 feet AGL and waits for up to 15 seconds for confirmation of the delivery from the recipient. If the delivery is not accepted within 15 seconds, the UA returns to the DC with the package. When the recipient accepts the delivery, the UA continues to hover while it lowers the package to the ground by a tether (wire). Once the package is on the ground, the UA releases the package using the following maneuver, which takes approximately eight seconds. The UA descends vertically to 75 feet AGL, unhooks the tether from the package, returns to 82 feet AGL, and retracts the tether back into the UA. The UA then climbs vertically back to en route altitude at 230 feet AGL. The entire process starting with descent from en route altitude, package release, and returning to en route altitude, takes less than a minute and a half.

En Route Inbound

Upon completion of a delivery, the UA will fly the en route inbound phase via the reverse of the respective en route outbound profile from the delivery point back to the DC.

Descent and Landing

Upon reaching the DC, the UA will commence a vertical descent from 230 feet to 33 feet AGL over 20 seconds. The UA then descends vertically the remaining 33 feet to ground level over 20 seconds. Once on the ground, the UA stops its rotors and is retrieved by the ground crew.

Noise Measurements

Causey provided noise measurement data for each phase of flight (takeoff and climb, en route, delivery, and descent and landing). Causey performed the noise measurements at a Causey facility near Liberty,

North Carolina. Refer to **Attachment B** for more information regarding the noise analysis. **Table 2** presents the estimated maximum sound exposure level (SEL)[2] for each phase of flight.

Table 2: Causey Unmanned Aircraft SEL

Flight Phase	Distance between Source and Receiver (feet)	Sound Exposure Level (decibels)
Takeoff and Climb	50	75.0
En route	216	66.4
Delivery	0	81.0
Descent and Landing	50	79.2

Action Area

The action area is defined as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR § 402.02). The action area is defined as Causey's proposed operating areas (see **Figures 1–3**). These areas capture all possible flight routes to the delivery areas and where potential effects (e.g., visual, auditory, physical) to listed species could occur.

ESA-Listed Species and Critical Habitat in the Action Area

The FAA acquired the Official Species List (see **Attachment A**) from the USFWS Information for Planning and Conservation online system to identify ESA-listed species and designated critical habitat in the action area (**Table 3**). The action area does not contain any designated or proposed critical habitat.

Table 3: ESA-Listed and Candidate Species Potentially Present in the Action Area

Common Name	Scientific Name	ESA Status
Mammals		
Tricolored Bat	*Perimyotis subflavus*	Proposed Endangered
Birds		
Golden-cheeked Warbler	*Setophaga chrysoparia*	Endangered
Piping Plover	*Charadrius melodus*	Threatened
Red Knot	*Calidris canutus rufa*	Threatened
Whooping Crane	*Grus americana*	Endangered
Clams		
Texas Fawnsfoot	*Truncilla macrodon*	Proposed Threatened
Insects		
Monarch Butterfly	*Danaus plexippus*	Candidate

The Official Species List states that the piping plover and red knot only need to be considered for wind energy projects. Since the action is not a wind energy project, these two species are not considered further.

Potential Effects of the Action on ESA-Listed Species

The action does not include any ground construction or habitat modification. During nominal operations, the UA wound not touch the ground except at the DCs. Therefore, the action would not result in any physical disturbance to habitat.

[2] Sound exposure level (SEL) is a single event metric that considers both the noise level and duration of the event, referenced to a standard duration of one second.

UA noise and the potential for airborne strikes with flying species are the action's potential stressors or threats to ESA-listed species. As described above, flight operations would take place within airspace and typically remain well above the tree line while en route, away from sensitive habitats. The duration of exposure by most wildlife on the ground to visual or noise impacts from the UA would be of very short duration (less than a minute).

As shown in **Table 2** above, the highest estimated sound level associated with Causey's proposed operations is SEL 81 dB. For context, the sound level of a diesel truck at 50 feet or a noisy urban environment during the day is estimated between 80 to 90 dB. The sound level on the ground when the UA is flying in the en route phase at an altitude of 216 feet AGL is estimated to be around 66 dB, which is comparable to the sound of an air conditioning unit at 100 feet (60 dB).

A noise descriptor for noise effects on wildlife has not been universally adopted, but some research indicates SEL is the most useful predictor of responses. Characteristic of the bulk of research to date has been lack of systematic documentation of the source noise event. Many studies report "sound levels" without specifying the frequency spectrum or duration. A notable exception is a study sponsored by U.S. Air Force that identifies SEL as the best descriptor for response of domestic turkey poults to low-altitude aircraft overflights.[3] This study identified a threshold of response for disturbance of domestic turkeys ("100 percent rate of crowding") as SEL 100 dB. As shown in **Table 2**, none of the predicted sound levels for the different flight phases exceed SEL 81.0 dB.

The following paragraphs describe the anticipated effects of the action on ESA-listed species that could occur in the action area.

Tricolored Bat

The tricolored bat typically uses trees, caves, or manmade structures for roosting and forages for insects during dusk, nighttime, and dawn time periods. Tricolored bats emerge early in the evening and forage at treetop level or above but may forage closer to ground later in the evening. This species exhibits slow, erratic, fluttery flight while foraging and are known to forage most commonly over waterways and forest edges.[4] This species spends six to nine months per year hibernating in caves or mines.[5] The USFWS has proposed to list the tricolored bat as an endangered species, primarily due to white-nose syndrome.[6] Other factors that influence the tricolored bat's viability include wind-energy-related mortality, habitat loss, and effects from climate change.

Suitable habitat for tricolored bat roosting and feeding in the action area includes wooded areas, open water habitat, and manmade structures. There are no known roost sites for the tricolored bat at either DC site, both of which are located in developed suburban areas.

As stated above, Causey is proposing UA operations from 8:00 a.m. to 10:00 p.m. Therefore, the time period that represents the greatest potential for the action to affect a tricolored bat is from dusk until 10:00 p.m. Also, the risk is only present for 3–6 months each year (i.e., when bats are not hibernating).

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[3] Bradley, F., C. Book, and A.E. Bowles. 1990. Effects of Low-Altitude Aircraft Overflights on Domestic Turkey Poults. Report No. HSD-TR-90-034, U.S. Air Force Systems Command, Noise and Sonic Boom Impact Technology Program, June.

[4] USFWS. Tricolored Bat. Available at: https://www.fws.gov/species/tricolored-bat-perimyotis-subflavus. Accessed on January 18, 2023.

[5] Texas Parks & Wildlife. Tricolored Bat (*Perimyotis subflavus*). Available at: https://tpwd.texas.gov/huntwild/wild/species/easpip/. Accessed on January 18, 2022.

[6] 87 Federal Register 56381 (September 14, 2022).

Tricolored bats at roost or in flight could experience UA noise during the en route and delivery flight phases. Bats foraging at or near the tree line at the time a UA flies by would experience the greatest sound levels. Roosting bats or bats foraging near the ground at the time a UA flies by would experience lower sound levels. Given the estimated sound levels of the UA (**Table 2**), the UA's linear flight profile to and from DCs and delivery locations, and the short period of time the UA would be in any particular location, UA noise is not expected to adversely affect tricolored bats. Any increase in ambient sound levels caused by the UA's flight would only last a few seconds during the en route phase and less than two minutes during a delivery.

Bats could also be struck by a drone, particularly from dusk until 10:00 p.m. when foraging. Given the bat's ability to avoid flying into objects and the short period of time the UA would be in any one place, the likelihood of the UA striking a bat is discountable.

Based on 1) the limited scale of operations (a maximum of 77 daily flights distributed among 11 delivery zones for the Granbury DC and a maximum of 71 daily flights distributed among 9 delivery zones for the Rowlett DC; refer to **Table 1**), 2) the altitude at which the UA flies in the en route phase (230 feet AGL), 3) the expected low sound levels experienced by a bat, 4) any increase in ambient sound levels would be short in duration, and 5) the low likelihood of the UA striking a bat, the FAA has determined the action *may affect, but is not likely to adversely affect,* the tricolored bat. Any effects would be discountable (extremely unlikely to occur) or insignificant (not able to be meaningfully measured, detected, or evaluated).

Golden-cheeked Warbler

Golden-cheeked warblers are insectivores that typically forage in forest habitats. They prefer mature Ashe juniper (*Juniperus ashei*) trees mixed with hardwood trees as nesting and foraging sites (preferring forested tracts greater than 12 acres). The golden-cheeked warbler is listed under the ESA primarily due to habitat loss and fragmentation, since they have specific nesting habitat requirements.[7,8]

The Rowlett DC portion of the action area contains large patches of forest mainly on the western side (near delivery zones H and I) and northeastern side (north of delivery zone D). The Granbury DC portion of the action area contains large patches of forest mainly on the south/southwest side (near delivery zones G, H, and I) and eastern side (near delivery zones C and D).

The action does not involve ground disturbance or vegetation removal and therefore would not physically impact suitable habitat within the action area. Golden-cheeked warblers could experience UA noise during the en route and delivery flight phases. Birds resting or foraging at or near the tree line at the time a UA flies by would experience the greatest sound levels. Birds near the ground at the time a UA flies by would experience lower sound levels. Given the estimated sound levels of the UA (**Table 2**), the UA's linear flight profile to and from DCs and delivery locations, and the short period of time the UA would be in any particular location, UA noise is not expected to adversely affect golden-cheeked warblers. Further, the chances of any one individual experiencing multiple overflights of a UA are low given the mobility of the birds, the defined flight paths, and the small number of daily flights associated with the delivery zones where large forest patches are located. One study found that, in most instances,

[7] USFWS ECOS. Golden-cheeked Warbler (*Setophaga chrysoparia*). Available: https://ecos.fws.gov/ecp/species/33. Accessed October 18, 2022.
[8] Texas Parks & Wildlife Department. Golden-cheeked Warbler. Available: https://tpwd.texas.gov/publications/pwdpubs/media/pwd_bk_w7000_0013_golden_cheeked_warbler.pdf. Accessed October 18, 2022.

drones within 4 meters of birds did not cause a behavioral response.[9] In another study, drones barely elicited behavioral responses in terrestrial mammals.[10]

Golden-cheeked warblers could be struck by a UA in flight when foraging above tree tops or in flight between foraging sites or during migration. The risk of a strike is low given the species' ability to fly and avoid the UA. Additionally, Causey reported in February 2023 that there has never been a bird strike with its drones.

Based on 1) the limited scale of operations (a maximum of 77 daily flights distributed among 11 delivery zones for the Granbury DC and a maximum of 71 daily flights distributed among 9 delivery zones for the Rowlett DC; refer to **Table 1**), 2) the altitude at which the UA flies in the en route phase (230 feet AGL); 3) the expected low sound levels experienced by a golden-cheeked warbler, 4) any increase in ambient sound levels would be short in duration, and 5) the low likelihood of the UA striking a warbler, the FAA has determined that the action *may affect, but is not likely to adversely affect,* the golden-cheeked warbler. Any effects would be discountable (extremely unlikely to occur) or insignificant (not able to be meaningfully measured, detected, or evaluated).

Whooping Crane

Whooping cranes use a variety of habitats, including wetlands, estuaries, pastures, agricultural fields, and shallow areas of open water habitats. They are omnivores that eat a variety of food including insects, reptiles, rodents, fish, small birds, mollusks, crustaceans, and berries. Whooping cranes breed in northwest Canada and migrate south and winter in Texas, primarily in the Aransas National Wildlife Refuge located on the Gulf coast.[11] The whooping crane is listed under the ESA primarily due to hunting pressures and habitat loss.[12,13] Suitable foraging habitat in the action area includes shallow areas of open water habitats, marshes, pastures, and agricultural fields.

The whooping crane may occur in the action area in the fall or winter months as it migrates south to the Aransas National Wildlife Refuge. The crane may use habitat in the action area as a stopover site to feed or rest during migration. The action does not include ground disturbance and therefore would not physically impact potential foraging or resting habitat. If present in the action area during operations, whooping cranes could experience en route noise. Given the estimated sound levels of the UA (**Table 2**), the UA's linear flight profile to and from DCs and delivery locations, and the short period of time the UA would be in any particular location, UA noise is not expected to adversely affect whooping cranes. Further, the chances of any one individual experiencing multiple overflights of a UA are low given the mobility of the birds, the defined flight paths, and the small number of daily flights associated with each delivery zone.

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[9] Vas, E., A. Lescroel, O. Duriez, G. Boguszewski, and D. Gremillet. 2015. Approaching Birds with Drones: First Experiments and Ethical Guidelines. Biology Letters (The Royal Society).

[10] Mulero-Pázmány, M., S. Jenni-Eiermann, N. Strebel, T. Sattler, J. José Negro, and Z. Tablado. 2017. Unmanned Aircraft Systems as a New Source of Disturbance for Wildlife: A Systematic Review. *PloS One* 12 (6).

[11] TPWD. Whooping Crane (*Grus americana*). Available: https://tpwd.texas.gov/huntwild/wild/species/whooper/#:~:text=Whooping%20cranes%20begin%20their%20fall,America%20in%20the%20mid%2D1800s. Accessed: January 26, 2023.

[12] USFWS. Whooping Crane. Available: https://www.fws.gov/species/whooping-crane-grus-americana. Accessed October 18, 2022.

[13] The Cornell Lab All About Birds. Whooping Crane Life History. Available: https://www.allaboutbirds.org/guide/Whooping_Crane/lifehistory#nesting. Accessed October 18, 2022.

Whooping cranes could be struck by a drone when in flight. The risk of a strike is low given the crane's limited occurrence in the action area and the crane's ability to fly and avoid the UA. Additionally, Causey reported in February 2023 that there has never been a bird strike with its drones.

Based on 1) the limited scale of operations (a maximum of 77 daily flights distributed among 11 delivery zones for the Granbury DC and a maximum of 71 daily flights distributed among 9 delivery zones for the Rowlett DC; refer to **Table 1**), 2) the altitude at which the UA flies in the en route phase (230 feet AGL); 3) the expected low sound levels experienced by a whooping crane, 4) any increase in ambient sound levels would be short in duration, and 5) the low likelihood of the UA striking a whooping crane, the FAA has determined that the action *may affect, but is not likely to adversely affect,* the whooping crane. Any effects would be discountable (extremely unlikely to occur) or insignificant (not able to be meaningfully measured, detected, or evaluated).

Texas Fawnsfoot

The Texas fawnsfoot is a freshwater mussel that is endemic to Texas and found in the three river basins: Colorado, Brazos, and Trinity. The action does not involve any ground-disturbing activities or activities within Texas fawnsfoot habitat. As there is no plausible route of effect to this species, the FAA determined the action would have *no effect* on the Texas fawnsfoot.

Monarch Butterfly

The monarch butterfly is a candidate for federal listing. The primary threat to monarch butterflies is habitat loss, including the loss of breeding, migratory, and overwintering habitat. Pesticide use and climate change are also threats. While portions of the action area may contain potential summer breeding habitat, the entirety of Texas is within the migration path of monarch butterflies flying back and forth to wintering grounds in Mexico.[14]

The action would not physically affect monarch butterfly habitat or host plants. Monarch butterflies could be struck by drones en route to and from delivery; however, strikes are not likely given the species' mobility. Information regarding drone impacts on insects is limited, and there have been no widespread negative impacts identified in the scientific literature. Based on the information available and the limited scale of operations, the action is not expected to adversely affect the monarch butterfly.

Conclusion

Based on the analysis above, the FAA has determined the action ***may affect, but is not likely to adversely affect***, the tricolored bat, golden-checked warbler, and whooping crane. The FAA appreciates your review of the proposed project and requests your concurrence with our effects determinations for these three species. If you have any questions, please contact Mr. Mike Millard, of my staff, at 202-267-7906 or at Mike.Millard@faa.gov.

[14] Texas Parks & Recreation. The Monarch Butterfly & Other Insect Pollinators. Available at: https://tpwd.texas.gov/huntwild/wild/wildlife_diversity/texas_nature_trackers/monarch/#:~:text=Monarchs%20funnel%20through%20Texas%20both,Wichita%20Falls%20to%20Eagle%20Pass. Accessed on January 18, 2023.

Sincerely,

Dave Menzimer
Manager, General Aviation Operations Section
General Aviation and Commercial Division
Office of Safety Standards, Flight Standards Service

Attachments: Figure 1: Action Area
Figure 2: Granbury Distribution Center and Delivery Zones
Figure 3: Rowlett Distribution Center and Delivery Zones
Figure 4: Flytrex FTX-M600P UA Diagram
Attachment A: USFWS Official Species List
Attachment B: Noise Analysis Report

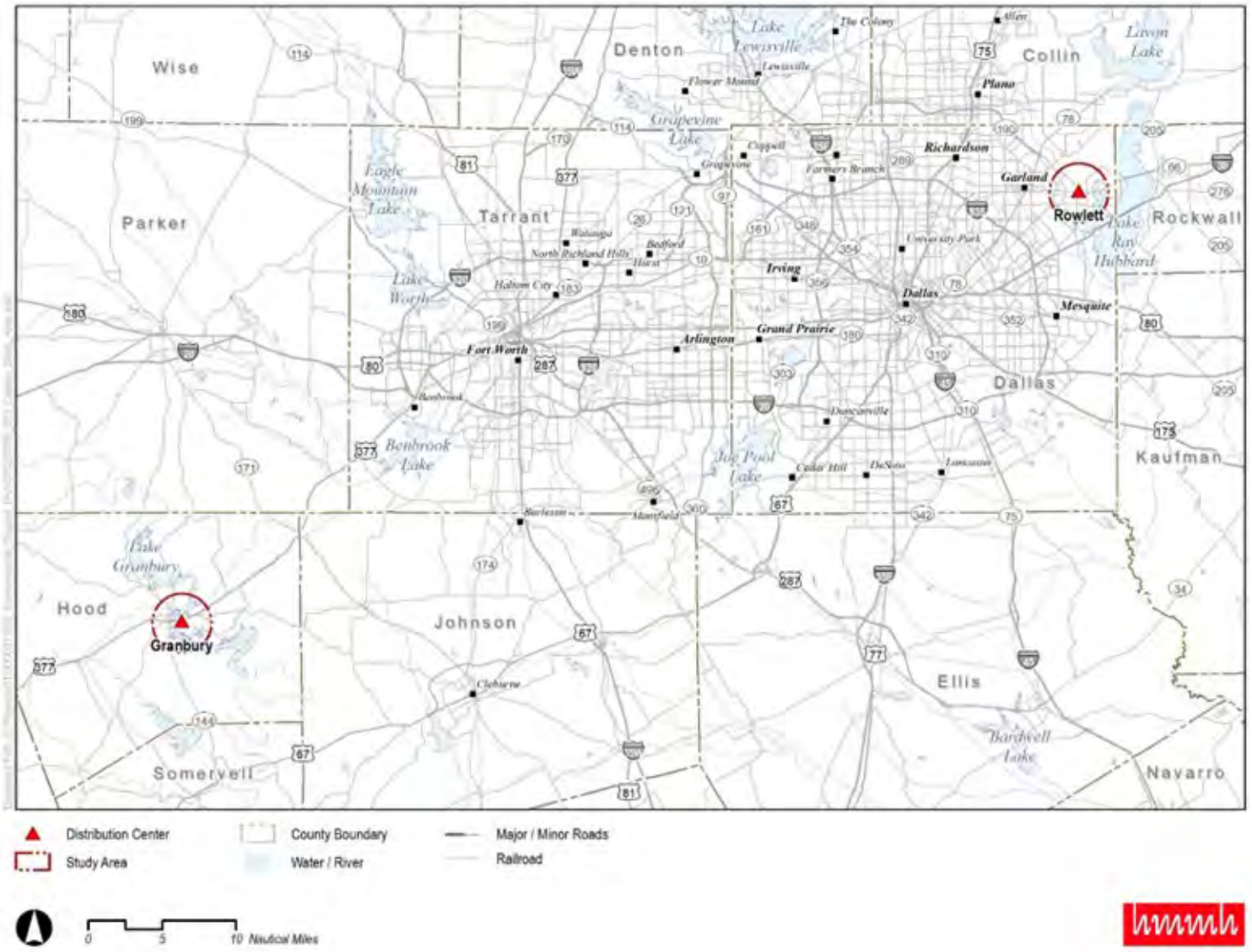

Figure 1. Action Area

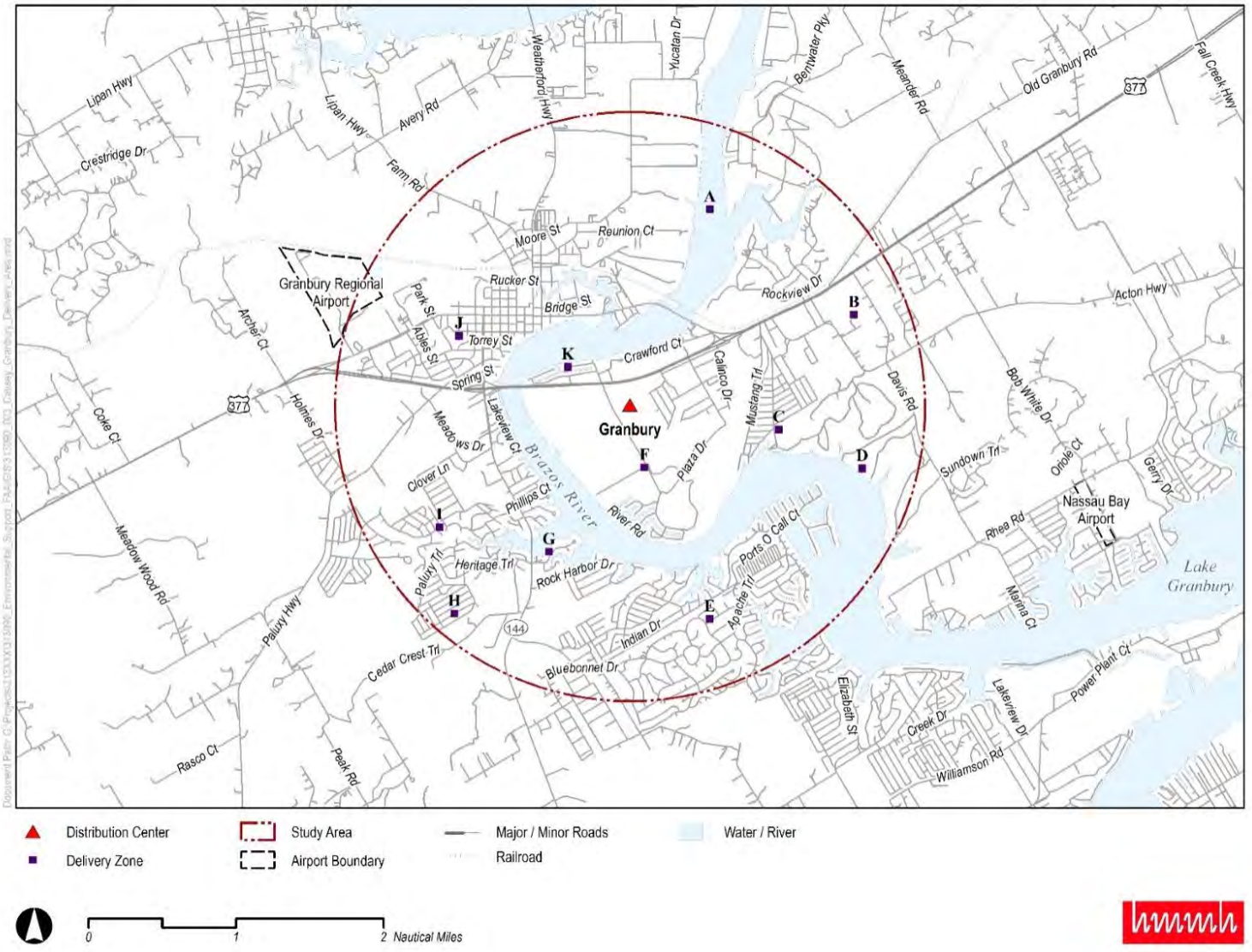

Figure 2. Granbury Distribution Center and Delivery Zones

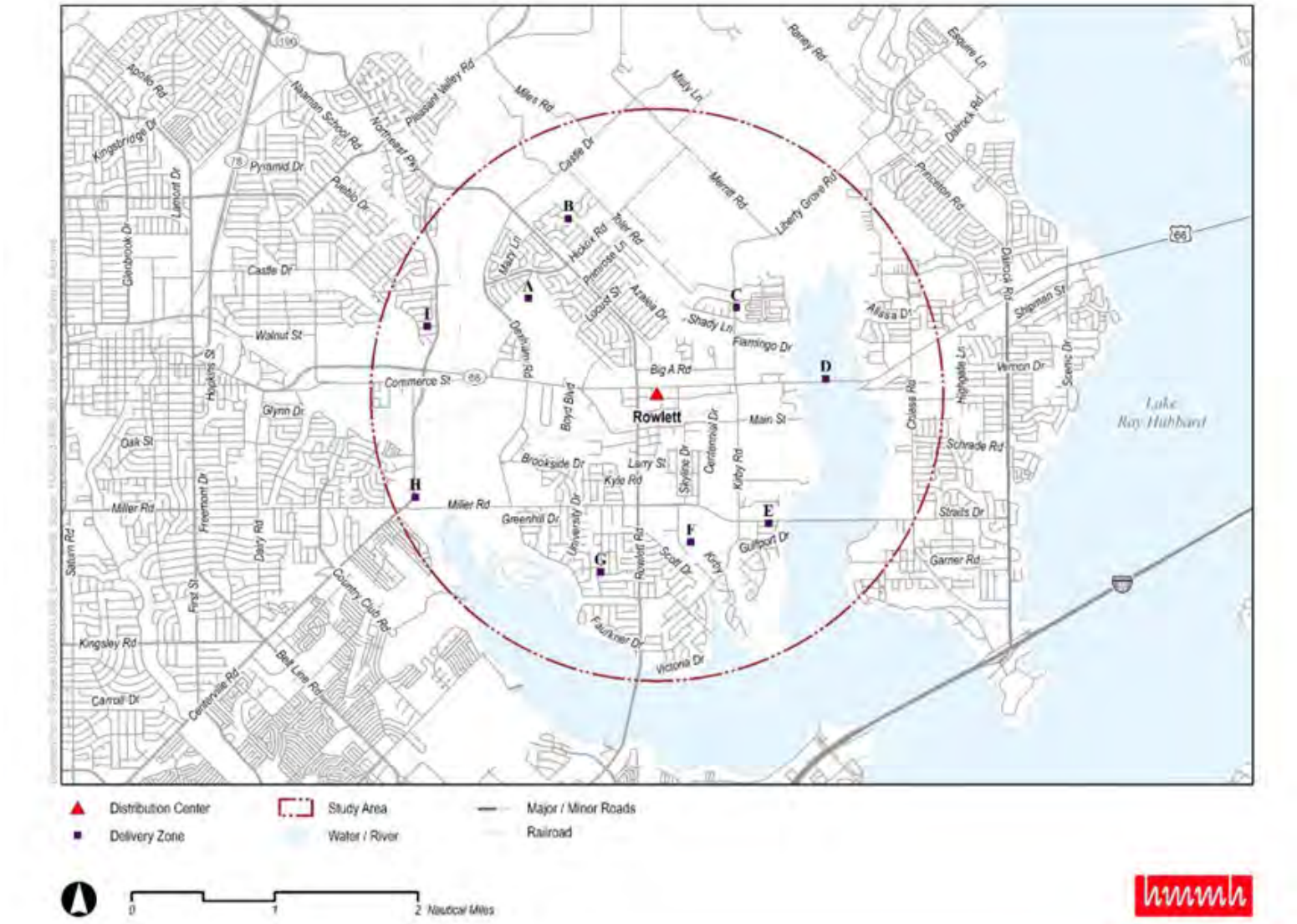

Figure 3. Rowlett Distribution Center and Delivery Zones

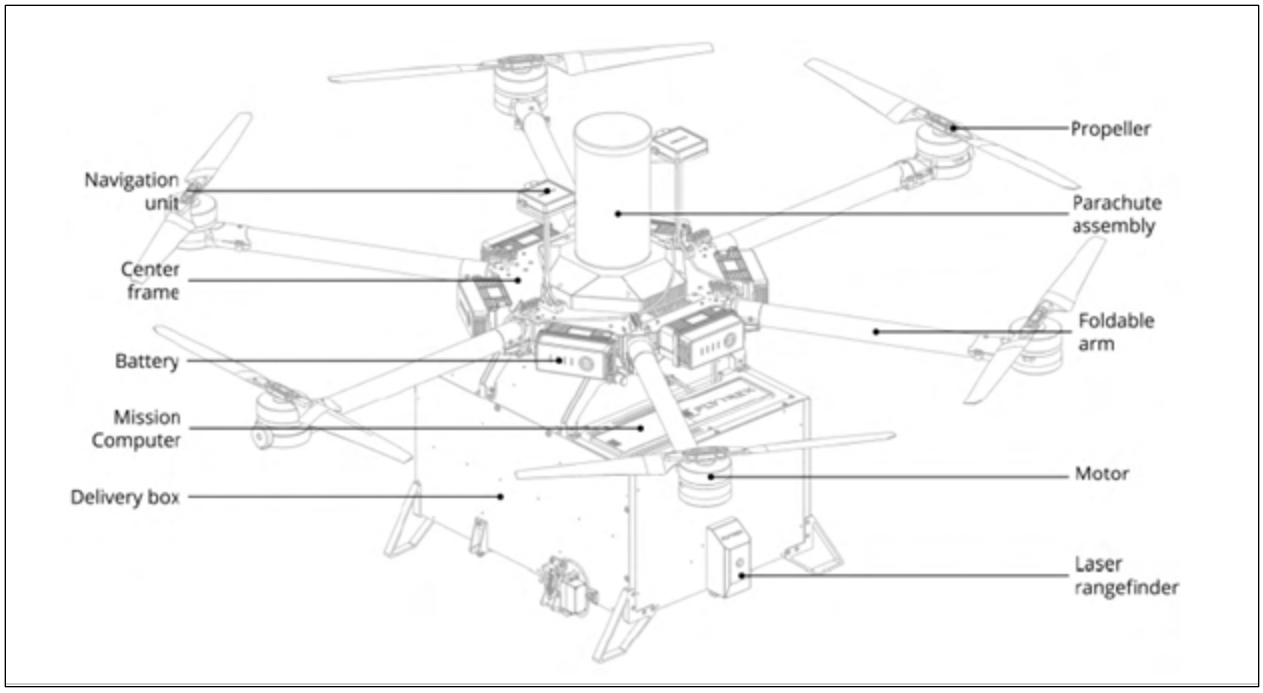

Figure 4. Flytrex FTX-M600P UA Diagram

ATTACHMENT A
IPac Official Species Lists

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Arlington Ecological Services Field Office
2005 Ne Green Oaks Blvd
Suite 140
Arlington, TX 76006-6247
Phone: (817) 277-1100 Fax: (817) 277-1129
Email Address: arles@fws.gov

In Reply Refer To: November 20, 2022
Project Code: 2023-0017513
Project Name: Causey Aviation Unmanned, Inc. Drone Package Delivery Operations in Granbury TX

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed, and candidate species, as well as proposed and final designated critical habitat, which may occur within the boundary of your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under section 7(a)(1) of the Act, Federal agencies are directed to utilize their authorities to carry out programs for the conservation of threatened and endangered species. Under and 7(a)(2) and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to determine whether their actions may affect threatened and endangered species and/or designated critical habitat. A Federal action is an activity or program authorized, funded, or carried out, in whole or in part, by a Federal agency (50 CFR 402.02).

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For Federal actions other than major construction activities, the Service suggests that a biological evaluation (similar to a Biological Assessment) be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

After evaluating the potential effects of a proposed action on federally listed species, one of the following determinations should be made by the Federal agency:

1. *No effect* - the appropriate determination when a project, as proposed, is anticipated to have no effects to listed species or critical habitat. A "no effect" determination does not require section 7 consultation and no coordination or contact with the Service is necessary. However, the action agency should maintain a complete record of their evaluation, including the steps leading to the determination of affect, the qualified personnel conducting the evaluation, habitat conditions, site photographs, and any other related information.
2. *May affect, but is not likely to adversely affect* - the appropriate determination when a proposed action's anticipated effects to listed species or critical habitat are insignificant, discountable, or completely beneficial. Insignificant effects relate to the size of the impact and should never reach the scale where "take" of a listed species occurs. Discountable effects are those extremely unlikely to occur. Based on best judgment, a person would not be able to meaningfully measure, detect, or evaluate insignificant effects, or expect discountable effects to occur. This determination requires written concurrence from the Service. A biological evaluation or other supporting information justifying this determination should be submitted with a request for written concurrence.
3. *May affect, is likely to adversely affect* - the appropriate determination if any adverse effect to listed species or critical habitat may occur as a consequence of the proposed action, and the effect is not discountable or insignificant. This determination requires formal section 7 consultation.

The Service has performed up-front analysis for certain project types and species in your project area. These analyses have been compiled into *determination keys*, which allows an action agency, or its designated non-federal representative, to initiate a streamlined process for determining a proposed project's potential effects on federally listed species. The determination keys can be accessed through IPaC.

The Service recommends that candidate species, proposed species, and proposed critical habitat be addressed should consultation be necessary. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found at: https://www.fws.gov/service/section-7-consultations

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.), and projects affecting these species may require development of an eagle conservation plan (https://www.fws.gov/library/collections/bald-and-golden-eagle-management). Additionally, wind energy projects should follow the wind energy guidelines (https://www.fws.gov/media/land-based-wind-energy-guidelines) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: https://www.fws.gov/media/recommended-best-practices-communication-tower-design-siting-construction-operation. The Federal Aviation Administration (FAA) released specifications for and made mandatory flashing L-810 lights on new towers 150-350 feet AGL, and the elimination of L-810 steady-burning side lights on towers above 350 feet AGL. While the FAA made these changes to reduce the number of migratory bird collisions (by as much as 70%), extinguishing steady-burning side lights also reduces maintenance costs to tower owners. For additional information concerning migratory birds and eagle conservation plans, please contact the Service's Migratory Bird Office at 505-248-7882.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Arlington Ecological Services Field Office
2005 Ne Green Oaks Blvd
Suite 140
Arlington, TX 76006-6247
(817) 277-1100

Project Summary

Project Code: 2023-0017513

Project Name: Causey Aviation Unmanned, Inc. Drone Package Delivery Operations in Granbury TX

Project Type: Drones - Use/Operation of Unmanned Aerial Systems

Project Description: Causey Aviation Unmanned, Inc. (Causey) seeks to amend its air carrier Operations Specifications (OpSpecs) and other Federal Aviation Administration (FAA) approvals necessary to begin unmanned aircraft (UA) commercial package delivery operations in Granbury, Texas using the Flytrex FTX-M600P UA. The UA is a multi-rotor design featuring six propellers mounted on equally spaced arms extending horizontally from a center frame. The system's computers and package containers are located on the underside of the airframe. The maximum allowable takeoff weight of the UA is 33.4 pounds and the maximum allowable package weight is 6.6 pounds.

Causey will operate from a distribution centers (DC) in Granbury, Texas, that serves as a central hub of operations. Causey proposes to conduct consumer package deliveries to vetted delivery locations such as residential properties and healthcare facilities within 2 NM from the DC. The operating area is approximately 16.6 square miles. The proposed commercial delivery operations would occur between 8:00 a.m. and 10:00 p.m. up to seven days per week.

Packages are loaded into the UA at the DC. The UA is then launched to perform aerial deliveries. With a multi-rotor design, the UA can take off and descend vertically, as well as hover. Normal cruising airspeeds are expected to be approximately 29 knots. Typical flights begin with the UA departing from a DC and ascending vertically to 230 feet above ground level (AGL). The UA then flies a pre-determined route at 230 feet AGL to the delivery point. Upon arrival at the delivery point, the UA descends vertically to the delivery hover altitude of 82 feet AGL and waits for the customer to accept the package through a user interface application. If the delivery is not accepted within 15 seconds, the UA returns to the DC with the package. If the delivery is accepted, the UA lowers the package to the ground using a tethered mechanism and then returns to the DC. Upon arrival at the DC, the UA descends vertically from 230 feet AGL to the ground for landing.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@32.431832,-97.77476298562257,14z

Counties: Hood County, Texas

Endangered Species Act Species

There is a total of 7 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 2 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

Birds

NAME	STATUS
Golden-cheeked Warbler *Setophaga chrysoparia* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/33	Endangered
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location does not overlap the critical habitat. This species only needs to be considered under the following conditions: ▪ Wind Energy Projects Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* There is **proposed** critical habitat for this species. This species only needs to be considered under the following conditions: ▪ Wind Energy Projects Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Whooping Crane *Grus americana* Population: Wherever found, except where listed as an experimental population There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/758	Endangered

Clams

NAME	STATUS
Texas Fawnsfoot *Truncilla macrodon* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8965	Proposed Threatened

Insects

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
American Golden-plover *Pluvialis dominica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Sep 1 to Jul 31
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 15 to Aug 25

NAME	BREEDING SEASON
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Little Blue Heron *Egretta caerulea* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds Mar 10 to Oct 15
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

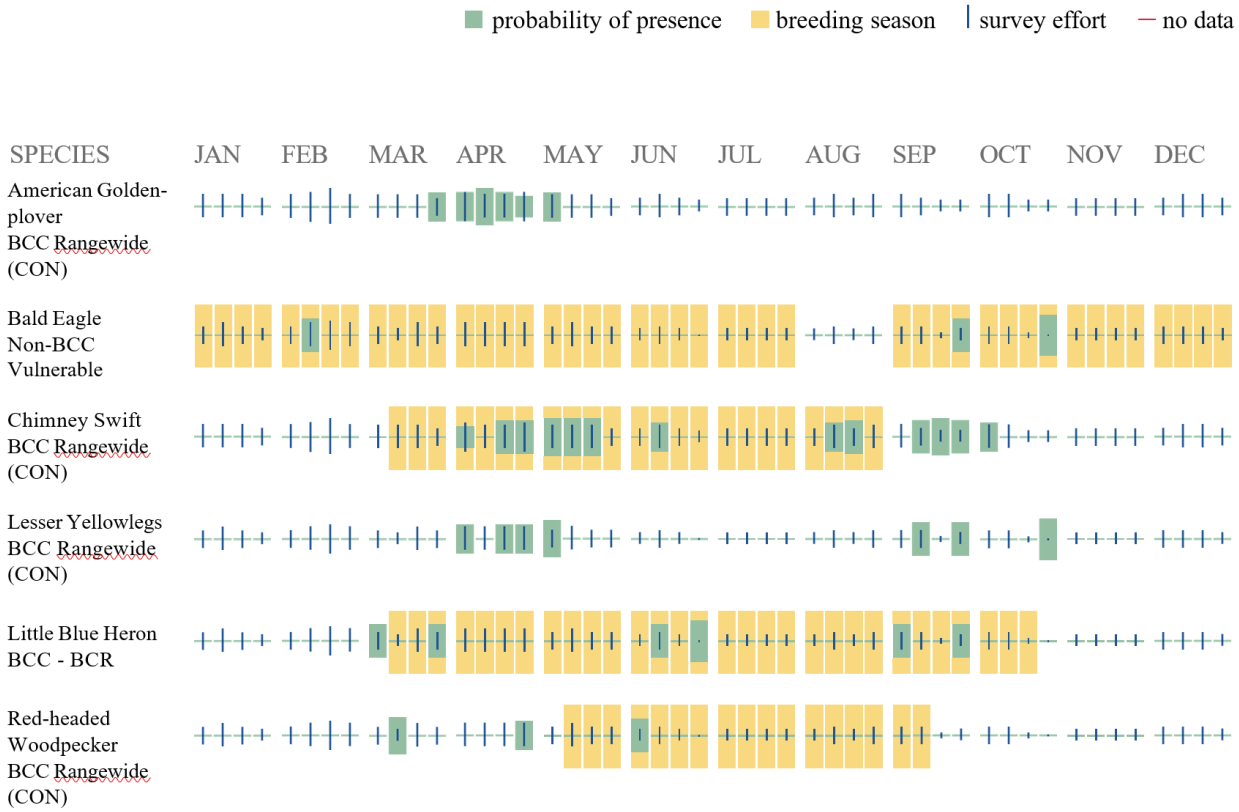
Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds

- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look

at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be

aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

FRESHWATER EMERGENT WETLAND

- Palustrine

LAKE

- Lacustrine

RIVERINE

- Riverine

IPaC User Contact Information

Agency: Federal Aviation Administration
Name: Sarah Brammell
Address: 19607 Lake Osceola Ln
City: Odessa
State: FL
Zip: 33556
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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Arlington Ecological Services Field Office
2005 Ne Green Oaks Blvd
Suite 140
Arlington, TX 76006-6247
Phone: (817) 277-1100 Fax: (817) 277-1129
Email Address: arles@fws.gov

In Reply Refer To: November 20, 2022
Project Code: 2023-0017514
Project Name: Causey Aviation Unmanned, Inc. Drone Package Delivery Operations in Rowlett TX

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed, and candidate species, as well as proposed and final designated critical habitat, which may occur within the boundary of your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under section 7(a)(1) of the Act, Federal agencies are directed to utilize their authorities to carry out programs for the conservation of threatened and endangered species. Under and 7(a)(2) and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to determine whether their actions may affect threatened and endangered species and/or designated critical habitat. A Federal action is an activity or program authorized, funded, or carried out, in whole or in part, by a Federal agency (50 CFR 402.02).

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For Federal actions other than major construction activities, the Service suggests that a biological evaluation (similar to a Biological Assessment) be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

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New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.), and projects affecting these species may require development of an eagle conservation plan (https://www.fws.gov/library/collections/bald-and-golden-eagle-management). Additionally, wind energy projects should follow the wind energy guidelines (https://www.fws.gov/media/land-based-wind-energy-guidelines) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: https://www.fws.gov/media/recommended-best-practices-communication-tower-design-siting-construction-operation. The Federal Aviation Administration (FAA) released specifications for and made mandatory flashing L-810 lights on new towers 150-350 feet AGL, and the elimination of L-810 steady-burning side lights on towers above 350 feet AGL. While the FAA made these changes to reduce the number of migratory bird collisions (by as much as 70%), extinguishing steady-burning side lights also reduces maintenance costs to tower owners. For additional information concerning migratory birds and eagle conservation plans, please contact the Service's Migratory Bird Office at 505-248-7882.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Arlington Ecological Services Field Office
2005 Ne Green Oaks Blvd
Suite 140
Arlington, TX 76006-6247
(817) 277-1100

Project Summary

Project Code: 2023-0017514

Project Name: Causey Aviation Unmanned, Inc. Drone Package Delivery Operations in Rowlett TX

Project Type: Drones - Use/Operation of Unmanned Aerial Systems

Project Description: Causey Aviation Unmanned, Inc. (Causey) seeks to amend its air carrier Operations Specifications (OpSpecs) and other Federal Aviation Administration (FAA) approvals necessary to begin unmanned aircraft (UA) commercial package delivery operations in Rowlett, Texas using the Flytrex FTX-M600P UA. The UA is a multi-rotor design featuring six propellers mounted on equally spaced arms extending horizontally from a center frame. The system's computers and package containers are located on the underside of the airframe. The maximum allowable takeoff weight of the UA is 33.4 pounds and the maximum allowable package weight is 6.6 pounds.

Causey will operate from a distribution centers (DC) in Rowlett, Texas, that serves as a central hub of operations. Causey proposes to conduct consumer package deliveries to vetted delivery locations such as residential properties and healthcare facilities within 2 NM from the DC. The operating area is approximately 16.6 square miles. The proposed commercial delivery operations would occur between 8:00 a.m. and 10:00 p.m. up to seven days per week.

Packages are loaded into the UA at the DC. The UA is then launched to perform aerial deliveries. With a multi-rotor design, the UA can take off and descend vertically, as well as hover. Normal cruising airspeeds are expected to be approximately 29 knots. Typical flights begin with the UA departing from a DC and ascending vertically to 230 feet above ground level (AGL). The UA then flies a pre-determined route at 230 feet AGL to the delivery point. Upon arrival at the delivery point, the UA descends vertically to the delivery hover altitude of 82 feet AGL and waits for the customer to accept the package through a user interface application. If the delivery is not accepted within 15 seconds, the UA returns to the DC with the package. If the delivery is accepted, the UA lowers the package to the ground using a tethered mechanism and then returns to the DC. Upon arrival at the DC, the UA descends vertically from 230 feet AGL to the ground for landing.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@32.906719949999996,-96.56662001268086,14z

Counties: Dallas County, Texas

Endangered Species Act Species

There is a total of 7 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 2 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

Birds

NAME	STATUS
Golden-cheeked Warbler *Setophaga chrysoparia* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/33	Endangered
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location does not overlap the critical habitat. This species only needs to be considered under the following conditions: ▪ Wind Energy Projects Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* There is **proposed** critical habitat for this species. This species only needs to be considered under the following conditions: ▪ Wind Energy Projects Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Whooping Crane *Grus americana* Population: Wherever found, except where listed as an experimental population There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/758	Endangered

Clams

NAME	STATUS
Texas Fawnsfoot *Truncilla macrodon* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8965	Proposed Threatened

Insects

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
American Golden-plover *Pluvialis dominica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Sep 1 to Jul 31
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 15 to Aug 25

NAME	BREEDING SEASON
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Little Blue Heron *Egretta caerulea* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds Mar 10 to Oct 15
Long-billed Curlew *Numenius americanus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/5511	Breeds elsewhere
Prothonotary Warbler *Protonotaria citrea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 1 to Jul 31
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence

in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

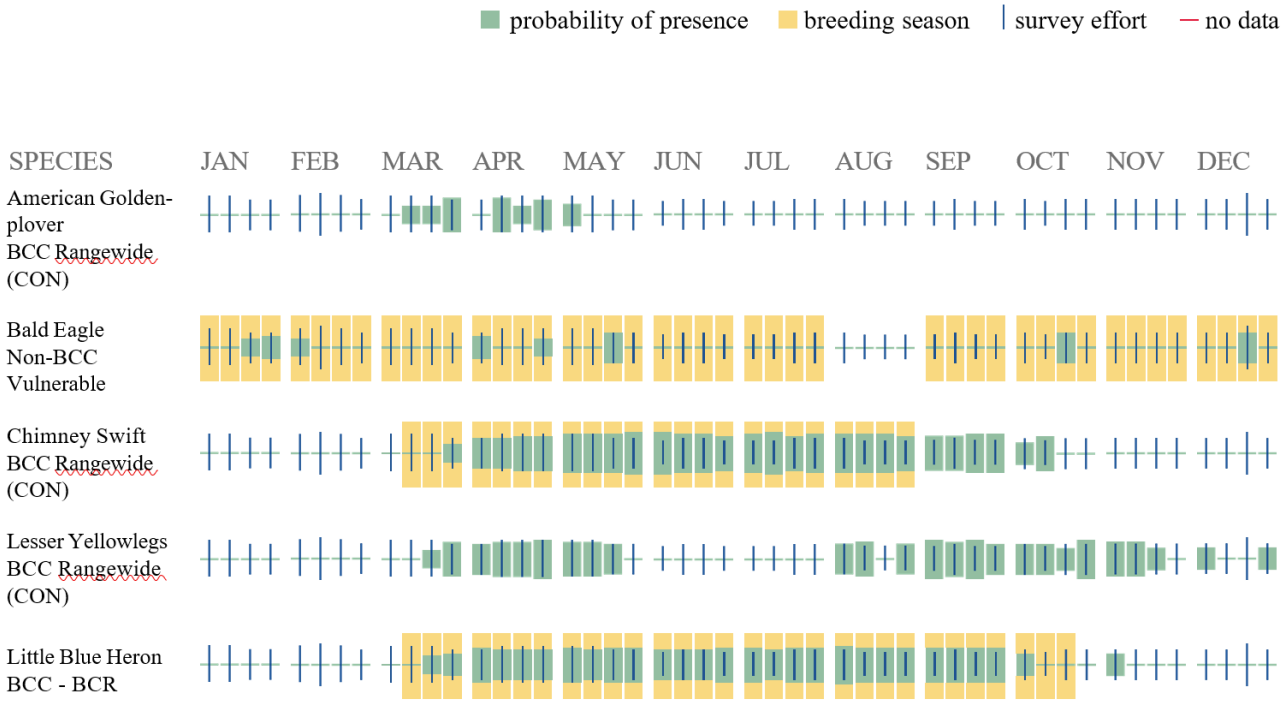
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

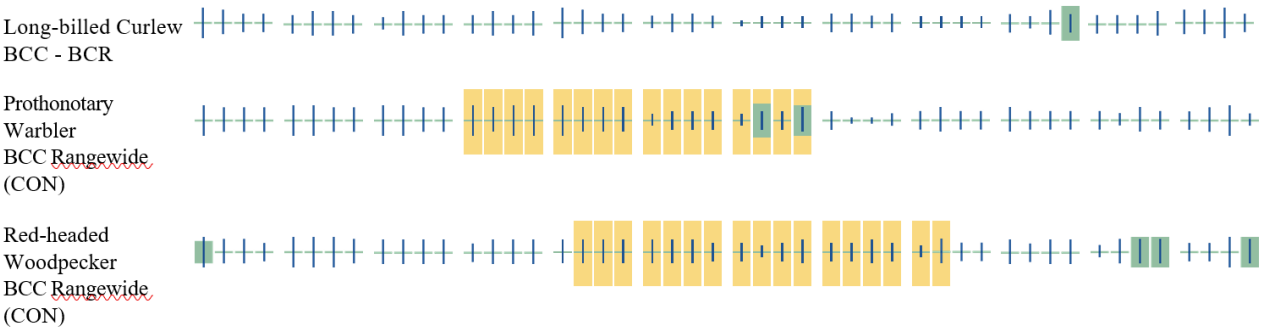
Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.





Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?
The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides

birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

LAKE

- Lacustrine

FRESHWATER POND

- Palustrine

RIVERINE

- Riverine

IPaC User Contact Information

Agency: Federal Aviation Administration
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ATTACHMENT B
Noise Analysis Report

Noise Assessment for Causey Proposed Package Delivery Operations with Flytrex FTX-M600P Unmanned Aircraft

In support of U.S. Code of Federal Regulations Title 14, Part 135

Final

HMMH Report No. 309990.003-5

February 28, 2022

Prepared for:

JD RoVolus, LLC
121 Pearl Street
Ypsilanti, MI 48197

Federal Aviation Administration
Aviation Safety, Flight Standards Service
Office of Environment and Energy
Policy, Engineering, Analysis, and Research (PEARS II)
693KA9-18-D-00005

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Contents

Figures

Tables

1 Introduction and Background

This document presents the methodology and estimation of noise exposure related to proposed Unmanned Aircraft (UA) package delivery operations conducted by Causey Aviation Unmanned, Inc. ("Causey") as a commercial operator under the provisions of 14 CFR Part 135. Causey is proposing to perform package delivery operations at multiple potential locations in the continental United States utilizing an operational model that involves a central distribution center and supporting route network to transport small commercial goods to public delivery points and residential backyards.

The distribution center and delivery points are determined based on partnerships Causey has established with organizations providing products at the distribution center to various end customers, typically at residential locations. Flight paths to and from the distribution center and delivery points use a network of route plans, with a structure of common flight path segments near the distribution center and various branches to deliver to individual locations. Causey selects delivery points after potential customers are identified and their specific locations have been surveyed and satisfy various criteria.

Causey is proposing operations with unmanned aircraft model Flytrex FTX-M600P (referred to throughout as "the Flytrex FTX-M600P UA," or "UA"). The Flytrex FTX -M600P UA is a multi-rotor design featuring six propellers mounted on equally spaced arms extending horizontally from a center frame. The system's computers and package containers are located on the underside of the airframe. The maximum allowable takeoff weight of the UA is 33.4 pounds, and the maximum allowable package weight is 6.6 pounds.

Figure 1 depicts the UA considered in this report.

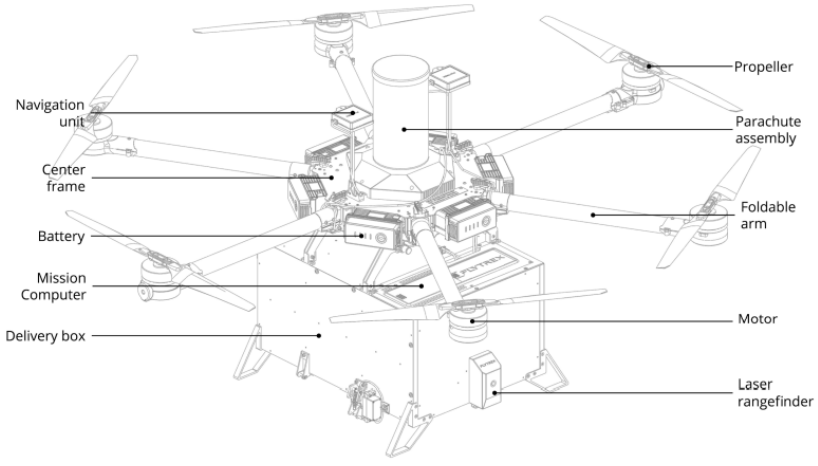

Figure 1: Flytrex FTX-M600P UA

Source: Causey, CONOPS July 19, 2021

The proposed delivery system will be implemented in suburban areas with distribution centers located at commercial or healthcare centers. At distribution centers, a remote pilot in command (RPIC) will load

the Flytrex FTX-M600P UA with the desired package and launch the UA to perform aerial deliveries. The UA will fly a predetermined flight path with supervision from the RPIC and per approved Federal Aviation Administration (FAA) operating authority until it reaches its desired delivery point. Once the UA arrives at the delivery point, it hovers above the ground and lowers the package to the ground on a cable.

With a multirotor design, the UA can take off and descend vertically as well as hover. Airspeeds during normal cruise are expected to be approximately 29 knots. Typical flights begin with the UA departing from a distribution center and ascending vertically to 230 feet Above Ground Level (AGL). The UA then flies a pre-assigned route at 230 feet AGL and 29 knots to a selected delivery point. Upon arrival at the delivery point, the UA descends vertically to the delivery hover altitude of 82 feet AGL and waits for the customer to accept package delivery through a user interface application (sometimes referred to as, an app). If the delivery is not accepted within 15 seconds, the UA will return to the distribution center with the package. If the delivery is accepted, the UA will lower the package to the ground using a tethered mechanism and subsequently return to the distribution center. When returning to the distribution center, the UA climbs vertically back to 230 feet AGL and follows a predefined route from the delivery point back to the distribution center. Upon arrival at the distribution center, the UA descends vertically from 230 feet AGL to the ground for landing.

The methodology proposed in this document provides quantitative guidance to FAA Environmental Specialists to inform environmental decision making on UA noise exposure from proposed Causey package delivery operations. The methods presented here are suitable for review of Federal actions under the requirements of the National Environmental Policy Act (NEPA) and other applicable environmental special purpose laws or other federal environmental review requirements at the discretion and approval of the FAA. In particular, this report is intended to function as a non-standard equivalent methodology under FAA Order 1050.1F, and as such, would require prior written approval from FAA's Office of Environment and Energy (AEE) for each individual project for which a NEPA determination is sought. [1]

The methodology has been developed with data provided by Causey and FAA to date and therefore is limited to Causey operations with the FTX-M600P UA and the flight phases and maneuvers described herein. The noise analysis methodology and estimated noise levels of the proposed activity levels are based upon noise measurement data provided by the FAA.[2] Results of the noise analysis are presented in terms of the Day-Night Average Sound Level (DNL) based on varying levels of operations for areas at ground level below each phase of the flight.[3]

Section 2 of this document describes the relevant noise and operations data made available by Causey and FAA. Section 3 describes the methodology to developing noise exposure estimates for the various UA flight phases associated with typical operations using available data. Section 4 presents the estimated DNL levels for various flight phases based on varying levels of typical operations as described by Causey to date.

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[1] Discussion of the use of "another equivalent methodology" is discussed in FAA Order 1050.1F, July 16, 2015, Appendix B, Section B-1.2, available online at https://www.faa.gov/documentlibrary/media/order/faa_order_1050_1f.pdf#page=113

[2] Hobbs, Chris, *Estimated Noise Levels for Flytrex FTXM600P UA* (Federal Aviation Administration, February 2, 2022)

[3] Discussion of modification of this process for use of the Community Noise Equivalent Level metric (CNEL) is discussed in Section 3.1.

2 Unmanned Aircraft Delivery Operations and Noise Measurement Data Set Descriptions

Two data sets form the basis of the noise assessment for the proposed Causey delivery operations. The data sets include the Causey Aviation Unmanned, Inc. Part 135 Concept of Operations (CONOPS) dated July 19, 2021 and the FAA's Memorandum, "Estimated Noise Levels for Flytrex MTXM600P UA," dated February 17, 2022, which is provided with this report as Attachment A.[4]

2.1 Operations, Flight Paths, and Flight Profile Data

Operations and flight profile data for the UA provided by Causey and FAA were reviewed to determine the characteristics of typical operations for a proposed operating area. Based on this review, the following subsections describe the assumptions made about the operations and flight profiles that were used to inform the development of the estimated noise exposure and the methodology for the noise analysis.

2.1.1 Operations

The methodology presented in this report can be used to assess UA noise over a range of proposed activity levels; however, FAA review and approval of its use at specified activity levels is required. The activity ranges shown below in Section 4 represent what FAA considers low to moderate activity levels and anticipates as being appropriate for consideration with this methodology. At higher activity levels, this methodology may not be sufficient to inform an environmental determination and further consideration or refinements at the discretion of the FAA may be needed.

Note that DNL noise levels presented in this report are all shown consistent with effective daytime (7 AM to 10 PM) operations levels. For consideration of nighttime (10 PM to 7 AM) noise levels, a ten times operational weighting (equivalent to DNL 10 dB increase) should be applied. Section 3.1 provides techniques to apply the operational weighting necessary to calculate effective operations for analysis with the DNL metric.

2.1.2 Flight Paths and Profiles

The UA will fly a network of defined flight paths between a central distribution center and delivery points that are developed as needed, based on demand. Each delivery point is selected based on customer demand after a suitability survey is completed specific to each candidate location.

Distribution centers may include one or multiple launch pads for both UA takeoffs and landings depending on the frequency of UA operations. Figure 2 presents an example distribution center area plan for supporting only one airborne UA at time. Such facilities have a single launch pad for takeoffs

[4] Most of these documents have various markings indicating that that the contents are "Confidential & Proprietary". Only elements required to support the noise analysis methodology have been disclosed in this report.

and landings. Figure 3 presents an example distribution center area plan supporting two or more simultaneous airborne UAs. This example includes one launch pad that may be used for takeoffs and landings and multiple alternate landing pads. In addition to launch and landing pads, distribution centers include facilities for the crew to monitor and control the UAs, lineup positions where the UA batteries are charged and preparations are made for the next delivery, and areas where packages are accepted and sorted before loading into an UA.

After takeoff from the distribution center, the UA flies a network of defined flight paths from the distribution center to the intended delivery points that are developed on an "as-needed basis." As routes are developed, the UA navigates the same defined paths for both the outbound (distribution center to delivery) and inbound (post-delivery to landing) legs. Figure 4 provides an overview of a representative sample route system, including the distribution center, routes, and delivery points.

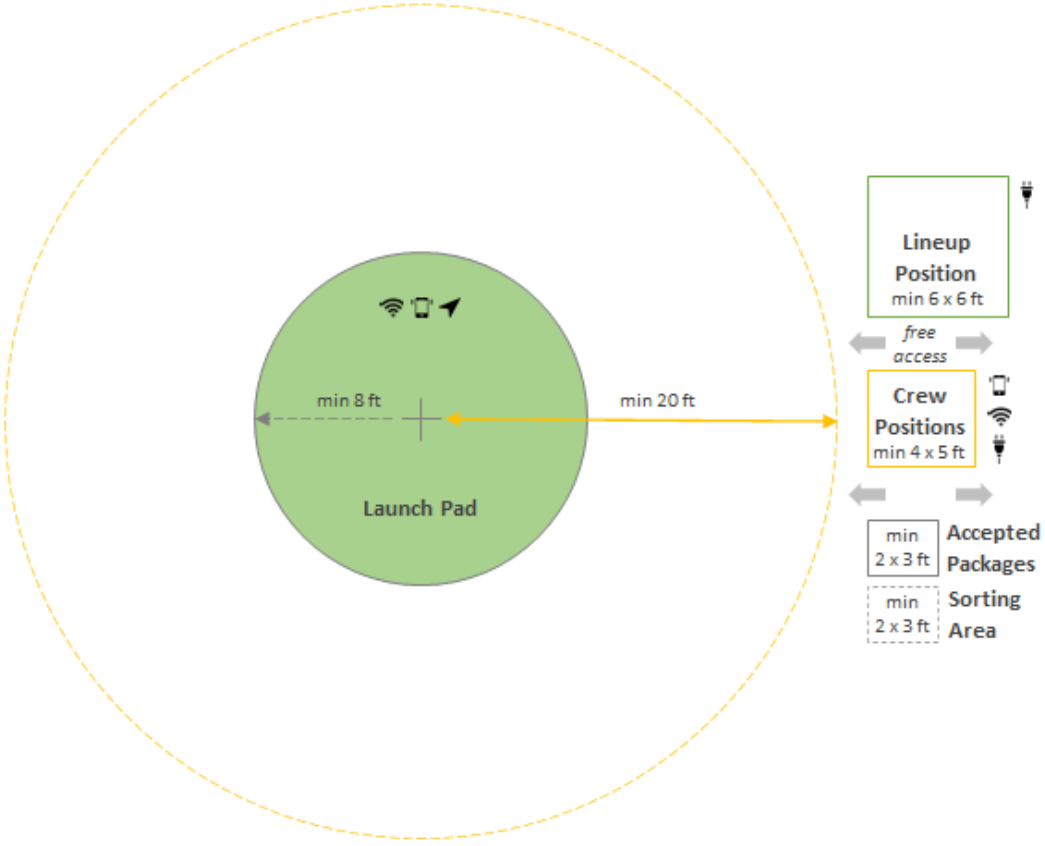

Figure 2: Distribution Center Area Plan for a Single Operating UA

Source: Causey, CONOPS July 19, 2021

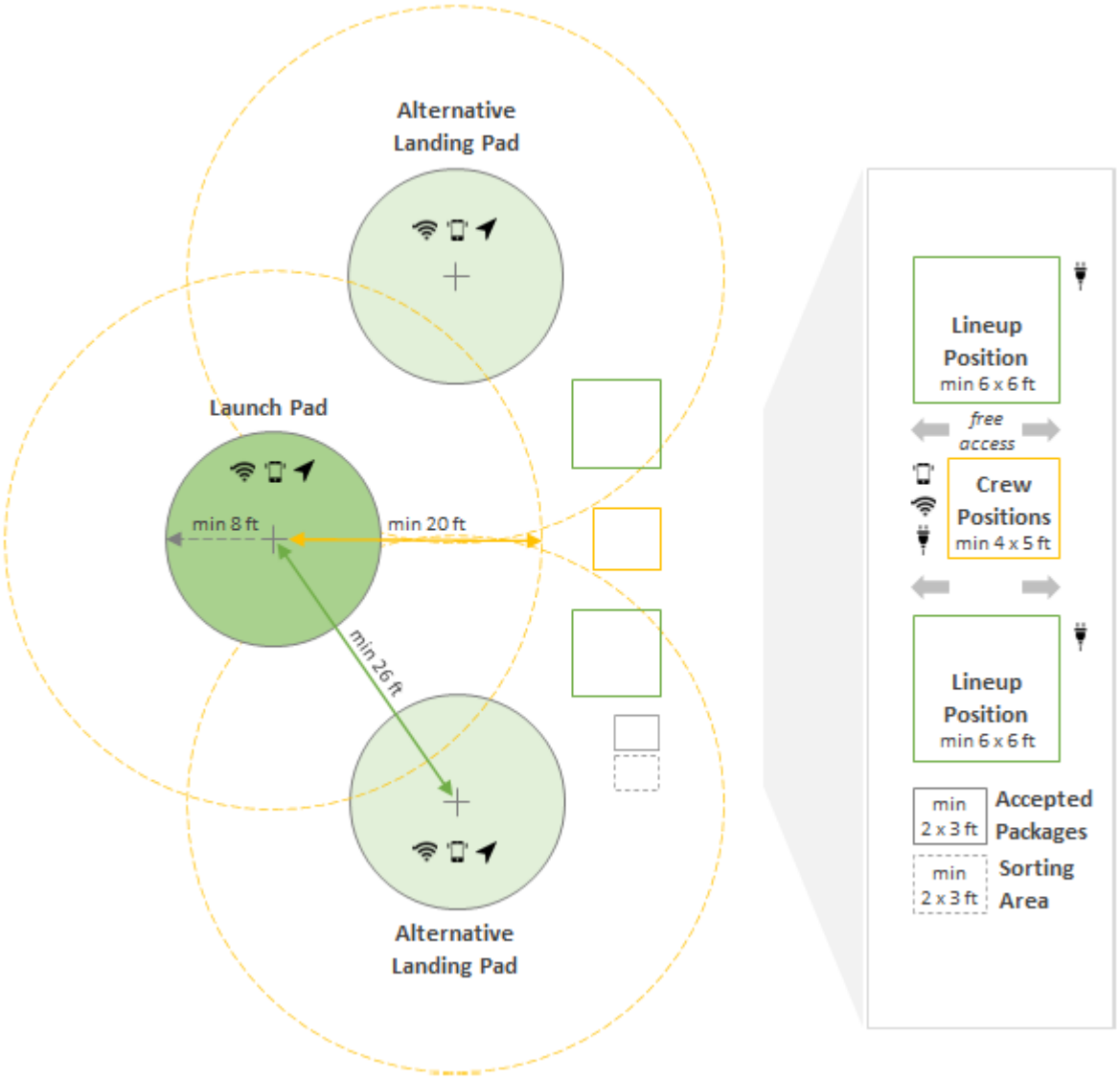

Figure 3: Distribution Center Area Plan with Two Simultaneous UAs Operating

Source: Causey, CONOPS July 19, 2021

Figure 3. Flight Network illustration. Flytrex GCS display, satellite view

Description of Points

Center — Represents the Distribution Center location on the map.

Waypoint — Represents location on the route which the sUA passes through and makes a turn.

Semaphore — Represents points where the sUA can safely hover at lower altitudes and perform emergency landing if needed, without posing a risk to people or property on the ground.

Delivery point — Represents a safe location where the sUA can lower packages to the ground for delivery and delivery requests can be made to this point.

Figure 4: Visualization of a Route System

Source: Causey, CONOPS July 19, 2021

Analysis of flight profile data provided by Causey and the FAA Office of Environment and Energy described that a typical operation profile of the UA can be broken into five discrete flight phases. Table 1 describes the typical flight profile that Causey is expected to use for delivery operations and provides detail of the five flight phases of takeoff and climb; en route outbound; delivery; en route inbound; and descent and landing. The sub sections that follow provide a narrative description of each of the flight phases.

Table 1. Flytrex FTX-M600P Typical Flight Profiles

Source: FAA February 17, 2022 (Attachment A)

Flight Phase (General)	Flight Segment (Detail)	Weight	Altitude at Segment Start (ft)	Altitude at Segment End (ft)	Ground Speed	Duration
Takeoff and Climb	Takeoff	Maximum	0	33	0	5 seconds
	Internal checks	Maximum	33	33	0	3 seconds
	Climb to cruise altitude	Maximum	33	230	0	15 seconds
En route outbound	Cruise to delivery point	Maximum	230	230	29.2 kts	1-5 minutes
Delivery	Descent for delivery	Maximum	230	82	0	22 seconds
	Open doors, Await Customer Response and lower package to ground	Maximum	82	82	0	35 seconds
	Maneuver to Unhook Package	Maximum	82	75	0	4 seconds
	Maneuver to Unhook Package	Empty	75	82		4 seconds
	Climb back to cruise altitude	Empty	82	230	0	13 seconds
En route inbound	Cruise back to distribution center	Empty	230	230	29.2 kts	1-5 minutes
Descent and Landing	Descent	Empty	230	33	0	20 seconds
	Landing	Empty	33	0	0	20 seconds

2.1.2.1 Takeoff and Climb

The Takeoff and Climb phase is defined as the portion of flight in which a fully loaded UA takes off from its launch pad at a distribution center and climbs vertically to 33 feet AGL. The UA is assumed to be carrying a package and at the maximum weight of 33.4 pounds. The UA then conducts various systems checks in a hover at 33 feet AGL over the course of three seconds. If the UA passes its systems checks, the UA then climbs vertically from 33 feet AGL to 230 feet AGL over five seconds.

2.1.2.2 En Route Outbound

The En route Outbound phase is defined as the part of flight in which the fully loaded UA transits from the distribution center to delivery points on a pre-defined network of flight paths. During this flight phase, the UA will typically operate at an altitude of 230 feet AGL and a typical airspeed of 29 knots.[5] However, the UA may operate within a corridor with altitudes as low as 171 feet AGL or as high as 289 feet AGL as needed due to obstructions and operational conditions.[6]

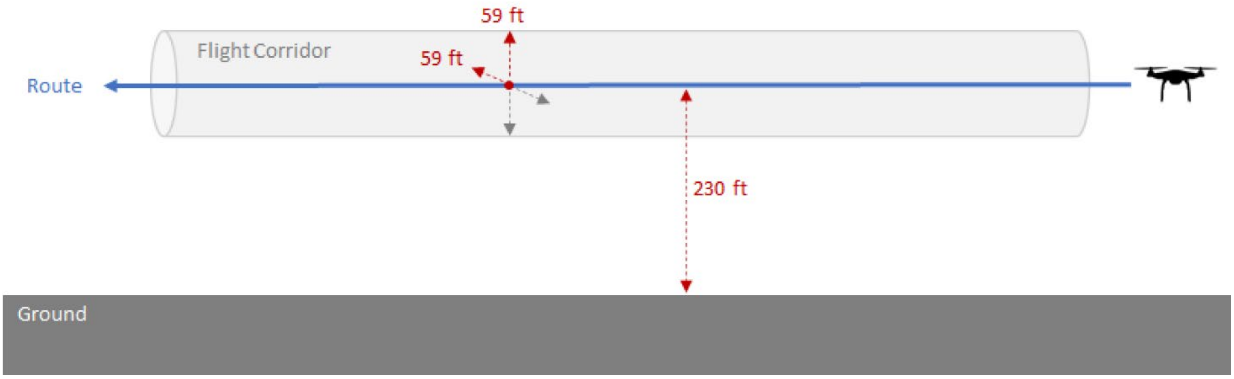

Figure 5: Flight Corridor

Source: Causey, CONOPS July 19, 2021

2.1.2.3 Delivery

The Delivery phase of flight is defined by descent from the En Route Outbound phase to a delivery point to deliver a package. This phase is assumed to start at maximum weight. The delivery point is a minimum 10 by 10-foot square area open to the sky, clear of obstacles, that is coordinated with the property owner and validated by Causey.[7]

During the delivery phase, the aircraft descends vertically from the en route altitude to 82 feet AGL. The UA then hovers at 82 feet AGL and waits for up to 15 seconds for confirmation of the delivery from the recipient. Once the recipient has communicated approval of the delivery, the UA continues to hover while it lowers the package to the ground by a tether (wire). Once the package is on the ground, the UA releases the package using the following maneuver, which takes approximately eight seconds. The UA descends vertically to 75 feet AGL, unhooks the tether from the package, returns to 82 feet AGL, and retracts the tether back into the UA. The UA then climbs at empty weight of 28.6 pounds vertically back to en route altitude at 230 feet AGL. The entire process starting with descent from en route altitude, package release, and returning to en route altitude, takes less than a minute and a half.

[5] Causey materials specify the speed as “33.6 mph (15m/s)" Speed in this memorandum is converted to knots.

[6] Causey, CONOPS July 19, 2021, pg. 15

[7] Causey, CONOPS July 19, 2021, pg. 21

2.1.2.4 En Route Inbound

Upon completion of a delivery, the UA will fly the en route inbound phase (or "return") via the reverse of the respective en route outbound profile (Section 2.1.2.2) from the delivery point back to the distribution center. The UA is assumed to be carrying no packages, and at empty weight, after delivery.

2.1.2.5 Descent and Landing

Upon reaching the distribution center, the UA will commence a vertical descent from 230 feet to 33 feet AGL over 20 seconds. The UA then descends vertically the remaining 33 feet to ground level over 20 seconds. Once on the ground, the UA stops its rotors and is retrieved by the ground crew.

2.2 Acoustical Data

Noise estimates for the UA were provided by the FAA Office of Environment and Energy representative of each phase of flight (takeoff and climb, en route, delivery, and descent and landing) as described in Section 2.1.2. The UA noise measurements were performed at a Causey facility near Liberty, North Carolina in July 2021. FAA analyzed the measurement data and summarized the acoustical data used in this report and included in Attachment A.

The following tables show the Sound Exposure Levels (SELs) used for this analysis as detailed in Attachment A, which can be matched to each flight phase detailed in Table 1.

Table 2 provides the estimated SEL for takeoff and climb associated with the flight phase described in Section 2.1.2.1. SEL in this table represents the aircraft starting from rest at the distribution center on the ground to climbing vertically to en route altitude. It does not include any horizontal/lateral flight.

Table 2. Estimate of SEL for Takeoff and Climb at Maximum Weight

Source: FAA February 17, 2022 (Attachment A)

Distance between Launch Pad and Receiver (ft) [a]	SEL (dB)
50	75.0
100	71.9
150	69.7
200	67.9
250	66.4
300	65.1
350	63.9
400	62.9
450	62.0
500	61.1

Note:
a) Distance is along ground from landing point (launch pad) to receiver.

Table 3 presents the en route sound exposure levels for maximum weight and empty weight. The maximum weight SELs are applicable for the UA carrying a package while flying outbound to a delivery point while the empty weight SEL is applicable for the UA flying inbound to the distribution center after the UA completes a delivery and/or is not carrying cargo, respectively. The estimates are based on measurements of the UA passing 216 feet above the microphone. FAA recommends that while the parameters for en route operation of the UA are typically at a speed of 29 knots and altitude of 230 feet AGL, the estimates derived from measurements at 216 feet AGL suggest that they should be used as is for the basis of any calculations.

Table 3. Estimates of En Route SEL

Source: FAA February 17, 2022 (Attachment A)

Configuration [a]	Applicable Flight Phase	Distance between Source and Microphone (ft)	SEL (dB)
Maximum	En route outbound	216	66.4
Empty	En route inbound	216	62.8
Note: a) Level flight at 29 knots			

Table 4 presents the SEL of the delivery profile discussed in Section 2.1.2.3. The SELs presented in the table are relative to the delivery point and can be applied radially/as a circle with the delivery point in the center. The values in Table 4 do not include the UA transiting to or from the delivery point at en route altitude.

Table 4. Estimate of SEL for Delivery Profile

Source: FAA February 17, 2022 (Attachment A)

Sideline Distance between Delivery Point and Receiver (ft)[a]	SEL [b] (dB)
0	81.0
50	79.7
100	77.3
150	75.1
200	73.3
250	71.7
300	70.3
350	69.1
400	68.1
450	67.1
500	66.2

Notes:
a) Distance is along ground from delivery point to receiver.
The distance of 0 feet represents a receiver directly underneath the UA.
b) Delivery profile as described in Table 1 Flight phases "Delivery – Maximum Weight" and "Delivery – Empty Weight", starting directly over delivery point at an altitude of 230 feet AGL, and remaining over the delivery point through descent, unhooking of the package, and climb back to an altitude of 230 feet AGL.

Table 5 presents the SEL associated with the descent from en route altitude to landing at the distribution center on the ground, as discussed in Section 2.1.2.5.

Table 5. Estimate of SEL for Descent and Landing at Empty Weight

Source: FAA February 17, 2022 (Attachment A)

Distance between Launch Pad and Receiver (ft) [a]	SEL (dB)
50	79.2
100	74.4
150	71.4
200	69.2
250	67.5
300	66.1
350	64.8
400	63.8
450	62.8
500	61.9

Note:
a) Distance is along ground from landing point (launch pad) to receiver.

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3 Methodology for Data Analysis

The previously described data sets were used to develop a method to estimate community noise exposure that could result from Causey delivery operations. These would be operations originating at a single distribution center within a proposed single area of operations, with each distribution center operating up to seven days a week with varying levels of daily and equivalent annual delivery operations. There are currently no standardized tools or processes in place to conduct a noise assessment for the proposed operational scenario and UA. HMMH, with detailed technical guidance from the FAA Office of Environment and Energy, developed a customized noise exposure prediction process based on the available data to conduct this analysis. The process was developed around FAA's understanding of typical use of the UA by Causey. The following subsections describe that noise analysis methodology.

3.1 Application of Operations

The DNL metric applies a 10 dB weighting for operations between 10 PM and 7 AM. The 10 dB weighing is mathematically equivalent to 10 times the number of operations. Therefore, the operations near point i can be weighted to develop a daytime equivalent number of operations ($N_{equiv,i}$). The generalized form is expressed in Equation (1).[8]

$$N_{Equiv,i} = W_{Day} \times N_{Day,i} + W_{Eve} \times N_{Eve,i} + W_{Night} \times N_{Night,i} \quad (1)$$

Where:

- $N_{Day,i}$ is the number of user-specified operations between 7 AM and 7 PM local time
- $N_{Eve,i}$ is the number of user-specified operations between 7 PM and 10 PM local time
- $N_{Night,i}$ is the number of user-specified operations between 10 PM and 7 AM local time
- W_{Day} is the day-time weighting factor, which is 1 operation for DNL
- W_{Eve} is the evening weighting factor, which is 1 operation for DNL
- W_{Night} is the night-time weighting factor, which is 10 operations for DNL

For the DNL metric, the number of DNL daytime equivalent operations, $N_{DNL,i}$ simplifies to

$$N_{DNL,i} = N_{Day,i} + N_{Eve,i} + 10 \times N_{Night,i} \quad (2)$$

In practice, Equation (2) can be further simplified by defining the user-defined operations between 7 AM and 10 PM as a single value, rather than tracking $N_{Day,i}$ and $N_{Eve,i}$ separately.

For the Community Noise Equivalent Level (CNEL) metric, which may be used in California, the number of CNEL daytime equivalent operations, $N_{CNEL,i}$ simplifies to:

[8] Equation (1) includes the three time periods of day, evening, night for consistency with other FAA documents that discuss the development of time averaging metrics such as DNL from individual SELs. Presentation of Equation (1) also allows the practitioner to modify this process for the CNEL metric for use in California.

$$N_{CNEL,i} = N_{Day,i} + 3 \times N_{Evening,i} + 10 \times N_{Night,i} \quad (3)$$

3.2 Distribution Center Infrastructure

As noted in Section 1 and Section 2.1.2, Causey operates UAs from a central distribution center. If the distribution center operates one UA, then it needs a single launch pad and landing pad. This launch pad must be at least sixteen feet wide with a protective radius of at least 20 feet around it. If the distribution center operates multiple UAs simultaneously, then it may need one launch pad and two landing pads. All three pads must be at least sixteen feet wide, with safety radii of at least forty feet between landing pads. The launch pad has a safety radius of twenty feet around it. The launch pad and alternate landing pads may be 10 feet apart from one another. The distribution center include facilities to recharge, pack, monitor, and prepare the UAs. For the purpose of this noise analysis methodology, the distribution center extents depicted in Figure 2 and Figure 3 refer to the portion of the property in which the launch and landing pads could be positioned depending on the frequency of UA operations, as appropriate. The distribution center extents for the noise analysis shall be a rectangle, circle, or other polygon that includes all the possible locations for the launch and landing pads.

3.3 Application of Acoustical Data

The Day-Night Average Sound Levels (DNLs) can be estimated with a summation of the SELs. SEL values for the UA and Causey operations covered in this report are detailed in the FAA's February 17, 2022 Memorandum and provided with this report as Attachment A.

For the purpose of calculating SEL, four specific activities are considered:

- The UA taking off from the distribution center;
- En route travel of the UA between the distribution center, the delivery point, and return;
- Delivery maneuvers of the UA at the delivery point; and
- Landing related activities of the UA at the distribution center.

3.3.1 General Assumptions

This analysis is based on the tables presented in Section 2.2. Table 2, Table 4, and Table 5 present noise exposure values at discrete distances in 50 foot increments relative to the UA's vertical profile from 0 to 500 feet for delivery, and 50 to 500 feet for takeoff and landing, respectively. If additional values between 0 to 500 feet are needed for delivery, or 50 to 500 feet for takeoff or landing, then SEL values at intermediary distances can be approximated by linear interpolation. In most cases, this should yield slightly conservative (higher) values compared to revisiting the FAA's detailed process. SEL values at distances less than 50 feet for takeoff or landing should not be extrapolated from the tables because the deviation of the method of estimation from the linearly extrapolated value increases closer to the source.

3.3.2 Takeoff and Climb

The available sound exposure levels for takeoff and climb are presented in Section 2.2 and specifically in Table 2, for the takeoff and climb profile described in Section 2.1.2.1. It should be noted that the SEL values provided only include climb to altitude and do not include horizontal flight that would occur after climb. As noted in Section 3.3.1, the values in Table 2 should only be used for distances between the launch pad at a distribution center and the receiver for distances of 50 feet to 500 feet.

Application of the SEL should be based on the position of the launch pad at a distribution center. If the exact location of the launch pad is not known, then using an outer boundary of the distribution center would be slightly conservative.

3.3.3 En Route

Flight of the aircraft in still air is anticipated to be typically 29 knots, with a typical altitude of 230 feet AGL. However, the CONOPs indicates that the aircraft could be +/- 59 feet relative to the typical 230 feet AGL. Sound exposure level for a given point i (SEL_i) with the aircraft flying directly overhead at altitude (Alt_i) in feet and a ground speed (V_i) in knots, will be calculated based on the guidance in *14 CFR Part 36 Appendix J, Section J36.205 Detailed Data Correction Procedures*.[9] It should be noted that the equations presented in this Section are only applicable for an aircraft that is moving relative to a stationary receptor.

In particular, the sound exposure level adjustment for the altitude defined in 14 CFR Part 36 for a moving aircraft, is presented here as Equation (4).

$$\Delta J_1 = 12.5 \times log_{10}\left(\frac{H_A}{H_T}\right), dB \quad (4)$$

where ΔJ_1 is the quantity in decibels that must be algebraically added to the measured SEL to adjust for a level flight path at an altitude differing from the measured altitude; H_A is the height, in feet, of the vehicle when directly over the noise measurement point; H_T is the height of the vehicle during the measurement (or reference height), and the constant (12.5) accounts for the effects on spherical spreading and duration from the off-reference altitude.

The sound exposure level adjustment for speed, as defined in 14 CFR Part 36, is presented here as Equation (5).

$$\Delta J_3 = 10 \times log_{10}\left(\frac{V_{RA}}{V_R}\right), dB \quad (5)$$

Where ΔJ_3 is the quantity in decibels that must be algebraically added to the measured SEL noise level to correct for the influence of the adjustment of the reference speed on the duration of the measured flyover event as perceived at the noise measurement station, V_R is the reference speed, and V_{RA} is the adjusted speed.

To estimate the SEL of the UA flying en route the measured SEL made during delivery will be used. As shown in Table 3, the SEL is 66.4 dB when the vehicle is at maximum weight, at 216 feet from the sound

[9] 14 CFR Part 36 Noise Standards: Aircraft Type And Airworthiness Certification available at https://www.ecfr.gov/current/title-14/chapter-I/subchapter-C/part-36

receiver and traveling at approximately 29 knots; therefore, adapting that to the maximum weight (outbound) en route condition when the UA is flying at an altitude of Alt_i feet AGL and ground speed of V_i knots can be made using Equation (6) to arrive at an estimate $SEL_{maximum\ weight}$ dB for that respective phase of flight.

$$SEL_{maximum\ weight} = 66.4 + 12.5 \times log_{10}\left(\frac{216}{Alt_i}\right) + 10 \times log_{10}\left(\frac{29}{V_i}\right), dB \quad (6)$$

The SEL for en route conditions inbound at empty weight can also be calculated using the values in Table 3. Equation (7) presents the calculation for en route conditions at empty weight.

$$SEL_{empty\ weight} = 62.8 + 12.5 \times log_{10}\left(\frac{216}{Alt_i}\right) + 10 \times log_{10}\left(\frac{29}{V_i}\right), dB \quad (7)$$

3.3.4 Delivery

The available SELs for delivery are presented in Section 2.2 and specifically in Table 4, for the delivery profile described in Section 2.1.2.3. It should be noted that the SEL values provided only include descent from en route to delivery altitude, various maneuvers associated with the delivery, and climb back to en route altitude. The SEL values do not include the noise contribution from the horizontal en route portion of the flight connecting the distribution center to the delivery point. As noted in Section 3.3.1, the values in Table 4 should only be used for distances between the launch pad and the receiver for distances between 0 to 500 feet.

3.3.5 Descent and Landing

The available SELs for descent and landing are presented in Section 2.2 and specifically in Table 5, for the descent and landing profile described in Section 2.1.2.5. It should be noted that the SEL values provided only include descent from en route altitude and do not include horizontal flight that would occur as the UA approached the landing at a distribution center. As noted in Section 3.3.1, the values in Table 5 should only be used for distances between the landing site at the distribution center and the receiver for distances of 50 feet to 500 feet.

Application of the SEL should be based on the position of the closest landing pad at the distribution center. If the exact location of the landing pads are not known, then using an outer boundary of the distribution center extents would be slightly conservative.

3.4 Proposed DNL Estimation Methodology

The number of operations overflying a particular receiver's location on the ground will vary based on the proposed operating area and demand. For a given receiver location *i*, and a single instance of sound source *A*, the SEL for that sound source SEL_{iA} is (energy) summed for the average annual daily number of DNL daytime equivalent operations ($N_{DNL,iA}$) to compute the DNL, or equivalently, by Equation (8).

$$DNL_{iA} = SEL_{iA} + 10 \times log_{10}(N_{DNL,iA}) - 49.4, (dB) \quad (8)$$

The above equation applies to an SEL value representing one noise source such as an UA takeoff or an UA landing. For cases where a particular receiver would be exposed to multiple sound sources (A through Z), the complete DNL at that point would be calculated with Equation (9).

$$DNL_i = 10 \times log_{10}\left(10^{\left(\frac{DNL_{iA}}{10}\right)} + 10^{\left(\frac{DNL_{iB}}{10}\right)} + \cdots + 10^{\left(\frac{DNL_{iZ}}{10}\right)}\right), (dB) \quad (9)$$

For each of the conditions presented below, results will be presented in tabular format with the estimated DNL.

3.4.1 DNL for Distribution Center

The takeoff and landing operations are anticipated to occur at the same location. Therefore, the results for both will be calculated for a single set of receptors. Operations will be assumed to be "head-to-head" in which case the takeoff and the landing flight paths will be the same.

Takeoff operations will be represented by two sound levels. First, aircraft will take off and climb to en route altitude with the relationship discussed in Section 3.3.2. Second, the UA will begin en route flight at maximum weight towards its first waypoint or semaphore[10] assuming that the UA will pass directly over the representative receiver using the relationship in Section 3.3.3.

Landing operations will be represented by two sound levels. First, the UA will fly to the distribution center from its last waypoint or semaphore at en route altitude and empty weight (Section 3.3.3). Second, the UA will descend from en route altitude to the ground and come to rest, which will be represented by the relationships defined in 3.3.5.

The four noise sources representing the complete takeoff and landing cycle associated with a single delivery departing and returning at the distribution center will be added together with Equation (9).

3.4.2 DNL for En Route

En route includes the UA flying to and from the distribution center to delivery points as discussed in Section 2.1.2.2 and 2.1.2.4 respectively. A representative receiver will be positioned directly under the flight path, and the DNL will be calculated based on the altitude and speed-adjusted delivery SEL calculated in Section 3.3.3. Operations will be based on representative numbers defined in relevant materials and generally assume that a receiver under the flight path will be overflown by the UA while it is traveling both outbound at maximum weight and inbound at empty weight for a single delivery. The en route outbound noise level and the en route inbound noise level will be added together with Equation (9).

3.4.3 DNL for Delivery Points

Delivery operations will be represented by a single sound level consisting of the UA starting at en route altitude, descending vertically over the delivery point at maximum weight and performing the delivery

[10] As presented in Figure 4, a semaphore is defined as a point where the UA can safely hover at lower altitudes and perform an emergency landing on an as needed basis without posing risks to people or property on the ground. A waypoint is defined as a location along a route from which the UA will pass and make a turn.

profile over the delivery point, and then ascending vertically over the delivery point at empty weight and returning to en route altitude (Section 3.3.4).

Use of the DNL Delivery, by itself, does not include the horizontal flight as the UA approaches the delivery point with the package or the horizontal flight as the UA leaves the delivery point after releasing the package. The FAA's envisioned use of this report is that the user will add the DNL Delivery to the appropriate en route DNL values with Equation (9). To assist simple conservative analyses, the results of DNL Delivery will also be presented with conservative en route approach and departure from the delivery point.

4 Noise Exposure Estimate Results

This section presents the estimated noise exposure for Causey's proposed operations for a given set of average annual day (AAD) deliveries. The values presented are in tabular format and use of the table requires estimating the number of DNL Equivalent deliveries associated with the distribution center. One delivery includes the outbound takeoff and inbound landing and is representative of two operations. The DNL Equivalent deliveries, $N_{DNL,i}$ as described in 3.1, is presented below as Equation (10).

$$Deliveries_{DNL,i} = Deliveries_{Day} + 10 \times Deliveries_{Night} \quad (10)$$

$Deliveries_{Day}$ are between 7 AM and 10 PM and $Deliveries_{Night}$ are 10 PM and 7 AM.[11] If a portion of a delivery occurs in the nighttime hours (either takeoff or landing) then it should be counted within $Deliveries_{Night}$.

For estimating noise exposure, the noise levels for each flight phase should be considered separate based on the level of proposed operations for a given location. If a particular location is at the transition of different flight phases, the cumulative noise should then be determined by adding the noise from each phase. For example a typical mission profile will include noise from multiple flight phases:

1. UA departure from and return to a distribution center;
2. En route flight at a defined altitude to and from a distribution center to a delivery point; and
3. Descent from en route flight to complete a delivery at the delivery point and ascent back to en route altitude for return to the distribution center.

The cumulative noise from the UA is then determined by adding the noise from each of these phases.

4.1 Noise Exposure for Operations at the Distribution Center

For operations at the distribution center, the UA-related noises include the takeoff and landing. To provide a conservative view, all operations are assumed to be on the same flight path operating in opposite directions.

Table 6 presents data for a given number of daily average DNL Equivalent deliveries (including the takeoff and climb, en route outbound, en route inbound, and descent and landing as detailed in Section 2.1.2), the estimated extent of DNL 45 dB, 50 dB, 55 dB, 60 dB, and 65 dB contours under the flight path for a distribution center extents as described in Section 3.2. The analyses presented in Table 6 were rounded up conservatively to the nearest 50 ft intervals out to 500 feet using the data from Section 2.2. The actual noise levels, should they be calculated with greater precision or measured, are anticipated to be within the estimated extents depicted.[12]

[11] Discussion of modification of this process for use in California with the CNEL metric is discussed in Section 3.1.

[12] The calculation of the equations presented in Section 3 require that distance is provided. The DNL levels were calculated at 50-foot intervals from 50 to 500 ft as provided in Section 2.2. The interval of 50 feet was selected as it represented the smallest distance for which measurement data was available for the UA.

Table 6. Estimated Extent of Noise Exposure from Distribution Center per Number of Deliveries

Number of DNL Equivalent Deliveries Served by Distribution Center		Estimated Extents, feet, for				
Average Daily	Annual	DNL 45 dB	DNL 50 dB	DNL 55 dB	DNL 60 dB	DNL 65 dB
<= 1	<= 365	50	50	50	50	50
<= 5	<= 1,825	50	50	50	50	50
<= 10	<= 3,650	50	50	50	50	50
<= 15	<= 5,475	50	50	50	50	50
<= 20	<= 7,300	50	50	50	50	50
<= 40	<= 14,600	100	50	50	50	50
<= 60	<= 21,900	150	50	50	50	50
<= 80	<= 29,200	150	100	50	50	50
<= 100	<= 36,500	200	100	50	50	50
<= 120	<= 43,800	200	100	50	50	50
<= 140	<= 51,100	250	100	50	50	50
<= 160	<= 58,400	250	100	50	50	50
<= 180	<= 65,700	300	150	50	50	50
<= 200	<= 73,000	300	150	50	50	50
<= 220	<= 80,300	350	150	50	50	50
<= 240	<= 87,600	400	150	100	50	50
<= 260	<= 94,900	450	150	100	50	50
<= 280	<= 102,200	500	150	100	50	50
<= 300	<= 109,500	Note c	200	100	50	50
<= 340	<= 124,100	Note c	200	100	50	50
<= 360	<= 131,400	Note c	200	100	50	50
<= 380	<= 138,700	Note c	200	100	50	50
<= 400	<= 146,000	Note c	200	100	50	50
<= 420	<= 153,300	Note c	250	100	50	50
<= 440	<= 160,600	Note c	250	100	50	50
<= 460	<= 167,900	Note c	250	100	50	50
<= 480	<= 175,200	Note c	250	100	50	50
<= 500	<= 182,500	Note c	250	100	50	50

Notes:
a) One delivery includes the outbound takeoff and inbound landing and is representative of two operations.
b) If a value for deliveries is not specifically defined in this table, use the next highest value. For example, if there are 50 average daily DNL Equivalent deliveries, use the entry for 60 average daily DNL Equivalent deliveries.
c) The extents of the 45 dB DNL extents are more than 500 feet based on the level of operations specified as the aircraft continues along its flight path. En route results may be more applicable in these instances for determining noise levels.

4.2 Noise Exposure under En Route Paths

For en route conditions, the UA is expected to fly the same outbound flight path between the distribution center and the delivery point and inbound flight path back to the distribution center (Section 3.4.3). Therefore, each location under the en route path would be overflown twice for each delivery served by the respective overhead en route path.

Table 7 the estimated DNL for a location on the ground directly under an en route path for various counts of daily average DNL Equivalent deliveries. The en route noise calculated for each delivery includes both the inbound and outbound traversal of the en route path.

Table 7. Estimated DNL Directly Under En Route Flight Paths at Various Altitudes

Number of DNL Equivalent Deliveries Served by Route		Estimated DNL for		
Average Daily	Annual	Altitude 171 feet AGL	Altitude 216 feet AGL	Altitude 289 feet AGL
<= 1	<= 365	19.9	18.6	17.0
<= 5	<= 1,825	26.9	25.6	24.0
<= 10	<= 3,650	29.9	28.6	27.0
<= 15	<= 5,475	31.6	30.4	28.8
<= 20	<= 7,300	32.9	31.6	30.0
<= 40	<= 14,600	35.9	34.6	33.0
<= 60	<= 21,900	37.7	36.4	34.8
<= 80	<= 29,200	38.9	37.6	36.1
<= 100	<= 36,500	39.9	38.6	37.0
<= 120	<= 43,800	40.7	39.4	37.8
<= 140	<= 51,100	41.3	40.1	38.5
<= 160	<= 58,400	41.9	40.6	39.1
<= 180	<= 65,700	42.4	41.2	39.6
<= 200	<= 73,000	42.9	41.6	40.0
<= 220	<= 80,300	43.3	42.0	40.5
<= 240	<= 87,600	43.7	42.4	40.8
<= 260	<= 94,900	44.0	42.8	41.2
<= 280	<= 102,200	44.3	43.1	41.5
<= 300	<= 109,500	44.6	43.4	41.8
<= 340	<= 124,100	45.2	43.9	42.3
<= 360	<= 131,400	45.4	44.2	42.6
<= 380	<= 138,700	45.7	44.4	42.8
<= 400	<= 146,000	45.9	44.6	43.0
<= 420	<= 153,300	46.1	44.8	43.3
<= 440	<= 160,600	46.3	45.0	43.5
<= 460	<= 167,900	46.5	45.2	43.7
<= 480	<= 175,200	46.7	45.4	43.8
<= 500	<= 182,500	46.9	45.6	44.0

Notes:
a) One delivery includes an outbound operation and inbound operation along the same flight path, thus two overflights.
b) If a value for deliveries is not specifically defined in this table, use the next highest value. For example, if there are 50 average daily deliveries, use the entry for 60 average daily deliveries.
c) If a value for altitude is not specifically defined in this table, use the next lowest value. For example, if the UA is anticipated to operate at an altitude of 190 ft AGL use the entry for 171 ft AGL.

In some instances, the UA may overfly locations at operations levels that may differ from both an inbound and outbound traversal of the en route path by the UA as described above and presented in Table 7. For these circumstances, Table 8 presents the equations for calculating the estimated DNL for a receiver directly under a specified given number of DNL Equivalent average daily individual overflights, defined as N_o.

Table 8. Estimated DNL Directly Under Overflights, Maximum and Empty Weight

Altitude, speed and configuration of Overflight and of Delivery		SEL for 1 Overflight (dB)	DNL for 1 Overflight between 7 AM and 10 PM (dB)	DNL equation for the number of DNL Equivalent Overflights
Altitude	Weight			
171 feet AGL	Empty	64.1	14.7	$10 \times \log_{10}(N_o) + 14.7$
171 feet AGL	Maximum	67.7	18.3	$10 \times \log_{10}(N_o) + 18.3$
230 feet AGL	Empty	62.8	13.4	$10 \times \log_{10}(N_o) + 13.4$
230 feet AGL	Maximum	66.4	17.0	$10 \times \log_{10}(N_o) + 17.0$
289 feet AGL	Empty	61.2	11.9	$10 \times \log_{10}(N_o) + 11.9$
289 feet AGL	Maximum	64.8	15.5	$10 \times \log_{10}(N_o) + 15.5$

Notes:
a) The DNL value for a given number of average DNL Equivalent Operations, N_o, can be found by using the equations associated with operation of the UA at a specified altitude and speed interval. In this case, one operation represents a single overflight.
b) If a value for altitude or speed is not specifically defined in this table, use the next lowest value. For example, if the UA is anticipated to operate at an altitude of 190 ft AGL, use the entry for 171 ft AGL.

4.3 Noise Exposure for Operations at Delivery Point

Table 9 presents the estimated DNL values for a range of potential daily average DNL Equivalent delivery counts at a delivery point. Only the partial DNL values associated with the delivery vertical flight maneuvers are presented. Also included in Table 9 is the equation for calculating the estimated DNL for a specific number of daily average DNL Equivalent delivery counts at a delivery point, defined as N_d, for instances where the number of deliveries may fall between the range of presented delivery count intervals.

In anticipated use, the value from Table 9 would be added using Equation (9) to the appropriate values from Table 7 for an UA flying to and from the delivery point at en route altitude, along with any other nearby en route operations.

Table 9. Estimated DNL at Delivery Point for Vertical Maneuvers

Number of DNL Equivalent Deliveries		Partial Estimated Delivery DNL of Vertical Maneuvers
Average Daily	Annual	Estimated DNL (dB)
<= 1	<= 365	31.7
<= 5	<= 1,825	38.7
<= 10	<= 3,650	41.7
<= 15	<= 5,475	43.4
<= 20	<= 7,300	44.7
<= 40	<= 14,600	47.7
<= 60	<= 21,900	49.5
<= 80	<= 29,200	50.7
<= 100	<= 36,500	51.7
<= 120	<= 43,800	52.5
<= 140	<= 51,100	53.1
<= 160	<= 58,400	53.7
<= 180	<= 65,700	54.2
<= 200	<= 73,000	54.7
<= 220	<= 80,300	55.1
<= 240	<= 87,600	55.5
<= 260	<= 94,900	55.8
<= 280	<= 102,200	56.2
<= 300	<= 109,500	56.5
<= 340	<= 124,100	57.0
<= 360	<= 131,400	57.2
<= 380	<= 138,700	57.5
<= 400	<= 146,000	57.7
<= 420	<= 153,300	57.9
<= 440	<= 160,600	58.1
<= 460	<= 167,900	58.3
<= 480	<= 175,200	58.5
<= 500	<= 182,500	58.7
N_d	$N_d \, x \, 365$	$10 \times \log_{10}(N_d) + 31.7$

Notes:
a) The DNL values presented in this table only reflect the UA conducting vertical flight maneuvers associated with a delivery. DNL values associated with en route flight to and from a distribution center to a delivery point associated with a delivery, or nearby en route overflights, should be added to these values utilizing the DNL levels presented in Table 7.
b) If a value for deliveries is not specifically defined in this table, use the next highest value. For example, if there are 50 average daily DNL Equivalent deliveries, use the entry for 60 average daily DNL Equivalent deliveries.

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Attachment A

Federal Aviation Administration

Memorandum

Date: February 17, 2022

To: Donald Scata, Manager, Noise Division, Office of Environment and Energy (AEE-100)

From: Chris Hobbs, General Engineer, Noise Division, Office of Environment and Energy (AEE-100)

Subject: Estimated Noise Levels for Flytrex FTXM600P UA

This document presents an analysis of noise measurements of the Flytrex FTXM600P Unmanned Aircraft (UA) by the FAA's Office of Environment and Energy (AEE), recorded in July 2021 at Causey Airfield (Causey) near Liberty, North Carolina. The purpose of the analysis is to provide estimates of expected sound exposure levels resulting from typical operations of the FTXM600P UA[1] by Causey Aviation Unmanned and provides the methods used to create the noise estimates.

1. Flight Profile and Segment Noise

The phases of a typical flight profile from takeoff to landing with an included delivery are listed in Table 1 for the FTXM600P UA. Because the noise level of the UA for a given speed varies with weight, the aircraft configuration lists the vehicle weight for each phase of flight. The noise measurements at Causey were made with the UA at its maximum takeoff weight (33.4 lbs/15.1kg) and empty weight (26.8 lbs/12.2 kg). The measurements showed that noise from the vehicle was greatest at maximum takeoff weight for all phases of flight; thus, using the maximum weight for phases of flight where the UA is carrying a package is a conservative estimate of the vehicle noise for that phase of flight as compared to the UA carrying a lighter package.

[1] M. James et al., "Causey UAS Acoustic Measurement," Technical Report 21-05, Blue Ridge Research and Consulting, LLC, 23 September 2021.

Table 1. Phases of Flight for Typical Flight Profile of FTXM600P UA

Phase of Flight	Description	Configuration
Takeoff	Launch from ground to operational altitude (230 ft)	Max weight (carrying package for delivery)
En Route to Delivery	Flying at operational altitude and cruise speed (29 kts)	Max weight
Delivery	Vertical descent from operational altitude to delivery height; Delivery of package; Vertical ascent to operational altitude	Max weight on descent/empty weight on ascent
En Route from Delivery	Flying at operational altitude and cruise speed	Empty weight
Landing	Land by vertical descent from operational altitude	Empty weight

The method used to estimate the noise on the ground during each phase of flight is listed below followed by suggestions on how to combine them for a representative estimate of the entire flight. The methodology presented for estimating the noise for each flight phase was chosen based on a comparison of the calculated noise estimates by AEE against the measurement data for each flight phase and determined to be an appropriate and conservative estimate based on available data received by AEE to date for the of the FTXM600P UA. The information detailing the flight profile was provided to the FAA via letter exchanges[2].

1.1. Takeoff Noise

The profile of the FTXM600P UA climbing to an operational altitude of 230 ft above ground level is detailed in Table 2. Following is the method used to estimate the sound exposure level (L_{AE}) of this part of the flight profile.

Table 2. FTXM600P UA Takeoff Profile Details

Flight Segment	Altitude (ft AGL)	Ground Speed (kts)	Duration (s)
Takeoff	0 ascend to 33	0	5
Internal Checks	Hover at 33	0	3
Climb to Operational Altitude	33 ascend to 230	0	15

Measurements of the noise emissions of the FTXM600P UA were made when it was at maximum weight and hovering 50 feet AGL above the ring of ground microphones shown in Fig. 1. Each recording lasted for 30 seconds and began after the UA was in a steady condition.

[2]Causey Letter Exchange UA_P135_Environmental_Analysis_FAA_AEE_Operational_Data_Needs_Causey_20211130.pdf, 15 December 2021.

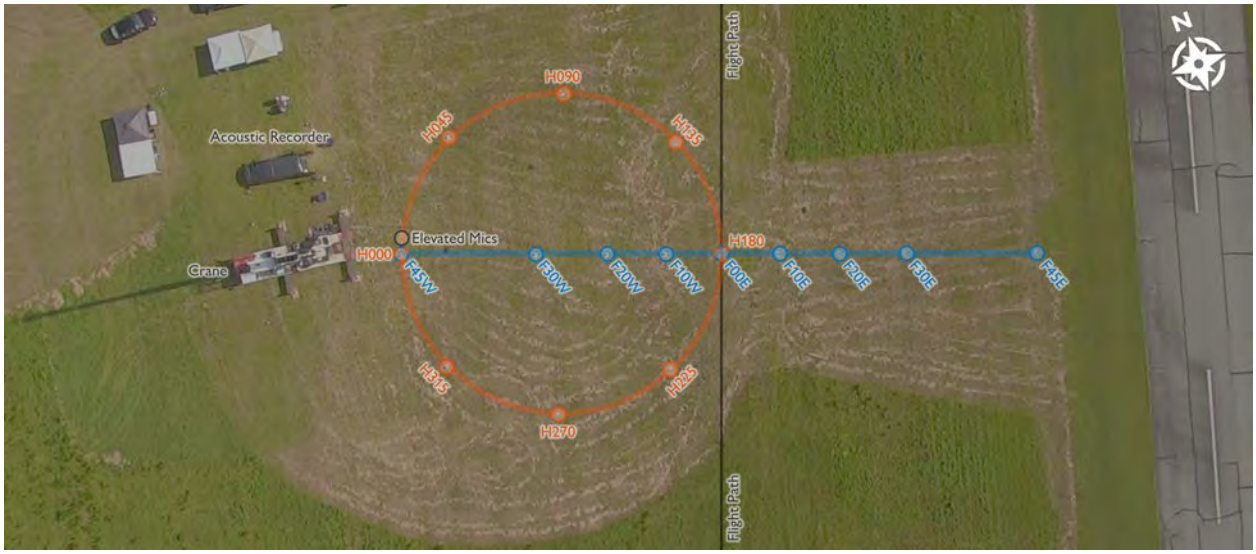

Figure 1. Microphone locations for hover measurements shown in orange when FTXM600P UA hovered above the origin.

The average sound pressure level was calculated at each of the microphones for five separate recordings. The average sound pressure level was normalized to a distance of 70.7 ft using spherical spreading from the actual distance from the FTXM600P UA to each microphone and corrected by 6 dB because all the microphones used were on ground boards. The results from one of the five recordings were discarded and the remaining four were averaged to generate the results as presented in Table 3. It is important to note that these measurements are all at the same relative angle from the bottom of the UA. It is expected that this is a conservative estimate of the noise due to the fact that broadband noise from the rotors is being captured; whereas, the noise emitted closer to the plane of the rotors would be dominated by blade passage frequency which is lower than the broadband frequency range and would consequently have a lower A-weighted sound level.

Table 3. Average Sound Pressure Level of FTXM600P UA while Hovering

Sound Pressure Level (dBA)	Distance (ft)	Aircraft Configuration
64.9	70.7	Maximum Weight
63.1	70.7	Empty Weight

In order to estimate the noise levels from the UA, the following assumptions have been made.

Sound transmission between the noise source and the receiver is solely a function of distance with no additional atmospheric attenuation or ground effects.

In this analysis, the levels in Table 3 represent reference sound pressure levels measured at reference distances for each weight configuration of the UA. Those reference levels will be adjusted for spherical spreading to develop the levels at other distances for each configuration of the aircraft. For a stationary point source, the spherical spreading relationship of the sound pressure level (L_i) at distance D_i from the reference sound pressure level (L_R) measured at a reference distance D_R is given by Eq. 1.

$$L_i = L_R + 20\log_{10}\left(\frac{D_R}{D_i}\right),\ dB$$

Sound transmits equally in all directions.

The levels in Table 3 are based on the measurement locations depicted in Figure 1 while the UA was hovering at approximately 50 ft AGL. The assumption that the UA is an omnidirectional sound source implies that the same sound levels would have been measured at any point on the surface of a sphere centered on the UA.

To estimate the sound exposure level of the takeoff segment of a flight, the takeoff path from ground to an operational height of 230 ft AGL is evenly divided into stations (blue ovals) as illustrated in Figure 2. The hover noise level noted in Table 3 is spherically spread from each station to a point on the ground a fixed distance from the takeoff point. Using the total takeoff duration of 23 seconds from Table 2, the sound exposure level is calculated assuming the UA spent equal amounts of time at each station. The brief hover time at 33 ft AGL is accounted for in this estimation as the first hover station is set to 33 ft AGL and the duration at each of the seven stations is approximately three seconds. Based on examination of the measured data during simulated takeoffs the duration of the climb from ground to operational height is best represented by a continuous climb with the duration of the entire climb divided into even intervals at each station.

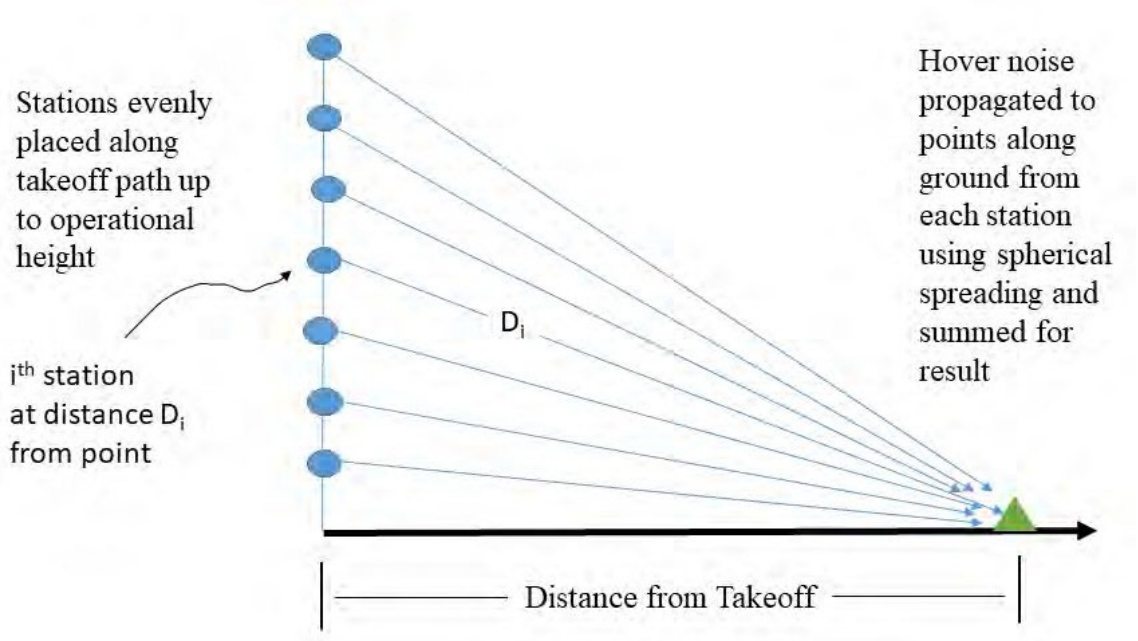

Figure 2. Graphical representation of how hover noise is used to simulate takeoff noise.

The sound exposure level ($L_{AEi}(r)$) as a function of distance from takeoff (r) from the UA at the i^{th} station shown in the figure is the product of the acoustic energy calculated from the Sound Pressure Level (L_i) spherically spread to a distance D_i using Equation 1 and the duration dt (~ 3 s) as given in the following equation:

$$L_{AEi}(r) = 10\log_{10}\left(10^{(.1L_i)}dt\right), dB \quad (2)$$

To calculate the sound exposure level for the entire takeoff at the distance from takeoff, r, one need only sum the levels calculated from each station according to Equation 3.

$$L_{AE}(r) = 10\log_{10}\left(\sum_{i}^{n} 10^{.1L_{AEi}(r)}\right), dB \quad (3)$$

Where n = number of stations used to simulate the takeoff.

The results of the computations using the 7 stations shown in Figure 2 are presented in Table 4.

Table 4. Estimate of Sound Exposure Level for Takeoff of FTXM600P UA at Maximum Weight

Distance from Takeoff (ft)	L_{AE} (dBA)
50	75.0
100	71.9
150	69.7
200	67.9
250	66.4
300	65.1
350	63.9
400	62.9
450	62.0
500	61.1

1.2. En Route Noise at Maximum and Empty Weights

The FTXM600P UA was measured flying at a cruise speed of 29 kts at an average altitude of 216 ft AGL both at max weight and empty weight over the array pictured in Figure 1. The average of the metrics measured for all the passes over the F00E microphone (undertrack) going both upwind and downwind are listed in Table 5. A 6 dB correction was made to the average because the microphone was on a ground board; thus, no attempt is being made to account for ground reflection at an observer's ear above the ground. While the parameters for en route operation of the FTXM600P UA are at a speed of 29 kts and altitude of 230 ft AGL, it is suggested that the measured metrics be used as is for the basis of any calculations.

Table 5. Estimates of En Route Noise of FTXM600P UA

Aircraft Configuration	Ground Speed (kts)	Altitude (ft AGL)	L_{AE} (dBA)
Max Weight	29	216	66.4
Empty Weight	29	216	62.8

1.3. Delivery Noise

The parameters for the delivery portion of a typical flight profile for the FTXM600P UA are included in Table 6. The ground speed is 0 kts for all flight segments. The noise for each segment listed in the table is modeled in similar fashion as the takeoff portion of the flight profile; each ascent and descent was divided into stations along the path; the hover portions of the profile were modeled with the vehicle at one location for the duration of the hover; and the sound pressure level was estimated at points along the ground using the appropriate aircraft configuration as presented in Table 3. The duration for each segment was used to sum the energy to get the sound exposure level for that segment at that point along the ground. All segments were added to get the sound exposure level as a function of distance along the ground from the delivery point as presented in Table 7. The same equations used and methodology applied for the takeoff portion of the profile were applied in this estimate of the delivery noise as a function of distance from the delivery point on the ground. The hover condition was modeled due to the extended time at that part of the profile.

Table 6. FTXM600P UA Delivery Profile Details

Flight Segment	Altitude (ft AGL)	Aircraft Configuration	Duration (s)
Descent for Delivery	230 descend to 82	Max Weight	22
Open Doors, Await Customer Response, and Lower Package	Hover at 82	Max Weight	35
Maneuver to Unhook Package	82 descent to 75 then ascend to 82	Max for Descent/Empty for Ascent	8
Ascend to Operational Height	82 ascend to 230	Empty Weight	13

Table 7. Estimate of Sound Exposure Level for Delivery Profile of FTXM600P UA

Distance from Delivery (ft)	L_{AE} (dBA)
0	81.0
50	79.7
100	77.3
150	75.1
200	73.3
250	71.7
300	70.3
350	69.1
400	68.1
450	67.1
500	66.2
Note: 0 feet represents a receiver directly underneath the UA.	

1.4. Landing Noise

The profile of the FTXM600P UA descending from an operational altitude of 230 ft AGL is detailed in Table 8. Because the UA spends half the descent time between 33 ft AGL and the ground, the modeling of the landing was done in the same manner as the takeoff for both flight segments separately and summed together to generate the final estimated noise level as presented in Table 9.

Table 8. FTXM600P UA Landing Profile Details

Flight Segment	Altitude (ft)	Ground Speed (kts)	Duration (s)
Descent	230 descend to 33	0	20
Landing	33 descend to 0	0	20

Table 9. Estimate of Sound Exposure Level for Landing of FTXM600P UA at Empty Weight

Distance Landing (ft)	L_{AE} (dBA)
50	79.2
100	74.4
150	71.4
200	69.2
250	67.5
300	66.1
350	64.8
400	63.8
450	62.8
500	61.9

2. Conclusion

The information and noise levels presented in this document represent conservative estimates of the noise made by the FTXM600P UA during each segment of a typical flight profile. In order to get the sound exposure level at any point on the ground, a calculation of the contributions from each flight segment should be combined to arrive at a final estimate of cumulative noise exposure. In order to calculate the maximum sound level from the takeoff, delivery, or landing portions of the flight profile, it is recommended that the sound pressure level from the appropriate aircraft configuration be used at the lowest altitude of the flight segment. Due to the directivity of the source and the excessive attenuation of ground to ground propagation this estimate of the sound exposure level will most likely be an over estimate, but this is conservative and appropriate for use in estimating noise exposure. Although further analysis of the measurements of the UA will be forthcoming and may change the estimates as presented in the document; the estimates presented here represent the most appropriate, conservative estimates of the noise based on comparison of the estimates to available measurement data received by AEE to date and can be used with confidence in conjunction with developing a generalized methodology for noise estimates of proposed Causey Unmanned operations using the FTXM600P UA.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
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2005 Ne Green Oaks Blvd
Suite 140
Arlington, TX 76006-6247
Phone: (817) 277-1100 Fax: (817) 277-1129
Email Address: arles@fws.gov

In Reply Refer To: November 20, 2022
Project Code: 2023-0017513
Project Name: Causey Aviation Unmanned, Inc. Drone Package Delivery Operations in Granbury TX

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed, and candidate species, as well as proposed and final designated critical habitat, which may occur within the boundary of your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under section 7(a)(1) of the Act, Federal agencies are directed to utilize their authorities to carry out programs for the conservation of threatened and endangered species. Under and 7(a)(2) and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to determine whether their actions may affect threatened and endangered species and/or designated critical habitat. A Federal action is an activity or program authorized, funded, or carried out, in whole or in part, by a Federal agency (50 CFR 402.02).

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For Federal actions other than major construction activities, the Service suggests that a biological evaluation (similar to a Biological Assessment) be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

After evaluating the potential effects of a proposed action on federally listed species, one of the following determinations should be made by the Federal agency:

1. *No effect* - the appropriate determination when a project, as proposed, is anticipated to have no effects to listed species or critical habitat. A "no effect" determination does not require section 7 consultation and no coordination or contact with the Service is necessary. However, the action agency should maintain a complete record of their evaluation, including the steps leading to the determination of affect, the qualified personnel conducting the evaluation, habitat conditions, site photographs, and any other related information.
2. *May affect, but is not likely to adversely affect* - the appropriate determination when a proposed action's anticipated effects to listed species or critical habitat are insignificant, discountable, or completely beneficial. Insignificant effects relate to the size of the impact and should never reach the scale where "take" of a listed species occurs. Discountable effects are those extremely unlikely to occur. Based on best judgment, a person would not be able to meaningfully measure, detect, or evaluate insignificant effects, or expect discountable effects to occur. This determination requires written concurrence from the Service. A biological evaluation or other supporting information justifying this determination should be submitted with a request for written concurrence.
3. *May affect, is likely to adversely affect* - the appropriate determination if any adverse effect to listed species or critical habitat may occur as a consequence of the proposed action, and the effect is not discountable or insignificant. This determination requires formal section 7 consultation.

The Service has performed up-front analysis for certain project types and species in your project area. These analyses have been compiled into *determination keys*, which allows an action agency, or its designated non-federal representative, to initiate a streamlined process for determining a proposed project's potential effects on federally listed species. The determination keys can be accessed through IPaC.

The Service recommends that candidate species, proposed species, and proposed critical habitat be addressed should consultation be necessary. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found at: https://www.fws.gov/service/section-7-consultations

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.), and projects affecting these species may require development of an eagle conservation plan (https://www.fws.gov/library/collections/bald-and-golden-eagle-management). Additionally, wind energy projects should follow the wind energy guidelines (https://www.fws.gov/media/land-based-wind-energy-guidelines) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: https://www.fws.gov/media/recommended-best-practices-communication-tower-design-siting-construction-operation. The Federal Aviation Administration (FAA) released specifications for and made mandatory flashing L-810 lights on new towers 150-350 feet AGL, and the elimination of L-810 steady-burning side lights on towers above 350 feet AGL. While the FAA made these changes to reduce the number of migratory bird collisions (by as much as 70%), extinguishing steady-burning side lights also reduces maintenance costs to tower owners. For additional information concerning migratory birds and eagle conservation plans, please contact the Service's Migratory Bird Office at 505-248-7882.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Arlington Ecological Services Field Office
2005 Ne Green Oaks Blvd
Suite 140
Arlington, TX 76006-6247
(817) 277-1100

Project Summary

Project Code: 2023-0017513

Project Name: Causey Aviation Unmanned, Inc. Drone Package Delivery Operations in Granbury TX

Project Type: Drones - Use/Operation of Unmanned Aerial Systems

Project Description: Causey Aviation Unmanned, Inc. (Causey) seeks to amend its air carrier Operations Specifications (OpSpecs) and other Federal Aviation Administration (FAA) approvals necessary to begin unmanned aircraft (UA) commercial package delivery operations in Granbury, Texas using the Flytrex FTX-M600P UA. The UA is a multi-rotor design featuring six propellers mounted on equally spaced arms extending horizontally from a center frame. The system's computers and package containers are located on the underside of the airframe. The maximum allowable takeoff weight of the UA is 33.4 pounds and the maximum allowable package weight is 6.6 pounds.

Causey will operate from a distribution centers (DC) in Granbury, Texas, that serves as a central hub of operations. Causey proposes to conduct consumer package deliveries to vetted delivery locations such as residential properties and healthcare facilities within 2 NM from the DC. The operating area is approximately 16.6 square miles. The proposed commercial delivery operations would occur between 8:00 a.m. and 10:00 p.m. up to seven days per week.

Packages are loaded into the UA at the DC. The UA is then launched to perform aerial deliveries. With a multi-rotor design, the UA can take off and descend vertically, as well as hover. Normal cruising airspeeds are expected to be approximately 29 knots. Typical flights begin with the UA departing from a DC and ascending vertically to 230 feet above ground level (AGL). The UA then flies a pre-determined route at 230 feet AGL to the delivery point. Upon arrival at the delivery point, the UA descends vertically to the delivery hover altitude of 82 feet AGL and waits for the customer to accept the package through a user interface application. If the delivery is not accepted within 15 seconds, the UA returns to the DC with the package. If the delivery is accepted, the UA lowers the package to the ground using a tethered mechanism and then returns to the DC. Upon arrival at the DC, the UA descends vertically from 230 feet AGL to the ground for landing.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@32.431832,-97.77476298562257,14z

Counties: Hood County, Texas

Endangered Species Act Species

There is a total of 7 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 2 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

Birds

NAME	STATUS
Golden-cheeked Warbler *Setophaga chrysoparia* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/33	Endangered
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location does not overlap the critical habitat. This species only needs to be considered under the following conditions: ▪ Wind Energy Projects Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* There is **proposed** critical habitat for this species. This species only needs to be considered under the following conditions: ▪ Wind Energy Projects Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Whooping Crane *Grus americana* Population: Wherever found, except where listed as an experimental population There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/758	Endangered

Clams

NAME	STATUS
Texas Fawnsfoot *Truncilla macrodon* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8965	Proposed Threatened

Insects

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
American Golden-plover *Pluvialis dominica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Sep 1 to Jul 31
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 15 to Aug 25

NAME	BREEDING SEASON
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Little Blue Heron *Egretta caerulea* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds Mar 10 to Oct 15
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

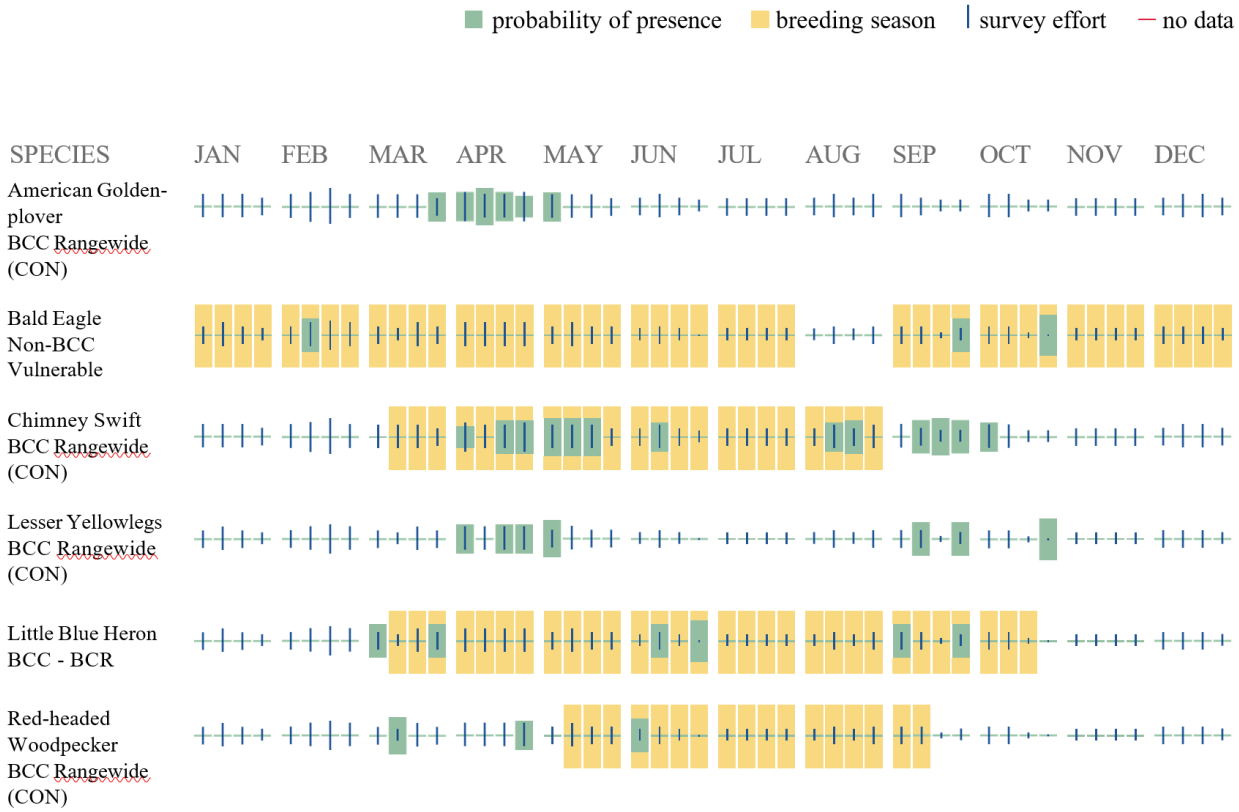
Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds

- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look

at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be

aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

FRESHWATER EMERGENT WETLAND

- Palustrine

LAKE

- Lacustrine

RIVERINE

- Riverine

IPaC User Contact Information

Agency: Federal Aviation Administration
Name: Sarah Brammell
Address: 19607 Lake Osceola Ln
City: Odessa
State: FL
Zip: 33556
Email sbrammell@bluewingenv.com
Phone: 8134043963

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Arlington Ecological Services Field Office
2005 Ne Green Oaks Blvd
Suite 140
Arlington, TX 76006-6247
Phone: (817) 277-1100 Fax: (817) 277-1129
Email Address: arles@fws.gov

In Reply Refer To: November 20, 2022
Project Code: 2023-0017514
Project Name: Causey Aviation Unmanned, Inc. Drone Package Delivery Operations in Rowlett TX

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed, and candidate species, as well as proposed and final designated critical habitat, which may occur within the boundary of your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under section 7(a)(1) of the Act, Federal agencies are directed to utilize their authorities to carry out programs for the conservation of threatened and endangered species. Under and 7(a)(2) and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to determine whether their actions may affect threatened and endangered species and/or designated critical habitat. A Federal action is an activity or program authorized, funded, or carried out, in whole or in part, by a Federal agency (50 CFR 402.02).

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For Federal actions other than major construction activities, the Service suggests that a biological evaluation (similar to a Biological Assessment) be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

After evaluating the potential effects of a proposed action on federally listed species, one of the following determinations should be made by the Federal agency:

1. *No effect* - the appropriate determination when a project, as proposed, is anticipated to have no effects to listed species or critical habitat. A "no effect" determination does not require section 7 consultation and no coordination or contact with the Service is necessary. However, the action agency should maintain a complete record of their evaluation, including the steps leading to the determination of affect, the qualified personnel conducting the evaluation, habitat conditions, site photographs, and any other related information.
2. *May affect, but is not likely to adversely affect* - the appropriate determination when a proposed action's anticipated effects to listed species or critical habitat are insignificant, discountable, or completely beneficial. Insignificant effects relate to the size of the impact and should never reach the scale where "take" of a listed species occurs. Discountable effects are those extremely unlikely to occur. Based on best judgment, a person would not be able to meaningfully measure, detect, or evaluate insignificant effects, or expect discountable effects to occur. This determination requires written concurrence from the Service. A biological evaluation or other supporting information justifying this determination should be submitted with a request for written concurrence.
3. *May affect, is likely to adversely affect* - the appropriate determination if any adverse effect to listed species or critical habitat may occur as a consequence of the proposed action, and the effect is not discountable or insignificant. This determination requires formal section 7 consultation.

The Service has performed up-front analysis for certain project types and species in your project area. These analyses have been compiled into *determination keys*, which allows an action agency, or its designated non-federal representative, to initiate a streamlined process for determining a proposed project's potential effects on federally listed species. The determination keys can be accessed through IPaC.

The Service recommends that candidate species, proposed species, and proposed critical habitat be addressed should consultation be necessary. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found at: https://www.fws.gov/service/section-7-consultations

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.), and projects affecting these species may require development of an eagle conservation plan (https://www.fws.gov/library/collections/bald-and-golden-eagle-management). Additionally, wind energy projects should follow the wind energy guidelines (https://www.fws.gov/media/land-based-wind-energy-guidelines) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: https://www.fws.gov/media/recommended-best-practices-communication-tower-design-siting-construction-operation. The Federal Aviation Administration (FAA) released specifications for and made mandatory flashing L-810 lights on new towers 150-350 feet AGL, and the elimination of L-810 steady-burning side lights on towers above 350 feet AGL. While the FAA made these changes to reduce the number of migratory bird collisions (by as much as 70%), extinguishing steady-burning side lights also reduces maintenance costs to tower owners. For additional information concerning migratory birds and eagle conservation plans, please contact the Service's Migratory Bird Office at 505-248-7882.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Arlington Ecological Services Field Office
2005 Ne Green Oaks Blvd
Suite 140
Arlington, TX 76006-6247
(817) 277-1100

Project Summary

Project Code: 2023-0017514

Project Name: Causey Aviation Unmanned, Inc. Drone Package Delivery Operations in Rowlett TX

Project Type: Drones - Use/Operation of Unmanned Aerial Systems

Project Description: Causey Aviation Unmanned, Inc. (Causey) seeks to amend its air carrier Operations Specifications (OpSpecs) and other Federal Aviation Administration (FAA) approvals necessary to begin unmanned aircraft (UA) commercial package delivery operations in Rowlett, Texas using the Flytrex FTX-M600P UA. The UA is a multi-rotor design featuring six propellers mounted on equally spaced arms extending horizontally from a center frame. The system's computers and package containers are located on the underside of the airframe. The maximum allowable takeoff weight of the UA is 33.4 pounds and the maximum allowable package weight is 6.6 pounds.

Causey will operate from a distribution centers (DC) in Rowlett, Texas, that serves as a central hub of operations. Causey proposes to conduct consumer package deliveries to vetted delivery locations such as residential properties and healthcare facilities within 2 NM from the DC. The operating area is approximately 16.6 square miles. The proposed commercial delivery operations would occur between 8:00 a.m. and 10:00 p.m. up to seven days per week.

Packages are loaded into the UA at the DC. The UA is then launched to perform aerial deliveries. With a multi-rotor design, the UA can take off and descend vertically, as well as hover. Normal cruising airspeeds are expected to be approximately 29 knots. Typical flights begin with the UA departing from a DC and ascending vertically to 230 feet above ground level (AGL). The UA then flies a pre-determined route at 230 feet AGL to the delivery point. Upon arrival at the delivery point, the UA descends vertically to the delivery hover altitude of 82 feet AGL and waits for the customer to accept the package through a user interface application. If the delivery is not accepted within 15 seconds, the UA returns to the DC with the package. If the delivery is accepted, the UA lowers the package to the ground using a tethered mechanism and then returns to the DC. Upon arrival at the DC, the UA descends vertically from 230 feet AGL to the ground for landing.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@32.906719949999996,-96.56662001268086,14z

Counties: Dallas County, Texas

Endangered Species Act Species

There is a total of 7 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 2 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

Birds

NAME	STATUS
Golden-cheeked Warbler *Setophaga chrysoparia* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/33	Endangered
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location does not overlap the critical habitat. This species only needs to be considered under the following conditions: ▪ Wind Energy Projects Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* There is **proposed** critical habitat for this species. This species only needs to be considered under the following conditions: ▪ Wind Energy Projects Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Whooping Crane *Grus americana* Population: Wherever found, except where listed as an experimental population There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/758	Endangered

Clams

NAME	STATUS
Texas Fawnsfoot *Truncilla macrodon* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8965	Proposed Threatened

Insects

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
American Golden-plover *Pluvialis dominica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Sep 1 to Jul 31
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 15 to Aug 25

NAME	BREEDING SEASON
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Little Blue Heron *Egretta caerulea* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds Mar 10 to Oct 15
Long-billed Curlew *Numenius americanus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/5511	Breeds elsewhere
Prothonotary Warbler *Protonotaria citrea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 1 to Jul 31
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence

in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

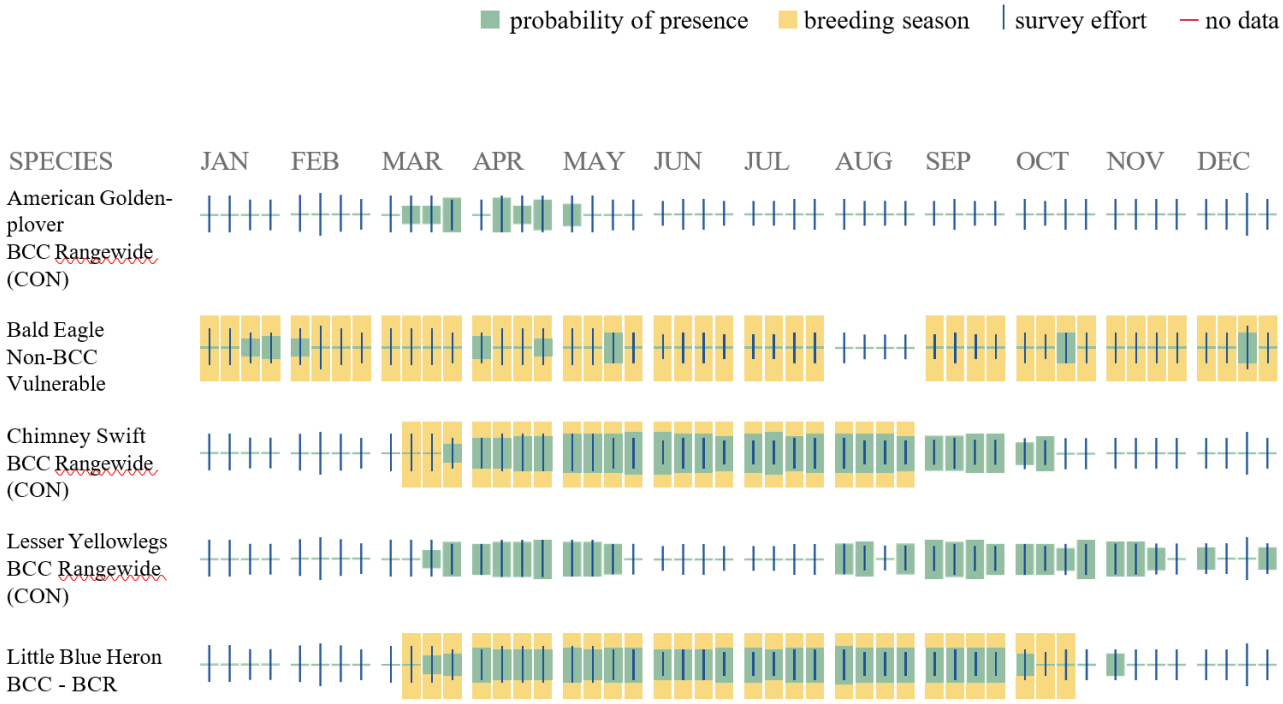
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

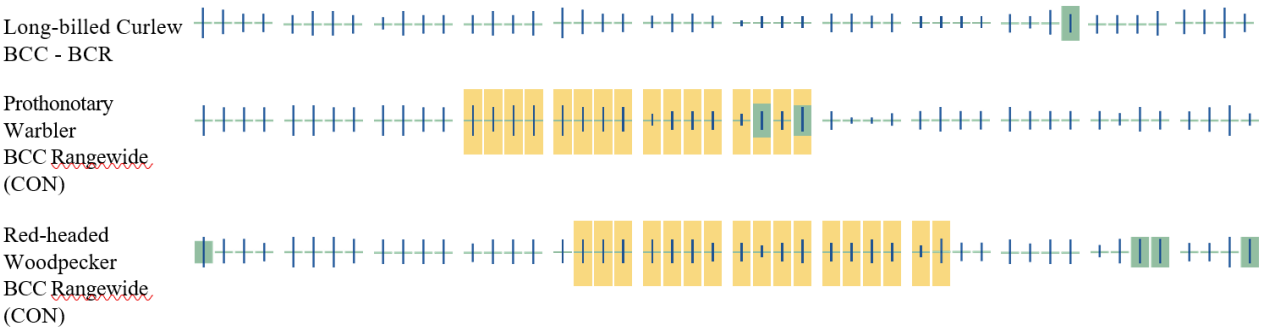
Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.





Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?
The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides

birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

LAKE

- Lacustrine

FRESHWATER POND

- Palustrine

RIVERINE

- Riverine

IPaC User Contact Information

Agency: Federal Aviation Administration
Name: Sarah Brammell
Address: 19607 Lake Osceola Ln
City: Odessa
State: FL
Zip: 33556
Email sbrammell@bluewingenv.com
Phone: 8134043963

SHPO Coordination

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

Mr. Mark Wolfe
State Historic Preservation Officer
Texas Historical Commission
P.O. Box 12276
Austin, TX 78711-2276

Via electronic submission to https://xapps.thc.state.tx.us/106Review/

Dear Mr. Wolfe:

The purpose of this letter is to inform you of a proposal under consideration by the Federal Aviation Administration (FAA) for the approval of a Certificate of Waiver and/or Exemption for an Unmanned Aircraft System (UAS) operation in Granbury, TX. The FAA has determined that this proposed action is a Federal undertaking as defined in 36 CFR § 800.16 (y). Therefore, the FAA is initializing consultation with the State Historic Preservation Officer (SHPO) pursuant to § 800.11 (d).

Proposed Activity Description
The Federal Aviation Administration (FAA) has been asked to approve waivers and/or exemptions to aeronautical regulations, thereby approving the UAS operation in the area. FAA approval of the UAS operation in the area is an undertaking subject to regulations pursuant to the National Historic Preservation Act.

The UAS operation will be flown by an unmanned aircraft weighing 33 lbs., including a 6.6 lb. payload, at approximately 230 feet Above Ground Level (AGL) in Granbury, TX (see attached operations area map). Upon reaching the delivery point, the UAS lowers to a delivery altitude of 65 feet AGL where it uses a wire/cable to lower the package to the ground. After the package has safely reached the ground, the UAS then ascends back to 230 feet AGL. The purpose is for package delivery, consisting of 57 projected daily delivery flight operations in the next 12 months, and 77 in 24 months that will be distributed within delivery zones located within the proposed operating areas. Flights will occur primarily Mon-Sun, with operating hours from 8 am until 10 pm. The dimension of the UAS area defines the Area of Potential Effect (APE). The UAS delivery area will have a radius of 2 nautical miles centered on a distribution center located at 1201 Water's Edge Drive, Granbury, TX 76048. According to the National Park Service online database of the National Register of Historic Places, four historic places were identified. The places are the

Baker-Carmichael House, Granbury Elementary School, Wright-Henderson-Duncan House and the Hood County Courthouse Historic District. The UAS operation will have no affects to the ground. All flights will takeoff from, and return to the Distribution Center.

Consultation
The FAA seeks concurrence from the SHPO of its no historic properties affected [§ 800.11 (d)] determination for the proposed UAS route. Your response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation.

If you have any comments or questions or need additional information regarding the proposed operation, please do not hesitate to contact Mr. Mike Millard, in writing at: FAA, AFS-800, 800 Independence Ave., S.W., Washington, D.C. 20591; by telephone: (202) 267-7906; or by email: 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

David Menzimer
Aviation Safety
Manager, General Aviation Operations Branch,
Flight Standards Service

Enclosure

From: noreply@thc.state.tx.us
To: 9-AWA-AVS-AFS-ENVIRONMENTAL (FAA); reviews@thc.state.tx.us
Subject: Section 106 Submission
Date: Monday, November 7, 2022 4:58:54 PM

Re: Project Review under Section 106 of the National Historic Preservation Act
THC Tracking #202301883
Date: 11/07/2022
Granbury Unmanned Aircraft System Delivery Area
1201 Water's Edge Drive
Granbury,TX 76048

Description: The UAS operation will be flown by an unmanned aircraft weighing 33 lbs., including a 6.6 lb. payload, at approximately 230 feet Above Ground Level (AGL) in Granbury, TX.

Dear Mike Millard:
Thank you for your submittal regarding the above-referenced project. This response represents the comments of the State Historic Preservation Officer, the Executive Director of the Texas Historical Commission (THC), pursuant to review under Section 106 of the National Historic Preservation Act.

The review staff, led by Justin Kockritz, has completed its review and has made the following determinations based on the information submitted for review:

Above-Ground Resources

- THC/SHPO concurs with information provided.
- No historic properties are present or affected by the project as proposed. However, if historic properties are discovered or unanticipated effects on historic properties are found, work should cease in the immediate area; work can continue where no historic properties are present. Please contact the THC's History Programs Division at 512-463-5853 to consult on further actions that may be necessary to protect historic properties.

We have the following comments: THC concurs that no historic properties will be affected by the project as proposed. Because no ground disturbance is proposed, no review by the THC Archeology Division is required.

We look forward to further consultation with your office and hope to maintain a partnership that will foster effective historic preservation. Thank you for your cooperation in this review process, and for your efforts to preserve the irreplaceable heritage of Texas. If the project changes, or if new historic properties are found, please contact the review staff. If you have any questions concerning our review or if we can be of further assistance, please email the following reviewers: justin.kockritz@thc.texas.gov.

This response has been sent through the electronic THC review and compliance system (eTRAC). Submitting your project via eTRAC eliminates mailing delays and allows you to check the status of the review, receive an electronic response, and generate reports on your submissions. For more information, visit http://thc.texas.gov/etrac-system.

Sincerely,

for Mark Wolfe, State Historic Preservation Officer
Executive Director, Texas Historical Commission

Please do not respond to this email.

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

Mr. Mark Wolfe
State Historic Preservation Officer
Texas Historical Commission
P.O. Box 12276
Austin, TX 78711-2276

Via electronic submission to https://xapps.thc.state.tx.us/106Review/

Dear Mr. Wolfe:

The purpose of this letter is to inform you of a proposal under consideration by the Federal Aviation Administration (FAA) for the approval of a Certificate of Waiver and/or Exemption for an Unmanned Aircraft System (UAS) operation in Rowlett, TX. The FAA has determined that this proposed action is a Federal undertaking as defined in 36 CFR § 800.16 (y). Therefore, the FAA is initializing consultation with the State Historic Preservation Officer (SHPO) pursuant to § 800.11 (d).

Proposed Activity Description
The Federal Aviation Administration (FAA) has been asked to approve waivers and/or exemptions to aeronautical regulations, thereby approving the UAS operation in the area. FAA approval of the UAS operation in the area is an undertaking subject to regulations pursuant to the National Historic Preservation Act.

The UAS operation will be flown by an unmanned aircraft weighing 33 lbs., including a 6.6 lb. payload, at approximately 230 feet Above Ground Level (AGL) in Rowlett, TX (see attached operations area map). Upon reaching the delivery point, the UAS lowers to a delivery altitude of 65 feet AGL where it uses a wire/cable to lower the package to the ground. After the package has safely reached the ground, the UAS then ascends back to 230 feet AGL. The purpose is for package delivery, consisting of 52 projected daily delivery flight operations in the next 12 months, and 71 in 24 months that will be distributed within delivery zones located within the proposed operating areas. Flights will occur primarily Mon-Sun, with operating hours from 8 am until 10 pm. The dimension of the UAS area defines the Area of Potential Effect (APE). The UAS delivery area will have a radius of 2 nautical miles centered on a distribution center located at 3805 Industrial Street, Rowlett, TX 75088. According to the National Park Service online database of the National Register of Historic Places, there are no registered historical places within the proposed APE. The

FAA is also consulting with the affected tribes to confirm this finding. The UAS operation will have no affects to the ground. All flights will takeoff from, and return to the Distribution Center.

Consultation
The FAA seeks concurrence from the SHPO of its no historic properties affected [§ 800.11 (d)] determination for the proposed UAS route. Your response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation.

If you have any comments or questions or need additional information regarding the proposed operation, please do not hesitate to contact Mr. Mike Millard, in writing at: FAA, AFS-800, 800 Independence Ave., S.W., Washington, D.C. 20591; by telephone: (202) 267-7906; or by email: 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

David Menzimer
Aviation Safety
Manager, General Aviation Operations Branch,
Flight Standards Service

Enclosure

From: noreply@thc.state.tx.us
To: 9-AWA-AVS-AFS-ENVIRONMENTAL (FAA); reviews@thc.state.tx.us
Subject: Section 106 Submission
Date: Monday, November 7, 2022 4:59:17 PM

Re: Project Review under Section 106 of the National Historic Preservation Act
THC Tracking #202301884
Date: 11/07/2022
Rowlett Unmanned Aircraft System Delivery Area
3805 Industrial Street
Rowlett,TX 75088

Description: The UAS operation will be flown by an unmanned aircraft weighing 33 lbs., including a 6.6 lb. payload, at approximately 230 feet Above Ground Level (AGL) in Rowlett, TX.

Dear Mike Millard:
Thank you for your submittal regarding the above-referenced project. This response represents the comments of the State Historic Preservation Officer, the Executive Director of the Texas Historical Commission (THC), pursuant to review under Section 106 of the National Historic Preservation Act.

The review staff, led by Justin Kockritz, has completed its review and has made the following determinations based on the information submitted for review:

Above-Ground Resources

- No historic properties are present or affected by the project as proposed. However, if historic properties are discovered or unanticipated effects on historic properties are found, work should cease in the immediate area; work can continue where no historic properties are present. Please contact the THC's History Programs Division at 512-463-5853 to consult on further actions that may be necessary to protect historic properties.

We have the following comments: THC concurs that no historic properties will be affected by the project as proposed. Because no ground disturbance is proposed, no review by the THC Archeology Division is required.

We look forward to further consultation with your office and hope to maintain a partnership that will foster effective historic preservation. Thank you for your cooperation in this review process, and for your efforts to preserve the irreplaceable heritage of Texas. If the project changes, or if new historic properties are found, please contact the review staff. If you have any questions concerning our review or if we can be of further assistance, please email the following reviewers: justin.kockritz@thc.texas.gov.

This response has been sent through the electronic THC review and compliance system (eTRAC). Submitting your project via eTRAC eliminates mailing delays and allows you to check the status of the review, receive an electronic response, and generate reports on your submissions. For more information, visit http://thc.texas.gov/etrac-system.

Sincerely,

for Mark Wolfe, State Historic Preservation Officer
Executive Director, Texas Historical Commission

Please do not respond to this email.

Tribal Coordination

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

Chairman Bobby Komardley
Apache Tribe of Oklahoma
P.O. Box 1330
Anadarko, OK 73005

Dear Chairman Komardley:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) for the approval of a Certificate of Waiver and/or Exemption, or Operations Specifications for an Unmanned Aircraft System (UAS) operation area in Granbury, TX. We wish to solicit your views regarding potential effects on tribal interests in the area.

Proposed Activity Description
The FAA has been asked to approve waivers and/or exemptions to aeronautical regulations, thereby approving the UAS operation in the area depicted below. FAA approval of the UAS operation in the area is an undertaking subject to regulations pursuant to the National Historic Preservation Act.

The UAS operation will be flown by an unmanned aircraft weighing 33 lbs., including a 6.6 lb. payload, at approximately 230 feet Above Ground Level (AGL) in Granbury, TX (see attached operations area map). Upon reaching the delivery point, the UAS lowers to a delivery altitude of 65 feet AGL where it uses a wire/cable to lower the package to the ground. After the package has safely reached the ground, the UAS then ascends back to 230 feet AGL. The purpose is for package delivery, consisting of 57 projected daily delivery flight operations in the next 12 months, and 77 in 24 months that will be distributed within delivery zones located within the proposed operating areas. Flights will occur primarily Mon-Sun, with operating hours from 8 am until 10 pm. The dimension of the UAS area defines the Area of Potential Effect (APE). The UAS delivery area will have a radius of 2 nautical miles centered on a distribution center located at 1201 Water's Edge Drive, Granbury, TX 76048. The UAS operation will have no affects to the ground. All flights will takeoff from, and return to the Distribution Center.

Consultation
The FAA is soliciting the opinion of the tribe(s) concerning any tribal lands, or sites of religious or cultural significance that may be affected by the proposed operation area. Based

on a review of the route modifications as well as our increasing knowledge with respect to the level of environmental impacts from drone operations, FAA has determined that this new approval has no potential to effect historic properties. FAA expects that drone operations will continue to grow and that we all will continue to learn more about this emerging technology. FAA would be amenable to trying to answer any questions you may have generally on this new technology. Your response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation.

If you have any comments or questions or need additional information regarding the proposed operation, please do not hesitate to contact Mr. Mike Millard, in writing at: FAA, AFS-800, 800 Independence Ave., S.W., Washington, D.C. 20591; by telephone: (202) 267-7906; or by email: 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

David Menzimer
Manager, General Aviation Operations Section
General Aviation and Commercial Division
Office of Safety Standards, Flight Standards Service

Enclosure

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

Chairman Mark Woommavovah
Comanche Nation
P.O. Box 908
Lawton, OK 73502

Dear Chairman Woommavovah:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) for the approval of a Certificate of Waiver and/or Exemption, or Operations Specifications for an Unmanned Aircraft System (UAS) operation area in Granbury, TX. We wish to solicit your views regarding potential effects on tribal interests in the area.

Proposed Activity Description
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Consultation
The FAA is soliciting the opinion of the tribe(s) concerning any tribal lands, or sites of religious or cultural significance that may be affected by the proposed operation area. Based

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If you have any comments or questions or need additional information regarding the proposed operation, please do not hesitate to contact Mr. Mike Millard, in writing at: FAA, AFS-800, 800 Independence Ave., S.W., Washington, D.C. 20591; by telephone: (202) 267-7906; or by email: 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

David Menzimer
Manager, General Aviation Operations Section
General Aviation and Commercial Division
Office of Safety Standards, Flight Standards Service

Enclosure

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

Chairman Jonathan Cernek
Coushatta Tribe of Louisiana
P.O. Box 818
Elton, LA 70532

Dear Chairman Cerneck:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) for the approval of a Certificate of Waiver and/or Exemption, or Operations Specifications for an Unmanned Aircraft System (UAS) operation area in Granbury, TX. We wish to solicit your views regarding potential effects on tribal interests in the area.

Proposed Activity Description
The FAA has been asked to approve waivers and/or exemptions to aeronautical regulations, thereby approving the UAS operation in the area depicted below. FAA approval of the UAS operation in the area is an undertaking subject to regulations pursuant to the National Historic Preservation Act.

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Consultation
The FAA is soliciting the opinion of the tribe(s) concerning any tribal lands, or sites of religious or cultural significance that may be affected by the proposed operation area. Based

on a review of the route modifications as well as our increasing knowledge with respect to the level of environmental impacts from drone operations, FAA has determined that this new approval has no potential to effect historic properties. FAA expects that drone operations will continue to grow and that we all will continue to learn more about this emerging technology. FAA would be amenable to trying to answer any questions you may have generally on this new technology. Your response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation.

If you have any comments or questions or need additional information regarding the proposed operation, please do not hesitate to contact Mr. Mike Millard, in writing at: FAA, AFS-800, 800 Independence Ave., S.W., Washington, D.C. 20591; by telephone: (202) 267-7906; or by email: 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

David Menzimer
Manager, General Aviation Operations Section
General Aviation and Commercial Division
Office of Safety Standards, Flight Standards Service

Enclosure

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

President Russell Martin
Tonkawa Tribe of Indians of Oklahoma
1 Rush Buffalo Rd.
Tonkawa, OK 74653

Dear President Martin:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) for the approval of a Certificate of Waiver and/or Exemption, or Operations Specifications for an Unmanned Aircraft System (UAS) operation area in Granbury, TX. We wish to solicit your views regarding potential effects on tribal interests in the area.

Proposed Activity Description
The FAA has been asked to approve waivers and/or exemptions to aeronautical regulations, thereby approving the UAS operation in the area depicted below. FAA approval of the UAS operation in the area is an undertaking subject to regulations pursuant to the National Historic Preservation Act.

The UAS operation will be flown by an unmanned aircraft weighing 33 lbs., including a 6.6 lb. payload, at approximately 230 feet Above Ground Level (AGL) in Granbury, TX (see attached operations area map). Upon reaching the delivery point, the UAS lowers to a delivery altitude of 65 feet AGL where it uses a wire/cable to lower the package to the ground. After the package has safely reached the ground, the UAS then ascends back to 230 feet AGL. The purpose is for package delivery, consisting of 57 projected daily delivery flight operations in the next 12 months, and 77 in 24 months that will be distributed within delivery zones located within the proposed operating areas. Flights will occur primarily Mon-Sun, with operating hours from 8 am until 10 pm. The dimension of the UAS area defines the Area of Potential Effect (APE). The UAS delivery area will have a radius of 2 nautical miles centered on a distribution center located at 1201 Water's Edge Drive, Granbury, TX 76048. The UAS operation will have no affects to the ground. All flights will takeoff from, and return to the Distribution Center.

Consultation
The FAA is soliciting the opinion of the tribe(s) concerning any tribal lands, or sites of religious or cultural significance that may be affected by the proposed operation area. Based

on a review of the route modifications as well as our increasing knowledge with respect to the level of environmental impacts from drone operations, FAA has determined that this new approval has no potential to effect historic properties. FAA expects that drone operations will continue to grow and that we all will continue to learn more about this emerging technology. FAA would be amenable to trying to answer any questions you may have generally on this new technology. Your response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation.

If you have any comments or questions or need additional information regarding the proposed operation, please do not hesitate to contact Mr. Mike Millard, in writing at: FAA, AFS-800, 800 Independence Ave., S.W., Washington, D.C. 20591; by telephone: (202) 267-7906; or by email: 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

David Menzimer
Manager, General Aviation Operations Section
General Aviation and Commercial Division
Office of Safety Standards, Flight Standards Service

Enclosure

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

Chairman Bobby Komardley
Apache Tribe of Oklahoma
P.O. Box 1330
Anadarko, OK 73005

Dear Chairman Komardley:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) for the approval of a Certificate of Waiver and/or Exemption, or Operations Specifications for an Unmanned Aircraft System (UAS) operation area in Rowlett, TX. We wish to solicit your views regarding potential effects on tribal interests in the area.

Proposed Activity Description
The FAA has been asked to approve waivers and/or exemptions to aeronautical regulations, thereby approving the UAS operation in the area depicted below. FAA approval of the UAS operation in the area is an undertaking subject to regulations pursuant to the National Historic Preservation Act.

The UAS operation will be flown by an unmanned aircraft weighing 33 lbs., including a 6.6 lb. payload, at approximately 230 feet Above Ground Level (AGL) in Rowlett, TX (see attached operations area map). Upon reaching the delivery point, the UAS lowers to a delivery altitude of 65 feet AGL where it uses a wire/cable to lower the package to the ground. After the package has safely reached the ground, the UAS then ascends back to 230 feet AGL. The purpose is for package delivery, consisting of 52 projected daily delivery flight operations in the next 12 months, and 71 in 24 months that will be distributed within delivery zones located within the proposed operating areas. Flights will occur primarily Mon-Sun, with operating hours from 8 am until 10 pm. The dimension of the UAS area defines the Area of Potential Effect (APE). The UAS delivery area will have a radius of 2 nautical miles centered on a distribution center located at 3805 Industrial Street, Rowlett, TX 75088. The UAS operation will have no affects to the ground. All flights will takeoff from, and return to the Distribution Center.

Consultation
The FAA is soliciting the opinion of the tribe(s) concerning any tribal lands, or sites of religious or cultural significance that may be affected by the proposed operation area. Based

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Sincerely,

David Menzimer
Manager, General Aviation Operations Section
General Aviation and Commercial Division
Office of Safety Standards, Flight Standards Service

Enclosure

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

Principal Chief Chuck Hoskin
Cherokee Nation
P.O. Box 948
Tahlequah, OK 74465

Dear Chief Hoskin:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) for the approval of a Certificate of Waiver and/or Exemption, or Operations Specifications for an Unmanned Aircraft System (UAS) operation area in Rowlett, TX. We wish to solicit your views regarding potential effects on tribal interests in the area.

Proposed Activity Description
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Sincerely,

David Menzimer
Manager, General Aviation Operations Section
General Aviation and Commercial Division
Office of Safety Standards, Flight Standards Service

Enclosure

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

Chairman Mark Woommavovah
Comanche Nation, Oklahoma
P.O. Box 908
Lawton, OK 73502

Dear Chairman Woommavovah:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) for the approval of a Certificate of Waiver and/or Exemption, or Operations Specifications for an Unmanned Aircraft System (UAS) operation area in Rowlett, TX. We wish to solicit your views regarding potential effects on tribal interests in the area.

Proposed Activity Description
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The UAS operation will be flown by an unmanned aircraft weighing 33 lbs., including a 6.6 lb. payload, at approximately 230 feet Above Ground Level (AGL) in Rowlett, TX (see attached operations area map). Upon reaching the delivery point, the UAS lowers to a delivery altitude of 65 feet AGL where it uses a wire/cable to lower the package to the ground. After the package has safely reached the ground, the UAS then ascends back to 230 feet AGL. The purpose is for package delivery, consisting of 52 projected daily delivery flight operations in the next 12 months, and 71 in 24 months that will be distributed within delivery zones located within the proposed operating areas. Flights will occur primarily Mon-Sun, with operating hours from 8 am until 10 pm. The dimension of the UAS area defines the Area of Potential Effect (APE). The UAS delivery area will have a radius of 2 nautical miles centered on a distribution center located at 3805 Industrial Street, Rowlett, TX 75088. The UAS operation will have no affects to the ground. All flights will takeoff from, and return to the Distribution Center.

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Sincerely,

David Menzimer
Manager, General Aviation Operations Section
General Aviation and Commercial Division
Office of Safety Standards, Flight Standards Service

Enclosure

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

Chairman Jonathan Cernek
Coushatta Tribe of Louisiana
P.O. Box 818
Elton, LA 70532

Dear Chairman Cernek:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) for the approval of a Certificate of Waiver and/or Exemption, or Operations Specifications for an Unmanned Aircraft System (UAS) operation area in Rowlett, TX. We wish to solicit your views regarding potential effects on tribal interests in the area.

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The FAA has been asked to approve waivers and/or exemptions to aeronautical regulations, thereby approving the UAS operation in the area depicted below. FAA approval of the UAS operation in the area is an undertaking subject to regulations pursuant to the National Historic Preservation Act.

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Sincerely,

David Menzimer
Manager, General Aviation Operations Section
General Aviation and Commercial Division
Office of Safety Standards, Flight Standards Service

Enclosure

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

President Russell Martin
Tonkawa Tribe of Indians of Oklahoma
1 Rush Buffalo Rd.
Tonkawa, OK 74653

Dear President Martin:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) for the approval of a Certificate of Waiver and/or Exemption, or Operations Specifications for an Unmanned Aircraft System (UAS) operation area in Rowlett, TX. We wish to solicit your views regarding potential effects on tribal interests in the area.

Proposed Activity Description
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Sincerely,

David Menzimer
Manager, General Aviation Operations Section
General Aviation and Commercial Division
Office of Safety Standards, Flight Standards Service

Enclosure

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

President Terri Parton
Wichita and Affiliated Tribes
P.O. Box 729
Anadarko, OK 73005

Dear President Parton:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) for the approval of a Certificate of Waiver and/or Exemption, or Operations Specifications for an Unmanned Aircraft System (UAS) operation area in Rowlett, TX. We wish to solicit your views regarding potential effects on tribal interests in the area.

Proposed Activity Description
The FAA has been asked to approve waivers and/or exemptions to aeronautical regulations, thereby approving the UAS operation in the area depicted below. FAA approval of the UAS operation in the area is an undertaking subject to regulations pursuant to the National Historic Preservation Act.

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Sincerely,

David Menzimer
Manager, General Aviation Operations Section
General Aviation and Commercial Division
Office of Safety Standards, Flight Standards Service

Enclosure

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CHEROKEE NATION®
P.O. Box 948 • Tahlequah, OK 74465-0948
918-453-5000 • www.cherokee.org

Chuck Hoskin Jr.
Principal Chief
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Bryan Warner
Deputy Principal Chief
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November 30, 2022

Mike Millard
Federal Aviation Administration
AFS-800
800 Independence Avenue, SW
Washington, D.C. 20591

Re: Unmanned Aircraft System Operation Area in Rowlett, Texas

Mr. Mike Millard:

The Cherokee Nation (Nation) is in receipt of your correspondence about **Unmanned Aircraft System Operation Area**, and appreciates the opportunity to provide comment upon this project. Please allow this letter to serve as the Nation's interest in acting as a consulting party to this proposed project.

The Nation maintains databases and records of cultural, historic, and pre-historic resources in this area. Our Historic Preservation Office (Office) reviewed this project, cross referenced the project's legal description against our information, and found instances where this project is within close proximity to such resources. These resources, however, are outside the Area of Potential Effects (APE). Thus, this Office does not object to the project proceeding as long as the following stipulations are observed:

1) The Nation requests that Federal Aviation Administration (FAA) re-contact this Office if there are any changes to the scope of or activities within the APE;

2) The Nation requests that the FAA halt all project activities immediately and re-contact our Offices for further consultation if items of cultural significance are discovered during the course of this project; and

3) The Nation requests that the FAA conduct appropriate inquiries with other pertinent Tribal and Historic Preservation Office regarding historic and prehistoric resources not included in the Nation's databases or records.

If you require additional information or have any questions, please contact me at your convenience. Thank you for your time and attention to this matter.

Wado,

Elizabeth Toombs, Tribal Historic Preservation Officer
Cherokee Nation Tribal Historic Preservation Office
elizabeth-toombs@cherokee.org
918.453.5389

APPENDIX B

Noise Analysis Report

Noise Assessment for Causey Proposed Package Delivery Operations with Flytrex FTX-M600P Unmanned Aircraft

In support of U.S. Code of Federal Regulations Title 14, Part 135

Final

HMMH Report No. 309990.003-5

February 28, 2022

Prepared for:

JD RoVolus, LLC
121 Pearl Street
Ypsilanti, MI 48197

Federal Aviation Administration
Aviation Safety, Flight Standards Service
Office of Environment and Energy
Policy, Engineering, Analysis, and Research (PEARS II)
693KA9-18-D-00005

Prepared by:

David A. Crandall

HMMH
700 District Avenue, Suite 800
Burlington, MA 01803
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Contents

Figures

Tables

1 Introduction and Background

This document presents the methodology and estimation of noise exposure related to proposed Unmanned Aircraft (UA) package delivery operations conducted by Causey Aviation Unmanned, Inc. ("Causey") as a commercial operator under the provisions of 14 CFR Part 135. Causey is proposing to perform package delivery operations at multiple potential locations in the continental United States utilizing an operational model that involves a central distribution center and supporting route network to transport small commercial goods to public delivery points and residential backyards.

The distribution center and delivery points are determined based on partnerships Causey has established with organizations providing products at the distribution center to various end customers, typically at residential locations. Flight paths to and from the distribution center and delivery points use a network of route plans, with a structure of common flight path segments near the distribution center and various branches to deliver to individual locations. Causey selects delivery points after potential customers are identified and their specific locations have been surveyed and satisfy various criteria.

Causey is proposing operations with unmanned aircraft model Flytrex FTX-M600P (referred to throughout as "the Flytrex FTX-M600P UA," or "UA"). The Flytrex FTX -M600P UA is a multi-rotor design featuring six propellers mounted on equally spaced arms extending horizontally from a center frame. The system's computers and package containers are located on the underside of the airframe. The maximum allowable takeoff weight of the UA is 33.4 pounds, and the maximum allowable package weight is 6.6 pounds.

Figure 1 depicts the UA considered in this report.

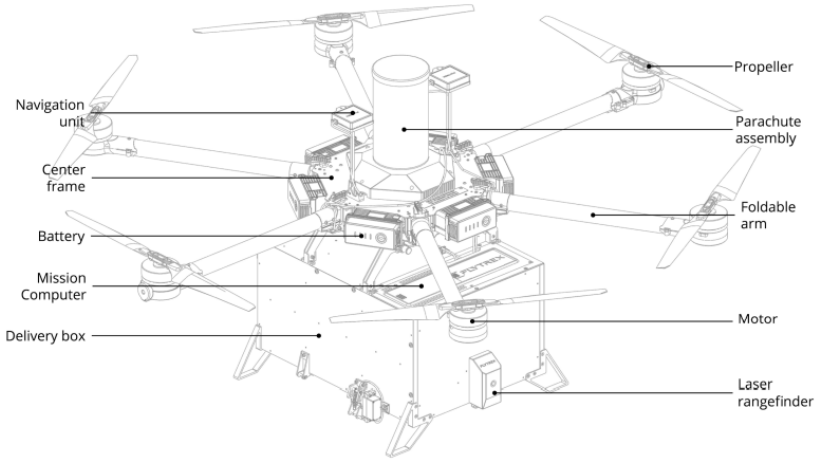

Figure 1: Flytrex FTX-M600P UA

Source: Causey, CONOPS July 19, 2021

The proposed delivery system will be implemented in suburban areas with distribution centers located at commercial or healthcare centers. At distribution centers, a remote pilot in command (RPIC) will load

the Flytrex FTX-M600P UA with the desired package and launch the UA to perform aerial deliveries. The UA will fly a predetermined flight path with supervision from the RPIC and per approved Federal Aviation Administration (FAA) operating authority until it reaches its desired delivery point. Once the UA arrives at the delivery point, it hovers above the ground and lowers the package to the ground on a cable.

With a multirotor design, the UA can take off and descend vertically as well as hover. Airspeeds during normal cruise are expected to be approximately 29 knots. Typical flights begin with the UA departing from a distribution center and ascending vertically to 230 feet Above Ground Level (AGL). The UA then flies a pre-assigned route at 230 feet AGL and 29 knots to a selected delivery point. Upon arrival at the delivery point, the UA descends vertically to the delivery hover altitude of 82 feet AGL and waits for the customer to accept package delivery through a user interface application (sometimes referred to as, an app). If the delivery is not accepted within 15 seconds, the UA will return to the distribution center with the package. If the delivery is accepted, the UA will lower the package to the ground using a tethered mechanism and subsequently return to the distribution center. When returning to the distribution center, the UA climbs vertically back to 230 feet AGL and follows a predefined route from the delivery point back to the distribution center. Upon arrival at the distribution center, the UA descends vertically from 230 feet AGL to the ground for landing.

The methodology proposed in this document provides quantitative guidance to FAA Environmental Specialists to inform environmental decision making on UA noise exposure from proposed Causey package delivery operations. The methods presented here are suitable for review of Federal actions under the requirements of the National Environmental Policy Act (NEPA) and other applicable environmental special purpose laws or other federal environmental review requirements at the discretion and approval of the FAA. In particular, this report is intended to function as a non-standard equivalent methodology under FAA Order 1050.1F, and as such, would require prior written approval from FAA's Office of Environment and Energy (AEE) for each individual project for which a NEPA determination is sought. [1]

The methodology has been developed with data provided by Causey and FAA to date and therefore is limited to Causey operations with the FTX-M600P UA and the flight phases and maneuvers described herein. The noise analysis methodology and estimated noise levels of the proposed activity levels are based upon noise measurement data provided by the FAA.[2] Results of the noise analysis are presented in terms of the Day-Night Average Sound Level (DNL) based on varying levels of operations for areas at ground level below each phase of the flight.[3]

Section 2 of this document describes the relevant noise and operations data made available by Causey and FAA. Section 3 describes the methodology to developing noise exposure estimates for the various UA flight phases associated with typical operations using available data. Section 4 presents the estimated DNL levels for various flight phases based on varying levels of typical operations as described by Causey to date.

---

[1] Discussion of the use of "another equivalent methodology" is discussed in FAA Order 1050.1F, July 16, 2015, Appendix B, Section B-1.2, available online at https://www.faa.gov/documentlibrary/media/order/faa_order_1050_1f.pdf#page=113

[2] Hobbs, Chris, *Estimated Noise Levels for Flytrex FTXM600P UA* (Federal Aviation Administration, February 2, 2022)

[3] Discussion of modification of this process for use of the Community Noise Equivalent Level metric (CNEL) is discussed in Section 3.1.

2 Unmanned Aircraft Delivery Operations and Noise Measurement Data Set Descriptions

Two data sets form the basis of the noise assessment for the proposed Causey delivery operations. The data sets include the Causey Aviation Unmanned, Inc. Part 135 Concept of Operations (CONOPS) dated July 19, 2021 and the FAA's Memorandum, "Estimated Noise Levels for Flytrex MTXM600P UA," dated February 17, 2022, which is provided with this report as Attachment A.[4]

2.1 Operations, Flight Paths, and Flight Profile Data

Operations and flight profile data for the UA provided by Causey and FAA were reviewed to determine the characteristics of typical operations for a proposed operating area. Based on this review, the following subsections describe the assumptions made about the operations and flight profiles that were used to inform the development of the estimated noise exposure and the methodology for the noise analysis.

2.1.1 Operations

The methodology presented in this report can be used to assess UA noise over a range of proposed activity levels; however, FAA review and approval of its use at specified activity levels is required. The activity ranges shown below in Section 4 represent what FAA considers low to moderate activity levels and anticipates as being appropriate for consideration with this methodology. At higher activity levels, this methodology may not be sufficient to inform an environmental determination and further consideration or refinements at the discretion of the FAA may be needed.

Note that DNL noise levels presented in this report are all shown consistent with effective daytime (7 AM to 10 PM) operations levels. For consideration of nighttime (10 PM to 7 AM) noise levels, a ten times operational weighting (equivalent to DNL 10 dB increase) should be applied. Section 3.1 provides techniques to apply the operational weighting necessary to calculate effective operations for analysis with the DNL metric.

2.1.2 Flight Paths and Profiles

The UA will fly a network of defined flight paths between a central distribution center and delivery points that are developed as needed, based on demand. Each delivery point is selected based on customer demand after a suitability survey is completed specific to each candidate location.

Distribution centers may include one or multiple launch pads for both UA takeoffs and landings depending on the frequency of UA operations. Figure 2 presents an example distribution center area plan for supporting only one airborne UA at time. Such facilities have a single launch pad for takeoffs

[4] Most of these documents have various markings indicating that that the contents are "Confidential & Proprietary". Only elements required to support the noise analysis methodology have been disclosed in this report.

and landings. Figure 3 presents an example distribution center area plan supporting two or more simultaneous airborne UAs. This example includes one launch pad that may be used for takeoffs and landings and multiple alternate landing pads. In addition to launch and landing pads, distribution centers include facilities for the crew to monitor and control the UAs, lineup positions where the UA batteries are charged and preparations are made for the next delivery, and areas where packages are accepted and sorted before loading into an UA.

After takeoff from the distribution center, the UA flies a network of defined flight paths from the distribution center to the intended delivery points that are developed on an "as-needed basis." As routes are developed, the UA navigates the same defined paths for both the outbound (distribution center to delivery) and inbound (post-delivery to landing) legs. Figure 4 provides an overview of a representative sample route system, including the distribution center, routes, and delivery points.

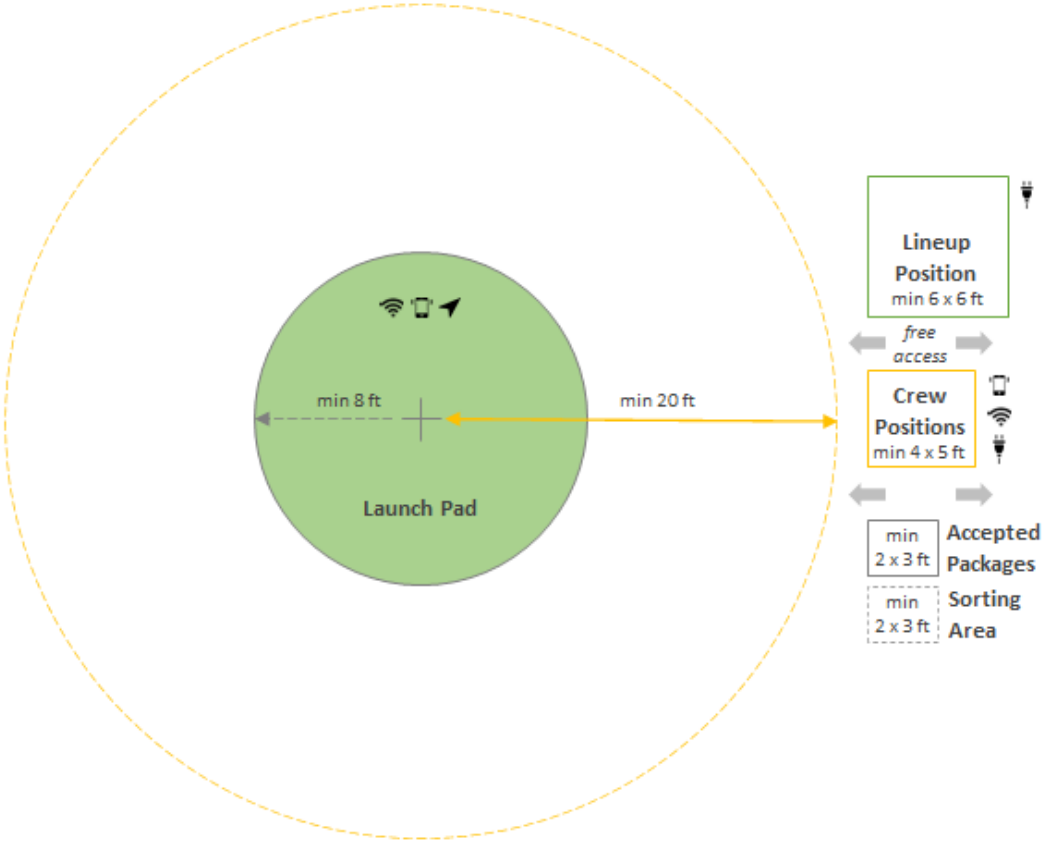

Figure 2: Distribution Center Area Plan for a Single Operating UA

Source: Causey, CONOPS July 19, 2021

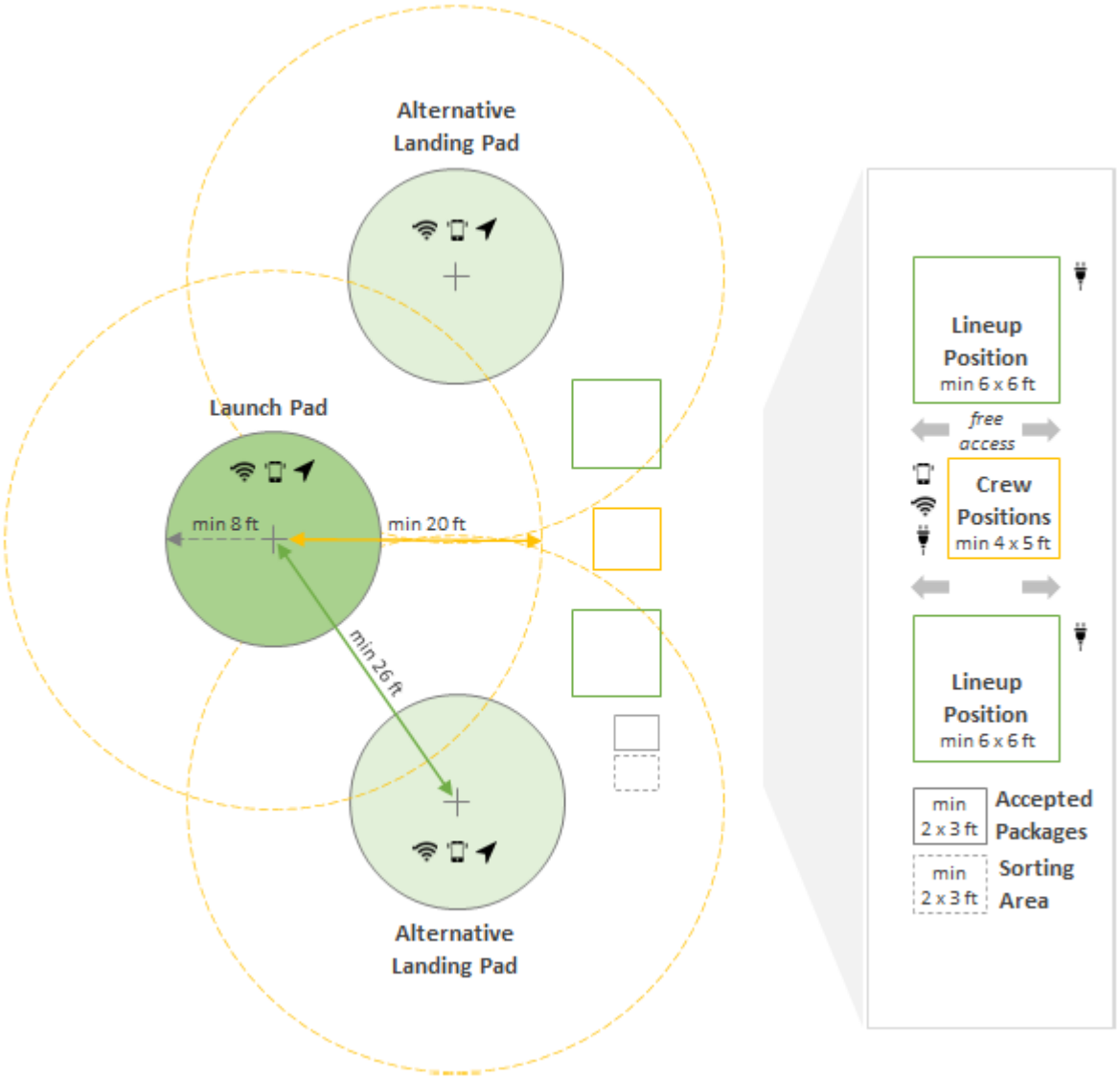

Figure 3: Distribution Center Area Plan with Two Simultaneous UAs Operating

Source: Causey, CONOPS July 19, 2021

Figure 3. Flight Network illustration. Flytrex GCS display, satellite view

Description of Points

Center — Represents the Distribution Center location on the map.

Waypoint — Represents location on the route which the sUA passes through and makes a turn.

Semaphore — Represents points where the sUA can safely hover at lower altitudes and perform emergency landing if needed, without posing a risk to people or property on the ground.

Delivery point — Represents a safe location where the sUA can lower packages to the ground for delivery and delivery requests can be made to this point.

Figure 4: Visualization of a Route System

Source: Causey, CONOPS July 19, 2021

Analysis of flight profile data provided by Causey and the FAA Office of Environment and Energy described that a typical operation profile of the UA can be broken into five discrete flight phases. Table 1 describes the typical flight profile that Causey is expected to use for delivery operations and provides detail of the five flight phases of takeoff and climb; en route outbound; delivery; en route inbound; and descent and landing. The sub sections that follow provide a narrative description of each of the flight phases.

Table 1. Flytrex FTX-M600P Typical Flight Profiles

Source: FAA February 17, 2022 (Attachment A)

Flight Phase (General)	Flight Segment (Detail)	Weight	Altitude at Segment Start (ft)	Altitude at Segment End (ft)	Ground Speed	Duration
Takeoff and Climb	Takeoff	Maximum	0	33	0	5 seconds
	Internal checks	Maximum	33	33	0	3 seconds
	Climb to cruise altitude	Maximum	33	230	0	15 seconds
En route outbound	Cruise to delivery point	Maximum	230	230	29.2 kts	1-5 minutes
Delivery	Descent for delivery	Maximum	230	82	0	22 seconds
	Open doors, Await Customer Response and lower package to ground	Maximum	82	82	0	35 seconds
	Maneuver to Unhook Package	Maximum	82	75	0	4 seconds
	Maneuver to Unhook Package	Empty	75	82		4 seconds
	Climb back to cruise altitude	Empty	82	230	0	13 seconds
En route inbound	Cruise back to distribution center	Empty	230	230	29.2 kts	1-5 minutes
Descent and Landing	Descent	Empty	230	33	0	20 seconds
	Landing	Empty	33	0	0	20 seconds

2.1.2.1 Takeoff and Climb

The Takeoff and Climb phase is defined as the portion of flight in which a fully loaded UA takes off from its launch pad at a distribution center and climbs vertically to 33 feet AGL. The UA is assumed to be carrying a package and at the maximum weight of 33.4 pounds. The UA then conducts various systems checks in a hover at 33 feet AGL over the course of three seconds. If the UA passes its systems checks, the UA then climbs vertically from 33 feet AGL to 230 feet AGL over five seconds.

2.1.2.2 En Route Outbound

The En route Outbound phase is defined as the part of flight in which the fully loaded UA transits from the distribution center to delivery points on a pre-defined network of flight paths. During this flight phase, the UA will typically operate at an altitude of 230 feet AGL and a typical airspeed of 29 knots.[5] However, the UA may operate within a corridor with altitudes as low as 171 feet AGL or as high as 289 feet AGL as needed due to obstructions and operational conditions.[6]

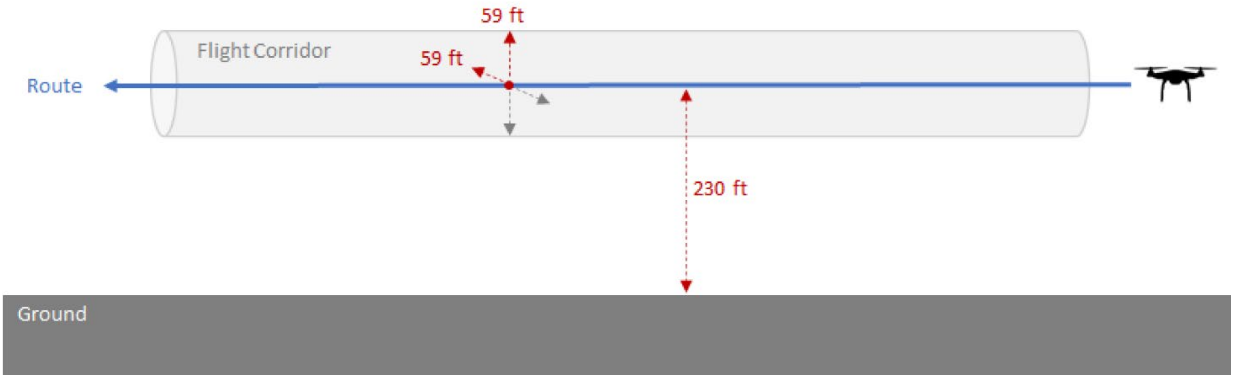

Figure 5: Flight Corridor

Source: Causey, CONOPS July 19, 2021

2.1.2.3 Delivery

The Delivery phase of flight is defined by descent from the En Route Outbound phase to a delivery point to deliver a package. This phase is assumed to start at maximum weight. The delivery point is a minimum 10 by 10-foot square area open to the sky, clear of obstacles, that is coordinated with the property owner and validated by Causey.[7]

During the delivery phase, the aircraft descends vertically from the en route altitude to 82 feet AGL. The UA then hovers at 82 feet AGL and waits for up to 15 seconds for confirmation of the delivery from the recipient. Once the recipient has communicated approval of the delivery, the UA continues to hover while it lowers the package to the ground by a tether (wire). Once the package is on the ground, the UA releases the package using the following maneuver, which takes approximately eight seconds. The UA descends vertically to 75 feet AGL, unhooks the tether from the package, returns to 82 feet AGL, and retracts the tether back into the UA. The UA then climbs at empty weight of 28.6 pounds vertically back to en route altitude at 230 feet AGL. The entire process starting with descent from en route altitude, package release, and returning to en route altitude, takes less than a minute and a half.

[5] Causey materials specify the speed as “33.6 mph (15m/s)" Speed in this memorandum is converted to knots.

[6] Causey, CONOPS July 19, 2021, pg. 15

[7] Causey, CONOPS July 19, 2021, pg. 21

2.1.2.4 En Route Inbound

Upon completion of a delivery, the UA will fly the en route inbound phase (or "return") via the reverse of the respective en route outbound profile (Section 2.1.2.2) from the delivery point back to the distribution center. The UA is assumed to be carrying no packages, and at empty weight, after delivery.

2.1.2.5 Descent and Landing

Upon reaching the distribution center, the UA will commence a vertical descent from 230 feet to 33 feet AGL over 20 seconds. The UA then descends vertically the remaining 33 feet to ground level over 20 seconds. Once on the ground, the UA stops its rotors and is retrieved by the ground crew.

2.2 Acoustical Data

Noise estimates for the UA were provided by the FAA Office of Environment and Energy representative of each phase of flight (takeoff and climb, en route, delivery, and descent and landing) as described in Section 2.1.2. The UA noise measurements were performed at a Causey facility near Liberty, North Carolina in July 2021. FAA analyzed the measurement data and summarized the acoustical data used in this report and included in Attachment A.

The following tables show the Sound Exposure Levels (SELs) used for this analysis as detailed in Attachment A, which can be matched to each flight phase detailed in Table 1.

Table 2 provides the estimated SEL for takeoff and climb associated with the flight phase described in Section 2.1.2.1. SEL in this table represents the aircraft starting from rest at the distribution center on the ground to climbing vertically to en route altitude. It does not include any horizontal/lateral flight.

Table 2. Estimate of SEL for Takeoff and Climb at Maximum Weight

Source: FAA February 17, 2022 (Attachment A)

Distance between Launch Pad and Receiver (ft) [a]	SEL (dB)
50	75.0
100	71.9
150	69.7
200	67.9
250	66.4
300	65.1
350	63.9
400	62.9
450	62.0
500	61.1

Note:
a) Distance is along ground from landing point (launch pad) to receiver.

Table 3 presents the en route sound exposure levels for maximum weight and empty weight. The maximum weight SELs are applicable for the UA carrying a package while flying outbound to a delivery point while the empty weight SEL is applicable for the UA flying inbound to the distribution center after the UA completes a delivery and/or is not carrying cargo, respectively. The estimates are based on measurements of the UA passing 216 feet above the microphone. FAA recommends that while the parameters for en route operation of the UA are typically at a speed of 29 knots and altitude of 230 feet AGL, the estimates derived from measurements at 216 feet AGL suggest that they should be used as is for the basis of any calculations.

Table 3. Estimates of En Route SEL

Source: FAA February 17, 2022 (Attachment A)

Configuration [a]	Applicable Flight Phase	Distance between Source and Microphone (ft)	SEL (dB)
Maximum	En route outbound	216	66.4
Empty	En route inbound	216	62.8
Note: a) Level flight at 29 knots			

Table 4 presents the SEL of the delivery profile discussed in Section 2.1.2.3. The SELs presented in the table are relative to the delivery point and can be applied radially/as a circle with the delivery point in the center. The values in Table 4 do not include the UA transiting to or from the delivery point at en route altitude.

Table 4. Estimate of SEL for Delivery Profile

Source: FAA February 17, 2022 (Attachment A)

Sideline Distance between Delivery Point and Receiver (ft)[a]	SEL [b] (dB)
0	81.0
50	79.7
100	77.3
150	75.1
200	73.3
250	71.7
300	70.3
350	69.1
400	68.1
450	67.1
500	66.2

Notes:
a) Distance is along ground from delivery point to receiver.
The distance of 0 feet represents a receiver directly underneath the UA.
b) Delivery profile as described in Table 1 Flight phases "Delivery – Maximum Weight" and "Delivery – Empty Weight", starting directly over delivery point at an altitude of 230 feet AGL, and remaining over the delivery point through descent, unhooking of the package, and climb back to an altitude of 230 feet AGL.

Table 5 presents the SEL associated with the descent from en route altitude to landing at the distribution center on the ground, as discussed in Section 2.1.2.5.

Table 5. Estimate of SEL for Descent and Landing at Empty Weight

Source: FAA February 17, 2022 (Attachment A)

Distance between Launch Pad and Receiver (ft) [a]	SEL (dB)
50	79.2
100	74.4
150	71.4
200	69.2
250	67.5
300	66.1
350	64.8
400	63.8
450	62.8
500	61.9

Note:
a) Distance is along ground from landing point (launch pad) to receiver.

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3 Methodology for Data Analysis

The previously described data sets were used to develop a method to estimate community noise exposure that could result from Causey delivery operations. These would be operations originating at a single distribution center within a proposed single area of operations, with each distribution center operating up to seven days a week with varying levels of daily and equivalent annual delivery operations. There are currently no standardized tools or processes in place to conduct a noise assessment for the proposed operational scenario and UA. HMMH, with detailed technical guidance from the FAA Office of Environment and Energy, developed a customized noise exposure prediction process based on the available data to conduct this analysis. The process was developed around FAA's understanding of typical use of the UA by Causey. The following subsections describe that noise analysis methodology.

3.1 Application of Operations

The DNL metric applies a 10 dB weighting for operations between 10 PM and 7 AM. The 10 dB weighing is mathematically equivalent to 10 times the number of operations. Therefore, the operations near point i can be weighted to develop a daytime equivalent number of operations ($N_{equiv,i}$). The generalized form is expressed in Equation (1).[8]

$$N_{Equiv,i} = W_{Day} \times N_{Day,i} + W_{Eve} \times N_{Eve,i} + W_{Night} \times N_{Night,i} \quad (1)$$

Where:

- $N_{Day,i}$ is the number of user-specified operations between 7 AM and 7 PM local time
- $N_{Eve,i}$ is the number of user-specified operations between 7 PM and 10 PM local time
- $N_{Night,i}$ is the number of user-specified operations between 10 PM and 7 AM local time
- W_{Day} is the day-time weighting factor, which is 1 operation for DNL
- W_{Eve} is the evening weighting factor, which is 1 operation for DNL
- W_{Night} is the night-time weighting factor, which is 10 operations for DNL

For the DNL metric, the number of DNL daytime equivalent operations, $N_{DNL,i}$ simplifies to

$$N_{DNL,i} = N_{Day,i} + N_{Eve,i} + 10 \times N_{Night,i} \quad (2)$$

In practice, Equation (2) can be further simplified by defining the user-defined operations between 7 AM and 10 PM as a single value, rather than tracking $N_{Day,i}$ and $N_{Eve,i}$ separately.

For the Community Noise Equivalent Level (CNEL) metric, which may be used in California, the number of CNEL daytime equivalent operations, $N_{CNEL,i}$ simplifies to:

[8] Equation (1) includes the three time periods of day, evening, night for consistency with other FAA documents that discuss the development of time averaging metrics such as DNL from individual SELs. Presentation of Equation (1) also allows the practitioner to modify this process for the CNEL metric for use in California.

$$N_{CNEL,i} = N_{Day,i} + 3 \times N_{Evening,i} + 10 \times N_{Night,i} \quad (3)$$

3.2 Distribution Center Infrastructure

As noted in Section 1 and Section 2.1.2, Causey operates UAs from a central distribution center. If the distribution center operates one UA, then it needs a single launch pad and landing pad. This launch pad must be at least sixteen feet wide with a protective radius of at least 20 feet around it. If the distribution center operates multiple UAs simultaneously, then it may need one launch pad and two landing pads. All three pads must be at least sixteen feet wide, with safety radii of at least forty feet between landing pads. The launch pad has a safety radius of twenty feet around it. The launch pad and alternate landing pads may be 10 feet apart from one another. The distribution center include facilities to recharge, pack, monitor, and prepare the UAs. For the purpose of this noise analysis methodology, the distribution center extents depicted in Figure 2 and Figure 3 refer to the portion of the property in which the launch and landing pads could be positioned depending on the frequency of UA operations, as appropriate. The distribution center extents for the noise analysis shall be a rectangle, circle, or other polygon that includes all the possible locations for the launch and landing pads.

3.3 Application of Acoustical Data

The Day-Night Average Sound Levels (DNLs) can be estimated with a summation of the SELs. SEL values for the UA and Causey operations covered in this report are detailed in the FAA's February 17, 2022 Memorandum and provided with this report as Attachment A.

For the purpose of calculating SEL, four specific activities are considered:

- The UA taking off from the distribution center;
- En route travel of the UA between the distribution center, the delivery point, and return;
- Delivery maneuvers of the UA at the delivery point; and
- Landing related activities of the UA at the distribution center.

3.3.1 General Assumptions

This analysis is based on the tables presented in Section 2.2. Table 2, Table 4, and Table 5 present noise exposure values at discrete distances in 50 foot increments relative to the UA's vertical profile from 0 to 500 feet for delivery, and 50 to 500 feet for takeoff and landing, respectively. If additional values between 0 to 500 feet are needed for delivery, or 50 to 500 feet for takeoff or landing, then SEL values at intermediary distances can be approximated by linear interpolation. In most cases, this should yield slightly conservative (higher) values compared to revisiting the FAA's detailed process. SEL values at distances less than 50 feet for takeoff or landing should not be extrapolated from the tables because the deviation of the method of estimation from the linearly extrapolated value increases closer to the source.

3.3.2 Takeoff and Climb

The available sound exposure levels for takeoff and climb are presented in Section 2.2 and specifically in Table 2, for the takeoff and climb profile described in Section 2.1.2.1. It should be noted that the SEL values provided only include climb to altitude and do not include horizontal flight that would occur after climb. As noted in Section 3.3.1, the values in Table 2 should only be used for distances between the launch pad at a distribution center and the receiver for distances of 50 feet to 500 feet.

Application of the SEL should be based on the position of the launch pad at a distribution center. If the exact location of the launch pad is not known, then using an outer boundary of the distribution center would be slightly conservative.

3.3.3 En Route

Flight of the aircraft in still air is anticipated to be typically 29 knots, with a typical altitude of 230 feet AGL. However, the CONOPs indicates that the aircraft could be +/- 59 feet relative to the typical 230 feet AGL. Sound exposure level for a given point i (SEL_i) with the aircraft flying directly overhead at altitude (Alt_i) in feet and a ground speed (V_i) in knots, will be calculated based on the guidance in *14 CFR Part 36 Appendix J, Section J36.205 Detailed Data Correction Procedures*.[9] It should be noted that the equations presented in this Section are only applicable for an aircraft that is moving relative to a stationary receptor.

In particular, the sound exposure level adjustment for the altitude defined in 14 CFR Part 36 for a moving aircraft, is presented here as Equation (4).

$$\Delta J_1 = 12.5 \times log_{10}\left(\frac{H_A}{H_T}\right), dB \quad (4)$$

where ΔJ_1 is the quantity in decibels that must be algebraically added to the measured SEL to adjust for a level flight path at an altitude differing from the measured altitude; H_A is the height, in feet, of the vehicle when directly over the noise measurement point; H_T is the height of the vehicle during the measurement (or reference height), and the constant (12.5) accounts for the effects on spherical spreading and duration from the off-reference altitude.

The sound exposure level adjustment for speed, as defined in 14 CFR Part 36, is presented here as Equation (5).

$$\Delta J_3 = 10 \times log_{10}\left(\frac{V_{RA}}{V_R}\right), dB \quad (5)$$

Where ΔJ_3 is the quantity in decibels that must be algebraically added to the measured SEL noise level to correct for the influence of the adjustment of the reference speed on the duration of the measured flyover event as perceived at the noise measurement station, V_R is the reference speed, and V_{RA} is the adjusted speed.

To estimate the SEL of the UA flying en route the measured SEL made during delivery will be used. As shown in Table 3, the SEL is 66.4 dB when the vehicle is at maximum weight, at 216 feet from the sound

[9] 14 CFR Part 36 Noise Standards: Aircraft Type And Airworthiness Certification available at https://www.ecfr.gov/current/title-14/chapter-I/subchapter-C/part-36

receiver and traveling at approximately 29 knots; therefore, adapting that to the maximum weight (outbound) en route condition when the UA is flying at an altitude of Alt_i feet AGL and ground speed of V_i knots can be made using Equation (6) to arrive at an estimate $SEL_{maximum\ weight}$ dB for that respective phase of flight.

$$SEL_{maximum\ weight} = 66.4 + 12.5 \times log_{10}\left(\frac{216}{Alt_i}\right) + 10 \times log_{10}\left(\frac{29}{V_i}\right), dB \quad (6)$$

The SEL for en route conditions inbound at empty weight can also be calculated using the values in Table 3. Equation (7) presents the calculation for en route conditions at empty weight.

$$SEL_{empty\ weight} = 62.8 + 12.5 \times log_{10}\left(\frac{216}{Alt_i}\right) + 10 \times log_{10}\left(\frac{29}{V_i}\right), dB \quad (7)$$

3.3.4 Delivery

The available SELs for delivery are presented in Section 2.2 and specifically in Table 4, for the delivery profile described in Section 2.1.2.3. It should be noted that the SEL values provided only include descent from en route to delivery altitude, various maneuvers associated with the delivery, and climb back to en route altitude. The SEL values do not include the noise contribution from the horizontal en route portion of the flight connecting the distribution center to the delivery point. As noted in Section 3.3.1, the values in Table 4 should only be used for distances between the launch pad and the receiver for distances between 0 to 500 feet.

3.3.5 Descent and Landing

The available SELs for descent and landing are presented in Section 2.2 and specifically in Table 5, for the descent and landing profile described in Section 2.1.2.5. It should be noted that the SEL values provided only include descent from en route altitude and do not include horizontal flight that would occur as the UA approached the landing at a distribution center. As noted in Section 3.3.1, the values in Table 5 should only be used for distances between the landing site at the distribution center and the receiver for distances of 50 feet to 500 feet.

Application of the SEL should be based on the position of the closest landing pad at the distribution center. If the exact location of the landing pads are not known, then using an outer boundary of the distribution center extents would be slightly conservative.

3.4 Proposed DNL Estimation Methodology

The number of operations overflying a particular receiver's location on the ground will vary based on the proposed operating area and demand. For a given receiver location *i*, and a single instance of sound source *A*, the SEL for that sound source SEL_{iA} is (energy) summed for the average annual daily number of DNL daytime equivalent operations ($N_{DNL,iA}$) to compute the DNL, or equivalently, by Equation (8).

$$DNL_{iA} = SEL_{iA} + 10 \times log_{10}(N_{DNL,iA}) - 49.4, (dB) \quad (8)$$

The above equation applies to an SEL value representing one noise source such as an UA takeoff or an UA landing. For cases where a particular receiver would be exposed to multiple sound sources (A through Z), the complete DNL at that point would be calculated with Equation (9).

$$DNL_i = 10 \times log_{10}\left(10^{\left(\frac{DNL_{iA}}{10}\right)} + 10^{\left(\frac{DNL_{iB}}{10}\right)} + \cdots + 10^{\left(\frac{DNL_{iZ}}{10}\right)}\right), (dB) \quad (9)$$

For each of the conditions presented below, results will be presented in tabular format with the estimated DNL.

3.4.1 DNL for Distribution Center

The takeoff and landing operations are anticipated to occur at the same location. Therefore, the results for both will be calculated for a single set of receptors. Operations will be assumed to be "head-to-head" in which case the takeoff and the landing flight paths will be the same.

Takeoff operations will be represented by two sound levels. First, aircraft will take off and climb to en route altitude with the relationship discussed in Section 3.3.2. Second, the UA will begin en route flight at maximum weight towards its first waypoint or semaphore[10] assuming that the UA will pass directly over the representative receiver using the relationship in Section 3.3.3.

Landing operations will be represented by two sound levels. First, the UA will fly to the distribution center from its last waypoint or semaphore at en route altitude and empty weight (Section 3.3.3). Second, the UA will descend from en route altitude to the ground and come to rest, which will be represented by the relationships defined in 3.3.5.

The four noise sources representing the complete takeoff and landing cycle associated with a single delivery departing and returning at the distribution center will be added together with Equation (9).

3.4.2 DNL for En Route

En route includes the UA flying to and from the distribution center to delivery points as discussed in Section 2.1.2.2 and 2.1.2.4 respectively. A representative receiver will be positioned directly under the flight path, and the DNL will be calculated based on the altitude and speed-adjusted delivery SEL calculated in Section 3.3.3. Operations will be based on representative numbers defined in relevant materials and generally assume that a receiver under the flight path will be overflown by the UA while it is traveling both outbound at maximum weight and inbound at empty weight for a single delivery. The en route outbound noise level and the en route inbound noise level will be added together with Equation (9).

3.4.3 DNL for Delivery Points

Delivery operations will be represented by a single sound level consisting of the UA starting at en route altitude, descending vertically over the delivery point at maximum weight and performing the delivery

[10] As presented in Figure 4, a semaphore is defined as a point where the UA can safely hover at lower altitudes and perform an emergency landing on an as needed basis without posing risks to people or property on the ground. A waypoint is defined as a location along a route from which the UA will pass and make a turn.

profile over the delivery point, and then ascending vertically over the delivery point at empty weight and returning to en route altitude (Section 3.3.4).

Use of the DNL Delivery, by itself, does not include the horizontal flight as the UA approaches the delivery point with the package or the horizontal flight as the UA leaves the delivery point after releasing the package. The FAA's envisioned use of this report is that the user will add the DNL Delivery to the appropriate en route DNL values with Equation (9). To assist simple conservative analyses, the results of DNL Delivery will also be presented with conservative en route approach and departure from the delivery point.

4 Noise Exposure Estimate Results

This section presents the estimated noise exposure for Causey's proposed operations for a given set of average annual day (AAD) deliveries. The values presented are in tabular format and use of the table requires estimating the number of DNL Equivalent deliveries associated with the distribution center. One delivery includes the outbound takeoff and inbound landing and is representative of two operations. The DNL Equivalent deliveries, $N_{DNL,i}$ as described in 3.1, is presented below as Equation (10).

$$Deliveries_{DNL,i} = Deliveries_{Day} + 10 \times Deliveries_{Night} \quad (10)$$

$Deliveries_{Day}$ are between 7 AM and 10 PM and $Deliveries_{Night}$ are 10 PM and 7 AM.[11] If a portion of a delivery occurs in the nighttime hours (either takeoff or landing) then it should be counted within $Deliveries_{Night}$.

For estimating noise exposure, the noise levels for each flight phase should be considered separate based on the level of proposed operations for a given location. If a particular location is at the transition of different flight phases, the cumulative noise should then be determined by adding the noise from each phase. For example a typical mission profile will include noise from multiple flight phases:

1. UA departure from and return to a distribution center;
2. En route flight at a defined altitude to and from a distribution center to a delivery point; and
3. Descent from en route flight to complete a delivery at the delivery point and ascent back to en route altitude for return to the distribution center.

The cumulative noise from the UA is then determined by adding the noise from each of these phases.

4.1 Noise Exposure for Operations at the Distribution Center

For operations at the distribution center, the UA-related noises include the takeoff and landing. To provide a conservative view, all operations are assumed to be on the same flight path operating in opposite directions.

Table 6 presents data for a given number of daily average DNL Equivalent deliveries (including the takeoff and climb, en route outbound, en route inbound, and descent and landing as detailed in Section 2.1.2), the estimated extent of DNL 45 dB, 50 dB, 55 dB, 60 dB, and 65 dB contours under the flight path for a distribution center extents as described in Section 3.2. The analyses presented in Table 6 were rounded up conservatively to the nearest 50 ft intervals out to 500 feet using the data from Section 2.2. The actual noise levels, should they be calculated with greater precision or measured, are anticipated to be within the estimated extents depicted.[12]

[11] Discussion of modification of this process for use in California with the CNEL metric is discussed in Section 3.1.

[12] The calculation of the equations presented in Section 3 require that distance is provided. The DNL levels were calculated at 50-foot intervals from 50 to 500 ft as provided in Section 2.2. The interval of 50 feet was selected as it represented the smallest distance for which measurement data was available for the UA.

Table 6. Estimated Extent of Noise Exposure from Distribution Center per Number of Deliveries

Number of DNL Equivalent Deliveries Served by Distribution Center		Estimated Extents, feet, for				
Average Daily	Annual	DNL 45 dB	DNL 50 dB	DNL 55 dB	DNL 60 dB	DNL 65 dB
<= 1	<= 365	50	50	50	50	50
<= 5	<= 1,825	50	50	50	50	50
<= 10	<= 3,650	50	50	50	50	50
<= 15	<= 5,475	50	50	50	50	50
<= 20	<= 7,300	50	50	50	50	50
<= 40	<= 14,600	100	50	50	50	50
<= 60	<= 21,900	150	50	50	50	50
<= 80	<= 29,200	150	100	50	50	50
<= 100	<= 36,500	200	100	50	50	50
<= 120	<= 43,800	200	100	50	50	50
<= 140	<= 51,100	250	100	50	50	50
<= 160	<= 58,400	250	100	50	50	50
<= 180	<= 65,700	300	150	50	50	50
<= 200	<= 73,000	300	150	50	50	50
<= 220	<= 80,300	350	150	50	50	50
<= 240	<= 87,600	400	150	100	50	50
<= 260	<= 94,900	450	150	100	50	50
<= 280	<= 102,200	500	150	100	50	50
<= 300	<= 109,500	Note c	200	100	50	50
<= 340	<= 124,100	Note c	200	100	50	50
<= 360	<= 131,400	Note c	200	100	50	50
<= 380	<= 138,700	Note c	200	100	50	50
<= 400	<= 146,000	Note c	200	100	50	50
<= 420	<= 153,300	Note c	250	100	50	50
<= 440	<= 160,600	Note c	250	100	50	50
<= 460	<= 167,900	Note c	250	100	50	50
<= 480	<= 175,200	Note c	250	100	50	50
<= 500	<= 182,500	Note c	250	100	50	50

Notes:
a) One delivery includes the outbound takeoff and inbound landing and is representative of two operations.
b) If a value for deliveries is not specifically defined in this table, use the next highest value. For example, if there are 50 average daily DNL Equivalent deliveries, use the entry for 60 average daily DNL Equivalent deliveries.
c) The extents of the 45 dB DNL extents are more than 500 feet based on the level of operations specified as the aircraft continues along its flight path. En route results may be more applicable in these instances for determining noise levels.

4.2 Noise Exposure under En Route Paths

For en route conditions, the UA is expected to fly the same outbound flight path between the distribution center and the delivery point and inbound flight path back to the distribution center (Section 3.4.3). Therefore, each location under the en route path would be overflown twice for each delivery served by the respective overhead en route path.

Table 7 the estimated DNL for a location on the ground directly under an en route path for various counts of daily average DNL Equivalent deliveries. The en route noise calculated for each delivery includes both the inbound and outbound traversal of the en route path.

Table 7. Estimated DNL Directly Under En Route Flight Paths at Various Altitudes

Number of DNL Equivalent Deliveries Served by Route		Estimated DNL for		
Average Daily	Annual	Altitude 171 feet AGL	Altitude 216 feet AGL	Altitude 289 feet AGL
<= 1	<= 365	19.9	18.6	17.0
<= 5	<= 1,825	26.9	25.6	24.0
<= 10	<= 3,650	29.9	28.6	27.0
<= 15	<= 5,475	31.6	30.4	28.8
<= 20	<= 7,300	32.9	31.6	30.0
<= 40	<= 14,600	35.9	34.6	33.0
<= 60	<= 21,900	37.7	36.4	34.8
<= 80	<= 29,200	38.9	37.6	36.1
<= 100	<= 36,500	39.9	38.6	37.0
<= 120	<= 43,800	40.7	39.4	37.8
<= 140	<= 51,100	41.3	40.1	38.5
<= 160	<= 58,400	41.9	40.6	39.1
<= 180	<= 65,700	42.4	41.2	39.6
<= 200	<= 73,000	42.9	41.6	40.0
<= 220	<= 80,300	43.3	42.0	40.5
<= 240	<= 87,600	43.7	42.4	40.8
<= 260	<= 94,900	44.0	42.8	41.2
<= 280	<= 102,200	44.3	43.1	41.5
<= 300	<= 109,500	44.6	43.4	41.8
<= 340	<= 124,100	45.2	43.9	42.3
<= 360	<= 131,400	45.4	44.2	42.6
<= 380	<= 138,700	45.7	44.4	42.8
<= 400	<= 146,000	45.9	44.6	43.0
<= 420	<= 153,300	46.1	44.8	43.3
<= 440	<= 160,600	46.3	45.0	43.5
<= 460	<= 167,900	46.5	45.2	43.7
<= 480	<= 175,200	46.7	45.4	43.8
<= 500	<= 182,500	46.9	45.6	44.0

Notes:
a) One delivery includes an outbound operation and inbound operation along the same flight path, thus two overflights.
b) If a value for deliveries is not specifically defined in this table, use the next highest value. For example, if there are 50 average daily deliveries, use the entry for 60 average daily deliveries.
c) If a value for altitude is not specifically defined in this table, use the next lowest value. For example, if the UA is anticipated to operate at an altitude of 190 ft AGL use the entry for 171 ft AGL.

In some instances, the UA may overfly locations at operations levels that may differ from both an inbound and outbound traversal of the en route path by the UA as described above and presented in Table 7. For these circumstances, Table 8 presents the equations for calculating the estimated DNL for a receiver directly under a specified given number of DNL Equivalent average daily individual overflights, defined as N_o.

Table 8. Estimated DNL Directly Under Overflights, Maximum and Empty Weight

Altitude, speed and configuration of Overflight and of Delivery		SEL for 1 Overflight (dB)	DNL for 1 Overflight between 7 AM and 10 PM (dB)	DNL equation for the number of DNL Equivalent Overflights
Altitude	Weight			
171 feet AGL	Empty	64.1	14.7	$10 \times \log_{10}(N_o) + 14.7$
171 feet AGL	Maximum	67.7	18.3	$10 \times \log_{10}(N_o) + 18.3$
230 feet AGL	Empty	62.8	13.4	$10 \times \log_{10}(N_o) + 13.4$
230 feet AGL	Maximum	66.4	17.0	$10 \times \log_{10}(N_o) + 17.0$
289 feet AGL	Empty	61.2	11.9	$10 \times \log_{10}(N_o) + 11.9$
289 feet AGL	Maximum	64.8	15.5	$10 \times \log_{10}(N_o) + 15.5$

Notes:
a) The DNL value for a given number of average DNL Equivalent Operations, N_o, can be found by using the equations associated with operation of the UA at a specified altitude and speed interval. In this case, one operation represents a single overflight.
b) If a value for altitude or speed is not specifically defined in this table, use the next lowest value. For example, if the UA is anticipated to operate at an altitude of 190 ft AGL, use the entry for 171 ft AGL.

4.3 Noise Exposure for Operations at Delivery Point

Table 9 presents the estimated DNL values for a range of potential daily average DNL Equivalent delivery counts at a delivery point. Only the partial DNL values associated with the delivery vertical flight maneuvers are presented. Also included in Table 9 is the equation for calculating the estimated DNL for a specific number of daily average DNL Equivalent delivery counts at a delivery point, defined as N_d, for instances where the number of deliveries may fall between the range of presented delivery count intervals.

In anticipated use, the value from Table 9 would be added using Equation (9) to the appropriate values from Table 7 for an UA flying to and from the delivery point at en route altitude, along with any other nearby en route operations.

Table 9. Estimated DNL at Delivery Point for Vertical Maneuvers

Number of DNL Equivalent Deliveries		Partial Estimated Delivery DNL of Vertical Maneuvers
Average Daily	Annual	Estimated DNL (dB)
<= 1	<= 365	31.7
<= 5	<= 1,825	38.7
<= 10	<= 3,650	41.7
<= 15	<= 5,475	43.4
<= 20	<= 7,300	44.7
<= 40	<= 14,600	47.7
<= 60	<= 21,900	49.5
<= 80	<= 29,200	50.7
<= 100	<= 36,500	51.7
<= 120	<= 43,800	52.5
<= 140	<= 51,100	53.1
<= 160	<= 58,400	53.7
<= 180	<= 65,700	54.2
<= 200	<= 73,000	54.7
<= 220	<= 80,300	55.1
<= 240	<= 87,600	55.5
<= 260	<= 94,900	55.8
<= 280	<= 102,200	56.2
<= 300	<= 109,500	56.5
<= 340	<= 124,100	57.0
<= 360	<= 131,400	57.2
<= 380	<= 138,700	57.5
<= 400	<= 146,000	57.7
<= 420	<= 153,300	57.9
<= 440	<= 160,600	58.1
<= 460	<= 167,900	58.3
<= 480	<= 175,200	58.5
<= 500	<= 182,500	58.7
N_d	$N_d \, x \, 365$	$10 \times \log_{10}(N_d) + 31.7$

Notes:
a) The DNL values presented in this table only reflect the UA conducting vertical flight maneuvers associated with a delivery. DNL values associated with en route flight to and from a distribution center to a delivery point associated with a delivery, or nearby en route overflights, should be added to these values utilizing the DNL levels presented in Table 7.
b) If a value for deliveries is not specifically defined in this table, use the next highest value. For example, if there are 50 average daily DNL Equivalent deliveries, use the entry for 60 average daily DNL Equivalent deliveries.

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Attachment A

Federal Aviation Administration

Memorandum

Date: February 17, 2022

To: Donald Scata, Manager, Noise Division, Office of Environment and Energy (AEE-100)

From: Chris Hobbs, General Engineer, Noise Division, Office of Environment and Energy (AEE-100)

Subject: Estimated Noise Levels for Flytrex FTXM600P UA

This document presents an analysis of noise measurements of the Flytrex FTXM600P Unmanned Aircraft (UA) by the FAA's Office of Environment and Energy (AEE), recorded in July 2021 at Causey Airfield (Causey) near Liberty, North Carolina. The purpose of the analysis is to provide estimates of expected sound exposure levels resulting from typical operations of the FTXM600P UA[1] by Causey Aviation Unmanned and provides the methods used to create the noise estimates.

1. Flight Profile and Segment Noise

The phases of a typical flight profile from takeoff to landing with an included delivery are listed in Table 1 for the FTXM600P UA. Because the noise level of the UA for a given speed varies with weight, the aircraft configuration lists the vehicle weight for each phase of flight. The noise measurements at Causey were made with the UA at its maximum takeoff weight (33.4 lbs/15.1kg) and empty weight (26.8 lbs/12.2 kg). The measurements showed that noise from the vehicle was greatest at maximum takeoff weight for all phases of flight; thus, using the maximum weight for phases of flight where the UA is carrying a package is a conservative estimate of the vehicle noise for that phase of flight as compared to the UA carrying a lighter package.

[1] M. James et al., "Causey UAS Acoustic Measurement," Technical Report 21-05, Blue Ridge Research and Consulting, LLC, 23 September 2021.

Table 1. Phases of Flight for Typical Flight Profile of FTXM600P UA

Phase of Flight	Description	Configuration
Takeoff	Launch from ground to operational altitude (230 ft)	Max weight (carrying package for delivery)
En Route to Delivery	Flying at operational altitude and cruise speed (29 kts)	Max weight
Delivery	Vertical descent from operational altitude to delivery height; Delivery of package; Vertical ascent to operational altitude	Max weight on descent/empty weight on ascent
En Route from Delivery	Flying at operational altitude and cruise speed	Empty weight
Landing	Land by vertical descent from operational altitude	Empty weight

The method used to estimate the noise on the ground during each phase of flight is listed below followed by suggestions on how to combine them for a representative estimate of the entire flight. The methodology presented for estimating the noise for each flight phase was chosen based on a comparison of the calculated noise estimates by AEE against the measurement data for each flight phase and determined to be an appropriate and conservative estimate based on available data received by AEE to date for the of the FTXM600P UA. The information detailing the flight profile was provided to the FAA via letter exchanges[2].

1.1. Takeoff Noise

The profile of the FTXM600P UA climbing to an operational altitude of 230 ft above ground level is detailed in Table 2. Following is the method used to estimate the sound exposure level (L_{AE}) of this part of the flight profile.

Table 2. FTXM600P UA Takeoff Profile Details

Flight Segment	Altitude (ft AGL)	Ground Speed (kts)	Duration (s)
Takeoff	0 ascend to 33	0	5
Internal Checks	Hover at 33	0	3
Climb to Operational Altitude	33 ascend to 230	0	15

Measurements of the noise emissions of the FTXM600P UA were made when it was at maximum weight and hovering 50 feet AGL above the ring of ground microphones shown in Fig. 1. Each recording lasted for 30 seconds and began after the UA was in a steady condition.

[2]Causey Letter Exchange UA_P135_Environmental_Analysis_FAA_AEE_Operational_Data_Needs_Causey_20211130.pdf, 15 December 2021.

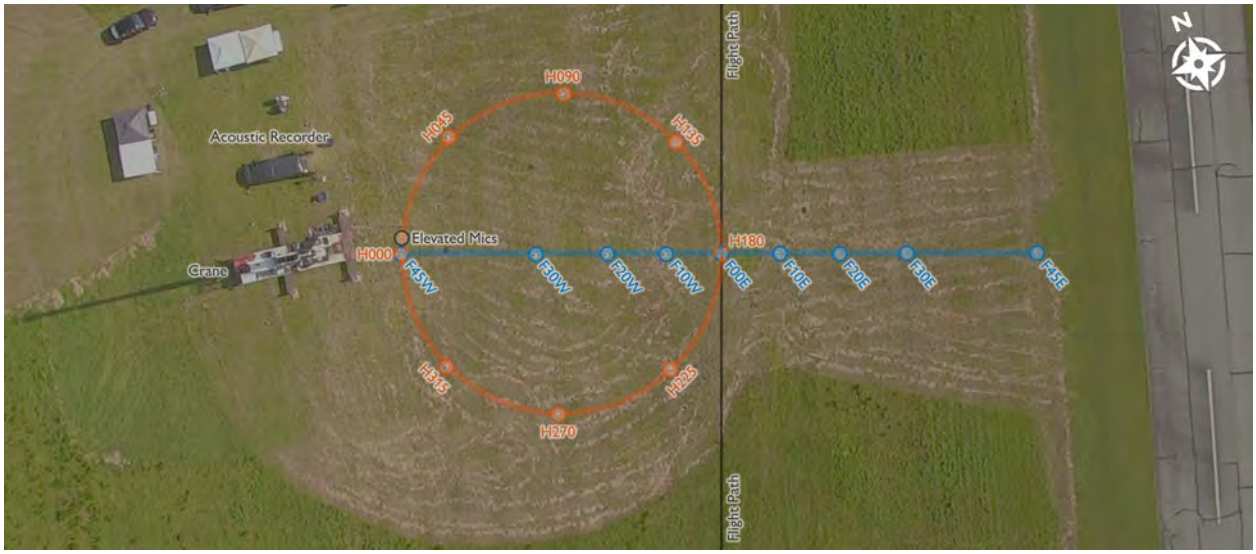

Figure 1. Microphone locations for hover measurements shown in orange when FTXM600P UA hovered above the origin.

The average sound pressure level was calculated at each of the microphones for five separate recordings. The average sound pressure level was normalized to a distance of 70.7 ft using spherical spreading from the actual distance from the FTXM600P UA to each microphone and corrected by 6 dB because all the microphones used were on ground boards. The results from one of the five recordings were discarded and the remaining four were averaged to generate the results as presented in Table 3. It is important to note that these measurements are all at the same relative angle from the bottom of the UA. It is expected that this is a conservative estimate of the noise due to the fact that broadband noise from the rotors is being captured; whereas, the noise emitted closer to the plane of the rotors would be dominated by blade passage frequency which is lower than the broadband frequency range and would consequently have a lower A-weighted sound level.

Table 3. Average Sound Pressure Level of FTXM600P UA while Hovering

Sound Pressure Level (dBA)	Distance (ft)	Aircraft Configuration
64.9	70.7	Maximum Weight
63.1	70.7	Empty Weight

In order to estimate the noise levels from the UA, the following assumptions have been made.

Sound transmission between the noise source and the receiver is solely a function of distance with no additional atmospheric attenuation or ground effects.

In this analysis, the levels in Table 3 represent reference sound pressure levels measured at reference distances for each weight configuration of the UA. Those reference levels will be adjusted for spherical spreading to develop the levels at other distances for each configuration of the aircraft. For a stationary point source, the spherical spreading relationship of the sound pressure level (L_i) at distance D_i from the reference sound pressure level (L_R) measured at a reference distance D_R is given by Eq. 1.

$$L_i = L_R + 20\log_{10}\left(\frac{D_R}{D_i}\right),\ dB$$

Sound transmits equally in all directions.

The levels in Table 3 are based on the measurement locations depicted in Figure 1 while the UA was hovering at approximately 50 ft AGL. The assumption that the UA is an omnidirectional sound source implies that the same sound levels would have been measured at any point on the surface of a sphere centered on the UA.

To estimate the sound exposure level of the takeoff segment of a flight, the takeoff path from ground to an operational height of 230 ft AGL is evenly divided into stations (blue ovals) as illustrated in Figure 2. The hover noise level noted in Table 3 is spherically spread from each station to a point on the ground a fixed distance from the takeoff point. Using the total takeoff duration of 23 seconds from Table 2, the sound exposure level is calculated assuming the UA spent equal amounts of time at each station. The brief hover time at 33 ft AGL is accounted for in this estimation as the first hover station is set to 33 ft AGL and the duration at each of the seven stations is approximately three seconds. Based on examination of the measured data during simulated takeoffs the duration of the climb from ground to operational height is best represented by a continuous climb with the duration of the entire climb divided into even intervals at each station.

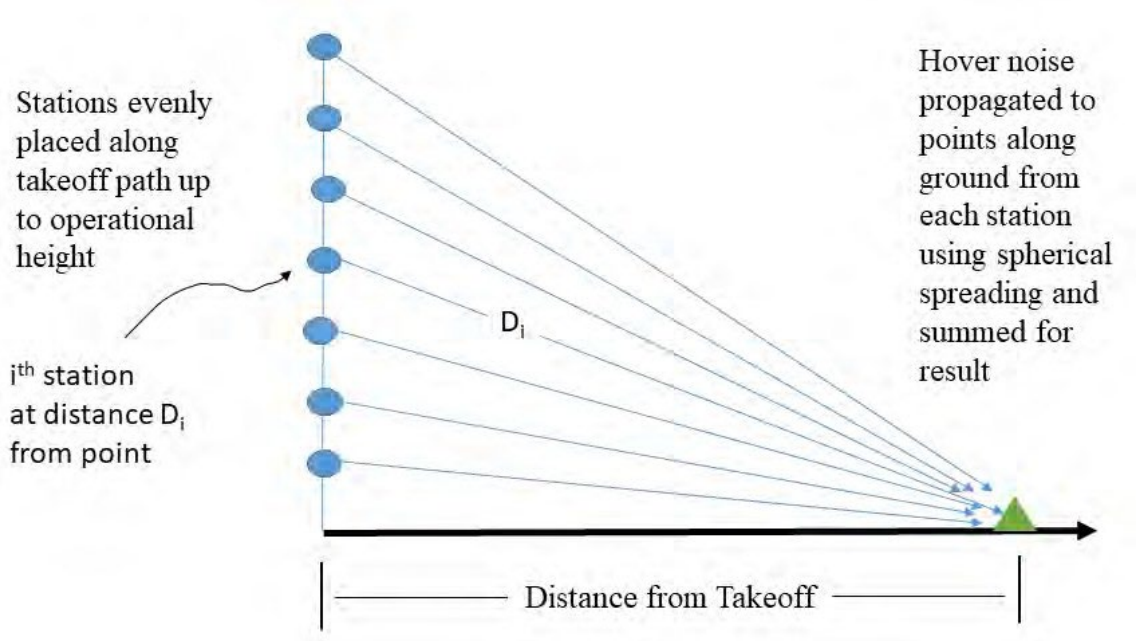

Figure 2. Graphical representation of how hover noise is used to simulate takeoff noise.

The sound exposure level ($L_{AEi}(r)$) as a function of distance from takeoff (r) from the UA at the i^{th} station shown in the figure is the product of the acoustic energy calculated from the Sound Pressure Level (L_i) spherically spread to a distance D_i using Equation 1 and the duration dt (~ 3 s) as given in the following equation:

$$L_{AEi}(r) = 10\log_{10}\left(10^{(.1L_i)}dt\right), dB \quad (2)$$

To calculate the sound exposure level for the entire takeoff at the distance from takeoff, r, one need only sum the levels calculated from each station according to Equation 3.

$$L_{AE}(r) = 10\log_{10}\left(\sum_{i}^{n} 10^{.1L_{AEi}(r)}\right), dB \quad (3)$$

Where n = number of stations used to simulate the takeoff.

The results of the computations using the 7 stations shown in Figure 2 are presented in Table 4.

Table 4. Estimate of Sound Exposure Level for Takeoff of FTXM600P UA at Maximum Weight

Distance from Takeoff (ft)	L_{AE} (dBA)
50	75.0
100	71.9
150	69.7
200	67.9
250	66.4
300	65.1
350	63.9
400	62.9
450	62.0
500	61.1

1.2. En Route Noise at Maximum and Empty Weights

The FTXM600P UA was measured flying at a cruise speed of 29 kts at an average altitude of 216 ft AGL both at max weight and empty weight over the array pictured in Figure 1. The average of the metrics measured for all the passes over the F00E microphone (undertrack) going both upwind and downwind are listed in Table 5. A 6 dB correction was made to the average because the microphone was on a ground board; thus, no attempt is being made to account for ground reflection at an observer's ear above the ground. While the parameters for en route operation of the FTXM600P UA are at a speed of 29 kts and altitude of 230 ft AGL, it is suggested that the measured metrics be used as is for the basis of any calculations.

Table 5. Estimates of En Route Noise of FTXM600P UA

Aircraft Configuration	Ground Speed (kts)	Altitude (ft AGL)	L_{AE} (dBA)
Max Weight	29	216	66.4
Empty Weight	29	216	62.8

1.3. Delivery Noise

The parameters for the delivery portion of a typical flight profile for the FTXM600P UA are included in Table 6. The ground speed is 0 kts for all flight segments. The noise for each segment listed in the table is modeled in similar fashion as the takeoff portion of the flight profile; each ascent and descent was divided into stations along the path; the hover portions of the profile were modeled with the vehicle at one location for the duration of the hover; and the sound pressure level was estimated at points along the ground using the appropriate aircraft configuration as presented in Table 3. The duration for each segment was used to sum the energy to get the sound exposure level for that segment at that point along the ground. All segments were added to get the sound exposure level as a function of distance along the ground from the delivery point as presented in Table 7. The same equations used and methodology applied for the takeoff portion of the profile were applied in this estimate of the delivery noise as a function of distance from the delivery point on the ground. The hover condition was modeled due to the extended time at that part of the profile.

Table 6. FTXM600P UA Delivery Profile Details

Flight Segment	Altitude (ft AGL)	Aircraft Configuration	Duration (s)
Descent for Delivery	230 descend to 82	Max Weight	22
Open Doors, Await Customer Response, and Lower Package	Hover at 82	Max Weight	35
Maneuver to Unhook Package	82 descent to 75 then ascend to 82	Max for Descent/Empty for Ascent	8
Ascend to Operational Height	82 ascend to 230	Empty Weight	13

Table 7. Estimate of Sound Exposure Level for Delivery Profile of FTXM600P UA

Distance from Delivery (ft)	L_{AE} (dBA)
0	81.0
50	79.7
100	77.3
150	75.1
200	73.3
250	71.7
300	70.3
350	69.1
400	68.1
450	67.1
500	66.2
Note: 0 feet represents a receiver directly underneath the UA.	

1.4. Landing Noise

The profile of the FTXM600P UA descending from an operational altitude of 230 ft AGL is detailed in Table 8. Because the UA spends half the descent time between 33 ft AGL and the ground, the modeling of the landing was done in the same manner as the takeoff for both flight segments separately and summed together to generate the final estimated noise level as presented in Table 9.

Table 8. FTXM600P UA Landing Profile Details

Flight Segment	Altitude (ft)	Ground Speed (kts)	Duration (s)
Descent	230 descend to 33	0	20
Landing	33 descend to 0	0	20

Table 9. Estimate of Sound Exposure Level for Landing of FTXM600P UA at Empty Weight

Distance Landing (ft)	L_{AE} (dBA)
50	79.2
100	74.4
150	71.4
200	69.2
250	67.5
300	66.1
350	64.8
400	63.8
450	62.8
500	61.9

2. Conclusion

The information and noise levels presented in this document represent conservative estimates of the noise made by the FTXM600P UA during each segment of a typical flight profile. In order to get the sound exposure level at any point on the ground, a calculation of the contributions from each flight segment should be combined to arrive at a final estimate of cumulative noise exposure. In order to calculate the maximum sound level from the takeoff, delivery, or landing portions of the flight profile, it is recommended that the sound pressure level from the appropriate aircraft configuration be used at the lowest altitude of the flight segment. Due to the directivity of the source and the excessive attenuation of ground to ground propagation this estimate of the sound exposure level will most likely be an over estimate, but this is conservative and appropriate for use in estimating noise exposure. Although further analysis of the measurements of the UA will be forthcoming and may change the estimates as presented in the document; the estimates presented here represent the most appropriate, conservative estimates of the noise based on comparison of the estimates to available measurement data received by AEE to date and can be used with confidence in conjunction with developing a generalized methodology for noise estimates of proposed Causey Unmanned operations using the FTXM600P UA.

APPENDIX C

Non-Standard Noise Methodology Memos

Federal Aviation Administration

Memorandum

Date: January 20, 2023

To: Don Scata, Noise Division Manager, Office of Environment and Energy (AEE-100)

From: Mike Millard, Flight Standards (AFS), General Aviation Operations Branch, AFS-830

Subject: Environmental Assessment (EA) Noise Methodology Approval Request for Causey Aviation Unmanned, Inc. Commercial Package Delivery Operations with the Flytrex FTX-M600P UA from in Granbury and Rowlett, TX

FAA Office of Flight Standards (AFS) requests FAA Office of Environmental and Energy, Noise Division (AEE-100) approval of the noise methodology to be used for the Environmental Assessment (EA) for Causey Aviation Unmanned, Inc. (Causey) operations using the Flytrex FTX-M600P unmanned aircraft (UA) in Granbury and Rowlett, TX to provide package delivery services as a 14 CFR Part 135 operator as described below.

As required under the National Environmental Policy Act (NEPA), the FAA must consider the potential for environmental impacts in informing the agency's decision to approving Federal actions, including the potential for noise impacts as detailed in FAA Order 1050.1F.

As the FAA does not currently have a standard approved noise model for UA, this memo serves as a request for written approval from AEE-100 to use the methodology proposed in the following sections to support the noise analysis for this EA.

Description of Aircraft and Proposed Operations

AFS is evaluating Causey's proposed commercial package delivery operations using the Flytrex FTX-M600P UA from Distribution Centers (DCs) located in Granbury and Rowlett, TX. Approval of a Federal Action providing Causey's air carrier Operations Specifications (OpSpecs) is required before these operations can occur.

Causey is proposing to perform package delivery operations from a single DC located within each of the two proposed operating areas and follow predetermined routes to deliver packages between the DC and delivery locations ("delivery points") such as medical centers, health facilities, and private homes in surrounding communities. The proposed UA operating areas will have a radius of two nautical miles

centered on the DC at each of the two sites, and the dimensions of the UA operating areas define the Area of Potential Effect (APE).

The Flytrex FTX-M600P is a six-motor structure (hexacopter) design with a maximum takeoff weight listed as 33.4 lbs., including a 6.6 lb. payload. The UA departs the DC from the ground via a vertical climb to en route altitude, at which point the UA navigates along a defined path from the distribution center to the intended delivery point. The en route portion of the flight would typically be operated at an altitude of 230 feet Above Ground Level (AGL) and speed of 29 knots. Upon reaching a delivery point, the UA descends vertically to an altitude of 82 feet AGL where it uses a wire/cable to lower the package to the ground. After the package has safely reached the ground, the wire/cable is retracted, and the UA then ascends back to 230 feet AGL for transit and landing back at the DC via a vertical descent to the ground.

Causey projects that flights will occur primarily Mon-Sun, with operating hours from 8 am until 10 pm. Causey anticipates maximum daily delivery flight operations will be distributed within delivery zones located within the two proposed operating areas as detailed in Table 1 under the scope of this proposed action:

Table 1. Maximum Anticipated Daily UA Delivery Operations per Delivery Zone

Granbury				**Rowlett**			
Delivery Zone	Daily Operations	Delivery Zone	Daily Operations	Delivery Zone	Daily Operations	Delivery Zone	Daily Operations
A	4	G	3	A	11	F	7
B	1	H	4	B	9	G	21
C	4	I	5	C	6	H	2
D	1	J	18	D	6	I	4
E	27	K	1	E	5		
F	9						
		Total	77			Total	71

Noise Analysis Methodology

AFS requests use of the noise analysis methodology described in HMMH Report No. 309990.003-5 for the “Noise Assessment for Causey Proposed Package Delivery Operations with Flytrex FTX-M600P Unmanned Aircraft” dated February 28, 2022.

Federal Aviation Administration

Memorandum

Date: January 24, 2023

To: Mike Millard, Flight Standards (AFS), General Aviation Operations Branch, AFS-830

From: For Don Scata, Manager, Noise Division, Office of Environment and Energy (AEE-100)

Subject: Environmental Assessment (EA) Noise Methodology Approval Request for Causey Aviation Unmanned, Inc. Commercial Package Delivery Operations with the Flytrex FTX-M600P UA from Granbury and Rowlett, TX

The Office of Environment and Energy, Noise Division (AEE-100), has reviewed the proposed non-standard noise modeling methodology to be used for Causey Aviation Unmanned, Inc. (Causey) operations using the Flytrex FTX-M600P unmanned aircraft (UA) at two sites in Granbury and Rowlett, Texas. This request is in support of an Environmental Assessment (EA) for Causey to provide package delivery services as a 14 CFR Part 135 operator in Granbury and Rowlett and associated operating areas.

The Proposed Action is to use the FTX-M600P UA from a single central distribution center located at each site connecting to a supporting route network to deliver packages to potential delivery locations ("delivery points") such as medical centers, health facilities, and private homes within each proposed operating area. Typical operations of the UA will consist of departure from the distribution center via a vertical climb to an approximate altitude 230 feet above ground level (AGL). The UA will then navigate en route along a defined path from the distribution center to the intended delivery point at a typical airspeed of 29 knots and 230 feet AGL. Reaching the delivery point, the UA will descend vertically to approximately 82 feet AGL and lower a package via a cable to the ground. Following delivery, the UA will retract the cable, climb back to en route altitude, fly along a defined path back to the distribution center, and then descend vertically to land on the ground upon reaching the distribution center.

Under the scope of this Proposed Action Causey anticipates all delivery flight operations at the two sites and associated operating areas would occur Monday through Sunday during daytime hours (8 AM to 10 PM). Causey anticipates daily delivery operations will be distributed among delivery zones located within each of the two sites as presented in Table 1 of the proposed non-standard noise modeling methodology request, "Environmental Assessment (EA) Noise Methodology Approval Request for Causey Aviation Unmanned, Inc. Commercial Package Delivery Operations with the Flytrex FTX-M600P UA from in Granbury and Rowlett, TX" dated January 20, 2023.

As the FAA does not currently have a standard approved noise model for assessing UA, and in accordance with FAA Order 1050.1F, all non-standard noise analysis in support of the noise impact analysis for the National Environmental Policy Act (NEPA) must be approved by AEE. This letter serves as AEE's response to the method developed in in HMMH Report No. 309990.003-5 for the "Noise Assessment for Causey Proposed Package Delivery Operations with Flytrex FTX-M600P Unmanned Aircraft" dated February 28, 2022.

The proposed methodology appears to be adequate for this analysis; therefore, AEE concurs with the methodology proposed for this project. Please understand that this approval is limited to this particular Environmental Review, location, vehicle, and circumstances. Any additional projects using this or other methodologies or variations in the vehicle will require separate approval.

APPENDIX D

Public Comments and

FAA Responses

PUBLIC COMMENTS AND FAA RESPONSES

COMMENT #1

Karen B. Hardin, Wildlife Habitat Assessment Program, Texas Parks & Wildlife, Wildlife Division, 4200 Smith School Road, Austin, Texas 78744-3291

June 12, 2023

As the state agency with primary responsibility for protecting the state's fish and wildlife resources and in accordance with the authority granted by Texas Parks and Wildlife Code section 12.0011, TPWD provides the following comments and recommendations to minimize potential adverse impacts to the state's fish and wildlife resources, including threatened and endangered species, in association with the proposed project.

Migratory Birds, State Listed Birds, and Birds of Conservation Concern
The EA acknowledges that birds may display disturbance behaviors toward drones, such as fleeing or attacking maneuvers or potential strikes. However, the EA concluded that no significant impacts to state listed protected birds, migratory bird species, and birds of conservation concern are expected due to the limited scale of the operations over a distributed area, the altitude of overflights at 230 feet AGL, and minimal anticipated noise and visual impacts from the proposed action.

Recommendation: TPWD recommends Causey report bird interactions with the UAs to TPWD and the Arlington U.S. Fish and Wildlife Service (USFWS) office, on an annual basis, if interactions occur. Reports should include dates, identify the bird by species, identify damage to the UA, identify injury or death to the bird, and provide a location of the interaction. Data obtained from reports may indicate a need for adjustments to flight paths or timing to reduce impacts to avian wildlife.

Recommendation: To minimize potential disturbance to nesting, foraging, and roosting birds, unnecessary flights should be avoided over woodlands and other undeveloped lands within the proposed operating areas. Undeveloped lands within public parks and recreation areas have less likelihood of future development and offer habitat for breeding birds, and TPWD recommends that Causey avoid or minimize flights over public parks and nature reserves.

Bald and Golden Eagle Protection Act
Because bald eagles have been observed in both operating areas, the EA indicates that precautions will be taken to avoid disturbance to nesting eagles that are identified by drone operators or by state, federal, or other natural resource stakeholders. Precautions include establishing an avoidance area to provide a 1,000-foot vertical and horizontal separation distance between the UA flight path and the nest. The avoidance area will be maintained until the end of the breeding season (December 1 through August 31) or until the nest has been determined to be vacated by a qualified biologist.

Recommendation: TPWD recommends that if an eagle nest is observed and an eagle nest avoidance area is established, Causey should report the nest and mitigative efforts to the USFWS Region 2 Migratory Bird Permit Office in a timely manner to ensure compliance with the Bald and Golden Eagle Protection Act and to determine if additional monitoring or reporting mechanisms are necessary. TPWD recommends sending a courtesy copy of reports to TPWD because the bald eagle is a species of greatest conservation need in Texas.

Parks, Nature Preserves, and Recreational Areas

The EA indicates that the operating area of the Granbury site includes flights over a portion of Lake Granbury and that the operating area of the Rowlett site includes flights over a portion of Lake Ray Hubbard, which provide fishing and watersport recreation. Lake Granbury is operated by the Brazos River Authority (BRA), and Lake Ray Hubbard is operated by Dallas Water Utilities (DWU). The operating area at the Granbury site includes multiple City of Granbury parks and portions of BRA lands, a park, and Lake Granbury waters. The operating area of the Rowlett site includes flights over city parks and natural areas managed by the City of Garland and the City of Rowlett. The EA does not indicate that pre-project coordination was held with the BRA or DWU regarding potential flight conflicts with BRA or DWU lake regulations. The EA does not indicate that pre-project coordination was held with the BRA, DWU, City of Granbury, the City of Rowlett, or the City of Garland to ensure that flight locations are placed to minimize visual nuisance and disturbance impacts to parklands and nature preserve users and wildlife.

Recommendation: To avoid disturbance and visual nuisance impacts to wildlife and park users, TPWD recommends avoiding flights over nature preserves, parklands, and recreational areas. If flights over nature preserves, parklands, and recreational areas are required, TPWD recommends coordinating with the cities, BRA, and DWU to ensure that flight paths are thoughtfully placed to minimize visual nuisance and disturbances. TPWD recommends coordinating with the BRA and DWU to ensure that commercial flights over Lake Granbury and Lake Ray Hubbard and commercial deliveries to BRA lands meet lake regulations.

The EA indicates that Causey identifies areas where open-air gathering of people typically occurs, such as open-air concert venues and school yards, and avoids these properties through the creation of static keep-out areas via Causey's route planning software, which prepares an optimized flight path from the DC to each designated delivery site. The software ensures that each route integrates and respects all of the restrictions entered into the database, including Section 4(f) properties such as public parks, recreational areas, wildlife refuges, and historic properties. Such areas can be automatically avoided based on the time of day and other factors. However, the EA does not identify the location of proposed keep-out areas associated with public parks, recreational areas, or nature preserves for the two operating areas.

Recommendation: TPWD recommends the EA identify the location of proposed keep-out areas of Causey's flight planning system that represent nature preserves, parklands, and recreation areas.

FAA RESPONSE

The FAA received confirmation from Causey Aviation Unmanned, Inc., addressing TPWD's concerns and recommendations.

> "Causey Aviation Unmanned, Inc. (CAU) appreciates Texas Parks and Wildlife Division's comments dated June 13, 2023 on the Draft Environmental Assessment regarding our proposed operations in Granbury and Rowlett, Texas. Protecting the state's fish and wildlife is important to us and we will endeavor to voluntarily implement the recommendations indicated in TPWD's letter.
>
> We would add that we do try to avoid nesting areas or other protected areas for wildlife, and almost all of our flights will be in moderately dense suburban neighborhoods and not near habitats for protected species. Within those neighborhoods we do prefer routes with trees or other natural features in order to increase safety for residents and to reduce the (already low) impact of noise. We are not aware of any incidents which would indicate an impact to wildlife for any of our 40,000 plus flights.

We understand that the bald eagle is a species of special conservation concern. We have not observed any eagle nests to date, but if we do observe any nests we will certainly report them and our mitigating efforts to the USFWS and to TPWD. We thank TPWD for making us aware of the matter.

Finally, we with respect to the TPWD's recommendation that the EA identify the location of proposed keep-out areas of CAU's flight planning system that represent nature preserves, parklands, and recreation areas we would note that those areas within our limited service volume would be likely to be very small and may change over time due to factors such as safety considerations, feedback from the community, community demand for products delivered to the edge of recreational areas, the conditions and limitations imposed by our operating exemption, and so forth. It is therefore impractical to positively identify all of those areas in the EA and expect that they will remain as identified in perpetuity. That said, we will try to avoid any such areas however small within our service volume.

We look forward to serving the communities of Granbury and Rowlett while making every effort to preserve their natural resources, and we sincerely appreciate the collaboration of the TPWD."

As described in the EA, noise and visual effects from Causey's overflights at or above 250 feet above ground level are not expected to be significant to humans or wildlife. While Causey may not be able to fully meet TPWD's recommendation regarding overflights of nature preserves, parklands, and recreation areas, Causey has indicated their willingness to consider additional recommendations and opportunities for discussion and to maintain respectful partnerships with state and local agencies and officials.

COMMENT #2

Gary Sheppard, Pecan Plantation

Pecan Plantation is a high-density private airpark with two runways and several hundred private light aircraft based in the subdivision.

Commercial drone activity would cause a significant obstacle to navigation and therefore reduce aviation safety in the area.

FAA RESPONSE

The FAA's mission is to provide the safest, most efficient aerospace system in the world. 49 United States Code Section 44807 grants the Secretary of Transportation the authority to use a risk-based approach to determine if certain unmanned aircraft systems may operate safely in the national airspace system on a case-by-case basis. After reviewing Causey's 2020 petition for exemption to conduct 14 Code of Federal Regulations Part 135 air carrier operations for commercial package delivery using a UA, the FAA decided to issue Causey an exemption (see Exemption No. 19508; Regulatory Docket No. FAA-2020-0532[1]). When conducting UAS operations, Causey must adhere to the conditions and limitations of the exemption.

[1] See: https://www.regulations.gov/search?filter=FAA-2020-0532.