Bipartisan Infrastructure Law (BIL)
Airport Traffic Control Tower (ATCT) Replacement Program

Programmatic Environmental Assessment

June 2023

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ACRONYMS AND ABBREVIATIONS

ACHP..... Advisory Council on Historic Preservation
AIRFA..... American Indian Religious Freedom Act
AOA..... Air Operations Area
APR..... Area of Potential Effects
ARPA..... Archaeological Resources Protection Act
ARSR..... Air Route Surveillance Radar
ARTCC..... Air Route Traffic Control Center
ATCB..... Air Traffic Control Beacon
ATCT..... Airport Traffic Control Tower
B ..... Billion
BIL..... Bipartisan Infrastructure Law
BMP..... Best Management Practice
CAA..... Clean Air Act
CBRA..... Coastal Barrier Resources Act
CBRS ..... Coastal Barrier Resources System
CEQ..... Council on Environmental Quality
CERCLA ..... Comprehensive Environmental Response, Compensation, and Liability Act
CFR..... Code of Federal Regulations
CO ..... Carbon Monoxide
CO2..... Carbon Dioxide
CONUS..... Continental United States
CWA..... Clean Water Act
CZMA..... Coastal Zone Management Act
DOI ..... Department of Interior
DOT ..... Department of Transportation
EA..... Environmental Assessment
EFH..... Essential Fish Management
EIS..... Environmental Impact Statement
EO ..... Executive Order
ESA ..... Endangered Species Act
F&E..... Facilities and Equipment
FAA..... Federal Aviation Administration
FEMA..... Federal Emergency Management Agency
FHWA..... Federal Highway Administration
FONSI ..... Finding of No Significant Impact
FPPA..... Farmland Protection Policy Act
FY..... Fiscal Year
GA ..... General Aviation
GHG..... Greenhouse Gas
HABS..... Historic American Buildings Survey
HAER..... Historic American Engineering Record

HAP ..... Hazardous Air Pollutant
HMS..... Hazard Materials Survey
HUB…….. Historically Underutilized Business
HUC ..... Hydrologic Unit Codes
IAL ..... Intermediate Activity Level
IIJA…… Infrastructure Investment and Jobs Act
IPCC..... Intergovernmental Panel on Climate Change
JO…… Joint Order
LAL ..... Low Activity Level
m ..... Meter
MAL..... Major Activity Level
MBTA..... Migratory Bird Treaty Act
MOA ..... Memorandum of Agreement
MOU ..... Memorandum of Understanding
n.d. ..... No Date
NAAQS ..... National Ambient Air Quality Standards
NAGPRA .... Native American Graves Protection and Repatriation Act
NAS……National Airspace System
NCHPO ..... National Conference of State Historic Preservation Officers
NEPA ..... National Environmental Policy Act
NESHAP..... National Emission Standards For Hazardous Air Pollutants
NexRad ..... Next Generation Radar
NHL ..... National Historic Landmark
NHO..... Native Hawaiian Organization
NHPA..... National Historic Preservation Act of 1966
NLAA ..... Not Likely to Adversely Affect
NMFS..... National Marine Fisheries Service
NO2 ..... Nitrogen Dioxide
NOAA..... National Oceanic and Atmospheric Administration
NPDES..... National Pollutant Discharge Elimination System
NPL..... National Priorities List
NPS..... National Park Service
NRCS..... Natural Resources Conservation Service
NRHP..... National Register of Historic Places
NWSRS..... National Wild and Scenic River System
OSHA ..... Occupational Safety and Health Administration
PA..... Programmatic Agreement
PAU ..... Practice for Architecture and Urbanism
P.L. ..... Public Law
PEA..... Programmatic Environmental Assessment
PM..... Particulate Matter
ppb ..... Parts Per Billion
ppm..... Parts Per Million

RCRA..... Resource Conservation and Recovery Act
REC……Recognized Environmental Condition
RT ..... Remote Tower
RTS..... Remote Tower System
SAFETEA-LU…Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SHPO..... State Historic Preservation Officer
SIP..... State Implementation Plan
SO2 ..... Sulfur Dioxide
TCP..... Traditional Cultural Property
THPO ..... Tribal Historic Preservation Officer
TIP ..... Tribal Implementation Plan
TRACON…. Terminal Radar Approach Control Facility
TRI..... Toxic Release Inventory
TSCA ..... Toxic Substances Control Act
USACE ..... U.S. Army Corps of Engineers
U.S.C. ..... U.S. Code
USDA..... U.S. Department of Agriculture
USEPA ..... U.S. Environmental Protection Agency
USFWS ..... U.S. Fish and Wildlife Service
USGS ..... U.S. Geological Survey
WHA..... Wildlife Hazard Assessment
WHMP..... Wildlife Hazard Management Plan
WSRA ..... Wild and Scenic Rivers Act
µg ..... microgram

SECTION 1 | INTRODUCTION

1.1 OVERVIEW

The Federal Aviation Administration (FAA) is proposing to replace numerous existing Airport Traffic Control Towers (ATCTs) at airports across the nation. The Infrastructure Investment and Jobs Act (IIJA; Public Law [P.L] 117-58), enacted on November 15, 2021, also known as the Bipartisan Infrastructure Law (BIL), appropriated $25 billion (B) over a five-year period (Fiscal Year 2022 [FY22] to 2026 [FY26]) for airport and air traffic control projects. The FAA established the BIL ATCT Replacement Program[1] to use the aviation BIL funding to replace existing FAA-owned ATCTs at mainly non-major airports with modern ATCT facilities (FAA, n.d. (a)). Section 1.4, Proposed Action, describes the proposed federal action in greater detail.

This Programmatic Environmental Assessment (PEA) has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, as amended (42 United States Code [U.S.C.] § 4321 et seq.); the White House Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations [CFR] Parts 1500-1508); FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*; and other applicable federal laws and regulations to provide sufficient evidence and analysis for determining whether to prepare a Finding of No Significant Impact (FONSI) or an Environmental Impact Statement (EIS). NEPA requires that a federal agency prepares a statement of environmental impacts as part of the development process for projects requiring a federal action, such as funding, approving, or permitting.

FAA Order 1050.1F states that the "establishment or relocation of facilities such as air route traffic control centers (ARTCCs), airport traffic control towers (ATCTs), off airport air route surveillance radars (ARSRs), air traffic control beacons (ATCBs), and next generation radar (NexRad)" are actions that normally require an Environmental Assessment (EA). The FAA has recognized that a NEPA programmatic review and potential tiering for the BIL ATCT Replacement Program is appropriate "to sequence environmental documents from the early stage of a proposed action (e.g., need for the action and site selection) to a subsequent stage (e.g., proposed construction) to help focus on issues that are ripe for decision and exclude from consideration issues not yet ripe or already decided." See Paragraph 3-2, FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*. Accordingly, this NEPA programmatic review is the initial step of an efficient, sequenced environmental review method in which the PEA analyzes the similar common aspects for the BIL ATCT Replacement Program and considers cumulative impacts of these activities, followed by

[1] The FAA's BIL ATCT Replacement Program is complimentary to, yet separate from, other FAA ATCT programs, such as the regular replacement of towers with Facilities and Equipment (F&E) funds and the BIL-funded grant programs administered by the FAA Airports Division that provides funding to airport sponsors to replace their own ATCTs. This PEA may be used for proposed future ATCT replacement projects that demonstrate similar conditions.

separate-future site-specific environmental tiered analyses, when appropriate (CEQ, 2014). The FAA is the lead federal agency for the Proposed Action.

1.2 OVERVIEW OF BIL AVIATION-RELATED FUNDING

The BIL funding for aviation includes $15B for airport infrastructure projects that increase safety and expand capacity; $5B in competitive grants that address aging infrastructure at airports, such as airport terminals, airport-owned ATCTs, and on-airport rail access projects; and $5B ($1B annually over five years) to upgrade the physical condition of FAA air traffic control facilities (FAA, n.d. (b)).

As a requirement of the BIL, the Secretary of Transportation submitted to Congress a detailed spend plan which included a list of recommended initial ATCTs for replacement with BIL funding. The spend plan, submitted to Congress as part of the FY23 President's Budget Submission, identified the initial phase of ATCTs for proposed replacement as part of the BIL ATCT Replacement Program (Appendix A).[2] This initial phase of the BIL ATCT Replacement Program proposes to follow with additional phases to be detailed in future submissions to Congress.

Under the BIL ATCT Replacement Program, any additional proposed phases could utilize distinct criteria and different designs from the initial replacement phase to identify appropriate candidate facilities. This PEA covers all phases of the BIL ATCT Replacement Program qualitatively from planning to construction. Section 1.5 describes the FAA's process for using this programmatic approach.

1.3 OVERVIEW OF AIRPORT TRAFFIC CONTROL TOWERS DESIGN TYPES

Prior to the 1960's, there were more than 500 unique FAA ATCT and Terminal Radar Approach Control (TRACON) facilities at airports located atop and collocated with airport terminal buildings. In the mid-1960s, the FAA began implementing standard designs for ATCT facilities as stand-alone buildings separate from airport terminal buildings. Since the 1960's, there have been 12 unique standard FAA ATCT design types (FAA, 2020a). Table 1-1 identifies each standard design type in order of their introduction (facility commissioning) with the number of current operational facilities.

[2] The initial ATCTs identified in the spend plan may be revised by the FAA based on the outcome of pre-planning activities.

Table 1-1. ATCT Design Types

ATCT Design Type	Commission Years	Number
Type O	1965-1968	26
Pei	1966-1976	15
Type L	1966-1969	4
Hunt/AVCO	1967-2000	84
Mock	1969-1987	23
Welton Becket	1974-2007	24
Golemon & Rolfe	1980-2007	35
Leo Daly/HNTB Low Activity Level (LAL)	1987-2008	19
Leo Daly Major Activity Level (MAL)	1992-2003	14
Leo Daly/HNTB Intermediate Activity Level (IAL)	1994-2003	4
Radian/2006 LAL	2002-2014	19
Radian/2006 IAL	2008-2016	4

Source: (FAA, 2020a)

Presently, of the over 200 regional and municipal ATCTs that the FAA owns and maintains more than half of these ATCTs are past their design life and are due for replacement (FAA, 2022a). The FAA also owns and operates some ATCTs that are of unique (not standard) design. Appendix B provides greater detail on the ATCT types and characteristics considered in this PEA.

1.4 PROPOSED ACTION

The Proposed Action is to replace existing FAA-owned Airport Traffic Control Towers (ATCTs) with modern facilities at airports across the nation. The following activities are anticipated as part of the Proposed Action:

- Construction and operation of replacement ATCTs, administrative base buildings, and other associated facility support features such as parking areas and security fences.
- Extension and/or relocation of access roads and utilities to the replacement ATCTs.
- Modification and/or relocation of existing National Airspace System (NAS) facilities or airport structures necessary to enable project implementation.
- Installation of modern air traffic control electronic equipment in replacement ATCTs.
- Commissioning of replacement ATCTs, cutover of air traffic services to replacement ATCTs, and decommissioning of existing ATCTs.
- Demolition and disposal of existing ATCT facilities and associated infrastructure.

To facilitate implementation of the Proposed Action given its anticipated scope, geographic spread, and accelerated schedule, the FAA plans to utilize a standard design approach. The FAA solicited proposals from industry, academia, and other interested parties through its *Sustainable Tower Design Initiative*. Through this initiative, the FAA selected a standard design that is replicable and adaptable at the BIL ATCT Replacement Program project sites nationwide, enabling cost and time-efficient construction. In April 2023, the FAA announced the selection of the new sustainably designed ATCT (FAA, 2023). The selected standard design is intended to meet the energy and sustainability requirements of FAA's *Terminal Facilities Design Standard* (FAA Air Traffic Organization, 2022) while adhering to the *Guiding Principles for Sustainable Federal Buildings and Associated Instructions* (CEQ, 2020). The selected sustainable ATCT design is adaptable and meets the key sustainability requirements identified by the FAA including an all-electric building system, thermally efficient façade, use of chemical free materials and products, use of high-recycled steel and metal, use of renewable wood, and where possible, heating and cooling from local ground-sources. Other key features are the standardized design elements allowing for adjustable tower heights and construction of parts of the tower offsite to reduce costs and building timeframes (FAA, 2023). The incorporation of these design features would permit the proposed BIL ATCTs to achieve federal high performance building standards, which would support the purpose and need (see Section 2) to "improve environmental performance, resulting in energy savings, water efficiency, reduced carbon emissions, and improved indoor air quality" (FAA Air Traffic Organization, 2022).

The timeframe to replace an ATCT is approximately five years from construction, electronics installation, and air traffic services cutover to demolition of the existing ATCT.

1.5 PROCESS FOR USE OF A PROGRAMMATIC ENVIRONMENTAL ASSESSMENT

A programmatic analysis is prepared to address broad agency action(s) such as agency-wide policy and programs (e.g., new agency mission or initiatives) or approval of multiple actions (e.g., a group of projects that are similar in scope, scale, magnitude, or reasonably foreseeable actions that share common geography or timing). Programmatic reviews add value and efficiency to the decision-making process when they inform the scope of decisions and subsequent tiered NEPA reviews. A programmatic NEPA document can facilitate decisions on agency actions that precede site- or project-specific decisions and actions and provide information and analysis for incorporation by reference in future, tiered, NEPA documents.

The CEQ Regulations at 40 CFR § 1500.4(k), 40 CFR §1501.11 and 40 CFR § 1502.4(b) include the concept for programmatic analyses of broad actions and the tiering process. CEQ's guidance document *Effective Use of Programmatic NEPA Reviews* supports federal agency use of programmatic reviews.[3] CEQ interprets its regulations as allowing for the use of a

[3]CEQ's Effective Use of Programmatic NEPA Reviews guidance (December 2014), states "[i]n the absence of certainty regarding the environmental consequences of future proposed actions, agencies may be able to

programmatic approach in developing an Environmental Assessment (EA) and EIS. FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, paragraph 3-2 also covers programmatic analyses.

The FAA determined a programmatic analysis as the most appropriate approach because the implementation of the BIL ATCT Replacement Program would occur over multiple geographical areas nationwide and the limitations in available information and uncertainty regarding the timing and potential environmental impacts of subsequent implementing activities by FAA. Specific project details would not be known until the FAA determines final project site details. Therefore, the analysis in this PEA supports the planning-level decisions for anticipated future actions of the BIL ATCT Replacement Program and establishes the framework and parameters for subsequent analyses based on this programmatic review by examining reasonably foreseeable impacts.

Using this programmatic approach, the FAA identified and prepared a qualitative analysis of the BIL ATCT Replacement Program's potential environmental impacts for the broad scope of actions planned for ATCT replacement projects. The FAA would prepare focused "tiered" analyses for potential future actions, as appropriate. Subsequent analyses would be based on location-specific environmental factors. The FAA would fulfill its responsibilities under NEPA and other applicable environmental protection laws and regulations using this programmatic approach. The FAA identified and prepared a qualitative analysis of the BIL ATCT Replacement Program's potential environmental impacts for the broad scope of actions planned for ATCT replacement projects. The FAA would prepare focused "tiered" analyses for potential future actions, as appropriate when site-specific project plans are sufficiently ripe for subsequent environmental analysis. The depth of these subsequent analyses would be based on location-specific environmental factors and would be commensurate with the anticipated impacts and mitigation.

Some ATCT sites are expected to involve site-specific consultation efforts not known at the time of the writing of this PEA. These proposed ATCT sites would require preparation of a site-specific EA to identify anticipated environmental impacts and mitigation measures. Site-specific EAs would be prepared for projects meeting requirements for applicable special purpose laws, such as eligibility as a National Register of Historic Places property, Section 404 permitting requirements under the Clean Water Act, Section 7 of the Endangered Species Act, or other environmental regulations. Site-specific EAs would be tiered from this PEA in accordance with the CEQ NEPA implementing regulations (40 CFR § 1508.28).

make broad program decisions and establish parameters for subsequent analyses based on a programmatic review that adequately examines the reasonably foreseeable consequences of a proposed program, policy, plan, or suite of project

SECTION 2 | PURPOSE AND NEED

2.1 PURPOSE

An ATCT serves an as observation facility for air traffic controllers to monitor aircraft take-offs and landings and ground traffic visually and electronically within the airfield. Air traffic controllers within an ATCT facility ensure aircraft are properly separated and enhance the safety of aircraft operations at and in the vicinity of the airport.

The purpose of the BIL ATCT Replacement Program is to replace select ATCTs with modern ATCTs providing for uninterrupted air traffic control services. The Proposed Action would provide for modern, operationally efficient ATCTs that would meet all applicable FAA requirements. The replacement ATCTs would enable the installation of modern and required air traffic control equipment, provide adequate space and an enhanced work environment for FAA personnel, lower operating costs, and improve environmental performance, resulting in energy savings, water efficiency, reduced carbon emissions, and improved indoor air quality.

2.2 NEED

The FAA recognizes the need to provide continual air traffic control services at airports across the nation that are served by aging ATCTs. Many airports are served by FAA-owned ATCTs that are beyond their useful design life and have reached their operational and functional capability. These ATCTs may not have the ability to accommodate upgrades to the latest air traffic control technologies, lack personnel space requirements and modern amenities, and exhibit physical problems such as maintenance-intensive deficient mechanical appurtenances (e.g., heating and ventilation, plumbing). Improvements made to rectify this situation must ensure uninterrupted air traffic control services to maintain the safety of the NAS.

SECTION 3 | ALTERNATIVES

3.1 INTRODUCTION

The identification, consideration, and analysis of alternatives are integral to objective decision-making and key to the NEPA process. In accordance with 40 CFR Part 1502.14 and FAA Order 1050.1F, a reasonable range of alternatives to the Proposed Action are identified and evaluated. In addition, alternatives that have been eliminated from further study are also identified and discussed.

The BIL ATCT Replacement Program established criteria to identify existing ATCTs to be considered for replacement under the initial phase of the program. These criteria serve as the criteria for the alternatives analysis in this PEA. Meeting these standards is central to satisfying the purpose and need (Section 2). The criteria under the BIL ATCT Replacement Program are:

- The existing ATCT is located at a regional, municipal, or small General Aviation (GA) airport having less than 150,000 air traffic control operations per year
- The existing ATCT must be an FAA-owned standalone tower without a terminal radar approach control facility (TRACON).
- The existing ATCT is over 40 years of age.
- The proposed new facility would be under 120 feet in height to the cab floor.
- Located within the Continental United States (CONUS).
- Replacement of the ATCT would not disrupt operations to the NAS.

Additional characteristics considered by the FAA when selecting proposed ATCTs for the BIL ATCT Replacement Program include that an existing ATCT be located within a designated U.S. Small Business Administration "historically underutilized business (HUB) Zone" and/or an ATCT be identified through FAA's existing regular recurring process to replace ATCTs based on facility condition.

3.2 ALTERNATIVES CONSIDERED

The alternatives for this PEA were developed to meet the ATCT BIL Replacement Program criteria in support of the Purpose and Need (see Section 2). The aviation related BIL funding provided monies to the FAA's Air Traffic Organization (ATO) to replace and/or upgrade ATCTs across the nation. This PEA considers the proposed replacement and/or upgrade of FAA-owned ATCTs for uninterrupted air traffic control services, while improving the safety, efficiency, and resiliency of the NAS. To be considered a reasonable alternative, an alternative needed to meet the Alternatives criteria (see Section 3.1).

3.2.1 Alternative 1 (No Action)

A No Action Alternative is required to be included in this PEA in accordance with CEQ NEPA implementing regulations (40 CFR § 1508.14). The No Action Alternative is defined as

maintaining the status quo (baseline conditions) without federal agency involvement. The No Action Alternative is used to evaluate the effects of not replacing the ATCTs and provides a benchmark against which other alternatives may be evaluated.

Under the No Action Alternative, the existing ATCTs and associated facilities would not be replaced and demolished. The existing ATCTs would continue to be used for air traffic control operations. New ATCTs would not be constructed, additional space for air traffic operations and new, modern equipment would not be available, and improvements to the safety, efficiency, and resiliency of the NAS would not be realized.

3.2.2 Alternative 2 (Preferred Alternative)

The FAA proposes to implement the Proposed Action to replace select FAA-owned ATCTs and associated structures meeting the Purpose and Need (see Section 2) utilizing the FAA's criteria under the BIL ATCT Replacement Program. Upon construction and commissioning of the new replacement ATCTs and cutover of air traffic control services, the existing facilities would be decommissioned and demolished, and the sites would be restored to their original condition and transferred back to the property lessor.

3.3 Alternatives Considered and Not Carried Forward

Multiple alternatives were examined to determine the best approach to implement the BIL-funded Replacement ATCT Program. To be considered a reasonable alternative, an alternative needed to meet the Alternatives criteria (see Section 3.1); two alternatives examined did not meet these criteria and therefore were not carried forward for detailed analysis in this PEA. They are described in further detail below.

3.3.1 Replacement of Existing Select ATCTs with Remote ATCTs

Under this alternative, the select existing ATCTs would be replaced with remote ATCTs (also referred to as virtual ATCTs or remote towers). Using a series of sensors and cameras mounted on an equipment tower located on the airport, these air traffic control services are provided by personnel located at a detached (remote) facility (e.g., consolidated ATCT). The information displayed on the screens and other monitoring equipment at this remote facility would replace the on-site visual presentations used by controllers in a traditional ATCT, but the ability to safely control air traffic operations would not diminish. Air traffic controllers using a remote ATCT would adhere to the same procedures in use at a traditional ATCT and following FAA Joint Order (JO) 7110.65 (FAA, 2020b). Remote ATCTs are less expensive and quicker to build / install than a traditional ATCT or refurbishing an existing ATCT and entail lower operating costs. In addition, remote ATCTs have a smaller construction and operation footprint.

Presently there is a non-federal program regulating the operation of remote ATCTs; however, none are currently approved or certified for federal use. The FAA is currently evaluating this technology to determine its suitability for use in the NAS (FAA, 2022b). Two remote ATCT test projects are currently applying high-definition video technology, radar, and microphones from two different vendors at Northern Colorado Regional Airport in

Loveland, Colorado, and Leesburg Executive Airport in Leesburg, Virginia (Colorado Department of Transportation, 2022; Town of Leesburg, Virginia, n.d.). The FAA recently announced it plans to decommission the remote ATCT program at the Leesburg Executive Airport in June 2023 (LoudounNow, 2023). The FAA developed a draft Advisory Circular and Technical Requirements document (FAA, 2021a) designed to allow for safe operations and provide proof of concept of the technologies (FAA, 2021b). Further test projects are planned at up to four more airports in the NAS. Outside the U.S., remote ATCT systems are deployed in Germany, Sweden, and Norway (FAA, 2020b).

Based on the pilot program status and current lack of federal approval, this alternative has been eliminated from further evaluation because it cannot yet be introduced into the NAS as a viable replacement for traditional ATCTs and therefore does not meet FAA's purpose and need.

3.3.2 Refurbishment of Existing ATCTs

Under this alternative, select existing ATCTs would be refurbished to provide modern amenities, meet current FAA standards, and extend the lifecycle of the facilities. However, most of the FAA-owned ATCTs identified for replacement are over 40 years old and were built prior to the advent of technologies now employed for safe performance of air traffic control operations. Additionally, existing ATCTs cannot be upgraded to accommodate the latest air traffic control technologies due to space limitations and other considerations.

The challenges of performing extensive upgrades on operational air traffic control facilities are such that it may introduce unnecessary avoidable risk to the NAS. Refurbishment activities, such as cosmetic upgrades of windows, and interior renovations are possible while conducting air traffic control operations without experiencing interruptions in service. However, ATCT equipment removal, replacement, and other extensive facility renovations are not feasible due to the possible need to curtail airport traffic for an extended duration during retrofit activities. Additionally, ATCTs of at least 40 years or older may not be designed to house the new equipment based on weight thresholds, power requirements, and other existing design limitations. For those cases where refurbishment of an ATCT would be feasible, a temporary, mobile ATCT would have to be utilized to allow airport operations to continue. This scenario is unfeasible due to the limited availability of mobile ATCTs in the FAA's inventory and their intended use as a response to emergencies such as natural disasters. Due to the inability of this alternative to provide for uninterrupted air traffic control services, this alternative does not meet the Alternatives criteria and is eliminated from further consideration.

SECTION 4 | AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

4.1 AIR QUALITY

Air quality is the measure of the type and quantity of pollutants emitted into and currently existing in the atmosphere, the size and topography of the airshed, and meteorological (weather) conditions. Overall, the concentration of pollutants in the atmosphere forms the basis of air quality in an area. Air quality regulations are founded on concerns that high concentrations of air pollutants can harm human health, particularly for the elderly, children, and people with compromised health conditions, in addition to causing potential damage to the natural (e.g., agricultural lands, vegetation) and built environments (e.g., buildings, infrastructure).

4.1.1 Regulatory Setting

The Clean Air Act (CAA), as amended (42 U.S.C. §§ 7409, 7410, and 7502-7514), requires the establishment of National Ambient Air Quality Standards (NAAQS) for six common air pollutants (carbon monoxide [CO], nitrogen dioxide [NO2], ozone [O3], particulate matter [PM], sulfur dioxide [SO2], and lead [Pb]) (40 CFR Part 50) and designating attainment or nonattainment areas based on those NAAQS within a state. The CAA also requires preparation of State Implementation Plans (SIP) for EPA approval for "nonattainment areas"[4] (see Section 4.1.2). In addition, the CAA requires compliance with General and Transportation Conformity regulations.[5]

Section 176(c) of the CAA (42 U.S.C. §§ 7571-7574), Determining Conformity of General Federal Actions to State or Federal Implementation Plans (40 CFR Part 93, Subpart B) identifies criteria for determining if a proposed federal action conforms to state (or federal) air quality implementation plans. The FAA is only required to demonstrate general conformity for the Proposed Action.

The CAA established national air quality standards, or NAAQS, for six common air pollutants (CO, NO_2, O_3, PM, SO_2, and Pb) and requires compliance with the NAAQS (40 CFR Part 50). Compliance is when the ambient outdoor levels of the NAAQS air pollutants are safe for human health, public welfare, and environment. These are further divided into primary standards to set limits to protect public health, including sensitive populations (e.g., elderly, children, asthmatics), and secondary standards to establish limits to protect from visibility issues and damage to the natural (e.g., animals, agricultural crops, vegetation) and built environments (e.g., physical structures) (U.S. EPA, 2022a).

[4] The U.S. EPA designates areas as "attainment" when meeting NAAQS or "nonattainment" when not meeting NAAQS after collecting monitoring data.

[5] The Transportation Conformity Regulations apply to highways and mass transit and establish the criteria and procedures for determining whether transportation plans, programs, and projects funded under title 23 U.S.C. or the Federal Transit Act conform with the SIP (U.S. EPA, 2022j).

A variety of sources generate air pollution emissions:

- Carbon dioxide is generated by motor vehicles and from wood burning activities.
- Nitrogen dioxide is a product of combustion; observed as a brown haze.
- Ozone is formed when organic gases react with NO_2.
- Smoke includes particulate matter.
- Fossil fuel burning results in SO_2.
- Lead from ore and metal processing and combustion of leaded fossil fuel.

Compliance with the NAAQS provides a method to enforce air quality standards by establishing measurable maximum allowable amounts. Table 4-1 identifies the primary and secondary NAAQS for the six criteria pollutants.

Table 4-1. National Ambient Air Quality Standards from EPA's Nonattainment Areas for Criteria Pollutants (Green Book)

Pollutant	Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide (CO)	Primary	8 hours	9 parts per million (ppm)	not to be exceeded more than once per year
Carbon Monoxide (CO)	Primary	1 hour	35 ppm	not to be exceeded more than once per year
Lead (Pb)	Primary and secondary	Rolling 3-month average	0.15 microgram (µg)/meter (m)^3 (1)	not to be exceeded
Nitrogen Dioxide (NO_2)	Primary	1 hour	100 parts per billion (ppb)	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
Nitrogen Dioxide (NO_2)	Primary and secondary	1 year	53 ppb (2)	annual mean
Ozone (O_3)	Primary and secondary	8 hours	0.070 ppm (3)	annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particulate Matter (PM) - $PM_{2.5}$	Primary	1 year	12.0 µg/m^3	annual mean, averaged over 3 years
Particle Pollution (PM) – $PM_{2.5}$	Secondary	1 year	15.0 µg/m^3	annual mean, averaged over 3 years
Particle Pollution (PM) – $PM_{2.5}$	Primary and secondary	24 hours	35.0 µg/m^3	98th percentile, averaged over 3 years
Particulate Matter (PM) - PM_{10}	Primary and secondary	24 hours	150 µg/m^3	not to be exceeded more than once per year on average over 3 years

Pollutant	Primary/ Secondary	Averaging Time	Level	Form
Sulfur Dioxide (SO_2)	Primary	1 hour	75 ppb (4)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
Sulfur Dioxide (SO_2)	Secondary	3 hours	0.5 ppm	not to be exceeded more than once per year

Notes:

(1) In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m^3 as a calendar quarter average) also remain in effect.

(2) The level of the annual NO_2 standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.

(3) Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O_3 standards are not revoked and remain in effect for designated areas. Additionally, some areas may have certain continuing implementation obligations under the prior revoked 1-hour (1979) and 8-hour (1997) O_3 standards.

(4) The previous SO_2 standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (2) any area for which an implementation plan providing for attainment of the current (2010) standard has not been submitted and approved and which is designated nonattainment under the previous SO_2 standards or is not meeting the requirements of a SIP call under the previous SO_2 standards (40 CFR 50.4(3)). A SIP call is an U.S. EPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the required NAAQS.

Source: (U.S. EPA, 2022a)

Under the CAA, when an area does not meet the NAAQS for a criteria pollutant, it may be subject to a formal rulemaking that designates it as a "nonattainment" area categorized based on the severity of their NAAQS exceedance from marginal, moderate, serious, severe, to extreme (U.S. EPA, 2022a). Attainment status can be described in one of four ways and determines whether air pollution control measures are required and for which criteria air pollutants an area may be in attainment for some pollutants and in nonattainment for others (40 CFR Part 81). The four attainment classifications are:

- Attainment: Area meets the NAAQS (primary or secondary) for the pollutant.
- Nonattainment: Area that does not meet (or that contributes to a nearby area that does not meet) the NAAQS (primary or secondary) for the pollutant.
- Maintenance: Area that once violated the NAAQS (previous nonattainment areas) but currently achieves the NAAQS.
- Unclassifiable: Area that cannot be classified based on available information for the pollutant (40 CFR Part 81).

The CAA requires preparation of State Implementation Plans (SIPs) for EPA approval for "nonattainment areas." A SIP includes those regulations and documents used by a state, territory, or local air district to implement, maintain, and enforce NAAQS (or for a Tribe, a Tribal Implementation Plan (TIP)). A SIP or TIP typically includes control measures

(statutes, regulations, or source-specific requirements) adopted by the state, non-regulatory components submitted by the state, or other requirements identified by the EPA to meet Section 110 or Part D of the CAA (U.S. EPA, 2022b).

In addition to the NAAQS, air quality can be impacted by hazardous air pollutants (HAP). These are chemicals that might not be as widespread but are potentially more toxic (e.g., benzene, mercury). The 1990 CAA Amendments identified a list of 188 chemicals and compounds considered as HAPs.[6]

Under 72 Federal Register 145, Federal Presumed to Conform Actions Under General Conformity, the FAA identified a list of actions presumed to conform to an applicable SIP for the criteria pollutants and their precursors as identified under 40 CFR Part 93.153(b)(1) and (b)(2) and in the NAAQS. With this Rule, under existing exemptions, Routine Installation and Operation of Navigation Aids, the in-kind replacement of navigational aids, such as ATCTs, are "presumed to conform because these activities would not generate emissions that exceed *de minimis* levels" (Federal Register, 2007).

4.1.2 Affected Environment

Given the nationwide scope of the BIL-funding ATCT Replacement Program, it is not possible to describe the existing environment for air quality across the nation in detail. A variety of air quality statutes may apply to a particular project depending on its location. Figure 4-1 illustrates areas that have been designated as nonattainment or maintenance for all criteria air pollutants (NAAQS).

[6] A list of regulated HAPs can be found on the U.S. EPA's Air Toxics website at: http://www.epa.gov/ttn/atw/orig189.html.

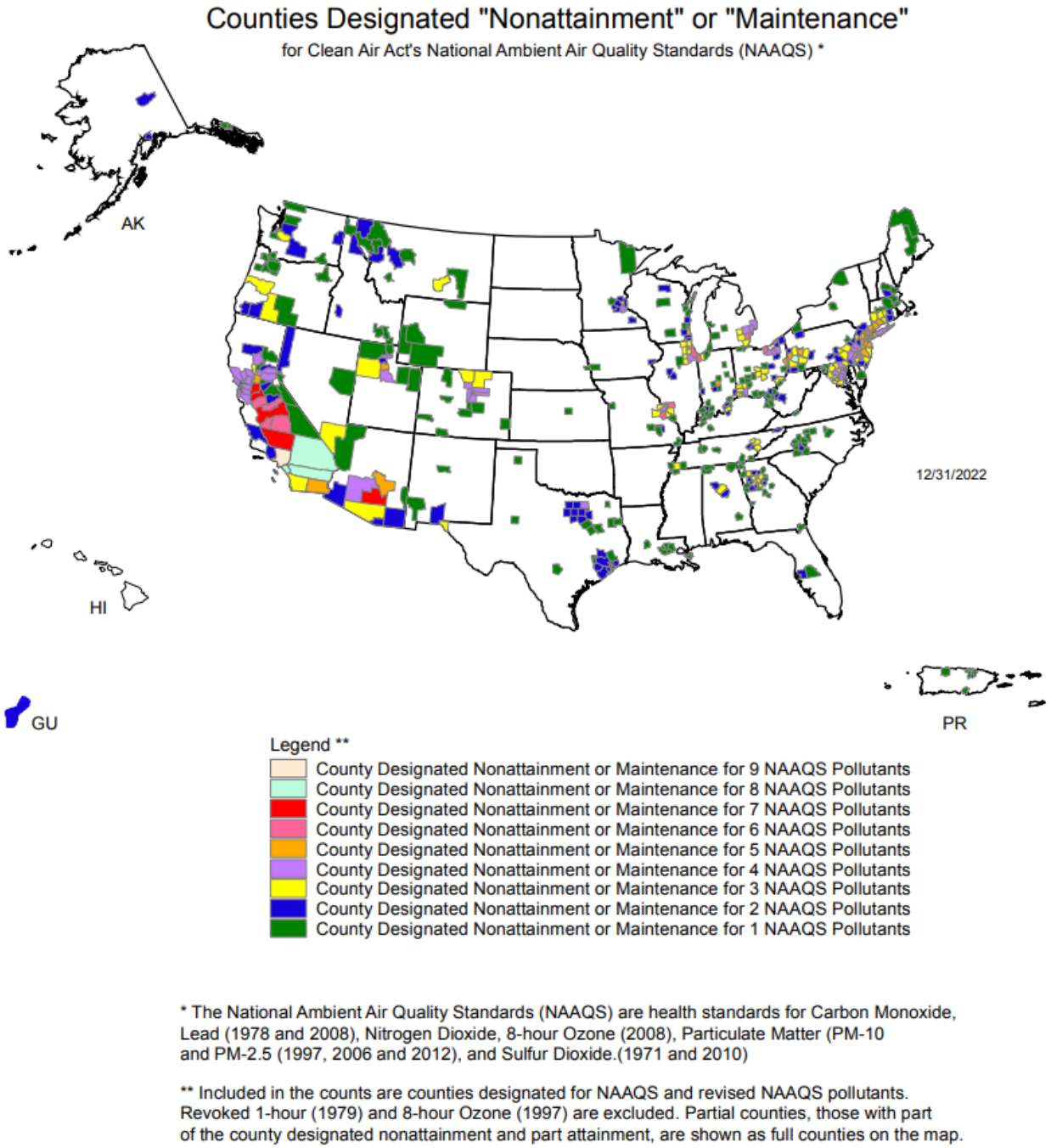

Figure 4-1. Designated Nonattainment or Maintenance Areas for All Criteria Pollutants (NAAQS)

Source: (U.S. EPA, 2022a)

4.1.3 Environmental Consequences

As noted in the FAA Order 1050.1F Desk Reference, the FAA has established a significance threshold for air quality (FAA, 2020c).

- No Impact: Impacts to air quality would not occur as a result of the Proposed Action.
- Significant Impact: The FAA identified the significance threshold as pollutant concentrations to exceed one or more of the NAAQS (Table 4-1) "for any of the time periods analyzed, or to increase the frequency or severity of any such existing violations" (FAA, 2015).

4.1.3.1 No Action Alternative

Under the No Action Alternative, the current ATCTs would not be removed and replaced, and activities associated with the ATCTs would remain the same. No impacts to air quality would be altered with the No Action Alternative.

4.1.3.2 Alternative 2 (Preferred Alternative)

Under Alternative 2 (Preferred Alternative), each replacement ATCT is presumed to conform under the CAA. New outdoor electric generators would be installed and would be more efficient than the older generators (electric or diesel) they would be replacing. This would result in a long-term reduction in emissions from reduced energy use in the new ATCTs. Following the CAA, the FAA identified the in-kind replacement of an ATCT as "presumed to conform because these activities would not generate emissions that exceed *de minimis* levels." Emissions generated by heavy construction equipment used to transport workers and equipment to the project sites are negligible given the temporary nature of these activities and the limited number of vehicles involved (Federal Register, 2007).

Emissions would not be expected to exceed criteria air pollutants as defined in Table 4-1. It is anticipated that air quality impacts resulting from construction-related activities under Alternative 2 (Preferred Alternative) would be short-term and temporary[7] in nature. Demolition of the existing ATCT and construction of a new ATCT is unlikely to result in an exceedance of air quality standards, regulated release of HAPs, or in more than a *de minimus* increase in emissions and are presumed to conform with the CAA.

4.1.4 Mitigation

Construction and demolition-related emissions can be reduced or mitigated using the following best management practices (BMP).

- Dust control BMPs can include, but are not limited to, spraying water to minimize dust, limiting the area of uncovered soil to the minimum needed for each activity, proper siting of staging areas to minimize fugitive dust, placement of mulch or a temporary gravel cover, using a soil stabilizer (or chemical dust suppressor),

[7] Short-term and temporary refers to the duration of the construction period of the project.

limiting the number and speed of construction vehicles at the site, and adding covers to trucks hauling dirt on or off the site.

- Revegetation of sites immediately following ground disturbance.
- Emission BMPs for construction vehicles and equipment can include, but are not limited to, limiting vehicle idling times, usage of low or ultra-low sulfur fuel and biodiesel, conducting proper vehicle engine maintenance, and using electric instead of gas-powered tools.
- Source locally available products and materials to reduce transportation-related emissions to the site.

4.2 BIOLOGICAL RESOURCES (INCLUDING FISH, WILDLIFE, AND PLANTS)

Biological resources are the singular or collective living things inhabiting the Earth, which include native plants, animals, and their habitats. Protected and sensitive biological resources include federally listed (endangered[8] or threatened[9]), proposed,[10] and candidate[11] species designated by the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), or a State. Sensitive habitats described in this section include those areas designated by the USFWS as critical habitat[12] protected by the Endangered Species Act of 1973 (ESA; 16 U.S.C. Chapter 35 § 1531 et seq.) and sensitive ecological areas as designated by state or federal rulings. Sensitive habitats also include wetlands, plant communities that are unusual or of limited distribution, and important seasonal use areas for wildlife (e.g., migration routes, breeding areas, and crucial summer and winter habitats).

4.2.1 Regulatory Setting

The Endangered Species Act (ESA;16 U.S.C. §§ 1531-1544) requires federal agencies to conserve endangered species by listing endangered and threatened species of plants and

[8] Endangered species are "any species which is in danger of extinction throughout all or a significant portion of its range" (ESA, Section 3(6))

[9] Threatened species are "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (ESA, Section 3(20))

[10] Proposed species are "any species of fish, wildlife, or plant that is proposed in the Federal Register to be listed under Section 4" of the ESA (EA, Section 402.02). USFWS and NMFS issue a rulemaking to propose an ESA species for listing or delisting to allow for public comment.

[11] Candidate species are any species whose status is under review "to determine whether it warrants listing under the ESA" (ESA, Section 4)

[12] Critical habitat refers to "(i) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 4 of this Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of this Act, upon a determination by the Secretary that such areas are essential for the conservation of the species." (ESA, Section 3(5)(A))

animals and designating critical habitats for animal species. The ESA defines an endangered species as "any species which is in danger of extinction throughout all or a significant portion of its range" and a threatened species as "any species which is likely to become an endangered species within the foreseeable future." Section 7 of the ESA requires federal agencies, in consultation with USFWS and/or NMFS, to ensure their actions are not likely to jeopardize the continued existence of any endangered or threatened species or to result in the destruction or adverse modification of critical habitat. The ESA defines critical habitat as specific geographic areas that are essential for the conservation of a threatened or endangered species and that may require special management and protection (USFWS, 2007).

The Fish and Wildlife Coordination Act (16 U.S.C. § 662(a)) identifies that when a federally approved or financed action may result in control or modification of the water of any stream or waterbody, the responsible federal agency must consult with the USFWS regarding the conservation of wildlife resources.

Executive Order (EO) 13112, Invasive Species, as amended EO 13751, directs federal agencies whose actions may affect the status of invasive species to use relevant programs and authorities, to the extent practicable and subject to available resources, to prevent the introduction of invasive species, and to provide for the restoration of native species and habitat conditions in ecosystems that have been invaded. Agencies are directed not to conduct actions that they believe are likely to cause or promote the introduction or spread of invasive species unless the benefits of such actions clearly outweigh the potential harm, and all feasible and prudent measures to minimize risk of harm are taken. Invasive species is defined by the EO as a non-native (regarding a particular ecosystem) organism whose introduction causes or is likely to cause economic or environmental harm, or harm to human, animal, or plant health.

The Magnuson-Stevens Fishery Conservation and Management Act of 1976, as amended by the Sustainable Fisheries Act (16 U.S.C. § 1855(b)(2) et seq.; see 50 CFR Part 600 for implementing regulations) prohibits actions that may affect "essential fish habitat" (EFH) defined as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity" for all managed species. Regional Fishery Management Councils throughout the country identify and describe fishery management plans to protect certain anadromous fish species. If an action would affect an EFH, an impact assessment on the affected EFH is needed. The EFH assessment and any mitigation measures are done in consultation with NMFS.

The Migratory Bird Treaty Act of 1918 (MBTA) (16 U.S.C. §§ 703-711) prohibits actions of taking, selling, or conducting other activities that would harm migratory birds, their eggs, or nests (such as removal of an active nest or nest tree). If it is determined there are no feasible alternatives to taking the migratory bird or its nest, USFWS and the Secretary of Interior must issue a permit for the taking and would require mitigation.

EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, directs federal agencies to further implement and strengthen the Migratory Birth Treaty Act. Specifically,

federal agency actions that have, or are likely to have, a measurable negative effect on migratory bird populations require development and implementation of a Memorandum of Understanding (MOU) with USFWS that promotes the conservation of migratory bird populations. The EO and MOUs are the regulatory basis for conservation actions or renewal of contracts, permits, delegations, or other third-party agreements associated with migratory birds. MOUs established under EO 13186 are published in the Federal Register.

Congress passed the Bald and Golden Eagle Protection Act of 1940 (amended in 1962) to protect both these avian species. The bald eagle was officially adopted as the Nation's symbol in 1782. From that time until 1940, population numbers for the bald eagle rapidly declined due to hunting, insecticide use, and habitat loss. To prevent the extinction of the bald eagle, Congress passed the Bald Eagle Act (16 U.S.C. §§ 668-668d) to prohibit the take, possession, sale, purchase, barter, or offer to sell, purchase, or barter, export, or import any part of a bald eagle, including their nests and eggs. In 1962, Congress amended the Bald Eagle Act to include golden eagles, recognizing that the declining population of the golden eagle as it was threatened with extinction. The bald eagle continues to be protected by the Bald and Golden Eagle Protection Act even though it has been delisted under the ESA in August 2007. (USFWS, n.d. (a))

In addition to the federal laws and EOs protecting biological resources, state regulations applicable to biological resources (e.g., state-listed species or habitats) would be addressed during site-specific analysis of the funded projects, where necessary.

4.2.2 Affected Environment

This PEA considers applicable actions across the U.S., which precludes a detailed description of all wildlife, plants, and habitats associated with each proposed ATCT location. If project locations intersect with sensitive species or habitats, a site-specific NEPA analysis would be conducted to ensure impacts are avoided or mitigated.

4.2.2.1 Vegetation

Distribution of vegetation within the continental U.S. is a function of the characteristic geology, soils, climate, and water of a given geographic area and correlates with distinct areas identified as ecoregions. Ecoregions are areas that share similar characteristics and environmental conditions (e.g., climate, geology, and soils) within a region having similar ecosystem types, functions, and qualities. Ecoregions are categorized from broad, Level I categories to very specific, Level IV. In the continental U.S., there are 12 Level 1 ecoregions, 25 Level II, 105 Level III, and 967 Level IV (U.S. EPA, 2022c). Figure 4-2 displays the Level III ecoregions for the continental U.S. A list of ecoregion descriptions correlated to the ecoregion numbers are provided in Appendix C. Common vegetation species are included in each ecoregion description along with typical geological features and land use.

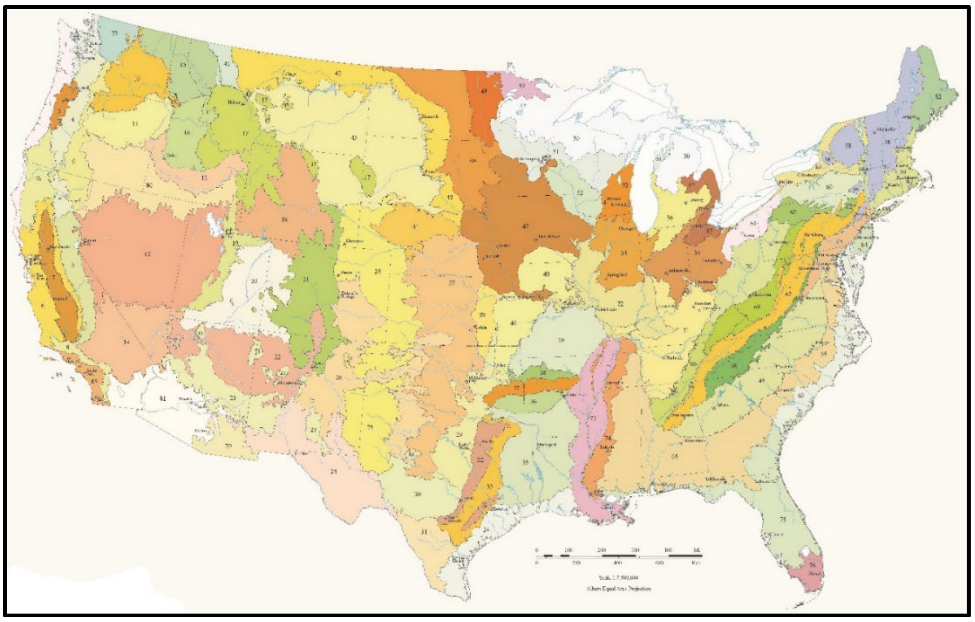

Figure 4-2. Level III Ecoregions of the Continental U.S.

Source: (U.S. EPA, 2013)

4.2.2.2 Wildlife and Fish

Wildlife, fish, and most animal species evolve within an ecoregion(s) of terrestrial or aquatic habitat. Some species are found in only one unique habitat (endemic), whereas others may be habitat generalists and can survive across many different ecoregions. The potential for an area to provide and be used as wildlife habitat is based on several factors, including topography, vegetative cover and type, water availability, connectedness, and interferences attributable to human activity. Fish and aquatic species habitat vary in numerous factors, such as elevation, water temperature, fresh or salt water, and type of aquatic habitat (e.g., stream, river, lake, pond, wetland, estuary, etc.). Some ecoregion descriptions in Appendix C include wildlife species that occur within those unique ecosystems. U.S. airports can be located near cities or developed areas. Native and non-native wildlife occurring near developed areas would be those that are more tolerant of human presence and can adapt to disturbed habitat features such as deer species, coyote, raccoon, bat species, rodent species, reptile species, insects, and avian species such as ravens and sparrows.

4.2.2.3 Special Status Species

As noted in Section 4.2.1, there are several laws that apply to wildlife, including status species such as the ESA requiring federal agencies to conserve endangered species by listing endangered and threatened species of plants and animals and designating critical habitat for animal species, and the Magnuson-Stevens Fishery Conservation and Management Act regulating fishery resources and fishing activities in federal waters and identifying EFH. The USFWS manages land and freshwater species, while NMFS manages marine and anadromous species. States also conserve over 12,000 fish and wildlife species managed under their State Wildlife Action Plans (Association of Fish and Wildlife Agencies, 2022). These plans include

federally listed species within each state, with "species of greatest conservation need" to prevent these species from becoming ESA listed (USFWS, 2020a).

Table 4-2 lists the number of threatened and endangered species for the U.S. and territories by taxonomic grouping to provide a general representation of plants and animals currently listed by USFWS and NMFS. In the continental U.S., 52 species are currently candidates for listing under the ESA. Figure 4-3 displays the number of species by state listed under the ESA. Figure 4-4 shows critical habitat for USFWS managed species, and Figure 4-5 shows critical habitat for NMFS managed species.

Table 4-2. Federally Listed Plant and Animal Species

Taxonomic Grouping	Number of Listed Species*
Animals	
Mammals[1]	80
Marine Mammals[2]	11
Birds[2]	108
Reptiles[2]	50
Marine Reptiles[2]	7
Amphibians[1]	39
Fishes[1]	141
Marine Fishes[2]	17
Clams[1]	124
Snails[1]	51
Insects[1]	96
Arachnids[1]	11
Crustaceans[1]	30
Marine Mollusks[2]	2
Marine Coral[2]	7
Plants	
Conifers and Cycads[1]	5
Ferns and Allies[1]	37
Lichens[1]	2

* Totals include species outside the continental U.S.
[1] Jurisdiction of USFWS
[2] Jurisdiction of NMFS, some species overlap with USFWS

Sources: (USFWS, n.d. (b); NOAA Fisheries, n.d. (a); NOAA Fisheries, n.d. (b); NOAA Fisheries, n.d. (c))

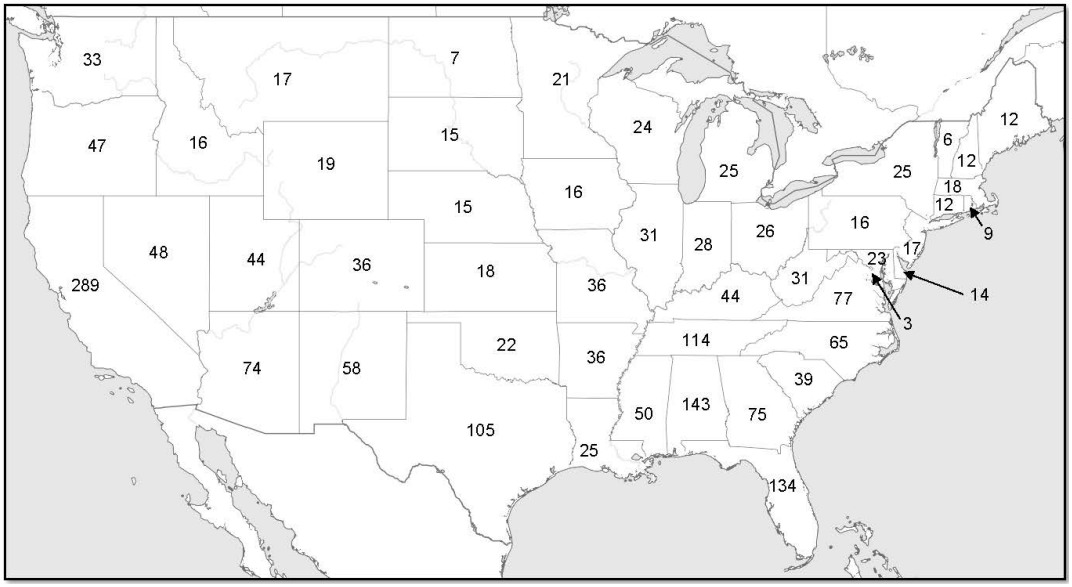

Figure 4-3. Number of USFWS Federally Listed Species, by State

Source: (USFWS, n.d. (c))

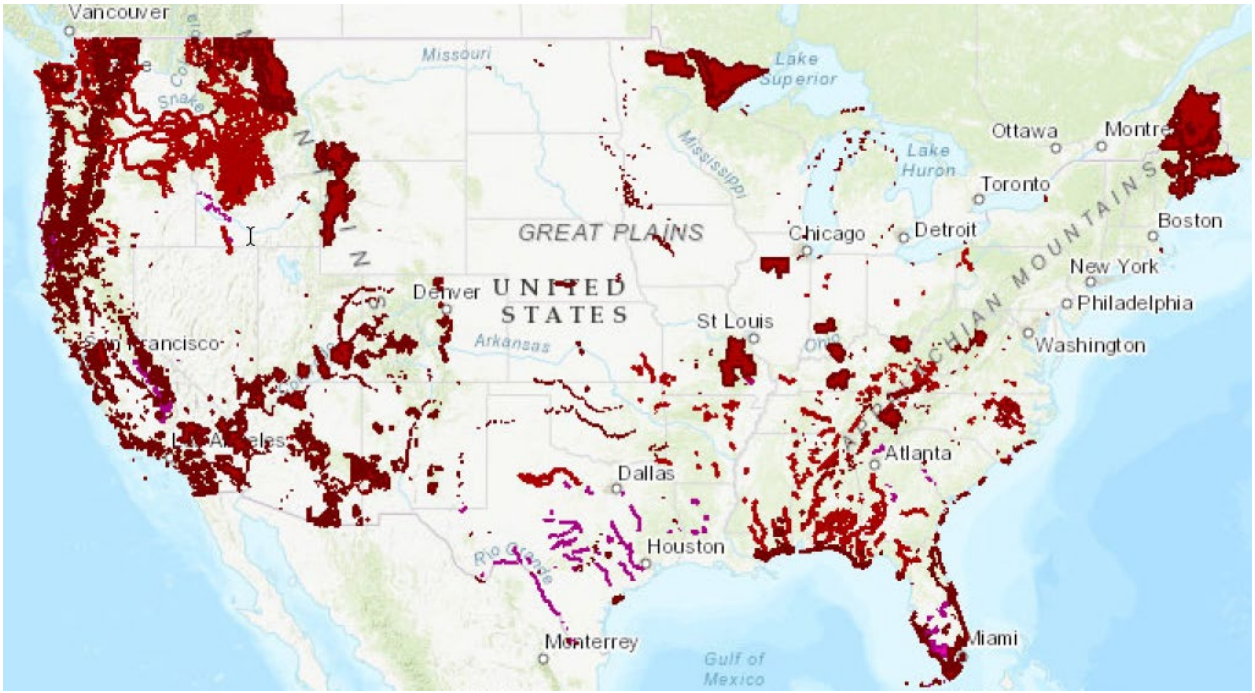

Figure 4-4. USFWS Critical Habitat

Source: (USFWS, 2022)

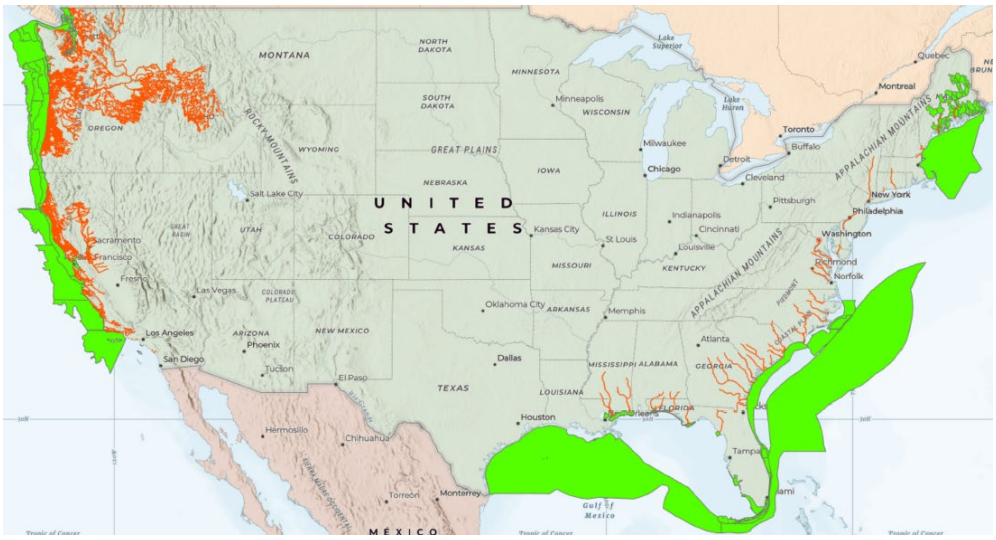

Figure 4-5. NMFS Critical Habitat

Source: (NOAA, 2022)

4.2.2.4 Migratory Birds

As noted in Section 4.2.1, there are several laws that apply to wildlife, including the MBTA. As of 2020, there are 1,093 species listed as migratory birds under the protection of the USFWS and 4 international treaties (USFWS, 2020b). There are four primary migratory bird U.S. flyways, which are the general routes birds follow as they travel from wintering to nesting areas within or outside of the continental U.S. (USFWS, n.d. (d)). Figure 4-6 displays the general routes of the Pacific, Central, Mississippi, and Atlantic Flyways.

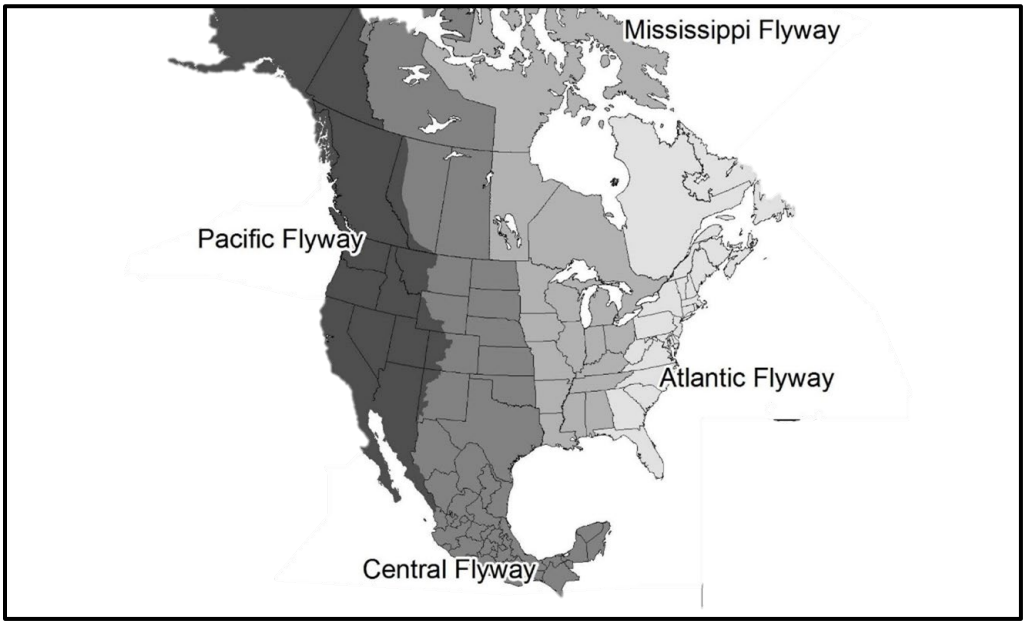

Figure 4-6. USFWS Migratory Bird Program Administrative Flyways

Source: (USFWS, n.d. (d))

4.2.2.5 Invasive Species

Invasive species are plants, animals, fungus, algae, or microorganisms that are introduced to a native ecosystem from elsewhere and cause harm or damage to the economy, human health, native species, biodiversity, ecosystems, water resources, agriculture, cultural resources, public safety, recreation, and forest resources (U.S. Forest Service, n.d.).

Many invasive species are from other countries and may have been brought intentionally or accidentally and have established populations where they did not originally exist, making them non-native species. Non-native species that become invasive are referred to as invasive non-native species, and include kudzu (*Pueraria montana*), feral swine (*Sus scrofa*), Burmese python (*Python bivittatus*), and northern snakehead (*Channa argus*) (NPS, 2022a). Many invasive non-native species are spread in day-to-day human activities, such as moving a boat from one waterbody to another or transporting seeds on shoes or vehicle tires; other species spread through habitat from reproduction and overpopulation or outcompeting native species. Non-native and invasive species are found in every U.S. state and presently there are more than 6,500 non-native species established in the U.S. resulting in great expense in fighting the spread of and damage from these species (USGS, n.d. (a)).

4.2.3 Environmental Consequences

The FAA does not have a threshold of significance for non-listed species.

- No Impact: Impacts to biological resources (non-listed species) would not occur as a result of the Proposed Action.

Factors to consider include if the action would have the potential for:

- "A long-term or permanent loss of unlisted plant or wildlife species, i.e., extirpation of the species from a large project area (e.g., a new commercial service airport);
- Adverse impacts to special status species (e.g., 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
- 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 for population maintenance." (FAA, 2015)

As noted in the FAA Order 1050.1F Desk Reference, the FAA identified the significance threshold for biological resources (including fish, wildlife, and plants) as when the USFWS or NMFS determines that the action would be likely to jeopardize the continued existence of a federally-listed threatened or endangered species, or would result in the destruction or adverse modification of federally-designated critical habitat (FAA, 2020c). Impacts to federally listed threatened and endangered species were evaluated using terminology defined under the ESA as follows:

- No effect: ESA listed species or designated critical habitat would not be affected or listed species or designated critical habitats are not present.
- May affect/not likely to adversely affect: Effects on ESA listed species or designated critical habitat are insignificant, discountable,[13] or beneficial. During consultation, USFWS or NMFS would provide written concurrence of a "not likely to adversely affect" determination.
- May affect/likely to adversely affect: An adverse effect to an ESA listed species or designated critical habitat may occur as a result of implementing the Proposed Action or its interrelated or independent actions, and the effect is not discountable, insignificant, or beneficial. If a proposed project is "likely to adversely affect," the federal agency initiates a formal Section 7 consultation and may also require the preparation of an EIS.
- Likely to jeopardize proposed species/adversely modify proposed critical habitat: Projects that could jeopardize a proposed species or adversely modify critical habitat to a species require a conference with USFWS or NMFS, and the preparation of an EIS may also be required.

4.2.3.1 No Action Alternative

Under the No Action Alternative, the current ATCTs would not be replaced and removed, and activities associated with the ATCTs would remain the same. No impacts to vegetation, wildlife, habitat, or invasive species would be involved with the No Action Alternative.

4.2.3.2 Alternative 2 (Preferred Alternative)

Under Alternative 2 (Preferred Alternative), construction activities would result in varying impacts depending on the soils where construction occurs and the distance between the project site and surrounding areas with aquatic or other habitat for plants and wildlife species. Construction of new ATCTs would cause temporary, short-term surface disturbing activities prior to construction, within one to four acres and would involve increased vehicle traffic and use of heavy machinery. During this time, disruption of soil surfaces, and soil contamination from chemicals such as hydraulic fluids or petroleum leaks could occur, resulting in increased soil erosion or runoff from the area. Soil, sediment, or chemical runoff could directly or indirectly result in degradation of water quality in aquatic habitats or alter in-stream habitat from sediment build-up. The presence of vehicles and heavy equipment could introduce non-native plant species, causing changes to surrounding ecosystems from the introduction of non-native plant sources.

Any additional impervious surface created beyond the original ATCT site and surrounding development could result in a minimal increase of runoff into adjacent waterbodies, resulting in increased erosion, vegetation loss, and sediment inputs which could alter or degrade aquatic and in-stream habitat for fish and other aquatic species.

[13] Extremely unlikely to occur and not able to be meaningfully measured, detected, or evaluated

Demolition and removal of decommissioned ATCTs could result in disturbance of soils and loss of vegetation within and adjacent to the project area. Use of heavy machinery for this work could cause disruption of soil surfaces, dust, introduction of non-native plant species through the transfer of seeds, and contamination of soils from chemicals, such as hydraulic fluids or petroleum leaks. Soil erosion or runoff from the area could result in degradation of water quality in aquatic habitats, alter in-stream habitat from sediment build-up, or cause changes to surrounding ecosystems from the introduction of non-native plant sources. Mitigation measures to contain runoff and introduction of non-native plants surrounding the project area would help reduce or prevent effects from demolition and removal of ATCTs. All Part 139 certified airports have completed or initiated a Wildlife Hazard Assessment (WHA) and Wildlife Hazard Mitigation Plan (WHMP) to mitigate wildlife hazards through habitat modification, harassment technology and research. Thus, the likelihood of significant wildlife populations at these airports would be reduced due to the WHMP.[14] Removal of vegetation surrounding the demolition sites would likely not affect native plant species. Similarly, removal of old ATCTs would not significantly affect wildlife species given the existing sites are within developed and active airport locations.

If needed, site-specific surveys would be conducted prior to construction and demolition activities to ensure that no sensitive or listed plant and animal species and migratory birds are affected.

4.2.4 Mitigation

Mitigation and BMPs that prevent or reduce habitat loss, disturbance of wildlife species, and erosion and runoff to habitat and water bodies would help preclude impacts to biological resources. The following measures could be applied to offset impacts:

- Phase activities to avoid breeding, nesting, flowering, or pollination seasons.
- Conduct surveys for nesting migratory birds during the breeding season prior to construction, resulting in avoidance and/or relocation of active nests to the extent possible.
- Conduct surveys for state or federally-listed plants prior to planned construction,
- Fencing best management practices, to the extent possible, that allow for wildlife movement at all locations when appropriate.
- Design project components in such a way as to reduce the potential to cause or enhance wildlife hazards to aviation.
- Re-vegetation of temporarily disturbed work areas, using original topsoil as a seed bank.
- Enhancement of off-site habitats (not near airports) to replace those habitats made un-usable or inaccessible.

[14] Many of the municipal and general aviation airports identified in Appendix A are not Part 139 certified.

- Monitor wildlife populations within and/or near the study area to examine for potential shifts in density and diversity.
- Adherence to state guidelines to reduce threats to local fauna.
- Adherence to state distribution line guidelines for on- and off-site construction of aboveground lines to reduce threats to birds, particularly raptors.

4.3 CLIMATE

Climate change is caused by the emission of greenhouse gases (GHG) such as CO_2, methane, nitrous oxide, and other aerosols from human activity and the burning of fossil fuels (U.S. EPA, 2022d). GHGs trap heat in the Earth's atmosphere, which results in an increase of average global temperature causing weather changes (U.S. EPA, 2022d). Under NEPA, a federal action needs to assess the impacts of their project to climate change and the potential impacts that may result from climate change.

4.3.1 Regulatory Setting

The Council on Environmental Quality (CEQ) released a notice of interim guidance (effective immediately on January 1, 2023). CEQ issued this guidance to assist federal agencies in their consideration of the effects of GHG emissions and climate change when evaluating proposed major federal actions in accordance with NEPA and to improve the efficiency and consistency of reviews of proposed federal actions for agencies, decision makers, project proponents, and the public. This guidance provides federal agencies a common approach while recognizing each of their unique circumstances (CEQ, 2023).

EO 13990, Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis, directs federal agencies to "immediately review and take action to address the promulgation of recent federal regulations to improve public health and protect our environment; ensure access to clean air and water; limit exposure to dangerous chemicals and pesticides; hold polluters accountable, including those who disproportionately harm communities of color and low-income communities; reduce greenhouse gas emissions; to bolster resilience to the impacts of climate change; restore and expand our national treasures and monuments; and prioritize both environmental justice and employment" (DOE, 2021).

4.3.2 Affected Environment

Small shifts in average temperature causes shifts in climate and weather, which has a wide range of environmental impacts (NASA, 2023). Impacts of climate change include increased frequency and severity of extreme weather events, changes in precipitation patterns, sea level rise, and ocean acidification (U.S. EPA, 2022d). The average surface temperature in the continental U.S. "has risen at an average rate of 0.17°F per decade, although temperatures have risen more quickly since the late 1970s (U.S. EPA, 2022e). Figure 4-7 shows the rate of temperature change in the U.S. from 1901 to 2021. Some regions have experienced more warming than others, particularly the North, West, and Alaska.

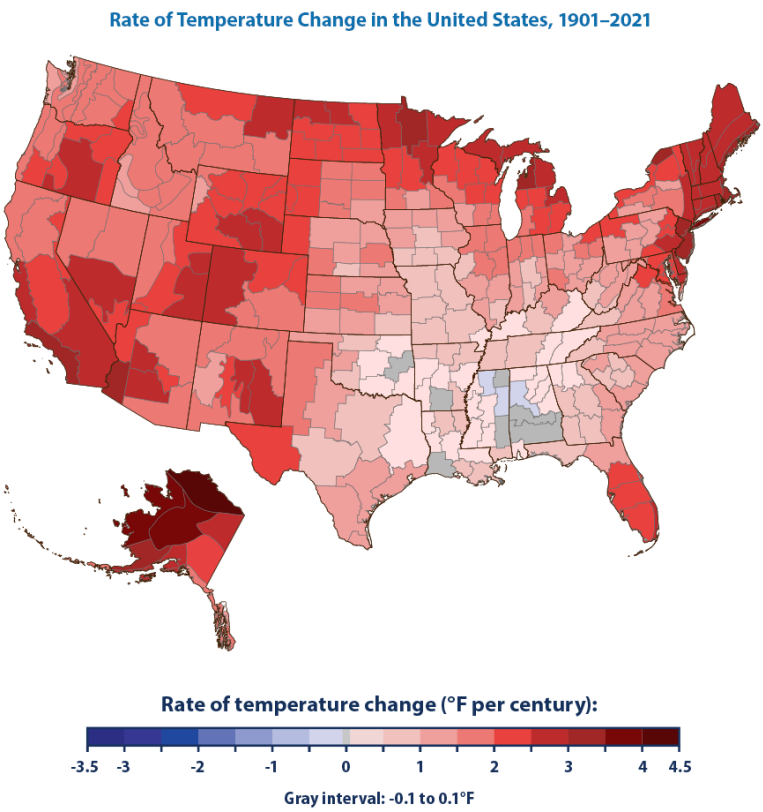

Figure 4-7. Rate of Temperature Change in the U.S.

Source: (U.S. EPA, 2022e)

The Intergovernmental Panel on Climate Change (IPCC) estimates that human activities "have caused approximately 1.0°C [33.8°F] of global warming above pre-industrial levels, with a likely range of 0.8°C to 1.2°C [33.4°F to 34.2°F]." The IPCC emphasizes the importance of limiting the global temperature rise to 34.7°F, which would require reducing global climate emissions to net-zero and achieving 45% reductions below 2010 levels by 2030. A Special Report by the IPCC shows that trends in GHG emissions and the level of international action to mitigate GHG emissions would not meet goals to limit global warming below 2°C [35.6°F] (IPCC, 2018).

The increase in GHG emissions is primarily from human activity in five economic sectors, including transportation, electric power, industry, commercial and residential, and agriculture. The total gross U.S. GHG emissions in 2020 were 5,981.4 million metric tons of CO_2 equivalent. CO_2 accounts for the majority of GHG emissions at 78.8%, while methane and N_2O account for 10.9% and 7.1%, respectively. There has been a 7.3% decrease in emissions from 1990 to 2020 that reflects "long term trends in population, economic growth, energy markets, technological changes including energy efficiency, and the carbon intensity of fuel choices" (U.S. EPA, 2022f). Figure 4-8 shows the decrease of total U.S. GHG emissions from 1990 to 2020. Despite this decrease, global GHG emissions have "increased by about 90

percent" since 1970 due to fossil fuel combustion, agriculture, deforestation, and other land use changes. The U.S. is one of the highest emitters of CO_2 from fossil fuel combustion and accounted for 15% of global CO_2 emissions in 2014 (U.S. EPA, 2022f).

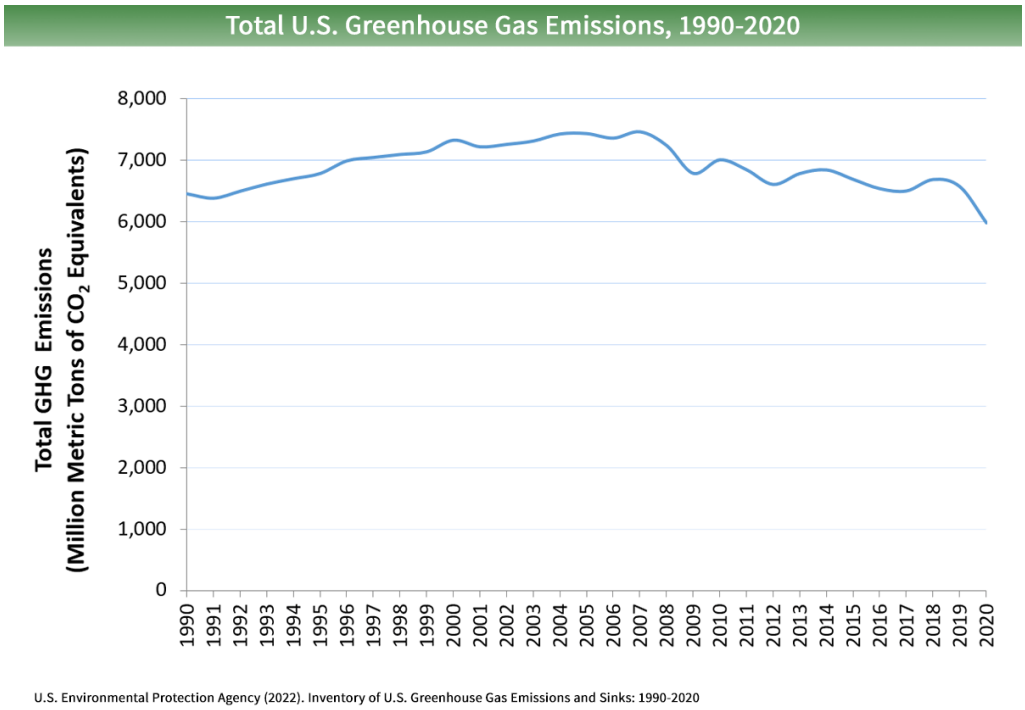

Figure 4-8. Total U.S. Greenhouse Gas Emissions, 1990-2020

Source: (U.S. EPA, 2022f)

Precipitation rates in the contiguous 48 states have "increased at a rate of 0.20 inches per decade" since 1901. Parts in the Northeast, Midwest and South have experienced increases in precipitation, while the Southwest has seen a decrease in precipitation (U.S. EPA, 2022k). Changes in precipitation patterns may lead to flooding, drought, erosion, and changes in streamflow that could impact water quality, infrastructure, health, agriculture, and ecosystems (NASA, 2023). Figure 4-9 shows the changes in precipitation in the U.S. between 1901 and 2021.

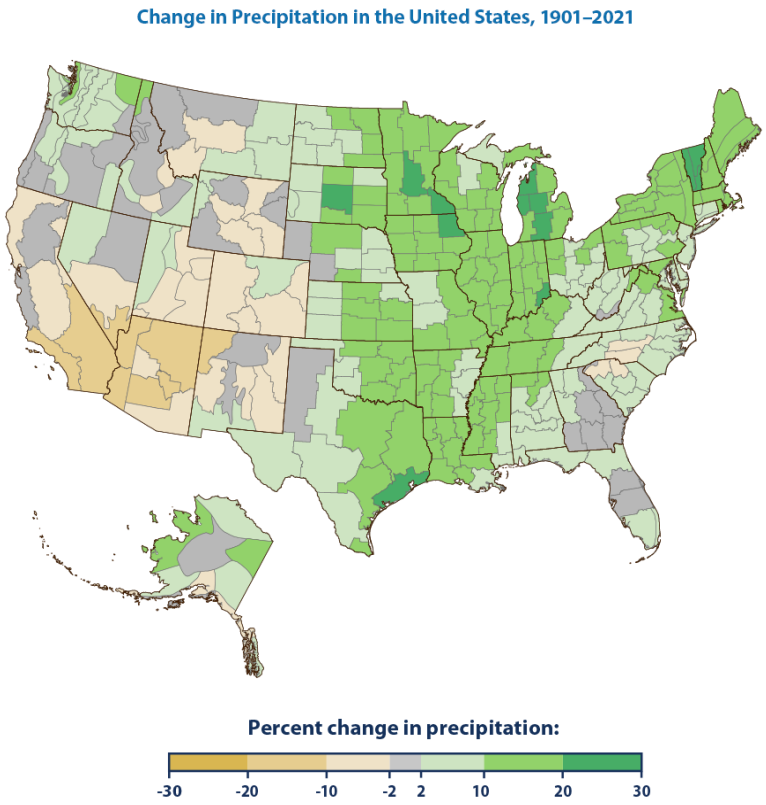

Figure 4-9. Change in Precipitation in the U.S.

Source: (U.S. EPA, 2022k)

4.3.3 Environmental Consequences

The FAA has not established a significance threshold for climate (FAA, 2015).

- No Impact: Impacts to climate would not occur as a result of the Proposed Action.

As noted in the FAA Order 1050.1F Desk Reference, "there are no significance thresholds for aviation or commercial space launch GHG emissions, nor has the FAA identified specific factors to consider in making a significance determination for GHG emissions. There are currently no accepted methods of determining significance applicable to aviation or commercial space launch projects given the small percentage of emissions they contribute" (FAA, 2020c). The CEQ's interim guidance which identifies an approach for assessing projected GHG emissions (CEQ, 2023). Given the ongoing scientific research being undertaken to improve the understanding of climate change, FAA's guidance notes that significance determination criteria "will evolve as the science matures or if new Federal requirements are established" (FAA, 2020c).

4.3.3.1 No Action Alternative

Under the No Action Alternative, the current ATCTs would not be replaced or removed, and activities associated with the ATCTs would remain the same. The No Action Alternative would not change existing ATCTs or emit additional GHGs. Benefits would not be realized

from the operation of more efficient ATCTs, such as reductions in energy and resources usage and the resultant decreases in GHG emissions.

4.3.3.2 Alternative 2 (Preferred Alternative)

Activities related to construction, demolition, and transportation of materials could lead to temporary increased GHG emissions from heavy machinery. The CEQ interim guidance recommends that federal agencies quantify projected GHG emissions using available data and suitable GHG quantification tools (CEQ, 2023). Site-specific analyses would conduct projected GHG emissions for each ATCT which would be used to help assess potential climate change effects.

The overall effects of Alternative 2 (Preferred Alternative) would reduce GHG emissions and impacts to climate due to the sustainability features and energy efficient design of the new ATCTs (FAA, 2023). Alternative 2 (Preferred Alternative) would provide for a modern, operationally efficient ATCT designed to meet the energy and sustainability requirements of FAA's *Terminal Facilities Design Standard* while adhering to the Council of Environmental Quality's *Guiding Principles for Sustainable Federal Buildings and Associated Instructions.* The sustainable ATCT design would be adaptable and would meet the key sustainability requirements identified by the FAA including an all-electric building system, thermally efficient façade, use of chemical free materials and products, use of high-recycled steel and metal, use of renewable wood, and where possible, heating and cooling from local ground-sources. The proposed replacement ATCT would enable the installation of modern air traffic control equipment, provide adequate space and an enhanced work environment for FAA personnel, lower operating costs, and improve environmental performance resulting in energy savings, water efficiency, reduced carbon emissions, and improved indoor air quality while meeting applicable FAA requirements (FAA, 2023). Long term, given the energy efficiencies and equipment to support air traffic control operations, the new ATCT would likely decrease GHG emissions when compared to the No Action Alternative.

4.3.4 Mitigation

The following measures could prevent or reduce impacts to the climate:

- Incorporate energy efficient design features when planning new construction, such as all-electric building systems and thermally efficient facades.
- Ensure that construction vehicle trips are combined or reduced.
- Use repurposed materials or high-recycled steel and metal products.
- Use energy efficient equipment.
- Use of materials and products free from chemicals known to pose health risks.
- Use of renewable mass timber when usable.
- When feasible, incorporate ground-source heating and cooling.

4.4 COASTAL RESOURCES

Coastal resources are the natural resources occurring within coastal waters and adjacent shorelands. Coastal resources include islands, transitional and intertidal areas, salt marshes, wetlands, floodplains, estuaries, beaches, dunes, barrier islands, and coral reefs, as well as fish and wildlife and their respective habitats within these areas. Coastal resources in the U.S. are located along the coastlines of the Atlantic Ocean, Pacific Ocean, the Great Lakes, and the Gulf of Mexico.

4.4.1 Regulatory Setting

Administered by the USFWS, Section 5 of the Coastal Barrier Resources Act of 1982 (CBRA), as amended by the Coastal Barrier Improvement Act of 1990 (P.L. 97-348, 16 U.S.C. §§ 3501-3510, 42 U.S.C. § 4028), prohibits federal financial assistance (direct or indirect) for development within the Coastal Barrier Resource System (CBRS) that contains protected sensitive and vulnerable barrier islands (undeveloped) along the U.S. Atlantic Ocean, Gulf of Mexico, and Great Lakes coastlines.

The Coastal Zone Management Act (CZMA) (16 U.S.C. §§ 1451-et seq.), administered by NOAA, applies to all coastal states and states that border the Great Lakes, and protects the coastal environment from growing demands associated with residential, recreational, commercial, and industrial uses (e.g., offshore oil and gas development). The CZMA provisions help states develop coastal management programs to manage and balance competing uses of the coastal zone. Federal agencies must follow the Federal Consistency provisions (Section 307 of the CZMA). The CZMA requires that federal actions that are reasonably likely to affect any land or water use or natural resource of the coastal zone be consistent with enforceable policies of a state's federally approved coastal management program. (DOI, n.d.)

EO 13089, Coral Reef Protection, directs federal agencies to identify their actions that may affect coral reef ecosystems, to protect and enhance coral reefs, and to ensure their activities will not degrade the conditions of coral reef ecosystems subject to the jurisdiction or control of the U.S. EO 13089 also established the interagency U.S. Coral Reef Task Force to develop and implement a comprehensive research and mapping program to inventory, monitor, and "identify the major causes and consequences of degradation of coral reef ecosystems." (The White House, 1998)

4.4.2 Affected Environment

There are 35 states and territories with approved CZM programs and 24 States that contain land in the CBRS (subject to CBRA regulations) (NOAA, 2021; USFWS, 2023). Figure 4-10 identifies the CBRS units in the U.S. The 35 states and territories participating in the National CZM program include all U.S. coastal states, including the Pacific, Atlantic, and Gulf coast states and those states that border the Great Lakes. Interior states without marine or Great Lake coastlines do not participate in the CZM or CBRS.

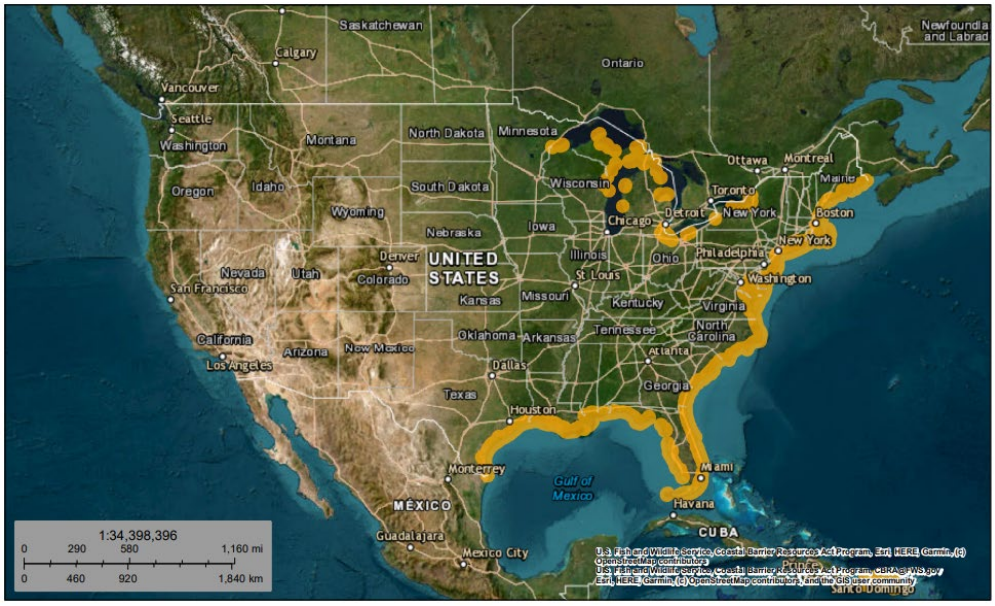

Figure 4-10 Coastal Barrier Resources System in the U.S.

Source: (USFWS, 2023)

4.4.3 Environmental Consequences

The FAA has not established a significance threshold for coastal resources (FAA, 2020c).

- No Impact: Impacts to coastal resources would not occur as a result of the Proposed Action.

Factors to consider include if the action has the potential to:

- "Be inconsistent with the relevant state coastal zone management plan(s);
- Impact a coastal barrier resources system unit (and the degree to which the resource would be impacted);
- Pose an impact to coral reef ecosystems (and the degree to which the ecosystem would be affected);
- Cause an unacceptable risk to human safety or property; or
- Cause adverse impacts to the coastal environment that cannot be satisfactorily mitigated." (FAA, 2015)

4.4.3.1 No Action Alternative

The No Action Alternative would not change existing ATCTs and the condition of the site where they are located. Existing ATCTs would not be replaced and removed, and activities associated with the ATCTs would remain the same. The No Action Alternative would not change existing ATCTs or physically disturb or destroy coastal resources. No impacts would be expected from the No Action Alternative.

4.4.3.2 Alternative 2 (Preferred Alternative)

Under Alternative 2 (Preferred Alternative), an increase in heavy machinery during construction could increase noise levels and emissions and potentially impact coastal species. Noise from construction activities could startle wildlife and disrupt natural behaviors (USBR, 2023). Constructing a new ATCT, support structures, and parking areas could lead to the disturbance of soils and potentially increase impervious surface area. Increased impervious surface area could change the water flow rate into a coastal ecosystem. If light emittance from the new ATCT differs from the old tower, there is the potential to affect light sensitive species. Refer to Visual Effects (see Section 4.14) for additional information. Proposed construction would occur within developed airports and would be unlikely to directly disturb critical coastal habitat.

The demolition of existing ATCTs would involve tearing down an ATCT using heavy equipment and disturbance of the soil beneath the old tower. Excavating soil and increased traffic of heavy machinery could lead to soil runoff and impact water quality in coastal ecosystems. Water quality is important to a coastal ecosystem, especially reefs, where sunlight is required for underwater plants and algae. Increased sedimentation could reduce the amount of sunlight reaching these organisms.

A federal consistency review would be required for those proposed ATCT sites located within coastal management zones. If any BIL-funded ATCT replacement projects are proposed within a state, coastal zone, or within states that have CBRS units, a site-specific study or consistency determination may be required once the site is finalized. Site-specific analyses of coastal resource impacts would be conducted for each applicable ATCT.

4.4.4 Mitigation

Measures to reduce or prevent impacts to coastal resources include the following:

- Adjust a project to promote consistency with federally approved coastal zone management plans.
- Incorporate any site-specific recommendations proposed by relevant federal or state agencies having jurisdiction over the coastal resource.

4.5 Department of Transportation Act, Section 4(f)

Section 4(f) of the U.S. Department of Transportation (DOT) Act of 1966 (codified in 49 U.S.C. § 303 and 23 U.S.C. § 138) applies to projects that receive funding from or require approval by agencies within the DOT and provides for the consideration of the certain properties of national, state, and/or local significance during transportation project development, such as:

- Publicly owned parks. This includes publicly owned land, open to the public, used as a public park.
- Recreational areas. This includes publicly owned land, open to the public, used as a recreational area, such as a baseball complex, tennis court, or other recreational facility.

- Wildlife and waterfowl refuges. This includes publicly owned land, open to the public, used as a wildlife and waterfowl refuge.
- Public and private historic sites. This includes publicly or privately owned land of an historic site listed or eligible for listing on the National Register of Historic Places (NRHP) and considered a historic property under the National Historic Preservation Act of 1966 (NHPA) (P.L. 89–665, as amended by P.L. 96-515, 54 U.S.C. § 300101 et seq.) and its implementing regulations (36 CFR Part 800).

Before approving a transportation project requiring the use of these properties, the DOT agency must determine that there is no feasible and prudent alternative to using that land and the project includes planning to minimize harm resulting from the use (FAA, 2020c).

4.5.1 Regulatory Setting

Section 4(f) of the U.S. Department of Transportation Act of 1966 (codified in 49 U.S.C. § 303 and 23 U.S.C. § 138) and its implementing regulations (23 CFR Part 774) provide for the consideration of park and recreation lands, wildlife and waterfowl refuges, and historic sites during transportation project development (FHWA, n.d. (a)). In 2005, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), Section 6009, amended Section 4(f) to simplify the process and approval of projects having only *de minimis* impacts (or no adverse effects) on of 4(f) properties (FHWA, n.d. (b)). Procedures for Section 4(f) compliance are in DOT Order 5610.1C (DOT, n.d.).

Under Section 4(f), the DOT agency is responsible for consulting with the relevant agencies and officials with jurisdiction over the Section 4(f) properties. When a draft Section 4(f) evaluation is prepared, it must be provided to the officials with jurisdiction over Section 4(f) properties, the Department of Interior (DOI), and other agencies, as appropriate, for a minimum 45-day review period. Section 4(f) evaluations and determinations must reflect consultation with these parties. The DOT agency must document evidence of concurrence or efforts to obtain concurrence of Federal, state, or local officials having jurisdiction over Section 4(f) properties regarding the project's use plans to minimize harm of the Section 4(f) property (FAA, 2020c).

Section 4(f) intersects with the NHPA. Both Section 4(f) and NHPA's Section 106 mandate the consideration of historic properties, or historic sites listed on or eligible for listing on the NRHP. Coordination between the Section 106 process and Section 4(f) evaluation is effective for project-level NEPA documentation, since the Section 106 process identifies, evaluates, and determines impacts on historic properties within a project area. Section 106 findings can also support Section 4(f) determinations for historic sites. Please refer to Chapter 4.10.1 for more information on the Section 106 process.

For historic properties, under Section 4(f), the official having jurisdiction over the Section 4(f) property is the relevant State Historic Preservation Office (SHPO) or, if located on tribal land, the relevant Tribal Historic Preservation Office (THPO) or appropriate tribal representative. If the Advisory Council on Historic Preservation (ACHP) is involved in Section 106 consultation for a property, the ACHP is also an official having jurisdiction over

the Section 4(f) property. If the property is a National Historic Landmark (NHL), the National Park Service (NPS) is also an official with jurisdiction over the Section 4(f) property (23 CFR 774.17). Although there is overlap between Section 4(f) and Section 106, there are key differences. Section 106 identifies historic properties within a project area and considers the project's effects on them, while Section 4(f) considers whether there is a use of historic properties and requires historic sites be avoided when possible. Please note that an adverse effect finding under the NHPA's Section 106 and a use under Section 4(f) are not the same. Section 4(f) applies to the actual use or occupancy of a historic site, whereas Section 106 assesses adverse effects on historic properties. Unlike Section 106, under Section 4(f), DOT agencies must avoid the use of historic sites when a prudent and feasible avoidance alternative is available. If there is no prudent or feasible alternative to avoid use, the agency must employ planning to minimize harm to historic sites (FHWA, n.d. (a)).

4.5.2 Affected Environment

Section 4(f) properties are site and project specific and cannot be described on a national scale. Site-specific conditions would be discussed in project-level NEPA documentation, which should determine whether the project would result in the use of any Section 4(f) properties and describe the potential impacts in detail. An affected property's documentation can include maps, photos, or drawings; its description should include "location, size, activities, patronage, access, access, unique or irreplaceable qualities, relationship to similarly used lands in the vicinity, jurisdictional entity, and other factors necessary to understand and convey the extent of the impacts on the resource" (FAA, 2020c). However, one can generally describe Section 4(f) properties, in terms of parks, recreational areas, wildlife and waterfowl refuges, and historic sites, as well as actions that can potentially use them. Section 4(f) properties typically include the following:

- Publicly owned parks. This includes publicly owned land, open to the public, with its major purpose being for park activities.
- Recreational areas. This includes publicly owned land, open to the public, with its major purpose being for recreational activities. This can include school playgrounds, running tracks, ball fields, fairgrounds, and other areas that are open to the public for regular recreational use.
- Wildlife and waterfowl refuges. This includes publicly owned land, accessible to the public, with the major purpose being to conserve, restore, and/or manage an endangered species, their habitat, and other wildlife and waterfowl resources. It may be part of the National Wildlife Refuge System or other publicly owned land and can include wildlife management areas that function as refuges. The refuge does not have to provide unrestricted access to the public to be considered a Section 4(f) property.
- Public and private historic sites. This includes publicly or privately owned land of an historic site listed or eligible for listing on the NRHP. Examples of historic sites include historic buildings, historic transportation facilities, archaeological sites, Traditional Cultural Properties (TCPs), historic districts, and historic trails. Please refer to Chapter 4.10.2 for a more in-depth discussion of historic properties.

- Public land with multiple uses, such as state and national forests, rivers, lakes, planned facilities, bikeways, trails, and Bureau of Land Management lands, have multiple designated uses, including recreation, environmental conservation, and/or historic preservation. Section 4(f) evaluation of such properties should examine the property's management plan, if possible, and coordinate with the officials having jurisdiction over the property to determine if Section 4(f) should apply. Section 4(f) can apply to all or portions of a property, depending on its public purpose and function (FHWA, n.d. (a)).

In general, actions that have the potential to affect Section 4(f) properties involve a physical or constructive use of such properties. A physical use can include temporary occupancy for construction-related activities; physical occupation of the property; alteration of structures or facilities on the property; or a physical taking, such as purchase or a permanent easement of the property (FAA, 2020c). A constructive use involves the project's proximity significantly impacting a Section 4(f) property so the attributes that qualify the property for protection are substantially impaired; this can include the effects of noise, vibration, access restrictions, visual impacts, ecological intrusions, etc. (FHWA, n.d. (a)).

4.5.3 Environmental Consequences

As noted in the FAA Order 1050.1F Desk Reference, the FAA has established significance thresholds for Section 4(f) properties (FAA, 2020c).

- No Impact: Impacts to any Section 4(f) properties would not occur, or such conditions are not present.
- Significant Impact: The action involves more than a minimal physical use of a Section 4(f) resource or constitutes a "constructive use" based on an FAA determination that the aviation project would substantially impair the Section 4(f) resource. A significant impact under NEPA would not occur if mitigation measures eliminate or reduce the effects of the use below the threshold of significance. If a project would physically use Section 4(f) property, the FAA is responsible for complying with Section 4(f) even if the impacts are less than significant for NEPA purposes (FAA, 2015).

4.5.3.1 No Action Alternative

Under the No Action Alternative, the current ATCTs would not be replaced and removed, and activities associated with the ATCTs would remain the same. There would be no impact to Section 4(f) properties resulting from the No Action Alternative.

4.5.3.2 Alternative 2 (Preferred Alternative)

As Section 4(f) properties are site-specific, impacts to these resources would vary across airport sites. A site-specific assessment could be required to determine whether Section 4(f) applies. Section 4(f) properties should be identified as early as possible in the planning process. If Section 4(f) properties are identified, it should be determined if there is a use of a Section 4(f) property (FTA, n.d.). If Alternative 2 (Preferred Alternative) may result in a physical and/or constructive use of a Section 4(f) property, coordination with the officials

having jurisdiction over the Section 4(f) property would be required to determine if the property is significant and qualifies for protection under Section 4(f); if the property is protected under Section 4(f), continued coordination would be required with those officials on any potential impacts, avoidance alternatives, and mitigation measures (WSDOT, n.d.). The site-specific assessment should include documentation and description of the affected Section 4(f) property.

Construction of replacement ATCTs and their associated facilities have the potential to result in physical uses of Section 4(f) properties. Physical use of a Section 4(f) property may result from the destruction or physical occupancy or taking of a Section 4(f) resource during the construction process. Construction-related activities may lend to temporary occupancy of a Section 4(f) resource, but these activities are often considered to have minimal effects unless the occupancy would result in adverse changes to the resource (FAA, 2020c). For instance, construction typically requires grading and excavation, which may result in a minor physical use or temporary occupancy of a Section 4(f) property. Related construction access roads and staging areas, underground installation of utilities, or other construction activities for the new ATCTs could also have similar impacts.

Operation of replacement ATCTs and their associated facilities may result in a constructive use of a Section 4(f) property. Constructive use may result from severe project proximity impacts that substantially impair a Section 4(f) resource. Operation of new ATCTs could potentially have significant impacts on Section 4(f) resources, if the site location in any way restricts access to or substantially impairs qualifying features of a Section 4(f) resource. For example, constructive use of a Section 4(f) property may be considered if the replacement ATCT would restrict access to a nearby historic site. However, day-to-day operations of replacement ATCTs would not typically require any physical or constructive use of a Section 4(f) property. property.

Decommissioning and demolition of existing ATCTs may result in direct impacts and physical uses of Section 4(f) properties, particularly if the ATCTs and/or their associated facilities are eligible for listing or are listed on the NRHP or are contributing elements to a historic property, such as a historic district, and qualify for protection under Section 4(f). If historic properties or other Section 4(f) resources are closely adjacent to an ATCT slated for demolition, the demolition and/or removal of the ATCT's foundation may result in physical uses of those resources as well. Demolishing existing ATCTs is unlikely to cause significant long-term effects (such as greatly increased noise, pollution, harm to wildlife, etc.) to a Section 4(f) property that it would qualify as constructive use of the property.

Once a site is finalized, a site-specific study may be required as well as coordination with the officials having jurisdiction over the Section 4(f) property to determine the nature and extent of any impacts from construction and operations-related activities of a replacement ATCT and demolition of an existing ATCT. Site-specific impacts and potential mitigation measures may be assessed through public involvement and coordination with the officials having jurisdiction over the Section 4(f) property. If impacts would be significant, a Section 4(f) evaluation would be required to analyze feasible and prudent alternatives or mitigation measures that avoid or minimize harm to the Section 4(f) property.

4.5.4 Mitigation

Mitigation for site-specific analyses regarding Section 4(f) properties would be addressed in site-specific environmental documentation. If there are no impacts on Section 4(f) properties, then mitigation would not be needed. If there would be no significant impact after taking into account avoidance, minimization, and enhancement measures and result in no adverse effects on activities, features, or attributes that qualify the property for protection under Section 4(f), then a *de minimis* impact determination may be made (FHWA, 2012). Once the *de minimis* impact determination is made, the FAA must publish a public notice and provide an opportunity for public review and comment. The FAA must also coordinate with the officials having jurisdiction over the affected Section 4(f) property and receive their concurrence with the determination in writing (FHWA, n.d. (a)).

For any projects with significant impacts on Section 4(f) resources, the FAA would prepare a Section 4(f) evaluation and consult with the officials having jurisdiction over the property to develop feasible and prudent alternatives to avoid the property, or, if the property cannot be avoided, mitigation measures to minimize the harm of impacts before proceeding with the project. Environmental documentation should include concurrence or efforts to obtain concurrence on the avoidance alternatives and mitigation measures from the officials having jurisdiction over the Section 4(f) property (FAA, 2020c).

Examples of potential measures to mitigate impacts to Section 4(f) properties include:

- Alter the project's design to reduce impacts on the Section 4(f) property.
- Replace land or facilities used by the project (e.g., replacing a neighborhood park).
- Provide monetary compensation to improve the affected Section 4(f) property's remaining areas.
- Build noise walls or installing visual or vegetative buffers to reduce impacts.
- Improve access to the Section 4(f) property that the jurisdictional agency supports (i.e., installing disabled access ramps).

4.6 FARMLANDS

Farmland in the U.S. is important to protect to ensure that crop demands of the country are met. This section refers to farmlands that are considered prime, unique, or that have state and local importance as defined below in 7 CFR Part 657.5 (FAA, 2020c).

- Prime farmland: Land having the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimal use of fuel, fertilizer, pesticides, or products.
- Unique Farmland: Land used for producing high-value food and fiber crops. It has the special combination of soil quality, location, growing season, and moisture necessary to produce high quality crops or high yield of crops.
- Statewide or Locally Important Farmland: Land that has been designated as "important" by either a state government (state Secretary of Agriculture or higher office), county commissioners, or an equivalent elected body (FAA, 2020c).

4.6.1 Regulatory Setting

The Farmland Protection Policy Act (FPPA) (P.L. 97-98, 7 U.S.C. §§ 4201-4209), as administered by the National Resources Conservation Service (NRCS), regulates federal actions with the potential to convert important farmland to non-agricultural uses. The FPPA applies to prime and unique farmlands and those of statewide or local importance and is intended to minimize the unnecessary and irreversible conversion of farmland to non-agricultural uses from federal actions.

The CEQ Memorandum on the Analysis of Impacts on Prime or Unique Agricultural Lands in the National Environmental Policy Act (45 Federal Register 59189) urges federal agencies to include analysis of the effects on prime or unique agricultural lands as an integral part of the NEPA process.

The FAA may determine whether the project site is prime, unique, state, or locally important farmland using criteria provided in 7 CFR § 658.5. If the FAA does not make its own determination, the FAA may elect to initiate coordination with the NRCS by completing Form AD-1006, a land evaluation and site assessment system used by NRCS to determine a rating score and establish impacts to farmlands.

4.6.2 Affected Environment

The Natural Resource Conservation Service (NRCS) maintains a current database of prime and unique farmland in the U.S. and acts as the authority for designating important farmland. This farmland is inventoried as land that is used, or could be used, to supply food for the nation. This land includes current important farmland as well as undeveloped land with ideal environmental and soil conditions, but not land designated for water storage or built-up urban land (USDA NRCS, n.d.). As of 2017 the USDA estimates that there are around 314 million acres of prime farmland in the U.S. Figure 4-11 displays the distribution of this land throughout the country (USDA NRCS, 2017).

Under 7 CFR Part 658.2(a), farmland does not include land already in or committed to urban development or water storage However, many airports lease their land to farmers for numerous reasons, including to generate revenue, to reduce maintenance costs, to provide habitat for wildlife, or to keep prime or important farmland in production (National Academies of Sciences, Engineering, and Medicine, 2022). It is possible that new ATCTs could be sited on active farmland. Many of the municipal and general aviation airports identified in Appendix A have active agricultural activities on much of the Air Operations Area (AOA).

4.6.3 Environmental Consequences

As noted in the FAA Order 1050.1F Desk Reference, the FAA has determined a significance threshold for farmlands (FAA, 2020c).

- No Impact: Impacts to important farmlands would not occur as a result of the Proposed Action as none are present.

- Significant Impact: When the total combined score on Form AD-1006, "Farmland Conversion Impact Rating," ranges between 200 and 260 points (FAA, 2015).

A factor to consider is whether the action has the potential to convert important farmlands to nonagricultural uses. Important farmlands include pastureland, cropland, and forest considered to be prime, unique, or statewide or locally important land.

4.6.3.1 No Action Alternative

The No Action Alternative would not result in any change to the current ATCTs or involve any land acquisition. The current ATCTs would not be replaced and removed, and activities associated with the ATCTs would remain the same. There would be no impacts to important farmlands resulting from the No Action Alternative.

4.6.3.2 Alternative 2 (Preferred Alternative)

Construction of new ATCTs could be sited on or adjacent to important farmland, which could result in temporary or permanent removal of agricultural production on the new ATCT site location. If the airports are located next to prime or unique farmland, current agricultural production activities may experience temporary increases from heavy equipment traffic on adjacent roadways during construction activities. New farm operations could utilize the former ATCT sites following decommissioning and removal of tower components and infrastructure, which would offset loss of farmland production if a new ATCT was located on active farmland.

The impacts of construction or demolition/decommissioning activities on important farmlands typically comes from direct land conversion but could also include actions that prevent access to these lands.

Potential impacts would be determined at the project-specific level. Impacts from the program are not anticipated to be significant.

4.6.4 Mitigation

If farmlands are expected to be impacted by Alternative 2, coordination should occur with the Natural Resources Conservation Service (NRCS) in addition to other state, local or Tribal agencies, as appropriate. These agencies may have established mitigation for impacts to farmlands. Mitigation measures may include the following:

- Adjust the size or location reduce the amount of farmland taken out of production or to reduce indirect impacts on agricultural uses
- Work with affected property owners and businesses to appropriately address any construction or operations-related impacts.
- Ensure that lands temporarily taken out of agriculture are restored to a condition appropriate for agricultural use.
- Land restored after decommissioning and demolition of the existing ATCT are returned to farmland.

4.7 HAZARDOUS MATERIALS, SOLID WASTE, AND POLLUTION PREVENTION

A hazardous material is "any substance or material that has been determined to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce" (FAA, 2020c). Hazardous materials include hazardous wastes and hazardous substances, in addition to petroleum and natural gas substances and materials per 49 CFR § 172.101. The RCRA implementing regulations define a solid waste "as any discarded material that meets specific regulatory requirements and can include such items as refuse and scrap metal, spent materials, chemical by-products, and sludge from industrial and municipal wastewater and water treatment plants" (FAA, 2020c).

Hazardous waste is a type of solid waste defined under the implementing regulations of RCRA. A hazardous waste (see 40 CFR § 261.3) is a solid waste that possesses at least one of the following four characteristics: ignitibility, corrosivity, reactivity, or toxicity as defined in 40 CFR part 261 subpart C or is identified in one of four lists in 40 CFR part 261 subpart D, which contains a list of specific types of solid waste that the U.S. Environmental Protection Agency (U.S. EPA) has deemed hazardous. RCRA imposes stringent requirements on the handling, management, and disposal of hazardous waste, especially in comparison to requirements for non-hazardous wastes. (FAA, 2020c)

Pollution prevention describes methods used to avoid, prevent, or reduce pollutant discharges or emissions through strategies such as using fewer toxic inputs, redesigning products, altering manufacturing and maintenance processes, and conserving energy.

4.7.1 Regulatory Setting

The Resource Conservation and Recovery Act (RCRA) (42 U.S.C. §§ 6901-6992k) amended the Solid Waste Disposal Act to establish guidelines for hazardous waste and non-hazardous solid waste management activities in the U.S. RCRA also gives the USEPA the authority to regulate the generation, storage, treatment, and disposal of waste as well as to address environmental problems that could result from underground storage tanks storing hazardous substances (40 CFR Parts 240-299). The RCRA database[15] is updated regularly with relevant information regarding hazardous and solid waste compliance, and violation notices.

The Toxic Substances Control Act (TSCA) (15 U.S.C. §§ 2601-2697), as amended by the Lautenberg Chemical Safety Act (Public Law [P.L.] Law 114–182), provides the U.S. EPA with the authority to regulate the production, importation, use, and disposal of chemicals defined as toxic, including lead, radon, asbestos, and Polychlorinated biphenyls (PCBs), that have the potential to cause unreasonable risk of injury to public health or the environment (40 CFR Parts 745, 761 and 763). This Act also mandates the USEPA to execute risk-based chemical assessments with clear and enforceable deadlines.

[15] https://enviro.epa.gov/facts/rcrainfo/search.html

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments Re-authorization Act of 1986 and the Community Environmental Response Facilitation Act of 1992 (42 U.S.C. §§ 9601-9675) establishes joint and several liabilities for those parties responsible for hazardous substance releases to pay cleanup costs and establishes a trust fund to finance cleanup costs in situations in which no responsible party could be identified. Enables the creation of the NPL, a list of sites with known releases or threatened releases of hazardous substances in the United States and its territories, used to guide the U.S. EPA in determining which sites warrant further investigation. As conditions of a sale, release, or transfer of federal lands or facilities used to store hazardous materials or where a release or disposal of hazardous materials has occurred, federal agencies must: identify those lands or facilities, and complete waste or contaminate clean-up of these lands or facilities (40 CFR Parts 300, 311, 355, 370, and 373).

The Solid Waste Disposal Act, as amended by the Federal Facilities Compliance Act (42 U.S.C. § 6961), waives any immunity otherwise applicable to federal agencies for substantive or procedural requirement in connection with a federal, state, interstate, or local solid waste or hazardous waste regulatory programs (40 CFR Part 22).

4.7.2 Affected Environment

As part of FAA's environmental due diligence, conditions at each ATCT site would be recorded within a Phase 1 Environmental Site Assessment conducted in parallel with the site-specific EA. The Phase 1 document would identify any existing or previous contamination within the proposed sites and within the immediate vicinity. The site-specific EA would address concerns of National Priorities List (NPL) sites and sites in consideration for listing on the NPL, RCRA Solid Waste Management Units, and contaminated sites regulated under state cleanup laws.

If hazardous waste is expected to be encountered at an ATCT site, the capacity of local disposal facilities should be identified. Solid waste disposal and/or repurposing facility capacity should be found to ensure waste materials can be properly disposed. The aspects would be conducted on a site-specific basis due to the unique conditions of each ATCT location. Older ATCTs and their respective buildings may have active and/or previously removed under and aboveground fuel storage tanks. During site-specific analyses, all storage tanks—active, inactive, and removed—would be identified to determine their location and condition. In addition, hazardous materials such as asbestos-containing materials, lead-based paint, and PCBs are commonly found in building materials at ATCT facilities constructed prior to the mid-1980s. Surveys conducted during the site-specific analysis would identify any hazardous materials present at existing ATCTs and recommend abatement or removal in accordance with National Emission Standards for Hazardous Air Pollutants (NESHAP) and CERCLA.

Existing hazardous conditions or materials or state regulated sites may exist and would be evaluated during site-specific analysis.

4.7.3 Environmental Consequences

The FAA has not established a significance threshold for hazardous materials, solid waste, or pollution prevention.

- No Impact: Impacts from hazardous materials, solid waste, and pollutants would not occur as a result of the Proposed Action.

Factors to consider include if the action has the potential to:

- "Violate applicable Federal, state, tribal, or local laws or regulations regarding hazardous materials and/or solid waste management;
- Involve a contaminated site (including but not limited to a site listed on the National Priorities List). Contaminated sites may encompass relatively large areas. However, not all of the grounds within the boundaries of a contaminated site are contaminated, which leaves space for siting a facility on non-contaminated land within the boundaries of a contaminated site. An EIS is not necessarily required. Paragraph 6-2.3.a of this Order [FAA Order 1050.1F] allows for mitigating impacts below significant levels (e.g., modifying an action to site it on non-contaminated grounds within a contaminated site). Therefore, if appropriately mitigated, actions within the boundaries of a contaminated site would not have significant impacts;
- Produce an appreciably different quantity or type of hazardous waste;
- Generate an appreciably different quantity or type of solid waste or use a different method of collection or disposal and/or would exceed local capacity; or
- Adversely affect human health and the environment" (FAA, 2015).

4.7.3.1 No Action Alternative

The No Action Alternative would not result in any change to the current ATCTs or involve construction activities associated with construction of a new ATCT. The current ATCTs would not be replaced and removed, and activities associated with the ATCTs would remain the same. There are potential safety concerns for the No Action Alternative of leaving the existing ATCTs as is.

- Several ATCTs may have been constructed prior to the banned use of lead-based paint in 1978 (CDC, 2022). Leaving the paint in place would increase the risk of exposure to employees as the paint deteriorates.
- PCBs are defined by the USEPA as a group of man-made organic chemicals that consist of carbon, hydrogen and chlorine atoms and were manufactured in several construction and industrial materials from 1929-1979, PCBs pose a similar concern of exposure over time (U.S. EPA, 2022l).
- Asbestos is a fibrous mineral that has been used in a variety of building construction materials such as floor tile, insulation, drywall, and siding (U.S. EPA, 2022l). Leaving these materials in place would increase the risk of exposure to employees.

Leaving the existing ATCTs as is could increase the risk of exposure over time if these hazardous materials are present. The FAA regularly monitors and tests for these hazardous materials, and there is a high probability that these materials are present in ATCT structures constructed prior to 1979.

4.7.3.2 Alternative 2 (Preferred Alternative)

Proposed sites for new ATCTs would be studied and a Phase I Environmental Site Assessment would be conducted to identify any potential contaminants or hazardous materials are present. Existing ATCTs and their support buildings may have active under and aboveground storage tanks. All active, inactive, and removed storage tanks would be identified to determine their location, status, and potential to impact Alternative 2 (Preferred Alternative). If contaminated soils are suspected or discovered, the appropriate measures and disposal actions would be taken in accordance with all applicable regulations.

Given the nature and previous uses of the ATCT facilities, the potential contaminants of concern included asbestos-containing materials, lead-based paint, and PCBs; these constituents are commonly associated with paint and building materials on historic structures. Hazardous materials such as asbestos-containing materials, lead-based paint, and PCBs may be encountered during demolition of ATCT facilities constructed prior to the mid-1980s. Surveys conducted during the site-specific analysis would identify any hazardous materials present at existing ATCTs. Short-term and temporary impacts may be experienced during construction activities and with the use of fuels and chemicals. Appropriate measures and disposal actions to mitigate the release of these hazardous materials would be taken during demolition of the existing ATCTs.

Construction activities under Alternative 2 could subject workers to heavy machinery, power tools, chemicals, or hazardous conditions. Mitigation measures and BMPs would reduce or prevent impacts to workers and other personnel from these concerns.

Decommissioning and demolishing existing ATCTs would result in industrial and construction material waste. The FAA intends to recycle all materials to the greatest extent possible. For both hazardous and solid wastes, proper storage, management, and disposal procedures would be implemented during decommissioning and demolition activities. The FAA acknowledges that some states have specific regulations on the handling of solid and hazardous waste and intends to comply with those standards by disposing of all waste in the proper licensed sanitary and construction landfills in the vicinity. Short-term and temporary impacts from demolition and removal of waste or other unknown materials from older ATCT sites may result.

During the operational phase of the proposed new ATCTs, similar, if not lesser volumes of waste would be generated relative to previous operations at the old ATCTs. No additional hazardous wastes would be generated, and minimal quantities of fuel would be stored on site to serve the emergency generator. Volumes consistent with household cleaning products would be stored onsite to aid in the maintenance of the proposed new ATCTs.

Potential impacts would be determined at the project-specific level. Impacts from the program are not anticipated to be significant.

4.7.4 Mitigation

Potential measures and BMPs to mitigate impacts related to hazardous materials, solid waste, and pollution include the following:

- Prepare an ASTM Standard E1527-21 Phase I Environmental Site Assessment prior to the acquisition and termination of leases associated with the replacement ATCT.
- Conduct a Hazardous Materials Survey (HMS) prior to demolition activities and conduct abatement activities, as necessary.
- Comply with mitigation or monitoring requirements applicable to prior or ongoing cleanup activities, such as at an NPL site.
- Implement any on-site treatment, engineering, or administrative controls that may be applied to reduce the hazards posed by wastes encountered.
- Develop a hazardous materials response plan and/or a spill prevention, control, and countermeasure plan to identify those precautions, training requirements, and response measures that would be taken to prevent and contain releases of hazardous materials.
- Employ source reduction strategies such as recovering, recycling, or composting waste materials.
- Find markets for recovered, recycled, or composted products, or other wastes that are usable for producing energy or other activities.
- Recycling of construction debris associated with the action.
- Incorporate recommendations provided by federal, state, tribal, or local agencies responsible for managing any known contaminated sites.

During planning activities for a proposed new ATCT, the FAA would conduct Phase I Environmental Site Assessments for the purposes of site selection, as well as in preparation for establishing a lease for the new ATCT site. After the HMS has been conducted and the former ATCT has been demolished, a Phase I Environmental Site Assessment would be conducted prior to disposition of the property. If any RECs are identified by the Phase I Environmental Site Assessment, an analysis would be conducted to determine potential impacts, or any material impact from a REC identified at the project site. If a potential impact is expected at the cleanup site, then appropriate planning measures would be implemented.

Prior to the demolition of the decommissioned ATCT, a hazardous materials survey would be completed to determine any potential hazardous materials and impacts and applicable abatement activities would occur. Following the demolition of the existing ATCT and prior to property transfer, the FAA would perform a Phase I Environmental Site Assessment to exercise due diligence by evaluating potential environmental liabilities through interviews with individuals familiar with the subject property, site reconnaissance, and historical

records review to identify and determine if any hazardous substances or petroleum products at the subject property present an impact or a Recognized Environmental Condition (REC) for the site.

Appropriate measures are required during project execution to alert workers of the potential for contamination and provide guidance for proper notification if a spill or release occurs. In such an event, the site would cease operations until protective measures are implemented the appropriate regulatory authorities are consulted. Performing environmental due diligence and conducting a hazardous material survey prior to project execution would minimize exposure to lead, PCBs, asbestos, or other hazardous materials during the demolition of the existing ATCTs.

If hazardous materials (oil, gas, petroleum) would be required during construction, detailed plans would be developed for site-specific protocols on the handling, storage, and management of hazardous materials at the construction site and transportation to and from the construction area.

4.8 HISTORICAL, ARCHITECTURAL, ARCHEOLOGICAL, AND CULTURAL RESOURCES

Historic and cultural resources are sites, structures, buildings, districts, or objects, associated with important historic events or people, demonstrating design or construction associated with a historically significant movement, or with the potential to yield historic or prehistoric data, that are considered important to a culture, a subculture, or a community for scientific, traditional, religious, or other reasons (NPS, 1997). Historic and cultural resources may be subdivided into the following categories:

- Archaeological resources. This includes prehistoric or historic sites where human activity has left physical evidence of that activity, but few aboveground structures remain standing.
- Architectural resources. This includes buildings or other structures or groups of structures that are of historic or aesthetic significance.
- Native resources. These include resources of traditional, cultural, or religious significance to a Native American Tribe, Native Hawaiian, or Native Alaskan organization.
- Traditional cultural properties (TCPs). These include archaeological resources, structures, neighborhoods, prominent topographic features, habitats, or areas where particular plants, animals, or minerals exist that any cultural group considers to be essential for the preservation of traditional cultural practices (NPS, 1998a).

4.8.1 Regulatory Setting

There are multiple federal regulations that protect historic and cultural resources. NEPA (42 U.S.C. § 4321 et seq.), under 40 CFR Part 1508.8, requires federal agencies to consider the effects of actions on historic and cultural resources. It is important to note that NEPA's

definitions of historic and cultural resources are broad and can include resources not eligible for the National Register of Historic Places (NRHP) (ACHP, 2013).

The National Historic Preservation Act of 1966 (NHPA) (P.L. 89–665, as amended by P.L. 96-515, 54 U.S.C. § 300101 et seq.) directs the federal government to consider the effects of its actions on historic properties listed or eligible for listing in the NRHP under Section 106 through a compliance process, set forth in the law's implementing regulations, 36 CFR Part 800. The NHPA defines historic properties as sites, structures, buildings, districts, or objects that are typically 50 years old, with some younger exceptions, which are significant within their historical context, retain their historical integrity, and are able to convey their significance. It is noteworthy, however, that the law does not necessarily mandate preservation but does mandate a carefully considered decision making process.

Conducting the Section 106 process in coordination with NEPA review of a federal action is an effective way to gather the information needed to assess broad impacts on historical, architectural, archeological, and cultural resources. Steps of the Section 106 compliance process include the following (ACHP, n.d.):

1) Establish whether the Proposed Action constitutes an undertaking. Per 36 CFR Part 800.16, an undertaking is an action funded in whole or in part under the direct or indirect jurisdiction of a federal agency. If the Proposed Action is an undertaking with the potential to affect historic properties, the appropriate State Historic Preservation Office (SHPO) or Tribal Historic Preservation Office (THPO) and other consulting parties (stakeholders), such as relevant Tribes, are identified and consulted with on the project in good faith.
2) Identify NRHP-listed or eligible properties. Eligible historic properties in the geographic area of the Proposed Action (also known as the area of potential effects [APE]) are identified and evaluated for significance, including properties potentially eligible or listed with the NRHP that may be affected by the Proposed Action. If historic properties are not present, the federal agency seeks concurrence of the SHPO/THPO in a 30-day review period and makes information available to other consulting parties.
3) Assess effects of the Proposed Action on eligible historic properties. If the assessment determines no historic properties or no adverse effect to eligible historic properties, the SHPO/THPO and other consulting parties are informed and given a 30-day review period. If the assessment determines actual or potential adverse effect to eligible historic properties, the SHPO/THPO and other consulting parties are notified for further consultation.
4) Resolve adverse effects to eligible historic properties through consultation with the SHPO/THPO, Advisory Council on Historic Preservation (ACHP), and other consulting parties, as necessary.

Historic properties are also protected under the U.S. Department of Transportation Act of 1966 (49 U.S.C. § 303) Section 4(f) and its implementing regulations (23 CFR Part 774). If there is a physical taking of a historic property, or adverse effects that substantially impair

the affected resource's historical integrity, there may be a "use" under Section 4(f). Refer to Section 4.5 for information on Section 4(f).

Other federal laws and regulations involving consideration of actions that have the potential to impact historic and cultural resources include those that affect:

- Cultural items as defined in the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 (P.L. 101-601, 25 U.S.C. 3001 et seq.), particularly the inadvertent discovery of Native American cultural items, including human remains, on federal and tribal lands (43 CFR Parts 1025 and 262.8).
- Religious sites and objects that are important to Native Americans, including Alaska Natives and Native Hawaiians, under the American Indian Religious Freedom Act (AIRFA) of 1978 (P.L. 95–341, 42 U.S.C. § 1996).
- Sacred sites under EO 13007, Indian Sacred Sites (61 Federal Register 26771), which requires federal agencies to consult on a government-to-government basis with Tribes if a proposed project involves a sacred site.
- Archaeological resources as defined by the Archaeological Resources Protection Act (ARPA) of 1979 (P. L. 96–95, 16 U.S.C. §470).
- Archaeological collections, material remains, religious remains, and associated records as defined by 36 CFR Part 79.

State and local governments typically have their own historic and cultural resources laws and may have a state-specific register of historic places, similar to the NRHP but maintained and managed under state law. The SHPO may be a resource on how a project can comply with state and local historic and cultural resources laws and which parties may have interest in an undertaking. The National Conference of State Historic Preservation Officers (NCHPO) offers a directory for SHPOs and may provide useful contact information (NCSHPO, n.d.).

4.8.2 Affected Environment

Historic and cultural resources are site- and project-specific and cannot be described on a national scale. Site-specific conditions would be discussed in project-level NEPA documentation, which should describe the project APE's physical boundaries, summarize the area's historic context, and describe identified historic and cultural resources (FAA, 2020c). However, one can generally describe historic and cultural resources, such as archaeological resources, architectural resources, native resources, and TCPs, as well as actions that can potentially affect them.

Under 36 CFR Part 800, it is the agency's responsibility to define the APE on historic properties in consultation with the SHPO/THPO and seek the SHPO/THPO's concurrence (36 CFR § 800.4(a)). The APE is "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. [The APE] is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking" (36 CFR §

800.16(d)). The agency, in consultation with consulting parties, must identify within the APE historic properties that are either in, or eligible for listing in, the NRHP (36 CFR § 800.4(b)).

In general, actions that have the potential to affect historic and cultural resources are those that involve modifications to land or buildings and structures, including construction, grading, excavation, maintenance, rehabilitation, and renovation, or the sale or lease of a historic property. Any project that would involve construction, ground disturbance, or modification of the exterior of a historic property, or a property in the viewshed of a historic property or district, may require consultation with the relevant SHPO/THPO and other consulting parties, as appropriate. Other effects to consider include noise, vibration, lighting, and increased traffic.

Efforts to identify historic and cultural resources within the project area can include reviewing the NRHP database and reaching out to the SHPO/THPO (most of which maintain databases of previous surveys and previously identified historic properties), consulting Tribes, as well as local museums, historical societies, and special interest organizations (NPS, n.d.) (NCSHPO, n.d.). Historic and cultural resources typically include the following:

- Archaeological Resources. Archaeological resources are defined by the ARPA as any material remains of past human life or activities that are of archaeological interest. This definition can apply to Indigenous (Native American, Native Hawaiian, or Native Alaskan) activity and/or historic land use from European colonization and into the mid-20th century. Resources can include habitation sites (e.g., camps, villages, farmsteads); procurement sites (e.g., agricultural fields, logging sites, and trading posts); manufacturing sites (e.g., kilns, mills, quarries); transportation sites (e.g., trail systems, landings); ceremonial sites (e.g., burial sites, shrines, petroglyphs, mounds, cemeteries); ruins of historic structures; battlefield sites; and more. Archaeological resources are present in a wide variety of habitats with surface features and may be potentially revealed or damaged by construction activities.
- Archaeological resources are site-specific. Therefore, requirements for SHPO/THPO coordination and consultation must also be site-specific concerning protection and preservation of archaeological resources. Any projects that would involve ground-disturbing activities (e.g., demolition, new construction, and/or replacement of ATCTs) have the potential to impact archaeological resources.
- Architectural Resources. Architectural resources include private residences, hotels, commercial buildings, canneries, shipyards, coastal fortifications, piers, ports, wharves, power plants, seawalls, jetties, bridges, locks and dams, lighthouses, historic districts (local, regional, or national), and other historic buildings or structures. Many of these types of resources are eligible for, or are listed on, the NRHP and State registers of historic places. These resources are protected by both federal and state laws.
- Architectural resources are site-specific. Therefore, requirements for SHPO and THPO coordination and consultation must also be site-specific concerning protection and preservation of architectural resources. Any projects that would

involve renovations to buildings or structures that are either historic or within the APE for other historic properties have the potential to impact architectural resources.

- Native Resources. Native resources can include cultural items (e.g., unassociated funerary objects, sacred objects, and objects of cultural patrimony); religious sites and objects important to Native Americans, including Alaska Natives and Native Hawaiians; and sacred sites (e.g., a landscape, site, or area religiously or spiritually significant) (DOJ, n.d.).

  Native resources are site-specific; therefore, Native American, Native Hawaiian Organizations (NHOs), and Native Alaskan coordination and consultation are also site-specific, depending on the project location. Federal agencies must make a reasonable and good faith effort to identify Tribes may have resources affected by the project. Tribes are invited via letter to be consulting parties to assist in the identification of resources in the study area. Policies on engaging in government-to-government tribal consultation can be found in FAA Order 1210.20, American Indian and Alaska Native Tribal Consultation Policy and Procedures. The SHPO may have suggestions about which entities might have an interest in the project area (FAA, 2020c).

- Traditional Cultural Properties. TCPs are defined as those resources associated with cultural practices or beliefs of a living community that are historically significant to the community and important to maintaining its cultural identity, and are therefore of traditional, cultural, or religious significance (NPS, 1998a). These resources are common throughout the country and are likely to be encountered in any area of long-term Indigenous people habitation. As with other historic and cultural resources, TCPs are site-specific, and findings of potential for impact trigger SHPO/THPO coordination and consultation.

- Aviation Properties. Because the BIL ATCT Replacement Program involves the replacement of existing FAA-owned ATCTs over 40 years of age with modern facilities, its actions may affect historic aviation properties on or near the airport. Such historic properties can include historic aircraft; aviation wrecks; aviation development facilities and production plants (e.g., test fields, experimental hangars, factories); air terminals; navigational aids (e.g., light beacons, radio beacons and stations, radar, weather services, emergency landing fields); and administrative and education facilities (e.g., flight and training schools). An ATCT planned for replacement may also be considered a historic property and/or important to the historic characteristic of an airport (NPS, 1998b).

- ATCTs. The ATCTs proposed for potential replacement may include ATCTs that fall under seven standard design types used for FAA ATCTs since the mid-1960s. These ATCT types and their respective commission dates include Type O (1965-1968), Pei (1966-1976), Type L (1966-1969), Hunt/AVCO (1967-2000), Mock (1969-1987), Welton Becket (1974-2007), and Golemon & Rolfe (1980-2007) (FAA, 2020a). Additional ATCTs proposed for replacement may also include ATCTs that are over 40 years of age and do not fall under a standard design type.

The FAA has some notable ATCTs within its inventory. Federal responsibility for air traffic control began in 1936, but it was not until 1941, that the Civil Aeronautics Administration (which was dissolved with the creation of the FAA in 1958) began operating ATCTs (FAA, n.d. (c)). With continued growth in the nation's airspace in the mid-late 20th century, it quickly became evident that airport safety and capacity had to be increased to prevent system delays. Between mid-1959 and mid-1969, the number of aircraft operations at FAA's ATCTs had increased by 112 percent (FAA, n.d. (d)). By 1966, the FAA had commissioned the nation's 30th ATCT at Hillsboro, Oregon (a Type O ATCT).

Starting in the mid-1960's, the FAA started implementing repeatable standard designs for ATCTs. Until 1961, the facilities were unique one-off facilities with many of them atop and collocated with the terminal building of the airport they served. The introduction of standard designs heralded a change in design philosophy for ATCTs with the standard ATCTs being a stand-alone building apart from the airport terminal building (FAA, 2020a).

In its standard designs, the FAA decided the new ATCTs would be freestanding structures "that would serve as a uniform symbol of air safety in airports" (Jodidio & Strong, 2008). The renowned architect I.M. Pei, whose best-known works include the Louvre Pyramid in France and the National Gallery of Art East Building in Washington, DC, headed the firm that won a 1962 competition to design standard ATCTs. The design of ATCTs consisted of a cab and shaft in a nondirectional pentagon shape for visuals on all sides and a base building.

The creation of ATCT design types also corresponded with the advent of computer technology in the early 1960s, which transformed the capabilities of air traffic control. Throughout the 1960s and into 1970s, the FAA worked to develop and, by the mid-1970s, succeeded in creating automation programs, using both ground and airborne radar data, for air traffic control. This placed the U.S. airspace system on the leading edge of technology. By the late 20th century, the FAA upgrades added safety features and worked to stay abreast of expanding traffic volume (FAA, n.d. (e)).

Although the FAA eventually changed course in how it designs towers, in the 1960's and 1970's the FAA built several towers using the Pei firm's ATCT design. Some of them are still in use today and fall under the ATCT Typo O (Figure 4-12) and Pei (Figure 4-13) design types. The meaningfulness of Pei's work on ATCTs was still evident as the City of Chicago pondered airport modernization at the Chicago O'Hare International Airport in Chicago, Illinois in the mid-2000s. The FAA noted the significance of the prototype Pei tower in Chicago in the 2005 O'Hare modernization EIS. The FAA identified the tower as potential for the NRHP because it "represents the work of a master," as it was a prototype, and it achieved "exceptional importance" in global airport design (FAA, 2020d). The integrity of the tower's exterior was reported as "excellent," and the tower was considered significant under Criteria C and G (FAA, 2005). This tower is now owned and maintained by the City of Chicago and used particularly for the management of snow removal operations on the airfield.

Another notable ATCT type is the Welton Becket ATCT design type (used by the FAA from 1974-2007) from the architecture firm Welton Becket and Associates (Figure 4-14). Welton

Becket is another renowned architect primarily known for his iconic buildings in Los Angeles, California including the Capitol Records building (Los Angeles Conservancy, n.d.).

Figure 4-11: Type O Design, LOU ATCT (Louisville, KY)

Source: (FAA, 2020a)

Figure 4-12: Pei Design Type, SMF ATCT (Sacramento, CA)

Source: (FAA, 2020a)

Figure 4-13: Welton Becket Design Type, ABQ ATCT (Albuquerque, NM)

Source: (FAA, 2020a)

4.8.3 Environmental Consequences

The FAA has not established a significance threshold for historical, architectural, archeological, and cultural resources (FAA, 2015).

- No Impact: Impacts to historical, architectural, archaeological, and cultural resources would not occur as a result of the Proposed Action.

Factors to consider include if the action "would result in a finding of *Adverse Effect* through the Section 106 process" (FAA, 2015). When evaluating impacts to historic and cultural resources, NHPA's implementing regulations must be followed by federal agencies to properly identify and assess effects to historic properties (resources eligible for listing or are listed within the NRHP) within the APE. Section 106 determinations and findings of effects to historic properties should be included in environmental documentation. Section 106 documentation should provide enough information for consulting parties to understand which historic properties are involved in the undertaking and how the agency determined effects to those properties (ACHP, 2013).

Determinations and findings of effects under Section 106 conclude one of the following:

- No Historic Properties Affected: If no historic properties are identified within the APE or if the undertaking would have no effect on historic properties, then this finding should be documented and shared with consulting parties for a 30-day review period. This finding equates to No Impact on historic properties.
- No Adverse Effect on Historic Properties: If historic properties are identified within the APE and (after consultation with the SHPO/THPO and other consulting parties, as appropriate) it is determined that the undertaking would not affect any historic

properties in a way that would alter their NRHP-qualifying characteristics, then this finding should be documented and shared with consulting parties for a 30-day review period. This finding equates to No Significant Impact on historic properties.

- Adverse Effect on Historic Properties: If the undertaking would cause direct, indirect, or cumulative impacts on historic properties, then this finding should be documented, and adverse effects resolved through avoidance, minimization, or mitigation in coordination with consulting parties. This finding equates to a Significant Impact on historic properties.

Impacts to historic and cultural resources include cumulative, direct, and indirect effects from construction and operation activities. Cumulative effects are impacts that can incrementally accumulate and "result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions" (FAA, 2015). Direct effects occur as a direct result of a Proposed Action and often physically change or impact historic and cultural resources, such as through demolition or ground disturbance. Indirect effects occur as an indirect result of a Proposed Action and foreseeably change the character of historic and cultural resources or their viewshed; these typically include audible, visual, and atmospheric effects (ACHP, 2013). To determine the nature of impacts to historic properties, as defined under the NHPA, consultation with the relevant SHPO/THPO may be required.

When determining the significance of environmental impacts, it is important to consider the context and intensity of impacts (FAA, 2015). The significance of impacts on historic and cultural resources and their short- and long-term effects should be analyzed in the context of society, the affected region, the affected interests, and the locality. The intensity or severity of impacts on historic and cultural resources should be evaluated by considering how impacts may:

- Be both beneficial and adverse.
- Affect the unique characteristics of the geographical area such as proximity to historic or cultural resources.
- May establish a precedent for future actions with significant effects.
- Be cumulative.
- Adversely affect resources listed in or eligible for listing in the NRHP.
- Violate a federal, state, or local law or requirements.

In environmental documentation, impacts to historic and cultural resources protected under laws other than NHPA should be evaluated and considered. FAA guidance recommends discussing these resources separately from those evaluated under Section 106 (FAA, 2020c). If no significant historic or cultural resources subject to other laws are identified within the project area, then no further analysis is needed for NEPA documentation.

4.8.3.1 No Action Alternative

Under the No Action Alternative, the current ATCTs would not be replaced and removed, and activities with the ATCTs would remain the same. Therefore, there would be no impacts to historic and cultural resources resulting from the No Action Alternative.

4.8.3.2 Alternative 2 (Preferred Alternative)

For Alternative 2 (Preferred Alternative), the FAA would coordinate its site-specific NEPA reviews in compliance with the NHPA and its implementing regulations at 36 CFR Part 800. The FAA would conduct individual Section 106 consultations for the construction of replacement ATCTs and later impacts resulting from the demolition of existing ATCTs after the replacement ATCTs' construction, as appropriate.

As historic and cultural resources are site-specific, impacts to these resources would vary by site. Alternative 2 (Preferred Alternative) may potentially create significant adverse short- and long-term impacts to historic and cultural resources through direct, indirect, and/or cumulative effects. A site-specific examination would be required to determine the full nature and extent of impacts to historic and cultural resources, including the initial impacts resulting from the construction of replacement ATCTs and later impacts resulting from the demolition of existing ATCTs after the replacement ATCTs' construction. As part of site-specific assessments for the construction of replacement ATCTs and demolition of existing ATCTs, consultation with the relevant SHPO/THPO and other consulting parties, as appropriate, would be required to accurately assess impacts, unless previously recorded cultural resources surveys indicate historic and cultural resources are not present at the project site.

First, the construction of replacement ATCTs and their associated facilities have the potential to adversely impact historic and cultural resources in both short- and long-term, direct and indirect, ways. Direct impacts would result from the destruction or severe degradation of historic or cultural resources during the excavation or construction process. For instance, construction-related activities for the replacement ATCTs and their associated facilities may have adverse direct impacts to archaeological resources. Construction typically requires grading and excavation, which may disturb recorded and unrecorded archaeological resources or other historic and cultural resources at project sites or alter historic landscapes. Related access roads, staging areas, and underground installation of utilities for the replacement ATCTs may also require ground-disturbing activities, such as grading and trenching, and could also have similar direct impacts to archaeological resources. If any archaeological resources present have not been previously disturbed, their permanent removal, degradation, or disturbance may constitute a significant adverse impact. If archaeological or other resources present at the proposed project site have been previously disturbed, the impacts from construction are not expected to be significant. Projects that do not involve any ground disturbing activities would not cause any direct impacts to archaeological resources.

Indirect impacts from the construction of replacement ATCTs may result from an infringement on the viewshed of a historic or cultural resource or an action that restricts

access to a historic or cultural resource. For example, the design of replacement ATCTs may indirectly impact the viewshed of architectural resources in the area if not aesthetically compatible with the character of the historic surroundings, or the placement of a replacement ATCT may somehow prevent access to a nearby historic or cultural resource. Building replacement ATCTs may also create temporary indirect effects to nearby historic and cultural resources through increased noise, traffic, and/or vibration from construction-related activities.

Once the replacement ATCTs are constructed, their operation and associated facilities may potentially have short- and long-term, direct and indirect impacts on historic and cultural resources. Operation of replacement ATCTs could potentially have direct impacts to historic or cultural resources, if the location of the site in any way restricts access to or degrades the integrity of a historic or cultural resource. Operation of replacement ATCTs would not typically require any ground-disturbing activities; therefore, no direct impacts to archaeological resources are expected. As noted earlier, the placement of replacement ATCTs may cause long-term indirect impacts to the viewshed of historic or cultural resources in the area if they are not aesthetically compatible with the character of the historic surroundings. Operations of replacement ATCTs may also create temporary indirect effects to nearby historic and cultural resources through increased noise, traffic, and/or vibration from operations-related activities.

After replacement ATCTs are constructed, the next step involves decommissioning and demolishing of existing ATCTs. Demolition of existing ATCTs may generate adverse direct impacts to historic and cultural resources, particularly if the ATCTs and/or their associated facilities are eligible for listing or are listed on the NRHP or are contributing elements to a historic property, such as a historic district. If archaeological sites and/or other historic or cultural resources are closely adjacent to an ATCT slated for demolition, the demolition and/or removal of the ATCT's foundation may have direct effects on those resources as well. Demolishing existing ATCTs may also lend to temporary indirect effects through increased noise, traffic, and/or vibration during their removal as well as longer-term indirect effects, such as visual and/or atmospheric effects by removing the ATCT from the landscape. Removal of an existing ATCT may indirectly affect the viewshed of historic or cultural resources in the area if the ATCT is aesthetically compatible with the character of the historic surroundings, especially if the ATCT is a contributing element to a historic district.

If impacts to any historic and cultural resource type are found to be significant as a result of construction and operations of replacement ATCTs and/or decommissioning and demolition of existing ATCTs, then the consultation process with the relevant SHPO/THPO and other consulting parties, as appropriate, would identify measures to mitigate the impacts to a level below significance.

4.8.4 Mitigation

Mitigation for site-specific analyses regarding historic and cultural resources would be addressed in future site-specific environmental documentation. If a significant impact on historic or cultural resources would occur, the FAA would coordinate with consulting parties and work to resolve adverse effects by developing and considering alternatives or

modifications to avoid, minimize, or mitigate those effects before proceeding with the project. This may lead to the development of an agreement document with consulting parities, such as a Memorandum of Agreement (MOA) or Programmatic Agreement (PA), to resolve adverse effects for individual site-specific projects. An MOA records the agreed upon terms and conditions to resolve adverse effects for a specific undertaking on historic properties. A PA records the agreed upon terms and conditions to resolve the potential adverse effects of a federal agency program or multiple or complex undertakings (36 CFR 800.14.b). If there would be No Impact or No Significant Impact on historic or cultural resources, then mitigation for historic and cultural resources is not needed.

Construction of replacement ATCTs may cause significant impacts on historic and cultural resources that may require mitigation measures. This includes directly impacting an archaeological or other resources due to construction-related ground disturbing activities, adversely impacting a resource's viewshed, or locating the ATCT in an area that would restrict access to a resource. After their construction, operation of replacement ATCTs may cause similar impacts that may also require mitigation. The replacement ATCTs' location and operation-related activities may potentially cause adverse impacts to a resource's viewshed, affect a nearby resource's integrity, or restrict site access.

After replacement ATCTs are built, later demolition of existing ATCTs may also cause significant impacts on historic and cultural resources that may require mitigation measures. If the ATCTs and/or their associated facilities are eligible for listing or are listed on the NRHP or are contributing elements to a historic property, such as a historic district, demolition and/or removal of the ATCTs would adversely impact those resources and/or nearby associated resources' viewsheds. Demolition-related ground disturbing activities may also adversely impact archaeological sites and/or other resources are adjacent to the ATCT.

Whether impacts occur during construction of replacement ATCTs or demolition of existing ATCTs, some potential measures to mitigate impacts to historic and cultural resources may include:

- As practicable, modifying, conditioning, or limiting activities associated with the Proposed Action to reduce effects.
- Implement standard BMPs during construction and maintenance activities to lessen potential impacts.
- Educate visitors, the public, construction, maintenance, and operations personnel, as well as contractors, and tenant organizations, on the importance of cultural resources, the need to stay within defined work zones, and the legal implications of vandalism and artifact looting.
- Train construction, maintenance, operations, contractor, and tenant personnel to recognize when archaeological resources or human remains have been discovered or when inadvertent damage has occurred to a resource, to halt ground disturbing activities in the discovery's vicinity, and to notify appropriate personnel.

- Conduct archival documentation of affected historic properties to HABS/Historic American Engineering Record (HAER) standards.
- Monitor resources during construction to ensure construction goes as planned and no unforeseen impacts occur.
- Monitor by a qualified archaeologist of ground-disturbing activities during construction.
- Conduct data recovery excavations of affected archaeological sites.

Note that inadvertent discoveries or unanticipated effects may be found on historic or cultural resources, may be found, prior to or during project implementation, after environmental review is complete. This may occur during ground disturbing activities, such as construction of replacement ATCTs or demolition of existing ATCTs. If cultural resources are uncovered during project implementation, immediately stop construction activities in the area of the resource (FAA, 2020c). Follow the instructions of any relevant agreement documents. If no agreements are in place, the FAA must notify the appropriate SHPO/THPO, the ACHP, Tribes, and other relevant organizations within 48 hours of the discovery; the notification should describe FAA's assessment of the resource's NRHP eligibility and propose actions to resolve adverse effects. These parties should respond within 48 hours after being notified. The FAA should consider their recommendations, carry out appropriate actions, then provide a report of those actions after they are completed (36 CFR Part 800.13).

4.9 LAND USE

The compatibility of existing and planned land uses is usually associated with noise impacts, as described in Section 4.11, Noise. FAA actions may also affect land use compatibility (e.g., disruption of communities, relocation, induced socioeconomic impacts, land uses protected under Section 4(f) (see Section 4.5, Department of Transportation Act, Section 4(f)). Land use is important when planning airport actions and should consider the existing use of the lands that could be affected by airport operations and projects, and future uses of adjacent lands, including the impacts of noise. Ownership of the land in addition to local, county, state, tribal, or federal laws and zoning regulations provide direction for how the land may be used or developed.

4.9.1 Regulatory Setting

In addition to applicable federal laws and Acts regulating land use, state regulations related to land use (e.g., state-listed requirements or restrictions) would be addressed during site-specific analysis of the funded projects, where necessary.

There are no federal geology and soils regulations.

4.9.2 Affected Environment

4.9.2.1 Land Use

Land use, ownership, and jurisdiction over the land varies by location. Each airport would consult local, county, state, tribal, federal, and other entities with jurisdictional authority to

determine surrounding land use, zoning, plans or planning documents to ensure projects conform to current, planned, and future land uses. Figure 4-15 displays the land use in the U.S. and includes vegetation types in natural areas, cultivated areas and farmland, and developed lands. Figure 4-16 displays land management status in the U.S. with different federal, state, local, tribal, nonprofit, and other entities that may own, manage, or charge fees for use of the land. Site-specific NEPA analysis would consider land use and the effects of noise for each project area.

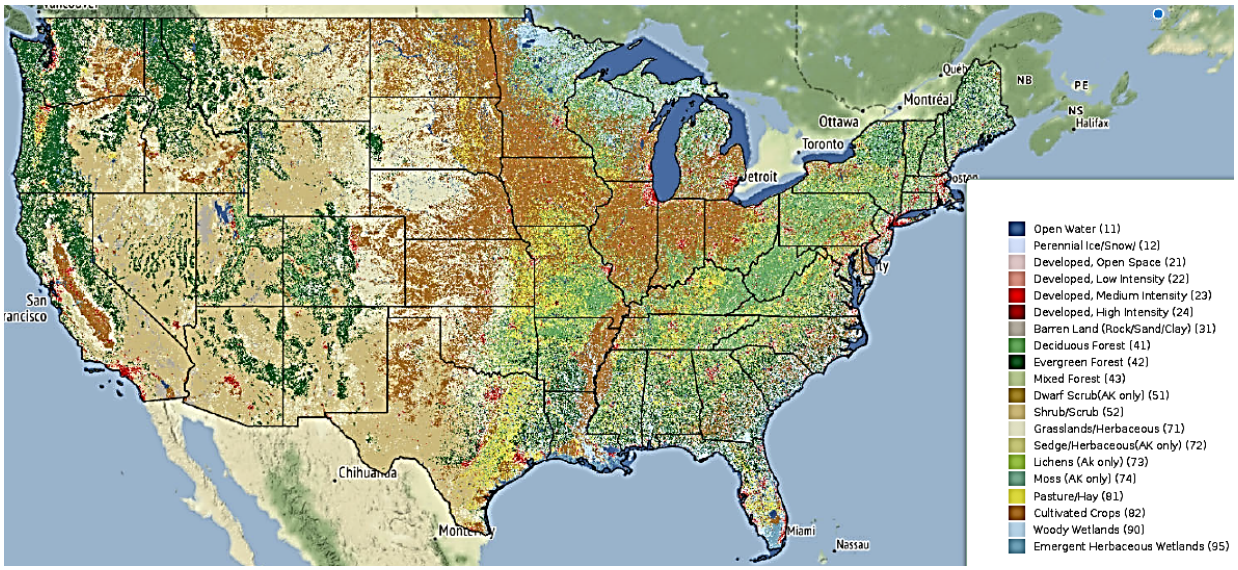

Figure 4-14 Land Use in the U.S.

Source: (Multi-Resolution Land Characteristics Consortium, 2019)

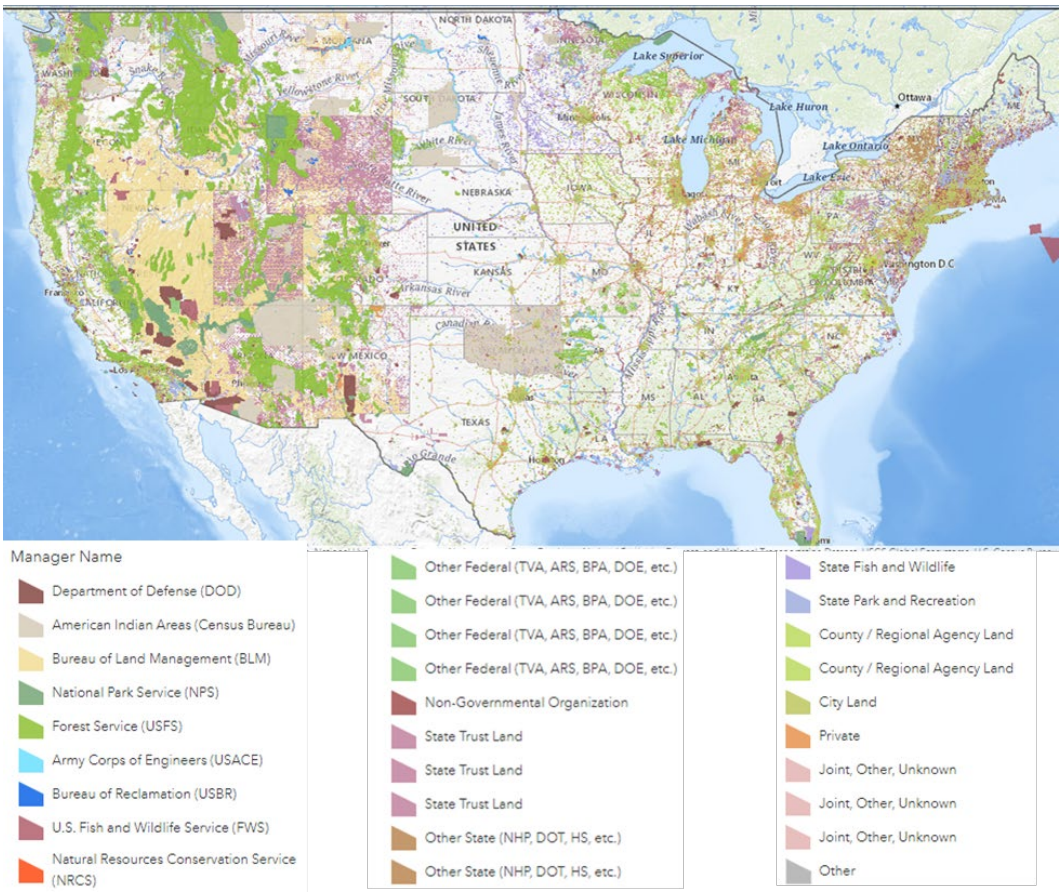

Figure 4-15 Land Management in the U.S.

Source: (USGS, 2022a)

4.9.2.2 Geology and Soils

The FAA Order 1050.1F Desk Reference does not identify the characterization of geology and soils within a NEPA document. Given the nature of the Proposed Action, this PEA provides a general overview of geology and soils as a sub-component of land use. Geology refers to the study of Earth's physical formation in how rocks and minerals form and change over time (NPS, n.d.). Soil is outermost layer of the Earth that has been generated over long periods of time and interacts with the atmosphere to act as a medium to support plant and animal life (USGS, 2020).

Descriptions of regional geology and soil vary and are often described by what minerals and particle sizes are present. Geology within the contiguous U.S. is classified using eight physiographic regions. These physiographic regions are divided and grouped based on attributes like terrain texture, rock type, geologic structure, and geologic history (USDA NRCS, 2016). These broad regions are further subdivided into provinces to provide more specific detail. The eight major physiographic regions in the U.S. are shown in Figure 4-17.

Figure 4-16. Major Physiographic Regions of the U.S.

Source: (USDA NRCS, 2016)

An important consideration on a geologic scale is the presence of fossils and other remains relevant to paleontology. Paleontology is the study of fossils existing within geological context. Fossils are either remnants of living things (like bones or leaves) or inferences of living organisms (like footprints or changes to soil form). Fossils are preserved as sediment is deposited on top of these features and converted into rock formations as pressure builds over time. It is important to consider areas of paleontological significance because these resources are unique and cannot be recovered once destroyed (NPS, 2023a). Care should be taken when excavating in an area that is known for its paleontological significance.

Soils are formed from geologic material and minerals that break down and combine with organic matter and living organisms on the surface of the earth (NOAA, n.d.). Different soil classifications exist for varying purposes, but the general soil type is determined by the mix of different sized particles found in the soil. The soil size particles include sand (the largest), silt, and clay (the smallest). The percentage of these categories in each soil determines how it is classified. Sandy soils are made up of larger particles that allow water to flow through easily whereas clay soils are made up of small particles that are tightly packed and slow water penetration (NOAA, n.d.). The USDA has defined twelve soil orders that take into consideration mineral presence, climate, vegetation, and types of weathering that formed the soil (USDA, n.d.). Figure 4-18 displays the scale and variation in soil orders within the U.S.

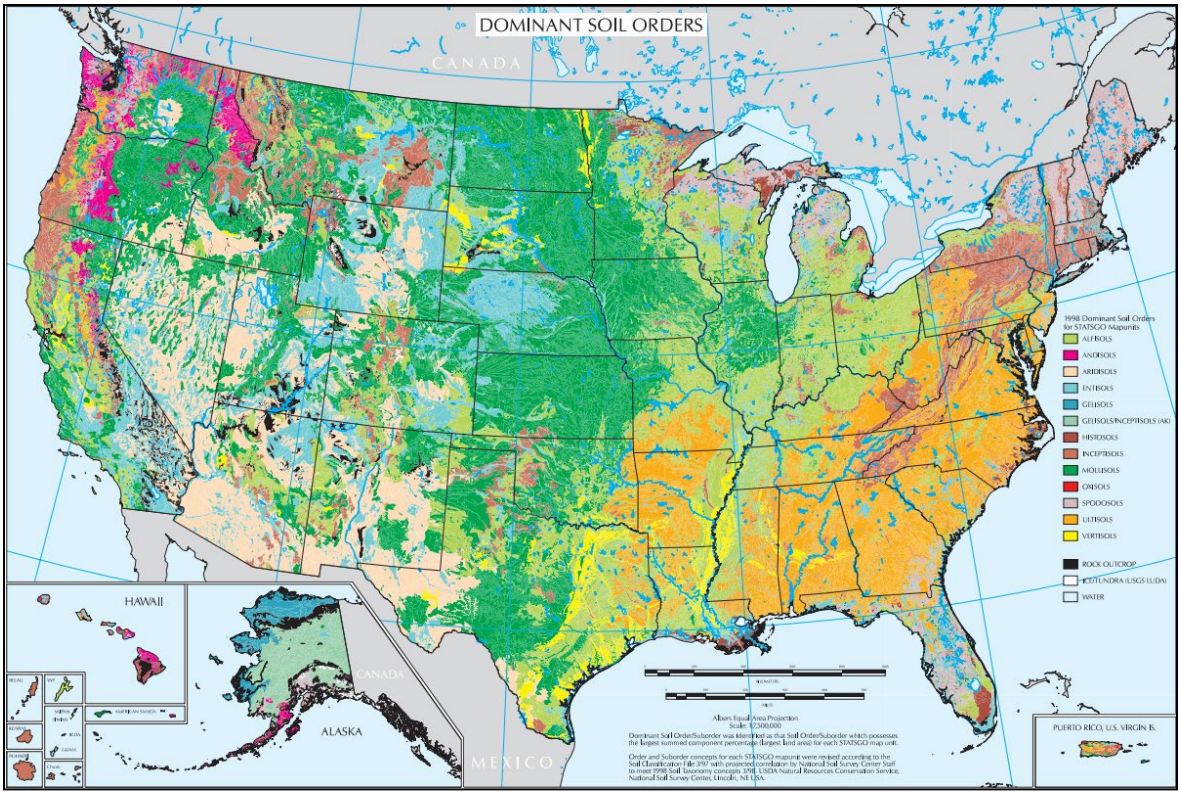

Figure 4-17. Dominant Soil Orders in the U.S. (1998)

Source: (USDA, n.d.)

4.9.3 Environmental Consequences

The FAA has not established a significance threshold for land use, nor has the FAA provided specific factors to consider in making a significance determination for land use. The determination that significant impacts exist in the land use impact category is normally dependent on the significance of other impact categories, such as land use impacts in relation to aircraft noise (FAA, 2015).

- No Impact: Impacts to land use would not occur as a result of the Proposed Action.

4.9.3.1 No Action Alternative

Under the No Action Alternative, the current ATCTs would not be replaced and removed, and activities with the ATCTs would remain the same. The No Action Alternative would not change existing land use conditions or effects to the surrounding land use. The No Action Alternative would not result in any change to the current ATCTs or involve soil-disturbing construction activities associated with construction of a new ATCT. There would be no changes to existing soil and geological conditions as a result of the No Action Alternative. No impacts to land use or geology and soils would be expected from the No Action Alternative.

4.9.3.2 Alternative 2 (Preferred Alternative)

New ATCTs would be constructed within the existing airport boundaries, most often adjacent to or within proximity of the existing tower. The new ATCT would be compatible

with existing use of the surrounding lands, having no new impacts to land use in most cases. These temporary conditions could impact local land use depending on airport surroundings. Alternative 2 (Preferred Alternative) would not increase air or ground traffic operations after the completion of construction. There would not likely be any long-term effects on land use. Site-specific analyses of land use implications should be conducted as conditions vary at each site.

Constructing new towers and demolishing existing ATCTs under Alternative 2 would involve ground-disturbing activities that could affect existing soil conditions. Construction of a new ATCT would involve activities such as soil excavation, clearing vegetation, grading land, and increasing impervious surface area. These activities could lead to soil loss and erosion, a change in direction and speed of runoff, and a change to soil permeation rates as soil is compacted. Potential impacts would be site-dependent as removals of the organic (top) layer of soils can increase the erosion rate as this layer has a large water-holding capacity, particularly if it is a clay soil. Soil grading and increasing impervious surfaces would change local topography and could impact existing soil conditions. Excavation in an undisturbed or developed area could destroy paleontologically significant sites if present (see Section 4.9, Historical, Architectural, Archaeological, and Cultural Resources, for additional information).

Demolishing the ATCTs would involve excavating existing structures, operating heavy machinery, and increased site traffic. These activities could increase soil loss through erosion and runoff, and soil compaction surrounding the site. Compact soil has a lower capacity for water drainage and permeation that could lead to flooding and a change in runoff speed and direction.

Where ATCTs are constructed on previously disturbed land, the impacts to soil and geology would likely be negligible. Site-specific analyses of geology and soil impacts would be conducted as conditions vary at each site.

4.9.4 Mitigation

Mitigation measures that apply to land use may be considered under other resources in this chapter. Land use specific measures to mitigate impacts include the following:

- Work with affected business and/or landowners to appropriately redress construction/operation-related damage to landowner's property (including access restrictions).
- Change site design to avoid land use concerns.
- Phase the project to be consistent with planned development in the area.
- Relocate development away from non-compatible land uses (e.g., landfills, wildlife refuges, wetland mitigation).

Mitigation measures to reduce or prevent impacts to soil resources could include the following:

- Apply construction controls to minimize erosion and sedimentation. Limit ground disturbance to the areas necessary for project-related construction.
- Conduct surveys for sensitive soils and paleontological resources, where appropriate.

4.10 NATURAL RESOURCES AND ENERGY SUPPLY

Natural resources often refer to finite forms of energy generating materials (coal, natural gas, oil, etc.) that are federally regulated for efficiency and conservation. Natural resources can also refer to water, wood, aggregate, and asphalt. Consumption and impact on natural resources would be evaluated and monitored prior to and during the Proposed Action.

Public services and utilities are the essential systems that support daily operations in a community and cover a broad array of public services, such as electricity, water, wastewater, and solid waste. Utility lines often cross or run along stream corridors, either overhead or underground. Public services and utilities include fire protection, law enforcement, Emergency Medical Services, schools, water, wastewater, sanitation, solid waste disposal, stormwater drainage, electric utilities, natural gas, and telephone/telecommunications.

It is the policy of the FAA to encourage the development of facilities that exemplify the highest standards of design, including principles of sustainability. All elements of the transportation system should be designed with a view to their aesthetic impact, conservation of resources such as energy, pollution prevention, harmonization with the community and environment, and sensitivity to the concerns of the traveling public (USFWS, 2007). Many states have individual departments of natural resources; consideration of state level requirements would take place during site-specific research.

As described in Section 2, an important goal of the BIL ATCT Replacement Program is to provide for modern, operationally efficient ATCTs that would meet all applicable FAA requirements. The proposed replacement ATCTs would lower operating costs and improve environmental performance, resulting in energy savings, water efficiency, reduced carbon emissions, and improved indoor air quality.

4.10.1 Regulatory Setting

Energy Independence and Security Act (42 U.S.C. § 17001 et seq.) requires federal agencies to take actions to move the U.S. toward greater energy independence and security, to increase the production of clean renewable fuels, to protect consumers, to increase the efficiency of products, buildings, and vehicles, to promote research on and deploy GHG capture and storage options, and to improve the energy performance of the federal government.

EO 13834, Efficient Federal Operations (83 Federal Register 23771), requires federal agencies to meet energy and environmental performance statutory requirements in a

manner that increases efficiency, optimizes performance, eliminates unnecessary use of resources, and protects the environment. Agencies are tasked to prioritize actions that reduce waste, cut costs, and enhance the resilience of federal infrastructure and operations.

4.10.2 Affected Environment

Sections 1502.16(e) and (f) of the CEQ Regulations require that federal agencies consider energy requirements, natural depletable resource requirements, and the conservation potential of alternatives and mitigation measures.

An impact on natural resources should be evaluated prior to construction activities. Site-specific assessment and consultation would take place in such cases to address the capacities of local public utilities and suppliers to provide energy and natural resources for the Proposed Action. If major changes in natural resources or energy supply consumption are necessary, then the following organizations should be consulted to determine if projected demands can be met by existing or planned source facilities:

- State, tribal, and local agencies responsible for enforcing local rules, ordinances, and guidelines who may be able to provide insight on recommended sustainability measures.
- Local utility companies who may have useful information on the available and planned electrical, natural gas, water, and sewage capabilities of the area.
- Local suppliers of consumable construction materials who may be a useful source of information if there are unusual construction circumstances.

Site-specific information would be gathered about energy resources found in the area (e.g., power plants, water utilities, sewage disposal, natural gas, and petroleum suppliers) and usage of other resources (e.g., water, asphalt, aggregate, and wood) upon funding of individual sites.

4.10.3 Environmental Consequences

As noted in the FAA Order 1050.1F Desk Reference, the FAA has not established a significance threshold for natural resources and energy supply.

- No Impact: Impacts to natural resources and energy supply would not occur as a result of the Proposed Action.

The factor to consider is if "the action would have the potential to cause demand to exceed available or future supplies of these resources" (FAA, 2020c).

4.10.3.1 No Action Alternative

Under the No Action Alternative, the current ATCTs would not be replaced and removed, and energy consumption would remain the same. Outdated materials and design of the existing ATCTs would not be able to realize energy efficiency and conservation goals of the ATCTs proposed by Alternative 2.

4.10.3.2 Alternative 2 (Preferred Alternative)

The proposed design of new ATCTs consist of consumable materials that may be locally sourced. Availability from local suppliers would be consulted on a case-by-case basis. In the unlikely event that the materials are scarce or unusual, the FAA would identify appropriate alternatives for sourcing the materials. During construction activities, energy and fuel consumption could temporarily increase. To ensure local capacity to sustain this increase, energy managers would be consulted for each eligible site to review demand and usage for the duration of construction activities.

In addition to generated energy, fuel would be used to transport the necessary construction materials and to run the heavy equipment (construction vehicles). Beyond this standard use, it is not expected that a major increase of fuel would be consumed. If the fuel sourcing is a concern, this would be addressed on a site-specific basis. Demolition and removal of old ATCTs would require machinery and equipment for the short-term, powered by fossil fuels and electricity. Components of old ATCTs would be repurposed or recycled whenever possible, reducing waste of resources.

Under Alternative 2, the proposed ATCTs are designed to be thermally efficient and use less energy than existing ATCTs. With completion of Alternative 2 (Preferred Alternative), it is likely that over the long term, beneficial impacts would result as the new ATCT would consume less energy and natural resources in accordance with the FAA's energy goals to continue to reduce energy and potable water use intensity.

4.10.4 Mitigation

The sustainable design of the ATCT considers several measures to prevent or reduce impacts to natural resources and energy supply, which include the following:

- Incorporate energy efficient design features when planning new construction, such as all-electric building systems and thermally efficient facades.
- Ensure that vehicle trips are combined or reduced.
- Use repurposed materials or high-recycled steel and metal products.
- Use of energy efficient equipment.
- Use of materials and products free from chemicals known to pose health risks.
- Use of renewable mass timber when usable.
- When feasible, incorporate ground-source heating and cooling.

4.11 NOISE

Sound is a physical phenomenon consisting of pressure fluctuations that travel through a medium, such as air, and are sensed by the human ear. Noise is considered unwanted sound that can disturb routine activities (e.g., sleep, conversation, student learning) and can cause annoyance (FAA, 2020c).

Noise can come from several sources and at varying frequencies and may be continuous or intermittent, persistent, or occasional. Noise and sound share the same physical aspects; however, noise is generally considered a disturbance, whereas sound is defined as a particular auditory effect produced by a given source (e.g., motor running). Sound is interpreted, as either pleasant (e.g., bird song) or unpleasant (e.g., jackhammer), depending on the listener's current activity, past experience, and attitude toward the source.

4.11.1 Regulatory Setting

The Aviation Safety and Noise Abatement Act (49 U.S.C. § 47501 et seq.) directs the FAA to establish, by regulation, a single system for measuring noise and determining the exposure of people to noise; which includes noise intensity, duration, frequency, and time of occurrence; and to identify land uses normally compatible with various noise exposures (14 CFR Part 150).

There may be state and local noise laws and ordinances that apply to the proposed ATCT projects. This would be determined on a site-specific basis by contacting relevant state and local regulatory agencies in the initial stages of any project-specific planning.

4.11.2 Affected Environment

In a typical day, most people are exposed to sound levels of 50 to 55 A-weighted decibels (dBA) or higher. Typical outdoor noise levels in residential areas vary depending on the density and location of housing and may range from 40 dBA at night up to 60 to 75 dBA when a car or motorcycle passes or an aircraft flies overhead, as shown in Figure 4-19.

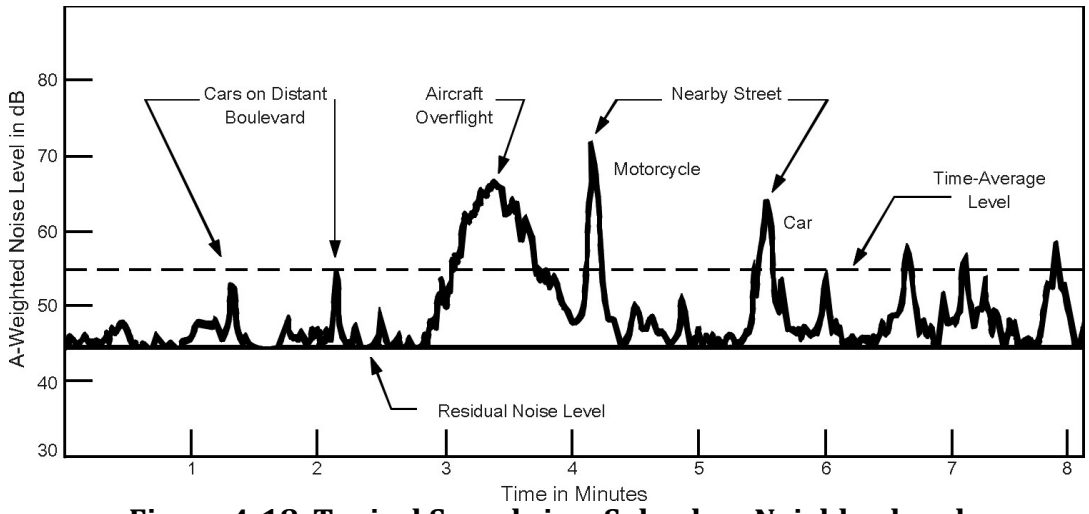

Figure 4-18. Typical Sounds in a Suburban Neighborhood

Source: (Sacramento County Department of Airports, 2023)

Typical outdoor noise levels at the proposed BIL replacement ATCTs would occur at general aviation or small municipal airports may vary depending on factors such as flight activity, nearby roads, and industrial activity. Noise levels at these airports may also consist of other activities such as construction, demolition, and heavy vehicle traffic. Figure 4-20 illustrates how ambient noise levels can vary across the country.

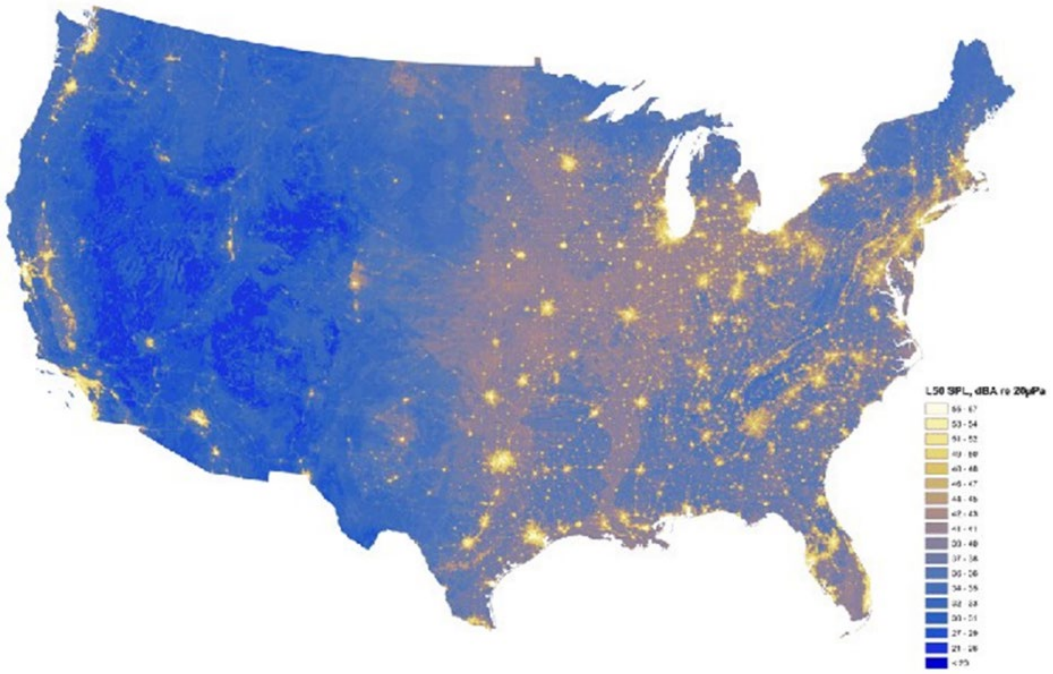

Figure 4-19. Mapping Sound - Natural Sounds

Source: (NPS, 2023b)

As with all facets of noise, current conditions depend on activities present at each airport location. Given the nationwide scope of the Proposed Action, it is not possible to describe in detail the entire affected environment for noise at each individual airport.

4.11.3 Environmental Consequences

For some noise analyses, it is necessary to include noise sources other than aircraft departures and arrivals. Here, the relevant noise impact analysis is construction noise. FAA Order 1050.1F includes significant thresholds for noise related to aircraft operations at an airport; however, the FAA does not have a threshold of significance for construction noise (FAA, 2020c). If appropriate, surface transportation impacts, including construction noise, should be analyzed using accepted methodologies from the appropriate modal administration, such as the Federal Highway Administration for highway noise.

- No Impact: Impacts of noise would not occur as a result of the Proposed Action.

In general, special attention should be given to noise sensitive areas when developing mitigation. In addition, FAA 1050.1F notes that special consideration needs to be given to the evaluation of the significance of noise impacts on noise sensitive areas within Section 4(f) properties (including, but not limited to, noise sensitive areas within national parks, national wildlife and waterfowl refuges, and historic sites, such as TCPs) where the land use compatibility guidelines in 14 CFR part 150 are not relevant to the value, significance, and enjoyment of the area in question.

4.11.3.1 No Action Alternative

Under the No Action Alternative, the current ATCTs would not be replaced and removed, and activities with the ATCTs would remain the same. Noise levels would remain the same as current conditions. The No Action Alternative would not change existing noise conditions or impact surrounding areas. The No Action Alternative would not require any construction or demolition activities. No impacts of noise are anticipated from the No Action Alternative.

4.11.3.2 Alternative 2 (Preferred Alternative)

During construction activities, noise resulting from construction vehicles using roadways and the operation of backup generators for providing emergency power could be sources of additional noise. Noise levels would exceed natural (ambient) sounds but would not exceed typical noise levels produced by heavy equipment (construction vehicles) and generally during working hours. Noise generated by construction and operation of the ATCT would be temporary or short-term in nature. Once the new ATCT is constructed, it is expected that noise at the airport would return to levels equivalent to those prior to demolition and construction. No impacts of construction or demolition noise activities are anticipated.

The replacement of existing ATCTs would not change the operations (number of departures or arrivals), fleet mix, flight paths, or landing or takeoff procedures at the airport. Noise levels due to aircraft operations would have no significant impact. Site-specific noise issues would be addressed in detail and as necessary in project specific NEPA documentation.

4.11.4 Mitigation

Measures to mitigate impacts from noise include the following construction related actions:

- Construct noise barriers or acoustic shielding to mitigate ground-level noise.
- Use of proper mufflers for construction equipment.
- Limit construction activities to daytime hours.
- Apply measures to limit noise from machinery or trucks as they traverse streets in noise sensitive areas.

4.12 SOCIOECONOMICS, ENVIRONMENTAL JUSTICE, AND CHILDREN'S ENVIRONMENTAL HEALTH AND SAFETY RISKS

The socioeconomics of a project encompass economic or social aspects, or a combination of both. Elements such as employment, housing, population, and public services are socioeconomic attributes considered in a NEPA document. Environmental justice focuses on "the fair treatment of populations and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (U.S. EPA, 2023)." EO 13045, Children's Environmental Health and Safety Risks, prioritizes four areas due to the vulnerability of young people to these conditions—asthma, cancer, unintentional injuries, and developmental disorders (e.g., lead poisoning) when compared to adults (FAA, 2020c).

4.12.1 Regulatory Setting

The Uniform Relocation Assistance and Real Property Acquisitions Policy Act of 1970 (42 U.S.C. § 61 et seq) contains provisions that must be followed if acquisition of real property or displacement of people would occur as a result of implementing the selected alternative (49 CFR Part 24).

Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C. §§ 2000d-2000d-7), states that "No person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance." Title VI explicitly prohibits any discrimination in federally funded programs and projects, including those sponsored by the FAA (28 CFR § 42.401).

EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (59 Federal Register 7629), requires federal agencies to incorporate environmental justice into their programs, policies, and activities.

EO 14096, Revitalizing Our Nation's Commitment to Environmental Justice for All (88 Federal Register 25251), builds upon and strengthens EO 12898 by requiring federal agencies to create their own environmental justice plans, conducting research on issues related to environmental justice, and the establishment of a new Environmental Justice Interagency Council and White House Office of Environmental Justice.

The CEQ's *Environmental Justice: Guidance Under the National Environmental Policy Act* outlines how environmental justice could be considered in NEPA documents. This guidance provides widely used definitions of minority, low-income, and other environmental justice concepts (CEQ, 1997).

The *Memorandum of Understanding on Environmental Justice and Executive Order 12898* identified that participating federal agencies (which includes the FAA) agreed to declare the continued importance of identifying and addressing environmental justice considerations in their programs, policies, and activities (White House, 1998).

The DOT's Environmental Justice Strategy describes the framework for comprehensively incorporating environmental justice into all of DOT's programs, policies, and activities (DOT, 2023). In addition, DOT Order 5610.2(a), Environmental Justice in Minority and Low-Income Populations (77 Federal Register 27534), establishes principles for integrating environmental justice into current policies and practices.

The USEPA's Interagency Working Group on Environmental Justice and NEPA Committee published *Promising Practices for EJ Methodologies in NEPA Reviews*, a compilation of methodologies obtained from current federal agency practices concerning the interface of environmental justice considerations through NEPA (U.S. EPA, 2022h).

EO 13045, Protection of Children from Environmental Health Risks and Safety Risks (62 Federal Register 19885), directs federal agencies to analyze their policies, programs,

activities, and standards for any environmental health or safety risks that may disproportionately affect children. Included in these categories are risks to health or safety that are attributable to products or substances that a child is likely to encounter or ingest, such as air, food, water, recreational waters, soil, or products they might use or be exposed to.

4.12.2 Affected Environment

Each airport considered under this PEA has unique aspects of socioeconomics, environmental justice, and children's environmental health and safety risks due to the location of the airport and the existing conditions surrounding the location. Socioeconomics, environmental justice, and children's environmental health and safety risks are critical elements for consideration under NEPA. It is not possible to describe these resources in detail for a nationwide document; however, the figures below depict a sample of nationwide information regarding the U.S. population, income, poverty, and persons under five (5) years of age.

Figure 4-21 and Figure 4-22 provide basic elements of socioeconomics. Figure 4-21 displays a map of population estimates in 2022 with a total of 333,287,557 people in the U.S. (including Alaska, Hawaii, and U.S. territories) (U.S. Census Bureau, 2022a). The median household income in 2021 was $69,021 for all states; Figure 4-22 displays the percentages of minority populations (U.S. Census Bureau, 2022b). Figure 4-23 displays the range of income for the 50 U.S. states (U.S. Census Bureau, 2022c). Figure 4-24represents an aspect of environmental justice with the percentage of poverty by state, averaging 11.6% for U.S. states and territories (U.S. Census Bureau, 2022d). The number of children under five (5) years of age averages about 5.7% across the U.S.; Figure 4-25 depicts this vulnerable section of the population considered under children's environmental health and safety risks (U.S. Census Bureau, 2022e). Data from these maps would be considered and analyzed in future site-specific NEPA documents. Another aspect of socioeconomics that would be considered when determining where a new ATCT should be located if the site is in a HUB Zone. HUB Zones are determined using U.S. Census data for economics and population and offer support to small businesses located within these zones (U.S. Small Business Administration, n.d.).

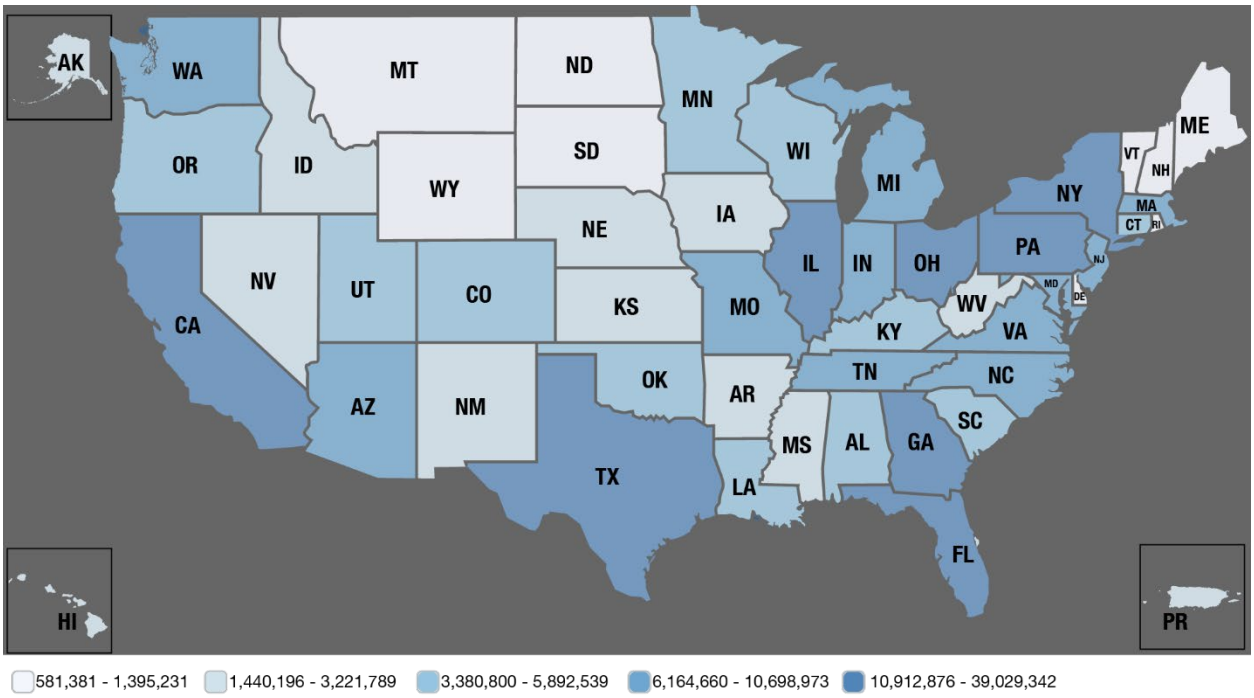

Figure 4-20. Population Estimates for July 2022 by State

Source: (U.S. Census Bureau, 2022a)

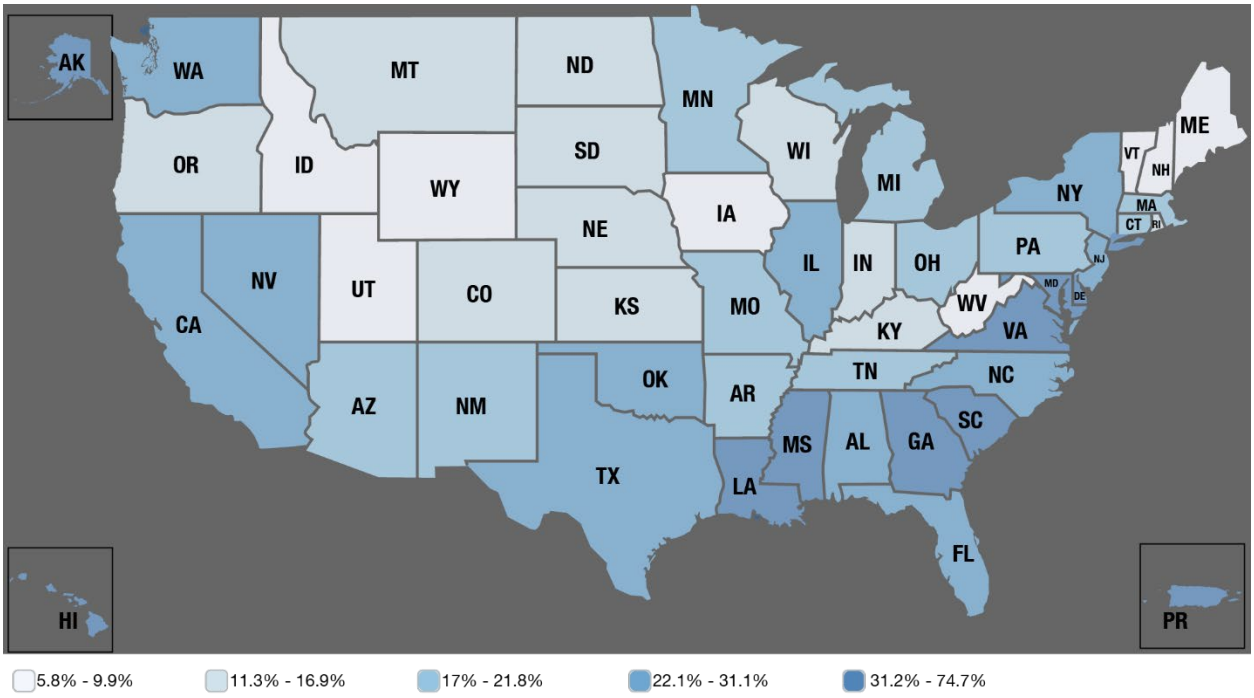

Figure 4-21. Percentage of Minority Populations by State

Source: (U.S. Census Bureau, 2022b)

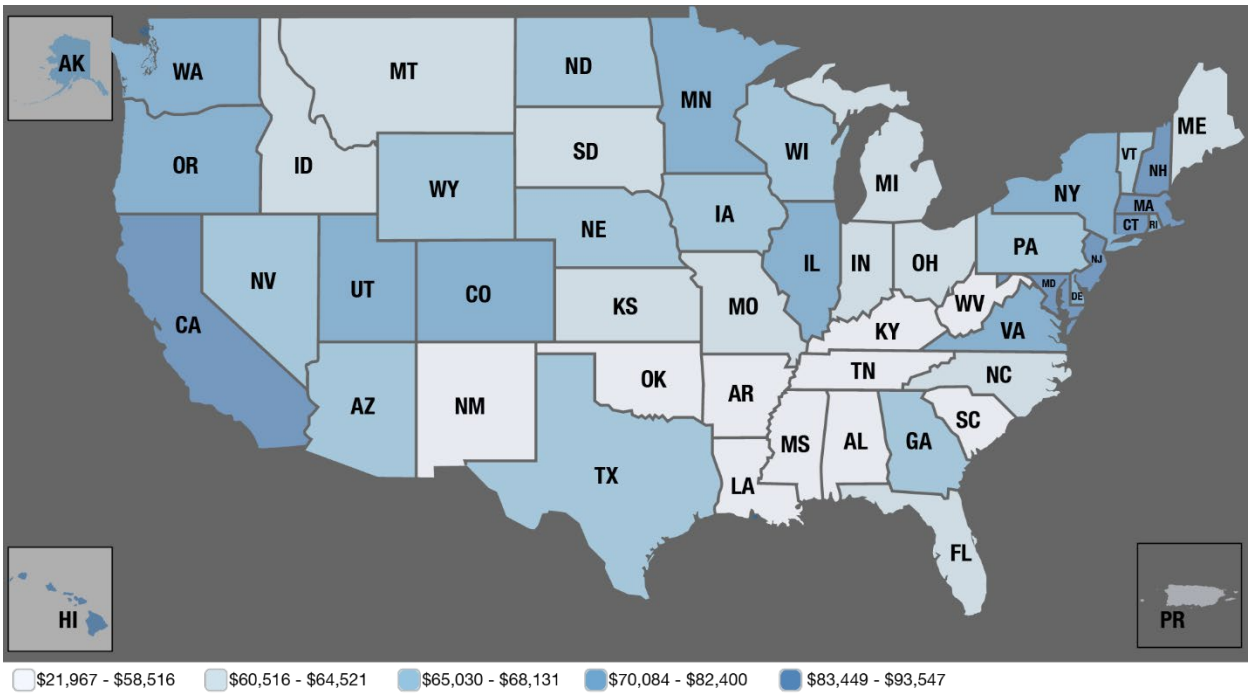

Figure 4-22. Median Household Income by State (in 2021 Dollars)

Source: (U.S. Census Bureau, 2022c)

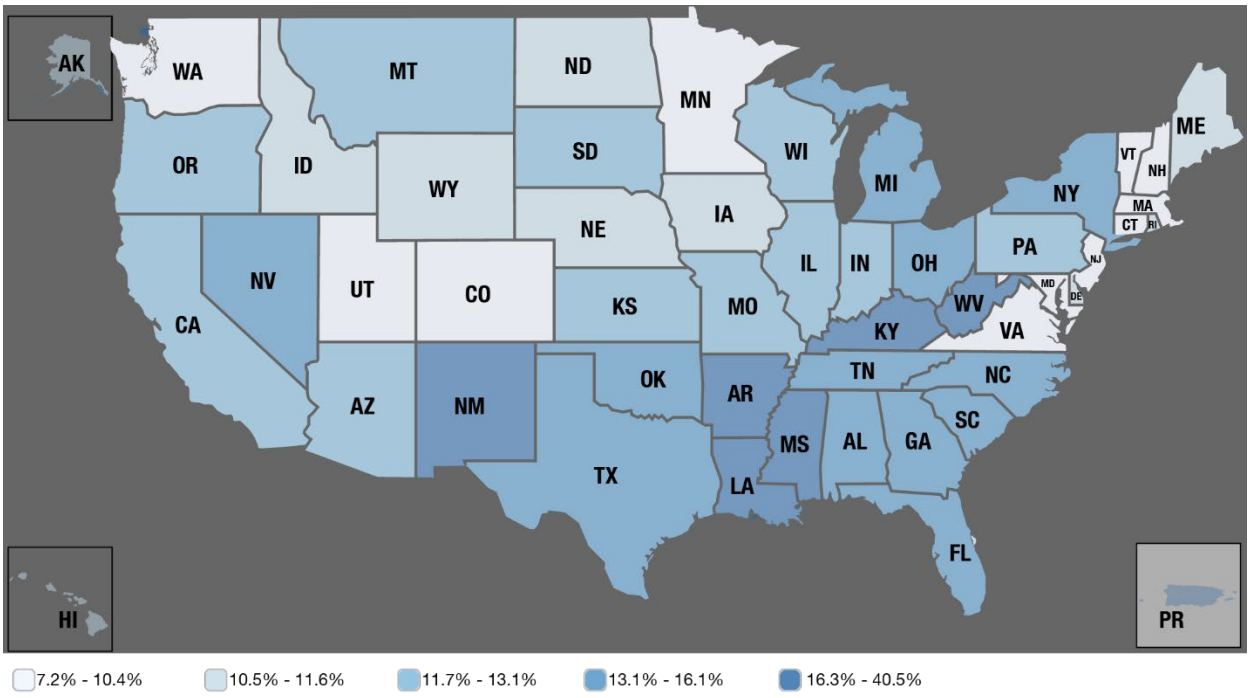

Figure 4-23. Percentage of Poverty by State

Source: (U.S. Census Bureau, 2022d)

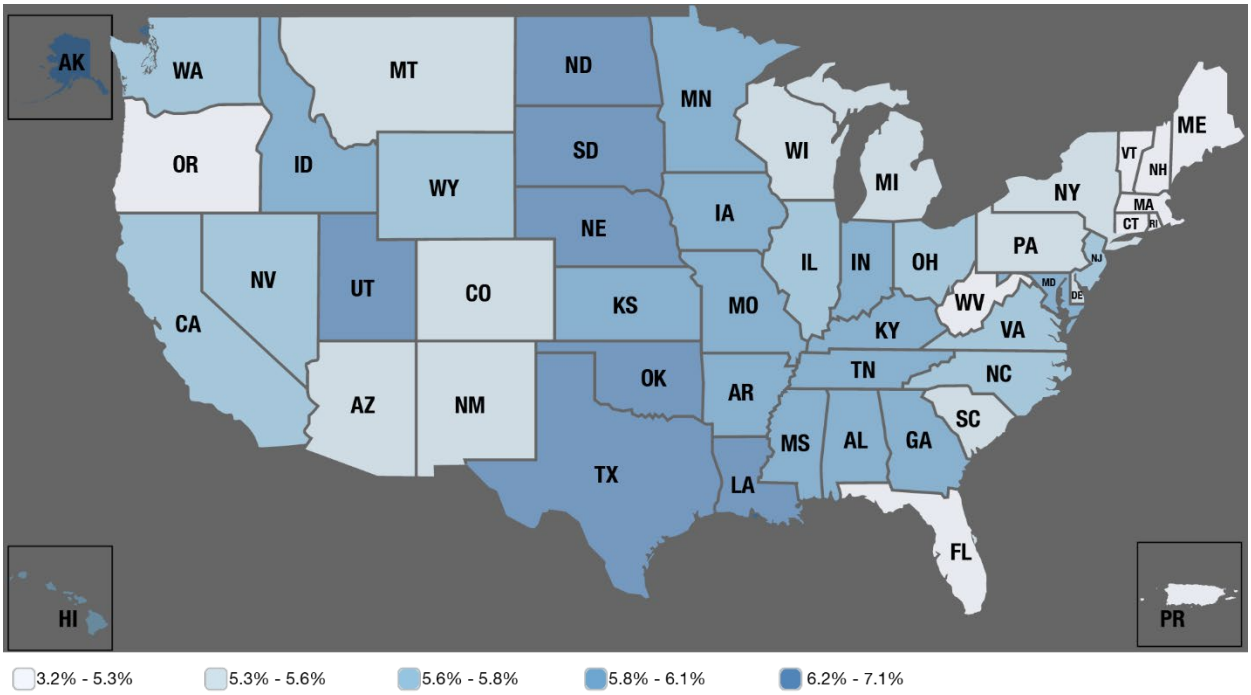

Figure 4-24. Percentage of the Population Age 5 Years or Younger by State

Source: (U.S. Census Bureau, 2022e)

4.12.3 Environmental Consequences

Effects to socioeconomics, environmental justice, and children's environmental health and safety risks would vary due to the location of the airport and the existing conditions surrounding the location. Site-specific analysis would identify if any significant effects could occur.

The FAA has not established significance thresholds for socioeconomics, environmental justice, and children's environmental health and safety; however, the FAA has identified factors to consider when evaluating the context and intensity of potential environmental impacts for socioeconomics. environmental justice, and children's environmental health and safety (see Exhibit 4-1 of FAA Order 1050.1F). The determination that significant impacts exist in the socioeconomic impact category is normally dependent on whether the potential socioeconomic impact(s) are interrelated with or inseparable from a physical or natural environmental effect. Note these factors are not intended to be thresholds. If these factors exist, there is not necessarily a significant impact; rather, the FAA must evaluate these factors considering context and intensity to determine if there are significant impacts (FAA, 2020c). The FAA has also identified factors to consider when evaluating the context and intensity of potential environmental impacts for environmental justice and for children's environmental health and safety. (FAA, 2015)

- No Impact: Impacts to socioeconomics, environmental justice, and children's environmental health and safety would not occur as a result of the Proposed Action.

Factors to consider that may be applicable to socioeconomic resources, if they are interrelated with natural or physical environmental impacts (see 40 CFR § 1508.14), include, but are not limited to, situations in which the action would have the potential to:

- Induce substantial economic growth in an area, either directly or indirectly (e.g., through establishing projects in an undeveloped area).
- Disrupt or divide the physical arrangement of an established community.
- Cause extensive relocation when sufficient replacement housing is unavailable.
- Cause extensive relocation of community businesses that would cause severe economic hardship for affected communities.
- Disrupt local traffic patterns and substantially reduce the levels of service of roads serving an airport and its surrounding communities.
- Produce a substantial change in the community tax base.

The factors to consider that may be applicable to environmental justice include, but are not limited, to a situation in which the Proposed Action or alternative(s) would have the potential to lead to a disproportionately high and adverse impact to an environmental justice population (i.e., 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 environmental justice population in a way that the FAA determines is unique to the environmental justice population and significant to that population.

The factor to consider that may be applicable to children's environmental health and safety includes, but is not limited to, situations in which the Proposed Action or alternative(s) would have the potential to lead to a disproportionate health or safety risk to children.

4.12.3.1 No Action Alternative

Under the No Action Alternative, the current ATCTs would not be replaced and removed, and activities would remain the same. No changes would occur to the existing socioeconomic, environmental justice, and children's environmental health and safety risk conditions. No impacts to socioeconomics, environmental justice, or children's environmental health and safety risks are anticipated from the No Action Alternative.

4.12.3.2 Alternative 2 (Preferred Alternative)

Under Alternative 2 (Preferred Alternative), a slight increase in local employment could occur during construction, decommissioning, and demolition activities; however, the workforce could be from existing businesses with current employees, making a minimal impact on local employment levels. Expenditures to local economies and businesses could have a slight increase during the implementation of ATCT projects with purchases of materials, fuels, and equipment from the local area. Part of the site selection process considered airports that are located within HUB Zones, which can lead to economic increases in businesses in the surrounding community. Each project location would likely have minor,

short-term increases in employment and local expenditures until the projects are complete. No permanent jobs are expected to result from Alternative 2 (Preferred Alternative).

Temporary, minor increases of construction vehicle noise and traffic may occur during daytime hours but would be less than significant due to the projects being located on active airports. Following the existing ATCT decommissioning and demolition, and construction of a new ATCT, operation and staffing of the tower would be the same or similar to previous conditions. Alternative 2 (Preferred Alternative) is not anticipated to cause the relocation of residences, businesses, or schools. No long-term effects to socioeconomics, environmental justice, and children's environmental health and safety risks are anticipated.

4.12.4 Mitigation

Mitigation measures could be applied, where appropriate, to further prevent or reduce impacts to socioeconomics, environmental justice, and children's environmental health and safety risks such as outreach to share ongoing information about the new ATCT and NEPA.

4.13 VISUAL EFFECTS

Visual effects are considered under two categories, light emissions, and visual resources/character. Light emissions from outdoor lighting in parking lots, streets, and within businesses or homes affect the darkness of the night sky, particularly in rural areas where fewer light sources are present. Light emissions also occur from reflective surfaces during the daytime when sunlight reflects off windows, metals, and other shiny surfaces. Visual resources are natural or human-made features such as traditional cultural properties, buildings, and the natural landscape. Visual character is the overall description of an area, such as rural, farmland, urban, coastal, or mountainous. (FAA, 2020c)

4.13.1 Regulatory Setting

There are no special purpose laws or requirements for visual effects. Some visual resources are protected under federal, state, or local regulations. Protected visual resources may include, but are not limited to:

- Federal, state, or local scenic roadways/byways
- Wild and scenic rivers
- National scenic areas
- Scenic easements
- Trails protected under the National Trails System Act or similar state or local regulations
- Biological resources
- Parks, recreation areas, and wildlife/waterfowl refuges
- Historic properties
- Features protected under other federal, state, or local regulations

Although there are no federal special purpose laws or requirements specific to light emissions and visual effects, there are special purpose laws and requirements that may be relevant. In addition to NEPA, laws protecting resources that may be affected by visual effects include Section 106 under the NHPA (see Section 4.9), Section 4(f) of the U.S. DOT Act (see Section 4.5), the Wild and Scenic Rivers Act (see Section 4.15), the Coastal Zone Management Act (see Section 4.4), and state and regional coastal protection acts. Visual resources are protected and managed on federal resource lands, such as U.S. Forest Service Resource Management Plans and the Bureau of Land Management Visual Resource Management System. In addition, there may be state and local regulations, policies, and zoning ordinances that apply to visual effects.

4.13.2 Affected Environment

4.13.2.1 Light Emissions

Light from electrical or reflective sources may be considered beautiful by some, but detrimental to others due to the light obscuring stars and other nighttime features. Light emissions are most noticeable from darker locations, especially when considering effects to night skies. The National Park Service (NPS) recognizes dark skies as a resource for the human and natural environment and notes that "a candle viewed a mile away is brighter than each of the stars in the Big Dipper constellation" (NPS, 2022b). Most light emissions occur from outdoor lighting and affect night sky visibility; however, nighttime lighting also affects nocturnal and crepuscular[16] wildlife species that take their cues from dawn, dusk, and the darkness of night in between. When an area is never fully dark or if bright lights shine out of place within sensitive areas, wildlife species may become disoriented or drawn toward the light and often into danger (NPS, 2018).

The addition of outdoor lighting in areas that already have heavy light emissions may make the area even more visible if the new lighting is not designed to focus downward instead of upward and horizontally (NPS, 2022b). Reflective surfaces may cause daytime glare as light emissions, disrupting vistas and affecting some wildlife species. Figure 4-25 displays nighttime light sources across the U.S.

[16] The USGS defines crepuscular as "…events relating to, resembling, or occurring during twilight, meaning morning and evening hours. An animal described as crepuscular is active during twilight." (USGS, 2015)

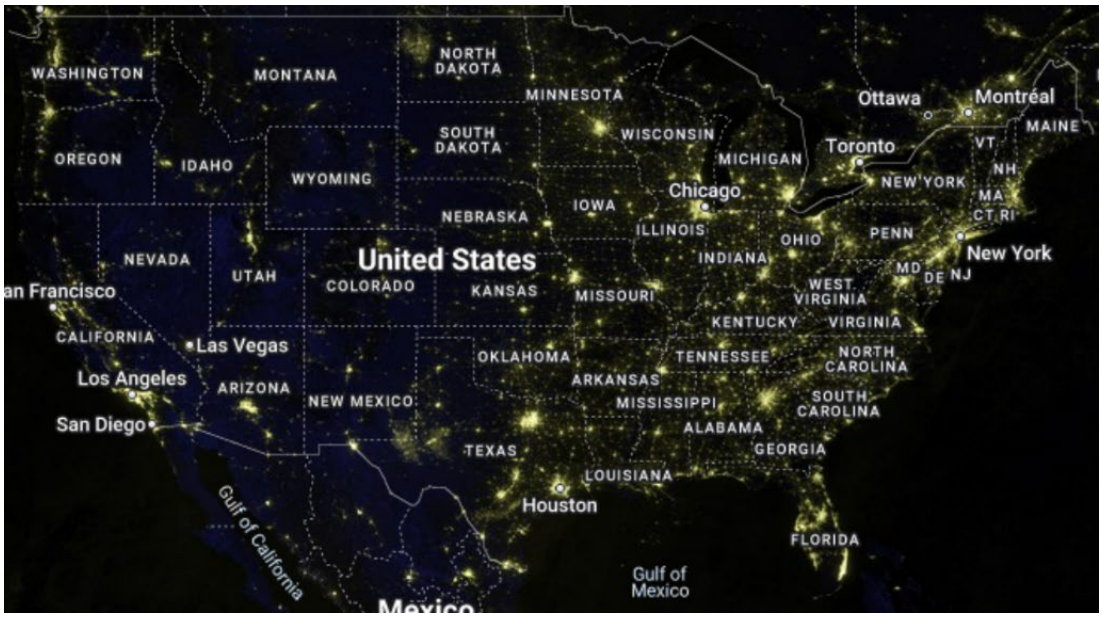

Figure 4-25. Map of the U.S. with Areas of Light Emissions

Source: (Earth Observation Group, 2022)

4.13.2.2 Visual Resources and Visual Character

Visual resources influence the human experience of a landscape. Various aspects—such as color, contrast, texture, line, and form—combine to create visual resources. Features (e.g., mountain ranges, city skylines, ocean views, unique geological formations, or rivers) and constructed landmarks (e.g., bridges, memorials, cultural resources, or statues) are considered visual character. While many aspects of visual resources and visual character are subjective, evaluating potential impacts on the character and continuity of the landscape is a factor when assessing a Proposed Action for NEPA and NHPA compliance. Considering visual resources and visual character across the nation is challenging and more applicable to site-specific planning. It is important to note that changes to an existing landscape by removing or adding an object, such as a building or natural feature, could be considered a change in visual resources and visual character.

4.13.3 Environmental Consequences

The FAA has not established a significance threshold for visual effects. The factors listed below may be considered when determining impacts from light emissions and to visual resources and visual character.

- No Impact: Impacts to visual effects would not occur as a result of the Proposed Action.

For light emissions, factors to consider include the extent the action has the potential to:

- Create annoyance or interfere with normal activities from light emissions; and
- Affect the visual character of the area due to the light emissions, including the importance, uniqueness, and aesthetic value of the affected visual resources.

For visual resources and visual character, factors to consider include the extent the action has the potential to:

- Affect the nature of the visual character of the area, including the importance, uniqueness, and aesthetic value of the affected visual resources.
- Contrast with the visual resources and/or visual character in the study area.
- Block or obstruct the views of visual resources, including whether these resources would still be viewable from other locations. (FAA, 2015).

4.13.3.1 No Action Alternative

Under the No Action Alternative, the current ATCTs would not be replaced and removed. Light emissions would remain the same, as would the visual character of the airport and surrounding area. No impacts to visual effects would occur from the No Action Alternative.

4.13.3.2 Alternative 2 (Preferred Alternative)

Construction and replacement of an ATCT would likely result in few, if any, impacts to visual resources. Construction activities would not result in any short-or long-term impacts, as construction would occur during the daytime and no additional nighttime lighting would be required. As lighting conditions would return to similar conditions as prior to the ATCT construction, impacts would likely be negligible.

If a new ATCT were taller than previous structures, the visual landscape could be altered due to a new structure present higher in the viewshed than the previous ATCT; however, most of the proposed replacement ATCTs are not anticipated to be substantially taller than the existing ATCTs. Impacts would vary based on new tower design and height; overall, similar types of structures would be replaced and the previously built landscape in the viewshed would show minimal, insignificant changes.

Lighting design would be similar to lighting present at the existing ATCT and surrounding area. A reduction of reflective surface from the removal of the ATCT during decommissioning could occur, but it would likely be negligible.

Under Alternative 2 (Preferred Alternative), existing ATCTs would be decommissioned and demolished. During this time, the visual character of the airport may experience a change with the removal of the existing ATCT and associated structures, resulting in minor effects to the visual landscape. Impacts from the removal of an existing ATCT to the visual landscape from changes to lighting would be minimal due to the insignificant change in ambient light. As lighting conditions would be returned to similar conditions as prior to the ATCT decommissioning, impacts would likely be negligible.

4.13.4 Mitigation

Measures that could be applied, where appropriate, could mitigate impacts to visual resources and light emissions include the following items.

Light Emissions:

- Shielding/baffles to reduce light emissions.
- Angular adjustments.

Visual Resources and Visual Character:

- Project modifications that would reduce the adverse impacts of visual encroachments into residential or recreational areas.
- The application of design, art, architecture, and landscape architecture to visually enhance an infrastructure project or obscure potentially intrusive or adverse visual impacts.
- The design of the new ATCT would be modified to blend in with the local environment to the extent possible.

4.14 WATER RESOURCES

Water resources encompass several subjects which include, wetlands, floodplains, surface water, groundwater, and wild and scenic rivers. These resources provide drinking water, irrigation, and other water uses for communities, in addition to recreation and transportation opportunities, and habitat for vegetation and wildlife species. Water resources are interconnected and can be affected through impacts above ground and below the surface.

4.14.1 Regulatory Setting

The Clean Water Act (33 U.S.C. §§ 1251-1387) establishes the basic structure for regulating the discharge of pollutants into waters of the United States and the National Pollutant Discharge Elimination System (NPDES) permit program.

The Fish and Wildlife Coordination Act (16 U.S.C. §§ 661-667d) requires federal agencies to consult with the USFWS, NMFS, and appropriate state fish and wildlife agencies regarding the conservation of wildlife resources when proposed federal or applicant projects may result in control or modification of the water of any stream or other water body (including wetlands).

EO 11990, Protection of Wetlands (42 Federal Register 26961), requires federal agencies to "avoid to the extent possible the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative." The stated purpose of EO 11990 is to "minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands."

DOT Order 5660.1A, Preservation of the Nation's Wetlands, implements the guidelines set forth in EO 11990. Transportation facilities should be planned, constructed, and operated to assure the protection and enhancement of wetlands to the fullest extent practicable.

EO 11988, Floodplain Management (42 Federal Register 26951), requires federal agencies to avoid, to the extent possible, the long and short-term adverse impacts associated with the occupancy and modification of 100-year floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative.

DOT Order 5650.2, Floodplain Management and Protection, implements the guidelines set forth in EO 11988. This DOT Order states that DOT agencies should ensure that proper consideration is given to avoid and mitigate adverse floodplain impacts in agency actions, planning programs, and budget requests.

The Safe Drinking Water Act (42 U.S.C. §§ 300(f)-300j-26) prohibits federal agencies from funding actions that would contaminate any EPA-designated sole source aquifer or its recharge area (40 CFR Parts 141-149).

The Wild and Scenic Rivers Act (WSRA) (16 U.S.C. §§ 1271-1287) preserves certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations and established the National Wild and Scenic River System, which consists of those rivers and river segments deemed by Congress to have one of more "outstandingly remarkable" scenic, recreational, geologic, fish and wildlife, historic or cultural values. Rivers in the system are classified based on the degree of development present along the river, and whether the river is wild, scenic, or recreational.

There may be additional state and local surface water, wetlands, floodplains and groundwater statutes and regulations in addition to the federal requirements discussed above. This would be determined on a case-by-case basis by contacting relevant state and local regulatory agencies in the initial stages of project planning.

4.14.2 Affected Environment

4.14.2.1 Wetlands

Wetlands are unique ecosystems comprised of very specific resources making them important for water quality, water storage, and high-value habitat for plants and wildlife. Wetlands provide natural flood protection by allowing storage of runoff and heavy precipitation. Wetlands also provide critical food and habitat for migratory birds, among other sensitive species such as frogs, salamanders, and insects. Figure 4-26 displays a high-level map of wetland and deep water (e.g., lakes and rivers) habitat distribution across the U.S.

The following regulatory definition is used by federal agencies when describing wetlands under 33 CFR § 328.3(c)(16): "Wetlands are areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands include swamps, marshes, bogs, and similar areas." Wetlands are regulated under Section 404 of the Clean Water Act and require permitting if construction were to occur in these areas (FAA, 2020c).

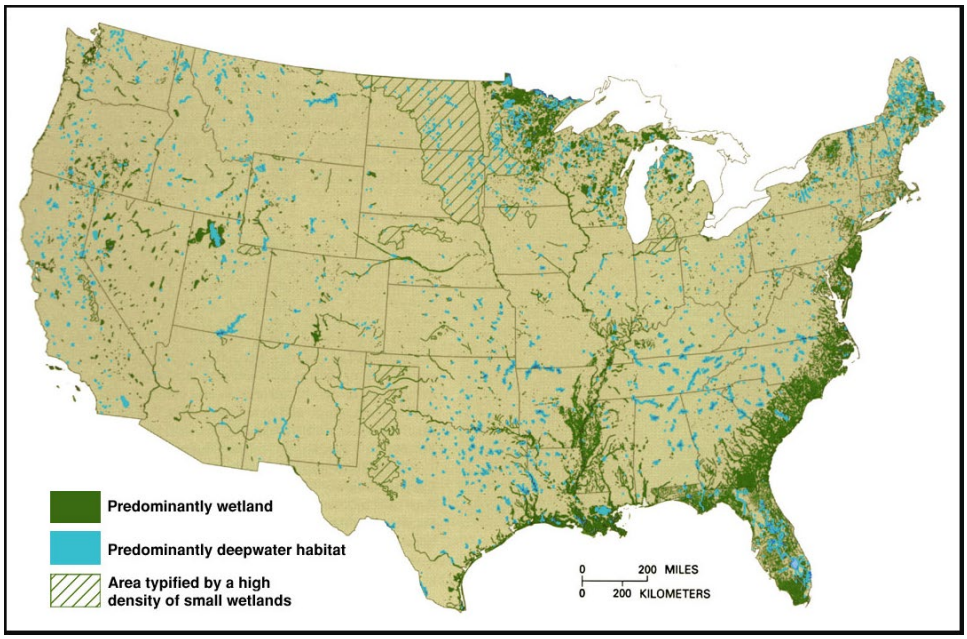

Figure 4-26. Distribution of Wetlands and Deep Water Habitat in the U.S.

Source: (Yuhas, 1996)

Soil type, vegetation, and soil saturation are considered when making a determination of whether an area is a wetland. Some wetlands are consistently saturated, while others are only wet through portions of the year making the identification of soils and vegetation of higher importance. Wetlands may be comprised of freshwater, saltwater, or brackish water. They are often in low-lying areas near waterbodies, therefore, lands within or adjacent to wetlands can be desirable locations for development. Because of these desirable building locations, wetlands are being lost and filled at an increasing rate. Due to the importance of wetlands, these areas should be avoided, if possible, when considering a project location.

4.14.2.2 Floodplains

Natural floodplains, those with native vegetation, undisturbed soils, and intact structure, are of extremely high value for water, biological, social, and economic resources. Floodplains provide natural flood protection through their ability to slow and absorb floodwater and naturally supply groundwater recharge for aquifers and surface water. Floodplains support rich ecosystems and habitats for many sensitive wildlife and plant species, as well as migratory corridors for a variety of wildlife species. These areas offer social value for recreational opportunities, such as hiking, birdwatching, and fishing or river access. As with wetlands, floodplains are in low-lying areas near rivers and streams, making them desirable locations for development. Because of these desirable building locations, floodplains have been filled and built upon for hundreds of years. Loss of floodplains from construction and programs designed to prevent flooding, such as the use of levees, have led to removal and loss of naturally functioning floodplain systems. FEMA provides mapping services that identify if floodplains may be present within a project area (FEMA, 2022)

Due to the importance of floodplains and the ecological functions they provide, these areas should be avoided, if possible, when considering a project location.

4.14.2.3 Surface Water

Lakes, rivers, streams, ponds, oceans, and other water found at ground level are considered surface waters. Similar to wetlands and floodplains, inland surface waters are an important source of drinking, industrial, and irrigation water. Both inland and ocean surface waters provide recreational opportunities, economic resources (such as food sources), and important habitat for wildlife. In the U.S., surface waters are organized into hydrologic units ranging from broad-scale first level units to smallest fourth level classifications (USGS, 2022b). Figure 4-27 displays the first level hydrologic units and hydrologic unit codes (HUC) with some of the larger rivers and lakes within these areas.

Figure 4-27. Surface Waters and Hydrologic Units in the U.S.

Source: (USGS, 2023b)

Surface waters are vulnerable to point and non-point sources of pollution from discharges directly into waterbodies, or indirect runoff of pollutants or sediment into rivers, lakes, or streams (U.S. EPA, 2022i). Numerous federal regulations protect surface water resources from pollutant discharge, construction activities, and other potentially damaging activity, described in Section 4.15.1, Regulatory Setting for Water Resources. Site-specific surveys would identify any surface waters within or adjacent to proposed ATCT activities which should be protected.

4.14.2.4 Groundwater

Water sources, both fresh and saline, are found underground ranging in depth and soil types. Groundwater is a major source of water used in U.S. homes, businesses, and agriculture (USGS, n.d. (b)). Water from rain, streams, lakes, or rivers flows downward pulled by gravity,

through the soil and permeable mineral layers where it collects underground. The saturated area below ground within porous or permeable rock, or within voids underground that holds water, is known as an aquifer (USGS, 2019). Aquifers hold much of the water that is extracted from wells for water supplies. Figure 4-28 displays the principal aquifers in the United States.

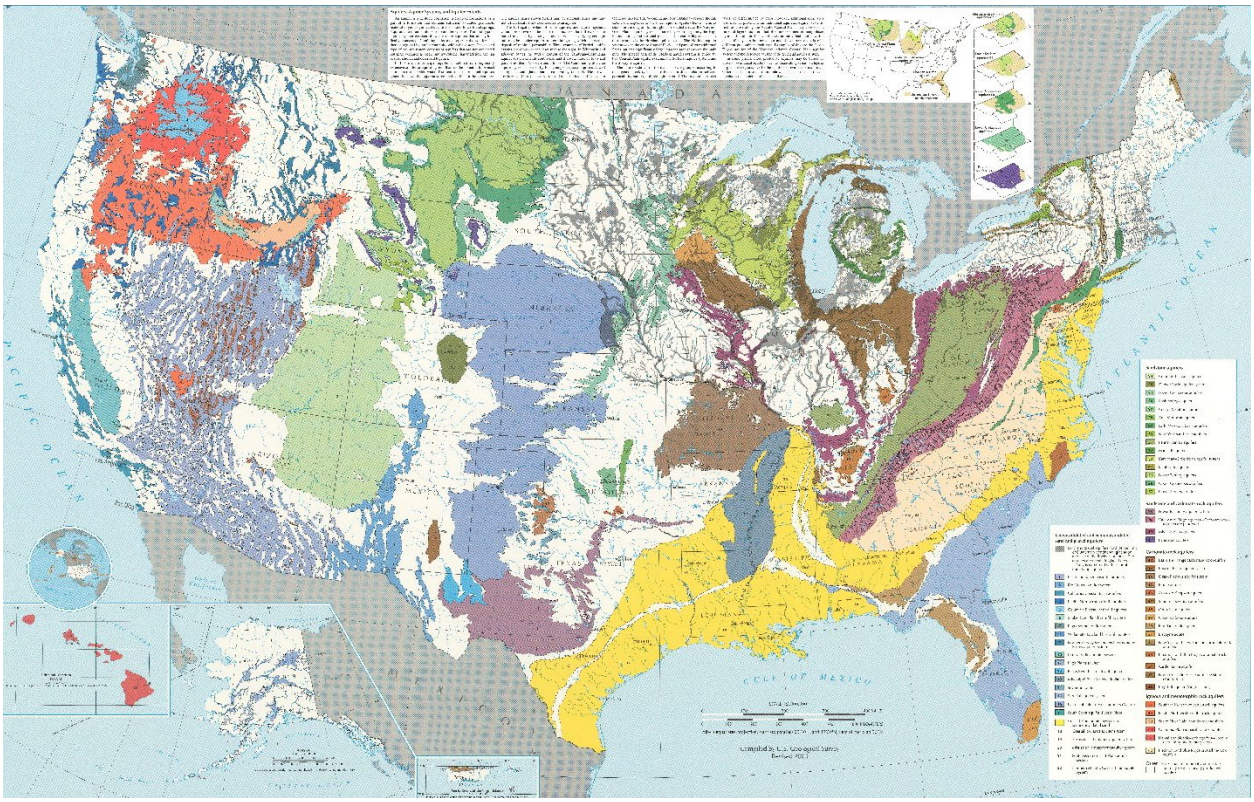

Figure 4-28. Principal Aquifers in the U.S.

Source: (USGS, 2003)

Rainwater is a major source of groundwater, supplying aquifers directly as the water flows through the ground. Water may be prevented from recharging aquifers by impermeable surfaces, such as parking lots, or channeling the water away through storm drain systems. When water seeps through the ground to recharge aquifers, many contaminants are filtered out in the process; however, other chemicals may be introduced into groundwater as it flows through soils. Contaminants, such as pesticides, bacteria, or chemicals, that are slow to degrade may pass into aquifers making the water unusable or requiring extensive removal or filtration processes to make the water clean enough for use (USGS, n.d. (c)). As with all water resources, protecting the quality of groundwater is critical in ensuring the integrity of the water supply. Understanding the extent of groundwater within and adjacent to a site-specific project, in addition to the amount of impermeable surface, are essential considerations to protect this valuable resource.

4.14.2.5 Wild and Scenic Rivers

As identified in Section 4.15.1, the Wild and Scenic River Act of 1968 (WSRA) (16 U.S.C. §§ 1271-1287) established legislation for a National Wild and Scenic River System (NWSRS) to

protect and preserve designated rivers in their free-flowing condition throughout the nation and to protect and preserve their immediate environments. Wild and scenic rivers, often only segments of rivers, are designated under three categories: Wild, Scenic, or Recreational. Wild rivers are the most pristine, without impoundments, development, or pollutants; scenic rivers allow for some minor development and accessibility; and recreational rivers allow for further access and development.

As of 2019, 226 rivers covering 13,413 miles across the U.S. and territories are protected under the WSRA (National Wild and Scenic Rivers System, n.d.). Because the character of these rivers or river segments is based on free-flowing condition with an element of remoteness and lack of disturbance, it is unlikely that wild and scenic rivers are present near a proposed ATCT project area. However, upstream water quality could affect wild and scenic rivers downstream. Site-specific studies would identify any wild and scenic rivers that could be affected directly or indirectly by proposed ATCT projects.

4.14.3 Environmental Consequences

Significance criteria for water resources are included in the "Significant Impact" descriptions in the bullet lists below.

- No Impact: Current water quality, hydrologic conditions, wetlands, floodplains, and wild and scenic rivers would not be altered, or conditions do not exist for impacts to occur.
- Significant Impact –Wetlands:
  - If an action would "adversely affect a wetland's function to protect the quality or quantity of municipal water supplies, including surface waters and sole source and other aquifers.
  - Substantially alter the hydrology needed to sustain the affected wetland system's values and functions or those of a wetland to which it is connected.
  - Substantially reduce the affected wetland's ability to retain floodwaters or storm runoff, thereby threatening public health, safety or welfare.[17]
  - Adversely affect the maintenance of natural systems supporting wildlife and fish habitat or economically important timber, food, or fiber resources of the affected or surrounding wetlands.
  - Promote development of secondary activities or services that would cause the circumstances listed above to occur.
  - Be inconsistent with applicable state wetland strategies." (FAA, 2015)
- Significant Impact – Floodplains: "The action would cause notable adverse impacts on natural and beneficial floodplain values," as defined in Paragraph 4.k of DOT Order 5650.2, *Floodplain Management and Protection*. (FAA, 2015)

[17] The term "welfare" includes cultural, recreational, and scientific resources or property important to the public.

- Significant Impact – Surface Water: "The action would exceed water quality standards established by federal, state, local, and tribal regulatory agencies; or contaminate public drinking water supply such that public health may be adversely affected" (FAA, 2015). Factors to consider include if an action would have the potential to "Adversely affect natural and beneficial water resource values to a degree that substantially diminishes or destroys such values; 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; or present difficulties based on water quality impacts when obtaining a permit or authorization." (FAA, 2015)
- Significant Impact – Groundwater: "The action would exceed groundwater quality standards established by federal, state, local, and tribal regulatory agencies; or contaminate an aquifer used for public water supply such that public health may be adversely affected" (FAA, 2015). Factors to consider include if an action would have the potential to: "adversely affect natural and beneficial groundwater values to a degree that substantially diminishes or destroys such values; adversely affect groundwater quantities such that the beneficial uses and values of such groundwater are appreciably diminished or can no longer be maintained, and such impairment cannot be avoided or satisfactorily mitigated; or difficulties based on water quality impacts when obtaining a permit or authorization." (FAA, 2015)
- Wild and Scenic Rivers: The FAA has not established criteria; however, factors to consider that may be applicable to wild and scenic rivers include, but are not limited to, situations in which the proposed action and or alternative(s) would have an adverse impact on the values for which a river was designated (or considered for designation) through the following:
  - "Destroying or altering a river's free-flowing nature;
  - A direct and adverse effect on the values for which a river was designated (or under study for designation);
  - Introducing a visual, audible, or other type of intrusion that is out of character with the river or would alter outstanding features of the river's setting;
  - Causing the river's water quality to deteriorate;
  - Allowing the transfer or sale of property interests without restrictions needed to protect the river or river corridor (which cannot exceed an average of 320 acres per mile which, if applied uniformly along the entire designated segment, is one-quarter of a mile on each side of the river);
  - Any of the above impacts preventing a river on the NRI or a Section 5 (d) river not included in the NRI from being included in the Wild and Scenic River System or causing a downgrade in its classification (e.g., from wild to recreational)." (FAA, 2015)

4.14.3.1 No Action Alternative

Under the No Action Alternative, the current ATCTs would not be replaced and removed; activities at the ATCT would remain the same. Conditions of wetlands, floodplains, surface

water, groundwater, and wild and scenic rivers would remain the same and no negligible impacts would occur.

4.14.3.2 Alternative 2 (Preferred Alternative)

Under Alternative 2 (Preferred Alternative), construction activities would result in varying impacts depending on the soils where construction occurs and the distance between the proposed project site and the receiving waters. Construction of a new ATCT would cause temporary, short-term surface disturbing activities (within one to four acres) and would involve increased vehicle traffic and use of machinery. During this time, disruption of soil surfaces, introduction of non-native plant species through transfer of seeds, and contamination of soils from chemicals such as hydraulic fluids or petroleum leaks could occur. Soil erosion or runoff from the construction site could result in interface with wetlands, floodplains, or surface water either adjacent to or downstream from the ATCT sites. Soil, sediment, or chemical runoff could directly or indirectly damage water quality, alter habitat from sediment build-up, or cause changes to the ecosystems from the introduction of non-native plant species. Any additional impervious surface beyond the original ATCT and surrounding development could result in a minimal increase of runoff into adjacent waterbodies, resulting in increased erosion, vegetation loss, and sediment inputs.

Demolition and removal of decommissioned ATCTs could result in disturbance of soils and loss of vegetation within and adjacent to the project area. Use of heavy machinery (construction equipment) for this work could cause disruption of soil surfaces, dust, introduction of non-native plant species through transfer of seeds, and contamination of soils from chemicals such as hydraulic fluids or petroleum leaks. Any soil erosion or runoff from the area could result in interface with wetlands, floodplains, surface water, and wild and scenic rivers either adjacent to or downstream from the ATCT sites. Soil, sediment, or chemical runoff could directly or indirectly damage water quality, alter habitat from sediment build-up, or cause changes to the ecosystems from introduction of non-native plant sources. Mitigation measures to contain runoff and prevent the introduction of non-native plants surrounding the project areas would help reduce or prevent effects from demolition and removal of ATCTs.

Decommissioning, demolition, and construction activities could have direct or indirect impacts on groundwater, depending on the location of ATCT projects and proximity to groundwater sources. The increased presence of heavy equipment (construction vehicles), fuel, chemicals, or solvents during the demolition or construction of an ATCT could affect groundwater if spills were to occur. The severity would depend on the volume and duration of the spill, the ability to respond, and the time it takes to contain the spill.

Mapping to identify all water resources would be required when conducting site-specific analysis to ensure that potential effects from Alternative 2 (Preferred Alternative) could be avoided or mitigated.

4.14.4 Mitigation

Mitigation measures and BMPs to offset unavoidable impacts to water resources allow for on-site absorption of rainwater such as permeable surfaces, allowing natural drainage processes, and erosion prevention measures. Descriptions of mitigation examples for wetlands, floodplains, surface water, ground water, and wild and scenic rivers are below.

Mitigation measures to prevent or reduce impacts to wetlands include avoidance and minimization and compensatory mitigation. Avoidance and minimization measures include adjusting plans to reduce or prevent any encroachment or damage to wetlands and directing runoff from construction/demolition activities away from wetlands or other aquatic habitat. If avoidance and minimization measures are not able to prevent impacts to wetlands, compensatory mitigation, such as wetland banking, restoration, enhancement, establishment, or preservation may be used to offset unavoidable impacts to wetlands. (FAA, 2020c)

If floodplains cannot be avoided, the following mitigation measures may be applied, but are not limited, to minimize potential damage to floodplains:

- Elevate facilities above the base flood elevation.
- Minimize fill placed in floodplains.
- Construction controls to minimize erosion and sedimentation.
- Design the facility to allow adequate flow circulation and preserve free, natural drainage.
- Commit to comply with special flood-related design criteria.
- Use pervious surfaces where practicable.
- Control runoff, while ensuring the runoff control measure does not attract wildlife hazardous to aviation.
- Control waste and spoils disposal to prevent contaminating ground and surface water, while not attracting wildlife hazardous to aviation (e.g., control the use of pesticides and herbicides, maintain vegetative buffers to reduce sedimentation and delivery of chemical pollutants to the water body). (FAA, 2020c)

Direct impacts to surface waters are unlikely, but if a project were to intersect a pond, stream, or other surface water body, the following mitigation measures could reduce effects to surface waters:

- Limit ground disturbance to the areas necessary for project-related construction.
- Employ erosion control measures to minimize sedimentation of surface waters.
- Restore vegetation on disturbed areas to prevent soil erosion following project completion.

- Develop oil response plans designed to contain any potential spills of oil or oil-based products associated with the Proposed Action and alternative(s).
- Include Section 404 and 401 permit terms and conditions for minimizing and compensating for impacts to surface waters or Section 402 permit terms and conditions for minimizing the discharge of pollutants into surface waters.

For proposed projects that would impact surface waters through dredged or fill material (e.g., rerouting a stream), mitigation would be required under the CWA as part of the Section 404 permit process.

Mitigation and BMPs to reduce direct impacts to groundwater include, but are not limited to, the following:

- Limit ground disturbance and depth to the areas necessary for project-related construction in sensitive and shallow groundwater areas.
- Protect water quality of surface water runoff that may infiltrate into the ground.
- Restore vegetation on disturbed areas to prevent soil erosion following project completion.
- Limit the area of new impervious surfaces to the areas necessary for project-related construction.
- Develop oil response plans designed to contain any potential spills of oil or oil-based products associated with the Proposed Action and alternative(s).

If any project locations are within proximity of wild and scenic rivers, the following mitigation measures would help prevent or reduce impacts:

- Avoid wild and scenic rivers, study rivers, or NRI rivers by re-siting components outside the 0.25-mile corridor.
- Remove structures (such as discharge structures) following completion of construction activities.
- Re-site project components to areas of previously disturbed riverbank.
- Reduce discharge velocities to avoid scouring of the riverbed.
- Transport construction materials, such as riprap, offsite rather than storing such materials within view of the river.
- Design a project to reduce visual and noise impacts.
- Adherence to the terms of applicable permits.

4.15 CUMULATIVE IMPACTS

The FAA regulations implementing the procedural provisions of NEPA define cumulative impacts as:

> *"Cumulative impacts are those that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, whether Federal or non-Federal." (FAA, 2015).*

Based on these regulations, if an alternative does not have direct or indirect effects, there can be no cumulative effects resulting from the project because there would be no impacts added to past, present, or reasonably foreseeable actions.

The CEQ regulations also describe cumulative impacts as impacts that "can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR Part 1508.7). On a programmatic level and combined with other actions, Alternative 2 (Preferred Alternative) could lead to cumulative impacts depending on the scale (number of projects), geography (localized area) in which the actions are performed, and other construction-related activities that may occur at each airport.

This PEA covers proposed replacement ATCTs across the U.S. In general, these ATCT projects include construction of towers less than 200 feet above the ground with one to four acres of ground-disturbing activities. These activities are expected to have no significant impacts if they do not involve significant risks or impacts to sensitive areas. Should the proposed BIL funded replacement ATCT involve significant risks or impacts to sensitive areas, the FAA would prepare a site-specific EA. Because the replacement ATCT projects could be proposed anywhere within the United States at specific airports which have not yet been identified, it is difficult to predict the cumulative effects of these projects when combined with other potential projects. The PEA can only address cumulative impacts qualitatively.

The proposed replacement ATCTs covered in this PEA would involve replacement and removal of the existing tower after construction of the new tower, typically and preferably in previously disturbed sites on airport property, thereby reducing any potential impacts to natural areas and wildlife resources because of the previously disturbed nature of the sites. Temporary cumulative impacts may result related to construction emissions and construction-related traffic. During construction, minor erosion and sedimentation may occur. The proposed ATCTs would not contribute to a significant adverse cumulative impact to natural resources or energy supply. The sustainable design of the proposed ATCTs is anticipated to exhibit energy and water efficiencies, thereby reducing energy and resource supply needs. Related to noise, air quality emissions, and climate, the ATCT construction and demolition activities would contribute to an adverse cumulative impact, but on a temporary basis, if other projects are occurring during the same timeframe at the airport. These ATCT projects would support an increase in construction funding, a positive benefit to the local economy at each airport.

Implementation of BMPs would further reduce the potential for any identified limited impacts. The cumulative impact of the replacement ATCTs presented in this PEA are not

anticipated to result in significant impacts or significant cumulative impacts to either human health or the environment.

4.16 MITIGATION

Measures to mitigate potential environmental impacts. Construction activities would follow the FAA's Construction Specifications 01575, "Temporary Environmental Controls," to ensure that procedures are met. Mitigation measures were identified for each resource area in Sections 4.1 to 4.15; these are summarized in Table 5-1.

SECTION 5 | SUMMARY OF IMPACTS

Table 5-1 summarizes the potential impacts of each alternative on the resource areas discussed in Section 4.

Table 5-1. Summary of Impacts and Mitigation Measures

Resource Area	Alternative 1: No Action	Alternative 2: Preferred Alternative	Mitigation Measures
Air Quality	No impact	Short-term and temporary increase in emissions and dust (particulate matter) during construction and demolition activities. Long-term reduction in emissions from reduced energy use in new ATCTs	Dust control BMPs, revegetation of sites following ground disturbance, emission BMPs for construction vehicles, and sourcing of locally available products and materials
Biological Resources	No impact	Short-term impacts from noise, vegetation removal, soil runoff, and erosion during construction activities. Temporary impacts from noise, soil runoff, and erosion during demolition	Phase activities to avoid breeding, nesting, flowering, or pollination seasons; conduct surveys for nesting migratory birds during breeding season; conduct surveys for listed species; employ fencing BMPs; design project to reduce the potential to cause or enhance wildlife hazards; re-vegetation of temporarily disturbed work areas; monitor wildlife populations within and/or near the project area; and adherence to state guidelines
Climate	No impact	Short-term increase in GHG emissions during construction and demolition activities. Long-term reduction in GHG emissions from reduced energy use in new ATCTs	Incorporate energy efficient design features, combined or reduced vehicle trips, use of repurposed or recycled materials, and use of energy efficient equipment
Coastal Resources	No impact	Short-term increase in runoff and erosion into coastal areas during construction and demolition activities	Relocate outside of coastal zone, promote consistency with CZM plans, incorporate site-specific recommendations proposed by relevant federal or state agencies having jurisdiction over the coastal resource

Resource Area	Alternative 1: No Action	Alternative 2: Preferred Alternative	Mitigation Measures
DOT Act, Section 4(f)	No impact	Impacts would vary case-by-case depending on location	Alter design to reduce impacts on the 4(f) property, replace land or facilities used by the project (e.g., replace a park), provide monetary compensation to improve the 4(f) .property's remaining areas, install visual or vegetative buffers, or improve access to the 4(f) property
Farmlands	No impact	Impacts would vary case-by-case depending on location	Adjust size or location to reduce amount of farmland taken, work with affected property owners to address any construction impacts, or ensure that lands temporarily taken out of agriculture are restored for agricultural use
Hazardous Materials, Solid Waste, and Pollution Prevention	Use of old ATCTs could expose occupants to outdated building materials that could pose health risks	Short-term and temporary impacts during construction and use of fuels and chemicals. Short-term and temporary impacts from demolition and removal of waste or other unknown materials from older ATCT sites	Prepare Phase I Environmental Site Assessments prior to acquisition and termination of ATCT leases; conduct a hazardous materials survey prior to demolition; mitigation or monitoring requirements prior or ongoing cleanup activities; develop a hazardous materials response plan and/or a spill prevention, control, and countermeasure plan
Historical, Architectural, Archeological, and Cultural Resources	No impact	Impacts would vary case-by-case depending on location	Modify or limit activities to reduce effects; develop an agreement document with consulting parties to resolve adverse effects; implement construction BMPs; educate visitors, public, and construction personnel on the importance of cultural resources; conduct training for personnel to recognize when archaeological

Resource Area	Alternative 1: No Action	Alternative 2: Preferred Alternative	Mitigation Measures
			resources or human remains have been discovered and to halt ground disturbing activities; conduct archival documentation of affected historic properties to HABS/ HAER standards; have a qualified archaeologist monitor ground-disturbing activities during construction; or conduct data recovery excavations of affected archaeological sites
Land Use	No impact	Negligible impacts	Change site design; phase project to be consistent with planned development in the area; or relocate development away from non-compatible land uses (e.g., landfills, wildlife refuges, wetland mitigation)
Natural Resources and Energy Supply	Use of old ATCTs may not meet energy efficiency goals due to outdated electrical, heating, cooling, and other infrastructure, and construction materials	Long-term beneficial impacts from reductions in energy use	Follow principles of environmental design and sustainability, efficient facility design and operation, or improved ground transportation or access incorporated into project design, or utilize energy from renewable sources
Noise	No impact	Short-term impacts during construction and demolition activities from equipment and vehicle noise	Construct noise barriers or acoustic shielding, use proper mufflers for construction equipment, or apply measures to limit noise from vehicles as they traverse noise sensitive areas
Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks	No impact	Short-term impacts during construction and demolition from minimal increases in employment, materials, or equipment purchases	Conduct outreach to share ongoing information about the ATCT project and NEPA process

Resource Area	Alternative 1: No Action	Alternative 2: Preferred Alternative	Mitigation Measures
Visual Effects	No impact	Minimal impacts from changes in viewshed	Shielding/baffles to reduce light emissions or angular adjustments, or modifications to reduce adverse impacts of visual encroachments into residential or recreational areas
Water Resources	No impact	Short-term impacts from soil disturbance, runoff, and erosion during construction. Temporary impacts from runoff and erosion during demolition	Limit ground disturbance to the areas necessary for construction, employ erosion control BMPs, restore vegetation on disturbed areas to prevent soil erosion, develop oil response plans to contain any potential spills of oil, limit area of new impervious surfaces, or adherence to the terms of applicable permits

Based on the analysis within this PEA, the FAA has preliminarily determined there would not be a significant impact to the human environment from implementation of the Proposed Action. The FAA intends for this PEA to create efficiencies by establishing a "tiering" framework, where appropriate, to project-specific actions that require additional analysis. As decisions on specific project sites are made, to the extent additional NEPA analysis is required, environmental reviews would be conducted to supplement the analysis set forth in this PEA.

SECTION 6 | PUBLIC INVOLVEMENT

The FAA is providing a 508-compliant electronic copy of this PEA for review by the public on the following website: https://www.faa.gov/air_traffic/atf. Electronic comments should be submitted to the Federal Regulations portal at: https://www.regulations.gov with Docket ID: FAA-2023-1368. The FAA published a Notice of Availability advertisement in the USA Today identifying the availability of the Draft PEA to allow the public to view the document electronically and where/how to submit comments.

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SECTION 8 | REFERENCES

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APPENDIX | A BIL ATCT REPLACEMENT PROGRAM – INITIAL TOWER LOCATIONS

Table A-1 displays a list of the city, state, and three-letter airport ID for the initial 31 ATCTs.

Table A-1. Initial List of 31 Air Traffic Control Towers

Airport Location ID	State	City
AHN	Georgia	Athens
ALN	Illinois	East Alton
BFM	Alabama	Mobile
BLI	Washington	Bellingham
DET	Michigan	Detroit
DTN	Louisiana	Shreveport
EMT	California	El Monte
EYW	Florida	Key West
FCM	Minnesota	Eden Prairie
FLO	South Carolina	Florence
FMY	Florida	Fr. Myers
FTW	Texas	Fort Worth
GLH	Missouri	Greenville
HFD	Connecticut	Hartford
HKS	Missouri	Jackson
LAW	Oklahoma	Lawton
LEB	New Hampshire	West Lebanon
LOU	Kentucky	Louisville
MCN	Georgia	Macon
MOD	California	Modesto
MVY	Massachusetts	Tisbury
MWA	Illinois	Marion
OGD	Utah	Ogden
PAH	Kentucky	West Paducah
PIH	Idaho	Pocatello
PNE	Pennsylvania	Philadelphia
PUB	Colorado	Pueblo
RDG	Pennsylvania	Reading

Airport Location ID	State	City
RVS	Oklahoma	Tulsa Riverside
SLE	Oregon	Salem
TOP	Kansas	Topeka

The proposed second and third phases of the BIL ATCT Replacement Program may use different criteria to determine which ATCTs would be eligible for replacement, but the types of ATCTs proposed for replacement and the associated project impacts are likely to be similar.

APPENDIX | B SUMMARY OF ATCT DESIGN TYPES

Type O

The Type O standard ATCT design consists of an occupied pentagonal steel framed shaft with inwardly sloping walls along its height supporting a pentagonal prefabricated, aluminum framed Cab (Figure B-1).

In November 1962, the Type O standard design concept prepared by I.M. Pei and Associates was accepted by the FAA to provide a free-standing tower without Terminal Radar Approach Control (TRACON) functions. Previously, towers were airport sponsored and designed. The first Type O tower was commissioned in February 1965 and the last in 1968.

There are currently 26 active Type O standard type ATCTs (Table B-1).

Figure B-1. Type O ATCT, MYF ATCT (San Diego, CA) with original cladding and corner windows, FAA

Table B-1. Type O ATCTs

	LOCID	Facility Name	City	State	Commission Year	Height to Cab Floor	Base Building
1	ALN	Alton Regional Tower	East Alton	IL	1966	48'-10"	No
2	APC	Napa Tower	Napa	CA	1965	48'-10"	No
3	DEC	Decatur Tower	Decatur	IL	1966	48'-10"	No
4	FMN	Farmington Tower	Farmington	NM	1968	48'-10"	No
5	FSD	Sioux Falls Tower	Sioux Falls	SD	1966	60'-0"	No
6	FTW	Meacham Tower	Fort Worth	TX	1965	60'-0"	No
7	HIO	Hillsboro Tower	Hillsboro	OR	1966	48'-10"	No
8	JVL	Janesville Tower	Janesville	WI	1966	48'-10"	No
9	LAW	Lawton Tower	Lawton	OK	1965	48'-10"	No

	LOCID	Facility Name	City	State	Commission Year	Height to Cab Floor	Base Building
10	LNS	Lancaster Tower	Lititz	PA	1965	48'-10"	No
11	LOU	Bowman Tower	Louisville	KY	1965	48'-10"	No
12	MBS	Saginaw Tower	Freeland	MI	1965	48'-10"	Yes
13	MEI	Meridian Tower	Meridian	MS	1965	48'-10"	No
14	MFE	Mc Allen Tower	McAllen	TX	1965	48'-10"	No
15	MKG	Muskegon Tower	Muskegon	MI	1967	60'-0"	Yes
16	MLB	Melbourne Tower	Melbourne	FL	1965	48'-10"	No
17	MOD	Modesto Tower	Modesto	CA	1965	48'-10"	No
18	MYF	Montgomery Tower	San Diego	CA	1965	48'-10"	No
19	POC	Brackett Tower	La Veme	CA	1965	48'-10"	No
20	PUB	Pueblo Tower	Pueblo	CO	1965	60'-0"	No
21	RAL	Riverside Tower	Riverside	CA	1965	48'-10"	No
22	RAP	Rapid City Tower	Rapid City	SD	1965	48'-10"	No
23	RDG	Reading Tower	Reading	PA	1966	48'-10"	Yes
24	RVS	Riverside Tower	Tulsa	OK	1965	48'-10"	No
25	SMO	Santa Monica Tower	Santa Monica	CA	1966	48'-10"	No
26	VNY	Van Nuys Tower	Van Nuys	CA	1967	60'-0"	No

Pei

The Pei standard ATCT design consists of a non-occupied pentagonal cast-in-place concrete shaft supporting a pentagonal prefabricated, aluminum framed Cab (Figure B-2). The Pei standard ATCT design was constructed from the late 1960s into the early 1970s. The standard derives its name from renowned architect I.M. Pei.

In June 1967, the FAA adopted design standard that retained the 5-sided Cab used for the Type O towers but instead substituted a utilitarian concrete shaft below the Cab (in lieu of occupied floors in the Type O towers) with functional space instead housed in an adjacent Base Building. The original concept was for the Pei type towers to range from 61'-10" to 121'-10". The standard was employed primarily at major and intermediate level activity facilities with TRACONs housed in associated Base Buildings. Many Pei ATCTs have been replaced and some that originally had TRACON Base Buildings have had that function relocated to other facilities.

There are currently 15 active Pei type standard ATCTs (Table B-2).

Figure B-2. Pei ATCT, CAE ATCT (Columbia, SC), FAA

Table B-2. Pei ATCTs

	LOCID	Facility Name	City	State	Commission Year	Height to Cab Floor	Spiral ATCT Stair	Insulated Cab Windows	Subterranean Base Building
1	ADW	Andrews Tower	Camp Springs	MD	1966	128'-9 ½" (above Base Level)	No	No	Yes
2	CAE	Columbia Tower and TRACON	West Columbia	SC	1968	91'-10"	Yes	No	No
3	DET	Detroit City Tower	Detroit	MI	1970	61'-10"	Yes	Yes	No
4	ELP	El Paso Tower and TRACON	El Paso	TX	1967	128'-9 ½" (above Base Level)	No	No	Yes

	LOCID	Facility Name	City	State	Commission Year	Height to Cab Floor	Spiral ATCT Stair	Insulated Cab Windows	Subterranean Base Building
5	GTF	Great Falls Tower and TRACON	Great Falls	MT	1967	106'-10"	Yes	Yes	Yes
6	HPN	Westchester Tower	White Plains	NY	1969	91'-10"	Yes	Yes	No
7	JAX	Jacksonville Tower and TRACON	Jacksonville	FL	1968	121'-10"	Yes	No	No
8	LBB	Lubbock Tower and TRACON	Lubbock	TX	1976	91'-10"	Yes	Yes	No
9	LEX	Lexington Tower and TRACON	Lexington	KY	1969	61'-10"	Yes	Yes	No
10	LGB	Long Beach Tower	Long Beach	CA	1968	121'-10"	Yes	No	No
11	MSN	Madison Tower and TRACON	Madison	WI	1967	61'-10"	Yes	Yes	No
12	OKC	Oklahoma City Tower and TRACON	Oklahoma City	OK	1967	121'-10"	Yes	Yes	No
13	SMF	Sacramento Tower	Sacramento	CA	1967	128'-9 ½" (above Base Level)	No	No	Yes
14	TPA	Tampa Tower and TRACON	Tampa	FL	1972	180'-6" (above Base Level)	No	No	Yes (Basement Level)
15	YNG	Youngstown Tower and TRACON	Vienna	OH	1970	61'-10"	Yes	Yes	No

Type L

The Type L standard ATCT design consists of an occupied square steel and concrete framed shaft supporting a pentagonal steel framed Cab (Figure B-3). TRACON operations are not conducted at facilities with this tower type.

The Type L standard ATCT design was constructed for a limited timeframe in the late 1960s. The last L type ATCT was commissioned in 1969. The standard type is exclusive to California. The L standard ATCT design consists of a square (functional/occupied) shaft supporting a pentagonal Cab. The standard was deployed at low activity level towers with the height requirement to the Cab being quite short. The 28'-0" height to the Cab floor for most adaptations of the standard is the shortest of the ATCT standards.

There are four active Type L standard ATCTs (Table B-3).

Figure B-3. Type L ATCT, RHV ATCT (San Jose, CA), FAA

Table B-3: Type L ATCTs

	LOCID	Facility Name	City	State	Commission Year	Height to Cab Floor
1	PAO	Palo Alto Tower	Palo Alto	CA	1968	28'-0"
2	RHV	Reid Hillview Tower	San Jose	CA	1967	28'-0"
3	SNS	Salinas Tower	Salinas	CA	1968	52'-0"
4	SQL	San Carlos Tower	San Carlos	CA	1969	28'-0"

Hunt/AVCO

The Hunt/AVCO standard ATCT design consists of a square functional steel framed shaft supporting a hexagonal steel framed Cab (Figure B-4). The Hunt and AVCO standard ATCT design are functionally the same design. The space, elevations, and layout are generally the same except for the location of the Junction Level toilet room. Given the similarities, the two design types are combined under a single ATCT type.

In the early to mid-1970s, this modular type ATCT was constructed at numerous low activity level airports. Unlike other previous ATCTs, this design type used prefabricated building components throughout (previous Type O and Pei standard designs used prefabricated Cabs only). The prefabricated nature for the whole tower construction (prefabricated interior and exterior walls) allowed them to be erected in a short time from a "kit of parts." The first Hunt ATCT was commissioned in July 1971. Most of the Hunt/AVCO towers were commissioned in the 1973-1975 timeframe with the design type predominately phased out by the end of the 70s. The prefabricated nature of the tower was exhibited when a tower originally constructed in Englewood, CO was disassembled and "recycled" for use at the HEF Airport in Manassas, VA in April 1992. Most Hunt/AVCO tower facilities do not conduct TRACON operations (4 out of 83); with the few that do have TRACONs have that function in an adjacent Base Building.

There are currently 84 active Hunt/AVCO type standard ATCTs (Table B-4).

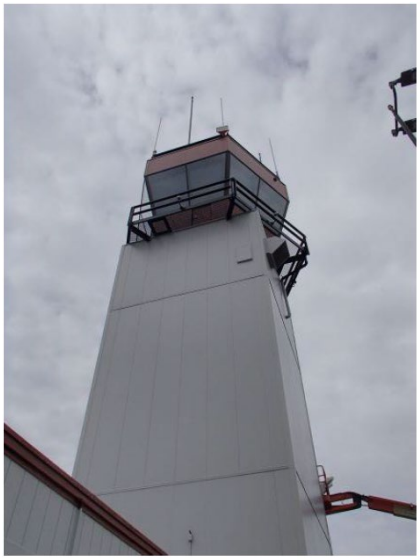

Figure B-4. Hunt/AVCO Type, FFZ ATCT (Mesa, AZ), FAA

Table B-4: Hunt/AVCO ATCTs

	LOCID	Facility Name	City	State	Commission Year	Height to Cab Floor	Base Building
1	ABY	Albany Tower	Albany	GA	1974	34'-1"	Yes
2	AHN	Athens Tower	Athens	GA	1973	44'-1"	No

	LOCID	Facility Name	City	State	Commission Year	Height to Cab Floor	Base Building
3	ALW	Walla Walla Tower	Walla Walla	WA	1975	54'-1"	No
4	ARB	Ann Arbor Tower	Ann Arbor	MI	1973	44'-1"	Yes
5	ARR	Aurora Tower	Sugar Grove	IL	1976	44'-1"	No (Equipment room extension)
6	ASE	Aspen ATCT and TRACON	Aspen	CO	1973	34'-1"	Yes
7	ATW	Appleton Tower	Appleton	WI	1985	74'-1"	No
8	BET	Bethel Tower	Bethel	AK	1983	44'-1"	Yes
9	BMG	Bloomington Tower	Bloomington	IN	1973	34'-1"	Yes
10	BVY	Beverly Tower	Beverly	MA	1975	44'-1"	Yes
11	CDW	Caldwell Tower	Fairfield	NJ	1978	54'-1"	Yes
12	CGF	County Tower	Highland Heights	OH	1974	44'-1"	No
13	CIC	Chico Tower	Chico	CA	1973	44'-1"	No
14	CKB	Clarksburg Tower and TRACON	Bridgeport	WV	1986	34'-1"	Yes
15	CLL	College Station Tower	College Station	TX	1975	44'-1"	No
16	COU	Columbia Tower	Ashland	MO	1973	34'-1"	Yes
17	CRE	Grand Strand Tower	N. Myrtle Beach	SC	1975	44'-1"	No
18	CRG	Craig Tower	Jacksonville	FL	1975	44'-1"	No
19	CRQ	Palomar Tower	Carlsbad	CA	1973	44'-1"	Yes
20	DBQ	Dubuque Tower	Dubuque	IA	1973	34'-1"	No
21	DHN	Dothan Tower	Dothan	AL	1974	74'-1"	No
22	DWH	Hooks Tower	Tomball	TX	1979	44'-1"	Yes
23	DXR	Danbury Tower	Danbury	CT	1973	34'-1"	Yes
24	EMT	El Monte Tower	El Monte	CA	1972	34'-1"	Yes
25	ENA	Kenai Tower	Kenai	AK	1974	44'-1"	Yes
26	EWN	New Bern Tower	New Bern	NC	1974	44'-1"	No
27	EYW	Key West Tower	Key West	FL	1975	44'-1"	No
28	FFZ	Falcon Tower	Mesa	AZ	1984	54'-0"	Yes
29	FLG	Flagstaff Tower	Flagstaff	AZ	1975	44'-1"	No

	LOCID	Facility Name	City	State	Commission Year	Height to Cab Floor	Base Building
30	FLO	Florence Tower and TRACON	Florence	SC	1974	64'-1"	No (Base building with TRACON remote from ATCT)
31	FMY	Page Tower	Ft Myers	FL	1975	74'-1"	No
32	FYV	Fayetteville Tower	Fayetteville	AR	1985	74'-1"	Yes
33	GCK	Garden City Tower	Garden City	KS	2000	44'-1"	No
34	GLH	Greenville Tower	Greenville	MS	1972	54'-1"	No
35	GNV	Gainesville Tower	Gainesville	FL	1980	34'-1"	Yes
36	GON	Groton Tower	Groton	CT	1975	44'-1"	No
37	GRI	Grand Island Tower	Grand Island	NE	1973	34'-1"	No
38	HEF	Manassas Tower	Manassas	VA	1992	54'-1"	Yes
39	HFD	Hartford Tower	Hartford	CT	1973	34'-1"	Yes
40	HGR	Hagerstown Tower	Hagerstown	MD	1973	34'-1"	No
41	HKS	Hawkins Tower	Jackson	MS	1967	44'-1"	No
42	HKY	Hickory Tower	Hickory	NC	1973	34'-1"	No
43	HRL	Harlingen Tower	Harlingen	TX	1973	44'-1"	Yes
44	HUM	Houma Tower	Houma	LA	1983	44'-1"	Yes
45	HVN	New Haven Tower	East Haven	CT	1983	44'-1"	Yes
46	ISO	Kinston Tower	Kinston	NC	1975	54'-1"	No
47	ITH	Ithaca Tower	Ithaca	NY	1973	34'-1"	Yes
48	LAF	Lafayette Tower	West Lafayette	IN	1986	54'-1"	Yes
49	LEB	Lebanon Tower	West Lebanon	NH	1975	44'-1"	No
50	LRD	Laredo Tower	Laredo	TX	1976	74'-1"	No
51	LSE	Lacrosse Tower	Lacrosse	WI	1971	34'-1"	Yes (trailer)
52	LVK	Livermore Tower	Livermore	CA	1974	34'-1"	Yes
53	LWB	Greenbrier Tower	Lewisburg	WV	1974	44'-1"	No
54	LWM	Lawrence Tower	North Andover	MA	1980	44'-1"	Yes
55	LWS	Lewiston Tower	Lewiston	ID	1974	65'-1"	No
56	MDH	Carbondale Tower	Murphysboro	IL	1984	64'-1"	Yes
57	MFD	Mansfield Tower and TRACON	Mansfield	OH	1974	74'-1"	Yes

	LOCID	Facility Name	City	State	Commission Year	Height to Cab Floor	Base Building
58	MGW	Morgantown Tower	Morgantown	WV	1971	34'-1"	No
59	MKK	Molokai Tower	Hoolehua	HI	1981	44'-1"	No
60	MOT	Minot Tower	Minot	ND	1976	44'-1"	No
61	MWA	Marion Tower	Marion	IL	1977	54'-1"	No
62	OGD	Ogden Tower	Ogden	UT	1975	64'-1"	No
63	OJC	Olathe Tower	Olathe	KS	1971	54'-1"	No
64	OLM	Olympia Tower	Olympia	WA	1975	64'-1"	No
65	OWD	Norwood Tower	Norwood	MA	1995	34'-1"	Yes
66	PAH	Barkley Tower	West Paducah	KY	1972	34'-1"	Yes (trailer)
67	PIH	Pocatello Tower	Pocatello	ID	1973	74'-1"	No
68	PNE	Northeast Philadelphia Tower	Philadelphia	PA	1973	64'-1"	Yes
69	POU	Poughkeepsie Tower	Wappinger's Falls	NY	1973	34'-1"	Yes
70	PSC	Pasco Tower	Pasco	WA	1973	44'-1"	Yes
71	RDD	Redding Tower	Redding	CA	1973	74'-1"	No
72	SDM	Brown Field Tower	San Diego	CA	1973	64'-1"	Yes (trailer)
73	SIG	Isla Grande Tower	Carolina	PR	1976	44'-1"	No
74	SLE	McNary Tower	Salem	OR	1973	44'-1"	No
75	SMX	Santa Maria Tower	Santa Maria	CA	1974	44'-1"	No
76	TCL	Tuscaloosa Tower	Tuscaloosa	AL	1973	44'-1"	No
77	TEB	Teterboro Tower	Teterboro	NJ	1974	64'-1"	Yes
78	TIW	Tacoma Narrows Tower	Gig Harbor	WA	1973	34'-1"	Yes
79	TOP	Topeka Tower	Topeka	KS	1977	54'-1"	No
80	TWF	Twin Falls Tower	Twin Falls	ID	1975	74'-1"	No
81	WDG	Woodring Tower	Enid	OK	1974	44'-1"	No
82	WJF	Fox Tower	Lancaster	CA	1973	44'-1"	Yes
83	YIP	Willow Run Tower	Belleview	MI	1986	72'-3"	Yes
84	YKM	Yakima Tower	Yakima	WA	1974	64'-1"	No

Mock

The Mock standard ATCT design consists of an occupied square shaft supporting either a pentagonal or eight-sided (chamfered square) Cab (Figure B-5). The pentagonal Cab was employed for the early deployment of the standard with 15 sites having this Cab geometry. Eight sites employ the eight-sided Cab. Many Mock ATCTs have TRACON functions within the tower shaft, with some sites having TRACABs in lieu of a traditional TRACON Room.

The Mock standard ATCT design was the predominant small to intermediate activity ATCT with TRACON standard design employed starting in the early 1970s and continuing to the mid-1980s when the Golemon & Rolfe standard design became the predominant standard type for that size facility. The last Mock standard was commissioned in 1987. At the same time the Mock standard was employed for small to intermediate size facilities the Welton Becket standard was used for larger ATCT with TRACON facilities.

In its original configuration the Mock standard was a stand-alone tower design with an occupied shaft. Many of the original designs were supplemented later with administrative Base Buildings (and one with a TRACON) added at the base of the ATCT.

There are currently 23 active Mock type standard ATCTs (Table B-5).

Figure B-5. Mock Type, TRI ATCT (Tri-Cities, TN) with pentagonal Cab, FAA

Table B-5. Mock ATCTs

	LOCID	Facility Name	City	State	Commission Year	Height to Cab Floor	Base Building	Cab Type
1	AGS	Augusta Tower and TRACON	Augusta	GA	1975	73'-8"	No	5-sided
2	ALO	Waterloo Tower and TRACON	Waterloo	IA	1987	73'-8"	No	8-sided
3	BFL	Bakersfield Tower and TRACON	Bakersfield	CA	1975	61'-7"	No	5-sided
4	BIS	Bismarck Tower and TRACON	Bismarck	ND	1973	61'-7"	No	5-sided
5	CID	Cedar Rapids Tower and TRACON	Cedar Rapids	IA	1981	73'-8"	No	8-sided
6	DSM	Des Moines Tower and TRACON	Des Moines	IA	1975	73'-8"	Yes	5-sided
7	EVV	Evansville Tower and TRACON	Evansville	IN	1976	73'-8"	Yes	5-sided
8	FAI	Fairbanks Tower and TRACON	Fairbanks	AK	1977	73'-8"	No	8-sided
9	FAR	Fargo Tower and TRACON	Fargo	ND	1979	73'-8"	No	8-sided
10	FAY	Fayetteville Tower and TRACON	Fayetteville	NC	1973	49'-6"	Yes	5-sided
11	FNT	Flint Tower and TRACON	Flint	MI	1975	73'-8"	Yes	5-sided
12	GGG	Longview Tower and TRACON	Longview	TX	1977	61'-7"	No	5-sided
13	GSO	Greensboro Tower and TRACON	Greensboro	NC	1974	73'-8"	Yes	5-sided
14	ILM	Wilmington Tower and TRACON	Wilmington	NC	1987	73'-8"	Yes	5-sided
15	ITO	Hilo Tower and TRACON	Hilo	HI	1979	85'-9"	No	8-sided
16	LNK	Lincoln Tower	Lincoln	NE	1973	73'-8"	Yes	5-sided
17	MKC	Downtown Tower	Kansas City	MO	1987	73'-8"	Yes	8-sided
18	MLI	Quad City Tower and TRACON	Milan	IL	1974	73'-8"	No	5-sided
19	PWM	Portland Tower and TRACON	Portland	ME	1977	61'-7"	Yes	5-sided
20	SGF	Springfield Tower and TRACON	Springfield	MO	1978	73'-8"	Yes	8-sided
21	SUS	Spirit Tower	Chesterfield	MO	1986	85'-9"	No	8-sided

	LOCID	Facility Name	City	State	Commission Year	Height to Cab Floor	Base Building	Cab Type
22	TRI	Tri-Cities Tower and TRACON	Blountville	TN	1986	73'-8"	Yes	5-sided
23	TXK	Texarkana Tower	Texarkana	AR	1969	49'-6"	No	5-sided

Welton Becket

The Welton Becket standard ATCT design consists of four separate non-occupied concrete legs for the full height of the shaft (Figure B-6). At the bottom of the shaft infilling between the four legs is an exterior steel framed platform. At the top of the shaft infilling between the legs are occupied levels consisting of steel framed floors. An eight-sided (chamfered square) steel framed Cab sits atop the shaft. Most (20 of 24) Welton Becket ATCTs have TRACON (or CERAP) functions within an associated Base Building.

The Welton Becket standard ATCT design was the predominant major activity level standard design employed starting in the mid-1970s until the Leo Daly MAL standard designs started to be employed in the mid to late 1990s. The standard derives its name from architecture firm Welton Becket and Associates. The Welton Becket standard design continued to be used past the introduction of the Leo Daly MAL standard; however, since the mid-1990s most ATCTs using the Welton Becket standard design were at lower activity level facilities. The last Welton Becket standard tower commissioning occurred in 2007.

The predominant feature of this tower type is the four precast concrete legs that extend for the full height of the tower to the underside of the Catwalk. At the lower levels of the tower, above the Ground Level, the four legs are the only interior spaces with exterior steel platforms connecting the four legs at 15'-0" vertical intervals. At the top of the tower the area between the legs, at 15'-0" vertical intervals, is infilled with interior spaces. The number of levels infilled with interior spaces varies from two to five, with the more recent commissioned towers tending towards a greater number of infilled floors at the top.

There are currently 24 active Welton Becket type standard ATCTs (Table B-6).

Figure B-6 Welton Becket Type, MSY ATCT (New Orleans, LA), FAA

Table B-6: Welton Becket ATCTs

	LOCID	Facility Name	City	State	Commission Year	Height to Cab Floor	Occupied Levels Directly Below Cab
1	ABE	Allentown Tower	Allentown	PA	1995	120’-0”	Four
2	ABQ	Albuquerque Tower and TRACON	Albuquerque	NM	1994	180’-0”	Two
3	ALB	Albany Tower and TRACON	Albany	NY	1999	90’-0”	Four
4	BDL/Y90	Bradley Tower and TRACON	Windsor Locks	CT	1999	150’-0”	Five
5	BHM	Birmingham Tower and TRACON	Birmingham	AL	2001	180’-6”	Four
6	BNA	Nashville Tower and TRACON	Nashville	TN	1981	150’-0”	Two
7	CHS	Charleston Tower and TRACON	Charleston	SC	1979	150’-0”	Two
8	CLT	Charlotte Tower and TRACON	Charlotte	NC	1978	150’-0”	Two
9	COS	Colorado Springs Tower and TRACON	Peterson AFB	CO	1979	120’-0”	Two
10	DFW	Dallas Center Tower	Dallas-Fort Worth	TX	1974	180’-0”	Two

	LOCID	Facility Name	City	State	Commission Year	Height to Cab Floor	Occupied Levels Directly Below Cab
11	FLL	Fort Lauderdale Tower	Fort Lauderdale	FL	1983	150’-0”	Three
12	FWA	Fort Wayne Tower and TRACON	Fort Wayne	IN	2007	180’-0”	Three
13	HNL	Honolulu Tower and CERAP	Honolulu	HI	1983	150’-0”	Two
14	MKE	Milwaukee Tower and TRACON	Milwaukee	WI	1986	180’-0”	Two
15	MSY	New Orleans Tower and TRACON	New Orleans	LA	1995	180’-0”	Four
16	PHL	Philadelphia Tower and TRACON	Philadelphia	PA	1981	105’-0”	Three
17	PIT	Pittsburgh Tower and TRACON	Pittsburgh	PA	1985	195’-0”	Three
18	RDU	Raleigh-Durham Tower and TRACON	Morrisville	NC	1986	195’-0”	Three
19	RIC	Richmond Tower	Richmond	VA	2004	150’-0”	Four
20	ROA	Roanoke Tower and TRACON	Roanoke	VA	2004	165’-0”	Four
21	ROC	Rochester Tower and TRACON	Rochester	NY	1983	120’-0”	Two
22	SAT	San Antonio Tower and TRACON	San Antonio	TX	1986	195’-0”	Three
23	SAV	Savannah Tower and TRACON	Savannah	GA	2005	164’-11”	Four
24	SYR	Syracuse Tower and TRACON	North Syracuse	NY	1999	120’-0”	Four

Golemon & Rolfe

The Golemon & Rolfe standard ATCT design consists of a primarily non-occupied eight-sided (chamfered square) shaft supporting an eight-sided (chamfered square) Cab (Figure B-7). There are variations in both shaft size and Cab size for this standard. A little over half (21 of 35) Golemon & Rolfe ATCTs have TRACON functions within an associated Base Building.

The Golemon & Rolfe standard tower design was first implemented in the early 1980s. The earliest tower of this standard type was commissioned in 1980 with the last one commissioned in 2007. The standard derives its name from Houston based architecture firm Golemon & Rolfe Associates.

There are currently 35 active Golemon & Rolfe type standard ATCTs (Table B-7).

Figure B-7. Golemon & Rolfe Type, PDK ATCT (Chamblee (Atlanta), GA), FAA

Table B-7. Golemon & Rolfe ATCTs

	LOCID	Facility Name	City	State	Commission Year	Height to Cab Floor	Shaft Size	Cab Size
1	ACY	Atlantic City Tower and TRACON	Atlantic City	NJ	1987	124'-11"	Small	Regular
2	BGR	Bangor Tower and TRACON	Bangor	ME	1996	111'-0"	Medium	Regular
3	BIL	Billings Tower and TRACON	Billings	MT	2006	95'-0"	Medium	Regular
4	BTR	Baton Rouge Tower and TRACON	Baton Rouge	LA	1982	76'-11"	Small	Regular

	LOCID	Facility Name	City	State	Commission Year	Height to Cab Floor	Shaft Size	Cab Size
5	BTV	Burlington Tower and TRACON	S. Burlington	VT	1989	76'-11"	Small	Regular
6	BUF	Buffalo Tower and TRACON	Buffalo	NY	1994	140'-11"	Small	Regular
7	CHA	Chattanooga Tower and TRACON	Chattanooga	TN	1982	76'-11"	Small	Regular
8	DAB	Daytona Beach Tower and TRACON	Daytona Beach	FL	1986	76'-11"	Large	Large
9	DAL	Dallas Love Tower	Dallas	TX	1992	124'-11"	Large	Large
10	DPA	DuPage Tower	West Chicago	IL	1997	108'-11"	Large	Large
11	EUG	Eugene Tower and TRACON	Eugene	OR	1987	92'-11"	Small	Regular
12	FRG	Farmingdale Tower	Farmingdale	NY	1983	92'-11"	Small	Regular
13	FSM	Fort Smith Tower and TRACON	Fort Smith	AR	1999	99'-0"	Large	Large
14	HOU	Hobby Tower	Houston	TX	2000	124'-11"	Large	Large
15	ICT	Wichita Tower and TRACON	Wichita	KS	1983	92'-11"	Small	Regular
16	ILG	Wilmington Tower	New Castle	DE	2001	111'-0"	Medium	Regular
17	LIT	Little Rock Tower and TRACON	Little Rock	AR	2001	124'-11"	Large	Large
18	MAF	Midland Tower and TRACON	Midland	TX	1983	76'-11"	Small	Regular
19	MDT	Harrisburg Intl Tower and TRACON	Middletown	PA	1989	108'-11"	Unknown	Unknown
20	MDW	Midway Tower	Chicago	IL	1997	108'-11"	Large	Large
21	MGM	Montgomery Tower and TRACON	Hope Hull	AL	1996	108'-11"	Small	Regular
22	NEW	Lakefront Tower	New Orleans	LA	1987	76'-11"	Unknown	Unknown
23	OGG	Maui Tower	Kahului	HI	1988	124'-11"	Small	Regular
24	ONT	Ontario Tower	Ontario	CA	1987	108'-11"	Small	Regular
25	ORF	Norfolk Tower and TRACON	Virginia Beach	VA	1995	108'-11"	Small	Regular
26	PDK	DeKalb – Peachtree Tower	Chamblee	GA	1988	108'-11"	Small	Regular
27	PHF	Patrick Henry Tower	Newport News	VA	2007	124'-11"	Medium	Regular

	LOCID	Facility Name	City	State	Commission Year	Height to Cab Floor	Shaft Size	Cab Size
28	PIE	St Petersburg Tower	St Petersburg/ Clearwater	FL	1994	124'-11"	Small	Regular
29	PTK	Pontiac Tower	Waterford	MI	1997	60'-11"	Large	Large
30	PVD	Providence Tower and TRACON	Warwick	RI	1991	76'-11"	Small	Regular
31	RSW	Fort Myers Tower and TRACON	Fort Myers	FL	1983	92'-11"	Small	Regular
32	SBN	South Bend Tower and TRACON	South Bend	IN	1980	76'-11"	Small	Regular
33	SNA	John Wayne Tower	Costa Mesa	CA	1982	64'-0 1/2"	Small	680 gsf
34	SPI	Springfield Tower and TRACON	Springfield	IL	1980	76'-11"	Small	Regular
35	TYS	Knoxville Tower and TRACON	Louisville	TN	1986	76'-11"	Small	Regular

Leo Daly/HNTB Low Activity Level (LAL) ATCT

The Leo Daly/HNTB LAL standard ATCT design consists of an occupied square shaft supporting either a hexagonal or eight-sided (chamfered square) Cab (Figure B-8). There are other variations in this design, such as shaft size and exterior wall construction that make this standard type more variable than other standard ATCT types. This standard design was employed exclusively at ATCTs without TRACON functions.

The Leo Daly/HNTB LAL standard tower design was first implemented in the late 1980s. The standard name interchangeably uses either architecture firm Leo Daly and Associates or engineering firm HNTB. This standard tower type continued through the 1990s and into the 2000s. The standard evolved with the initial design used at smaller facilities and thus the size of the floor plate of the shaft and Cab was relatively small. The initial design was a close relative to the Hunt/AVCO standard tower design of an earlier era. In the early 1990s through the early 2000s, the size of shaft floor plate and Cab grew from the original design for most of the ATCTs employing this standard with the Cab like the small Cab version Golemon & Rolfe standard tower design. The tower standard was gradually phased out as the 2006 LAL Radian standard design was implemented with some overlapping of the two tower types for a while in the 2000s. The earliest tower of this standard type was commissioned in 1987 with the last one commissioned in 2008.

There are currently 19 active Leo Daly/HNTB LAL type standard ATCTs (Table B-8).

Figure B-8. CMA ATCT (Camarillo, CA) with midsize shaft and regular size 8-sided (chamfered square) Cab, FAA

Table B-8: Leo Daly/HNTB Low Activity Level ATCTs

	LOCID	Facility Name	City	State	Commission Year	Shaft and Cab Size	Height to Cab Floor
1	BED	Bedford Tower	Bedford	MA	2003	Medium	98'-6"
2	BFM	Downtown Tower	Mobile	AL	1998	Medium	97'-10"
3	BLI	Bellingham Tower	Bellingham	WA	1996	Medium	57'-10"'
4	BMI	Bloomington Tower	Bloomington	IL	2002	Medium	68'-0"
5	BUR	Burbank Tower	Burbank	CA	1991	Medium	77'-10"
6	CMA	Camarillo Tower	Camarillo	CA	1991	Medium	67'-10"
7	CNO	Chino Tower	Chino	CA	1993	Medium	77'-10"
8	CPS	Downtown Tower	Cahokia/East St. Louis	IL	2008	Medium	111'-4"
9	FPR	St Lucie Tower	Fort Pierce	FL	1987	Small	87'-7 3/4"
10	LMT	Klamath Falls Tower	Klamath Falls	OR	1999	Medium	58'-6"
11	PRC	Prescott Tower	Prescott	AZ	1988	Small	47'-7 3/4"
12	PWK	Chicago Executive Tower	Wheeling	IL	1997	Medium	88'-0"
13	RDM	Redmond Tower	Redmond	OR	1997	Medium	68'-0"
14	SBP	San Luis Obispo Tower	San Luis Obispo	CA	1988	Small	47'-8 5/8"
15	SDL	Scottsdale Tower	Scottsdale	AZ	1989	Medium	77'-10"
16	SFB	Sanford Tower	Sanford	FL	1997	Medium	77'-10"
17	SGR	Sugarland Tower	Sugar Land	TX	2001	Unknown	Unknown
18	UGN	Waukegan Tower	Waukegan	IL	1987	Small	67'-7 3/4"

Leo Daly/HNTB Intermediate Activity Level (IAL) ATCT

Like its LAL cousin, this standard ATCT design consists of an occupied square shaft supporting an eight-sided (chamfered square) Cab (Figure B-9). The early versions of the tower employed at SAN (San Diego International Airport, CA) and SJC (San Jose International Airport, CA) were designed by Leo Daly, while the later versions employed at MRI (Merrill Field, AL) and PIE (St. Pete-Clearwater International Airport, FL) were designed by HNTB. This standard design was employed exclusively at ATCTs without TRACON functions.

The Leo Daly/HNTB IAL standard tower design uses many of the characteristics of the similarly named LAL standard design. The standard name interchangeably uses either architecture firm Leo Daly and Associates or engineering firm HNTB. This standard tower type had a brief lifespan starting in the mid-1990s and concluding with the last tower commissioned in 2003.

There are currently four active Leo Daly/HNTB IAL type standard ATCTs (Table B-9).

Figure B-9. SAN ATCT (San Diego, CA) Leo Daly IAL design

Table B-9. Leo Daly/HNTB Intermediate Activity Level ATCTs

	LOCID	Facility Name	City	State	Commission Year	Height to Cab Floor
1	MRI	Merrill Field	Anchorage	AK	1999	100'-0"
2	PAE	Payne Field	Everett	WA	2003	162'-0"
3	SAN	San Diego Tower	San Diego	CA	1996	104'-4"
4	SJC	San Jose Tower	San Jose	CA	1994	78'-4"

Radian/2006 Low Activity Level (LAL) ATCT

The Radian/2006 standard LAL type ATCT design consists of a non- occupied 10-sided shaft that transitions to a larger 20-sided upper tower section (Junction Level) before transitioning to a 10-sided Cab (Figure B-10). Less than one third (5 of 18) of the Radian/2006 LAL ATCTs have TRACON functions within an associated Base Building.

The Radian/2006 LAL standard was implemented starting in the late 1990s replacing the previous Leo Daly LAL standard design with a limited amount of overlap between the commissioning eras of the two standards. In 2006, the standard design was modified slightly thus this standard type is interchangeably referred to as either the Radian or 2006 LAL design. Euphemistically, it is also called the "water tower" design givens its narrow shaft transitioning to a much wider shaft at the top prior to the Cab.

There are currently 18 active Radian/2006 LAL type standard ATCTs (Table B-10).

Figure B-10. VGT ATCT (North Las Vegas, NV), FAA

Table B-10. Radian/2006 Low Activity Level ATCTs

	LOCID	Facility Name	City	State	Commission Year	Height to Cab Floor
1	ABI	Abilene Tower and TRACON	Abilene	TX	2012	115'-1"
2	AVP	Scranton Tower and TRACON	Scranton	PA	2012	92'-2"
3	AZO	Kalamazoo Tower and TRACON	Kalamazoo	MI	2014	137'-8"
4	BJC	Broomfield Tower	Broomfield	CO	2012	110'-0"
5	DVT	Deer Valley Tower	Phoenix	AZ	2007	130'-0"
6	FOE	Forbes Tower	Topeka	KS	2003	97'-0"
7	FXE	Fort Lauderdale Executive Tower	Fort Lauderdale	FL	2014	84'-0"
8	GCN	Grand Canyon Tower	Grand Canyon	AZ	2003	98'-0"
9	GPT	Gulfport Tower and TRACON	Gulfport	MS	2012	116'-8"
10	ISP	Islip Towe	Islip	NY	2011	129'-0"
11	KOA	Kona Tower	Kona	HI	2012	110'-4"
12	MHT	Manchester Tower	Manchester	NH	2006	145'-0"
13	OPF	Opa Locka Tower	Opa Locka	FL	2012	Unknown
14	PSP	Palm Springs Tower and TRACON	Palm Springs	CA	2013	126'-7"
15	SLN	Salina Tower	Salina	KS	2002	97'-0"
16	TVC	Traverse City Tower	Traverse City	MI	2013	135'-11"
17	VGT	North Las Vegas Tower	North Las Vegas	NV	2002	65'-0"
18	VRB	Vero Beach Tower	Vero Beach	FL	2003	82'-2"

Radian/2006 Intermediate Activity Level (IAL) ATCT

The Radian/2006 standard IAL type ATCT design consists of a non-occupied 12-sided shaft that transitions to a larger 12-sided upper tower section (Junction Level) before transitioning to a 12-sided Cab (Figure B-11). One half (2 of 4) of the Radian/2006 IAL ATCTs have TRACON functions within an associated Base Building.

The Radian/2006 IAL standard was implemented starting in the mid-2000s replacing the previous Leo Daly IAL and Golemon & Rolfe standard designs with a limited amount of overlap between the commissioning with the Golemon & Rolfe standard only. The IAL standard is a close relative of the similarly named LAL standard, with the primary difference being a 12-sided slightly larger shaft, a larger 12-sided Cab and greater tower height. As of 2020, the use of this standard is still on-going.

There are currently four active Radian/2006 IAL type standard ATCTs (Table B-11).

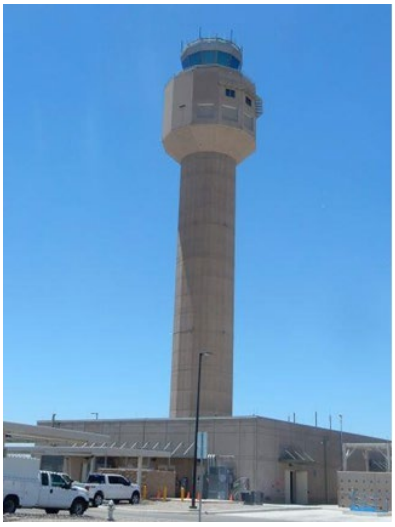

Figure B-11. TUS ATCT (Tucson, AZ)

Table B-11: Radian/2006 Intermediate Activity Level ATCTs

	LOCID	Facility Name	City	State	Commission Year	Height to Cab Floor
1	HSV	Huntsville Tower and TRACON	Huntsville	AL	2008	214'-1"
2	OAK	Oakland Tower	Oakland	CA	2013	218'-9"
3	PBI	Palm Beach Tower and TRACON	West Palm Beach	FL	2013*	203'-0"
4	TUS	Tucson Tower	Tucson	AZ	2016	224'-0"

* ATCT construction finished in 2010 with commissioning in 2013.

APPENDIX | C DESCRIPTIONS OF ECOREGIONS

This appendix contains descriptions of the Primary Distinguishing Characteristics of Level III Ecoregions of the Continental United States (U.S. Environmental Protection Agency, 2013). The descriptions below, numbered 1 to 85, correspond to the ecoregion numbers in Figure 4-2 within Biological Resources (see Section 4.2).

1. Coast Range

The low mountains of the Coast Range of western Washington, western Oregon, and northwestern California are covered by highly productive, rain-drenched coniferous forests. Sitka spruce forests originally dominated the fog-shrouded coast, while a mosaic of western redcedar, western hemlock, and seral Douglas-fir blanketed inland areas. Today, Douglas-fir plantations are prevalent on the intensively logged and managed landscape. In California, redwood forests are a dominant component in much of the region. In Oregon and Washington, soils are typically Inceptisols and Andisols, while Alfisols are common in the California portion. Landslides and debris slides are common, and lithology influences land management strategies. In Oregon and Washington, slopes underlain by sedimentary rock are more susceptible to failure following clear-cutting and road building than those underlain by volcanic rocks. Coastal headlands, high and low marine terraces, sand dunes, and beaches also characterize the region.

2. Puget Lowlands

This broad rolling lowland is characterized by a mild maritime climate. It occupies a continental glacial trough and is composed of many islands, peninsulas, and bays in the Puget Sound area. Coniferous forests originally grew on the ecoregion's ground moraines, outwash plains, floodplains, and terraces. The distribution of forest species is affected by the rainshadow from the Olympic Mountains. Douglas-fir, western hemlock, western red cedar, grand fir, red alder, and bigleaf maple are common forest components. A few small areas of oak woodlands occur in drier locations.

3. Willamette Valley

The Willamette Valley ecoregion contains terraces and floodplains of the Willamette River system, along with scattered hills, buttes, and adjacent foothills. Originally, it was covered by prairies, oak savannas, coniferous forests, extensive wetlands, and deciduous riparian forests. Elevation and relief are lower, and the vegetation mosaic differs from the coniferous forests of the surrounding Coast Range (1), Cascades (4), and Klamath Mountains (78). Mean annual rainfall is 37 to 60 inches and summers are generally dry; overall, precipitation is lower than in the surrounding mountains. Today, the Willamette Valley contains the bulk of Oregon's population, industry, commerce, and cropland. Productive soils and a temperate climate make it one of the most important agricultural areas in Oregon.

4. Cascades

This mountainous ecoregion stretches from the central portion of western Washington, through the spine of Oregon, and includes a disjunct area in northern California. It is

underlain by Cenozoic volcanics and much of the region has been affected by alpine glaciation. In Oregon and Washington, the western Cascades are older, lower, and dissected by numerous, steep-sided stream valleys. A high plateau occurs to the east, with both active and dormant volcanoes. Some peaks reach over 14,000 feet. Soils are mostly of cryic and frigid temperature regimes, with some mesic soils at low elevations and in the south. Andisols and Inceptisols are common. The Cascades have a moist, temperate climate that supports an extensive and highly productive coniferous forest that is intensively managed for logging. At lower elevations in the north, Douglas-fir, western hemlock, western red cedar, big leaf maple, and red alder are typical. At higher elevations, Pacific silver fir, mountain hemlock, subalpine fir, noble fir, and lodgepole pine occur. In southern Oregon and California, more incense cedar, white fir, and Shasta red fir occur along with other Sierran species. Subalpine meadows and rocky alpine zones occur at highest elevations.

5. Sierra Nevada

The Sierra Nevada is a mountainous, deeply dissected, and westerly tilting fault block. The central and southern part of the region is largely composed of granitic rocks that are lithologically distinct from the mixed geology of the Klamath Mountains (78) and the volcanic rocks of the Cascades (4). In the northern Sierra Nevada, however, the lithology has some similarities to the Klamath Mountains. A high fault scarp divides the Sierra Nevada from the Northern Basin and Range (80) and Central Basin and Range (13) to the east. Near this eastern fault scarp, the Sierra Nevada reaches its highest elevations. Here, moraines, cirques, and small lakes are common and are products of Pleistocene alpine glaciation. Large areas are above timberline, including Mt. Whitney in California, the highest point in the conterminous United States at nearly 14,500 feet. The Sierra Nevada casts a rain shadow over Ecoregions 13 and 80 to the east. The ecoregion slopes more gently toward the Central California Valley (7) to the west. The vegetation grades from mostly ponderosa pine and Douglas-fir at the lower elevations on the west side, pines, and Sierra juniper on the east side, to fir and other conifers at the higher elevations. Alpine conditions exist at the highest elevations. Large areas are publicly owned federal land, including several national parks.

6. Central California Foothills and Coastal Mountains

The primary distinguishing characteristic of this ecoregion is its Mediterranean climate of hot dry summers and cool moist winters and associated vegetative cover comprising mainly chaparral and oak woodlands; grasslands occur in some lower elevations and patches of pine are found at higher elevations. Surrounding the lower and flatter Central California Valley (7), most of the region consists of open low mountains or foothills, but there are some areas of irregular plains and some narrow valleys. Large areas are in ranch lands and grazed by domestic livestock. Relatively little land has been cultivated, although some valleys are major agricultural centers such as the Salinas or the wine vineyard center of Napa and Sonoma.

7. Central California Valley

Flat, intensively farmed plains with long, hot dry summers and mild winters distinguish the Central California Valley from its neighboring ecoregions that are either hilly or mountainous, forest or shrub covered, and generally nonagricultural. It includes the flat valley basins of deep sediments adjacent to the Sacramento and San Joaquin rivers, as well

as the fans and terraces around the edge of the valley. The two major rivers flow from opposite ends of the Central Valley, flowing into the Delta and into San Pablo Bay. It once contained extensive prairies, oak savannas, desert grasslands in the south, riparian woodlands, freshwater marshes, and vernal pools. More than half of the region is now in cropland, about three fourths of which is irrigated. Environmental concerns in the region include salinity due to evaporation of irrigation water, groundwater contamination from heavy use of agricultural chemicals, wildlife habitat loss, and urban sprawl.

8. Southern California Mountains

Similar to other ecoregions in central and southern California, the Southern California Mountains have a Mediterranean climate of hot dry summers and moist cool winters. Although Mediterranean types of vegetation such as chaparral and oak woodlands predominate in this region, the elevations are considerably higher, the summers are slightly cooler, and precipitation amounts are greater than in adjacent ecoregions, resulting in denser vegetation and some large areas of coniferous woodlands. In parts of the Transverse Range, a general slope effect causes distinct ecological differences. The south-facing slopes typically have higher precipitation (30-40 inches) compared to many of the north slopes of the range (15-20 inches), but high evaporation rates on the south contribute to a cover of chaparral. On the north side of parts of the ecoregion, lower evaporation, lower annual temperatures, and slower snow melt allows for a coniferous forest that blends into desert montane habitats as it approaches the Mojave Desert ecoregion boundary. Woodland species such as Jeffrey, Coulter, and Ponderosa pines occur, along with sugar pine, white fir, bigcone Douglas-fir, and, at highest elevations, some lodgepole and limber pines. Severe erosion problems are common where the vegetation cover has been destroyed by fire or overgrazing. Large portions of the region are National Forest public land.

9. Eastern Cascade Slopes and Foothills

The Eastern Cascade Slopes and Foothills ecoregion is in the rainshadow of the Cascade Range (4). It has a more continental climate than ecoregions to the west, with greater temperature extremes and less precipitation. Open forests of ponderosa pine and some lodgepole pine distinguish this region from the higher ecoregions to the west where hemlock and fir forests are common, and the lower, drier ecoregions to the east where shrubs and grasslands are predominant. The vegetation is adapted to the prevailing dry, continental climate, and frequent fire. Historically, creeping ground fires consumed accumulated fuel and devastating crown fires were less common in dry forests. Volcanic cones and buttes are common in much of the region. A few areas of cropland and pastureland occur in the lake basins or larger river valleys.

10. Columbia Plateau

The Columbia Plateau is an arid sagebrush steppe and grassland, surrounded on all sides by moister, predominantly forested, mountainous ecological regions. This region is underlain by basalt up to two miles thick. It is covered in some places by loess soils that have been extensively cultivated for wheat, particularly in the eastern portions of the region where precipitation amounts are greater. During the glaciation of the Pleistocene era, parts of the area were scoured to bedrock by huge floods from breached ice dams.

11. Blue Mountains

The Blue Mountains ecoregion is a complex of mountain ranges that are generally lower and more open than the neighboring Cascades (4), Northern Rockies (15), and the Idaho Batholith (16) ecoregions. Like the Cascades, but unlike the Northern Rockies, the region is mostly volcanic in origin. Only the few higher ranges, particularly the Wallowa and Elkhorn Mountains, consist of granitic intrusive and metamorphic rocks that rise above the dissected lava surface of the region. Unlike the bulk of the Cascades, Idaho Batholith, and Northern Rockies, much of this ecoregion is grazed by cattle.

12. Snake River Plain

This portion of the xeric intermontane western United States is considerably lower and more gently sloping than the surrounding ecoregions. Mostly because of the available water for irrigation, a large percent of the alluvial valleys bordering the Snake River are in agriculture, with sugar beets, potatoes, alfalfa, and vegetables being the principal crops. Cattle feedlots and dairy operations are also common in the river plain. Except for the scattered barren lava fields, most of the plains and low hills in the ecoregion have a sagebrush-grassland vegetation, now used mostly for cattle grazing.

13. Central Basin and Range

The Central Basin and Range ecoregion is composed of northerly trending, fault-block ranges and intervening, drier basins. In the higher mountains, woodland, mountain brush, and scattered open forest are found. Lower elevation basins, slopes, and alluvial fans are either shrub- and grass-covered, shrub-covered, or barren. The potential natural vegetation, in order of decreasing elevation and ruggedness, is scattered western spruce-fir forest, juniper woodland, Great Basin sagebrush, and saltbush-greasewood. The Central Basin and Range is internally drained by ephemeral streams and once contained ancient Lake Lahontan. In general, Ecoregion 13 is warmer and drier than the Northern Basin and Range (80) and has more shrubland and less grassland than the Snake River Plain (12). Soils grade upslope from mesic Aridisols to frigid Mollisols. The land is primarily used for grazing. In addition, some irrigated cropland is found in valleys near mountain water sources. The region is not as hot as the Mojave Basin and Range (14) and Sonoran Basin and Range (81) ecoregions, and it has a greater percent of land that is grazed.

14. Mojave Basin and Range

Stretching across southeastern California, southern Nevada, southwest Utah, and northwest Arizona, Ecoregion 14 is composed of broad basins and scattered mountains that are generally lower, warmer, and drier than those of the Central Basin and Range (13). Its creosotebush-dominated shrub community is distinct from the saltbush–greasewood and sagebrush–grass associations that occur to the north in the Central Basin and Range (13) and Northern Basin and Range (80); it is also differs from the palo verde–cactus shrub and saguaro cactus that occur in the Sonoran Basin and Range (81) to the south. In the Mojave, creosotebush, white bursage, Joshua-tree and other yuccas, and blackbrush are typical. On alkali flats, saltbush, saltgrass, alkali sacaton, and iodinebush are found. On mountains, sagebrush, juniper, and singleleaf pinyon occur. At high elevations, some ponderosa pine,

white fir, limber pine, and bristlecone pine can be found. The basin soils are mostly Entisols and Aridisols that typically have a thermic temperature regime; they are warmer than those of Ecoregion 13 to the north. Heavy use of off-road vehicles and motorcycles in some areas has made the soils susceptible to wind and water erosion. Most of Ecoregion 14 is federally owned and grazing is constrained by the lack of water and forage for livestock.

15. Northern Rockies

The Northern Rockies ecoregion is mountainous and rugged. Despite its inland position, both climate and vegetation are typically, but not always, marine-influenced. Douglas-fir, subalpine fir, Englemann spruce, and ponderosa pine and Pacific indicators such as western red cedar, western hemlock, and grand fir occur in the ecoregion. The vegetation mosaic is different from that of the Idaho Batholith (16) and Middle Rockies (17) which are not dominated by maritime species. The Northern Rockies ecoregion is not as high nor as extensively snow- and ice-covered as the Canadian Rockies (41), although alpine characteristics occur at highest elevations and include numerous glacial lakes. Granitic rocks and associated management problems are less extensive than in the Idaho Batholith. Thick volcanic ash deposits blanket large portions of Ecoregion 15 and are more widespread than in Ecoregion 16. Logging and mining are common and have caused stream water quality problems in the region.

16. Idaho Batholith

This ecoregion is a dissected, partially glaciated, mountainous plateau. Many perennial streams originate here, and water quality can be high if basins are undisturbed. Deeply weathered, acidic, intrusive igneous rock is common and is far more extensive than in the Northern Rockies (15) or the Middle Rockies (17). Soils are sensitive to disturbance especially when stabilizing vegetation is removed. Land uses include logging, grazing, and recreation. Mining and related damage to aquatic habitat was widespread. Grand fir, Douglas-fir, and, at higher elevations, Engelmann spruce and subalpine fir occur. Ponderosa pine, shrubs, and grasses grow in very deep canyons. Maritime influence lessens toward the south and is never as strong as in the Northern Rockies.

17. Middle Rockies

The climate of the Middle Rockies lacks the strong maritime influence of the Northern Rockies (15). Mountains have Douglas-fir, subalpine fir, and Engelmann spruce forests, as well as some large alpine areas. Pacific tree species are never dominant, and forests can have open canopies. Foothills are partly wooded or shrub- and grass-covered. Intermontane valleys are grass- and/or shrub-covered and contain a mosaic of terrestrial and aquatic fauna that is distinct from the nearby mountains. Many mountain-fed, perennial streams occur and differentiate the intermontane valleys from the Northwestern Great Plains (43). Granitics and associated management problems are less extensive than in the Idaho Batholith (16). Recreation, logging, mining, and summer livestock grazing are common land uses.

18. Wyoming Basin

This ecoregion is a broad intermontane basin interrupted by hills and low mountains and dominated by arid grasslands and shrublands. Nearly surrounded by forest covered mountains, the region is somewhat drier than the Northwestern Great Plains (43) to the northeast and does not have the extensive cover of pinyon-juniper woodland found in the Colorado Plateaus (20) to the south. Much of the region is used for livestock grazing, although many areas lack sufficient vegetation to support this activity. The region contains major producing natural gas and petroleum fields. The Wyoming Basin also has extensive coal deposits along with areas of trona, bentonite, clay, and uranium mining.

19. Wasatch and Uinta Mountains

This ecoregion is composed of a core area of high, precipitous mountains with narrow crests and valleys flanked in some areas by dissected plateaus and open high mountains. The elevational banding pattern of vegetation is similar to that of the Southern Rockies (21) except that areas of aspen, interior chaparral, and juniper-pinyon and scrub oak are more common at middle elevations. This characteristic, along with a far lesser extent of lodgepole pine and greater use of the region for grazing livestock in the summer months, distinguish the Wasatch and Uinta Mountains ecoregion from the more northerly Middle Rockies (17).

20. Colorado Plateaus

Ecoregion 20 is an uplifted, eroded, and deeply dissected tableland. Its benches, mesas, buttes, salt valleys, cliffs, and canyons are formed in and underlain by thick layers of sedimentary rock. Precipitous sidewalls mark abrupt changes in local relief, often of 1000 to 2000 feet or more. The region contains a greater extent of pinyon-juniper and Gambel oak woodlands than the Wyoming Basin (18) to the north. There are also large low-lying areas containing saltbrush-greasewood (typical of hotter, drier areas), which are generally not found in the higher Arizona/New Mexico Plateau (22) to the south where grasslands were typically more common. Summer moisture from thunderstorms supports warm season grasses not found in the Central Basin and Range (13) to the west. Many endemic plants occur, and species diversity is greater than in Ecoregion 13. Several national parks are located in this ecoregion and attract many visitors to view their arches, spires, and canyons.

21. Southern Rockies

The Southern Rockies are composed of steep, rugged mountains with high elevations. Although coniferous forests cover much of the region, as in most of the mountainous regions in the western United States, vegetation, as well as soil and land use, follows a pattern of elevational banding. The lowest elevations are generally grass or shrub covered and heavily grazed. Low to middle elevations are also grazed and covered by a variety of vegetation types including Douglas-fir, ponderosa pine, aspen, and juniper-oak woodlands. Middle to high elevations are largely covered by coniferous forests and have little grazing activity. The highest elevations have alpine characteristics.

22. Arizona/New Mexico Plateau

The Arizona/New Mexico Plateau represents a large transitional region between the drier shrublands and wooded higher relief tablelands of the Colorado Plateaus (20) in the north, the lower, hotter, less vegetated Mojave Basin and Range (14) in the west, and the semiarid grasslands of the Southwestern Tablelands (26) to the east. Higher, forest-covered mountainous ecoregions border the region on the northeast (21) and south (23). Local relief in the region varies from a few feet on plains and mesa tops to well over 1000 feet along tableland side slopes. The region extends across northern Arizona, northwestern New Mexico, and into the San Luis Valley of Colorado. Gunnison prairie dogs are a keystone species in many of the sagebrush ecosystems and their burrows provide habitat for other wildlife including burrowing owls, weasels, badgers, and a variety of snakes.

23. Arizona/New Mexico Mountains

The Arizona/New Mexico Mountains are distinguished from neighboring mountainous ecoregions by their lower elevations and an associated vegetation indicative of drier, warmer environments, due in part to the region's more southerly location. Forests of spruce, fir, and Douglas-fir, common in the Southern Rockies (21) and the Wasatch and Uinta Mountains (19), are only found in limited areas at the highest elevations in this region. Chaparral is common at lower elevations in some areas, pinyon-juniper and oak woodlands occur at lower and middle elevations, and the higher elevations are mostly covered with open to dense ponderosa pine forests. These mountains are the northern extent of some Mexican plant and animal species. Surrounded by deserts or grasslands, these mountains in Arizona and New Mexico can be considered biogeographical islands.

24. Chihuahuan Deserts

This desert ecoregion extends from the Madrean Archipelago (79) in southeast Arizona to the Edwards Plateau (30) in south-central Texas. It is the northern portion of the southernmost desert in North America that extends more than 500 miles south into Mexico. It is generally a continuation of basin and range terrain that is typical of the Mojave Basin and Range (14) and Sonoran Basin and Range (81) ecoregions to the west, although the pattern of alternating mountains and valleys is not as pronounced. The mountain ranges are a geologic mix of Tertiary volcanic and intrusive granitic rocks, Paleozoic sedimentary layers, and some Precambrian granitic plutonic rocks. Outside the major river drainages, such as the Rio Grande and Pecos River in New Mexico and Texas, the landscape is largely internally drained. Vegetative cover is predominantly desert grassland and arid shrubland, except for high elevation islands of oak, juniper, and pinyon pine woodland. The extent of desert shrubland is increasing across lowlands and mountain foothills due to gradual desertification caused in part by historical grazing pressure.

25. High Plains

Higher and drier than the Central Great Plains (27) to the east, and in contrast to the irregular, mostly grassland or grazing land of the Northwestern Great Plains (43) to the north, much of the High Plains is characterized by smooth to slightly irregular plains having a high percentage of cropland. Grama-buffalo grass is the potential natural vegetation in this

region as compared to mostly wheatgrass-needlegrass to the north, Trans-Pecos shrub savanna to the south, and taller grasses to the east. The northern boundary of this ecological region is also the approximate northern limit of winter wheat and sorghum and the southern limit of spring wheat.

26. Southwestern Tablelands

The southwestern Tablelands flank the High Plains (25) with red hued canyons, mesas, badlands, and dissected river breaks. Unlike most adjacent Great Plains ecological regions, little of the Southwestern Tablelands is in cropland. Much of this region is in sub-humid grassland and semiarid range land. The potential natural vegetation is grama-buffalo grass with some mesquite-buffalo grass in the southeast, juniper-scrub oak-midgrass savanna on escarpment bluffs, and shinnery (midgrass prairie with open low and shrubs) along the Canadian River.

27. Central Great Plains

The Central Great Plains are slightly lower, receive more precipitation, and are somewhat more irregular than the High Plains (25) to the west. Once a grassland, with scattered low trees and shrubs in the south, much of this ecological region is now cropland, the eastern boundary of the region marking the eastern limits of the major winter wheat growing area of the United States. Subsurface salt deposits and leaching contribute to high salinity found in some streams.

28. Flint Hills

The Flint Hills is a region of rolling hills with relatively narrow steep valleys and is composed of shale and cherty limestone with rocky soils. In contrast to surrounding ecological regions that are mostly in cropland, most of the Flint Hills region is grazed by beef cattle. The Flint Hills mark the western edge of the tallgrass prairie and contain the largest remaining intact tallgrass prairie in the Great Plains.

29. Cross Timbers

The Cross Timbers ecoregion is a transition area between the once prairie, now winter wheat growing regions to the west, and the forested low mountains or hills of eastern Oklahoma and Texas. The region does not possess the arability and suitability for crops such as corn and soybeans that are common in the Central Irregular Plains (40) to the northeast. Transitional “cross-timbers” (little bluestem grassland with scattered blackjack oak and post oak trees) is the native vegetation, and presently rangeland and pastureland comprise the predominant land cover, with some areas of woodland. Oil extraction has been a major activity in this region for over eighty years.

30. Edwards Plateau

This ecoregion is largely a dissected limestone plateau that is hillier in the south and east where it is easily distinguished from bordering ecological regions by a sharp fault line. The region contains a sparse network of perennial streams, but due to karst topography and resultant underground drainage they are relatively clear and cool compared to those of

surrounding areas. Originally covered by juniper-oak savanna and mesquite-oak savanna, most of the region is used for grazing beef cattle, sheep, goats, and wildlife. Hunting leases are a major source of income.

31. Southern Texas Plains

This rolling to moderately dissected plain was once covered with grassland and savanna vegetation that varied during wet and dry cycles. Following long continued grazing and fire suppression, thorny brush, such as mesquite, is now the predominant vegetation type. Also known as the Tamualipan Thornscrub, or the "brush country," as it is called locally, the subhumid to dry region has its greatest extent in Mexico. It is generally lower in elevation with warmer winters than the Chihuahuan Deserts (24) to the northwest, and it contains a high and distinct diversity of plant and animal life. Oil and natural gas production activities are widespread.

32. Texas Blackland Prairies

The Texas Blackland Prairies form a disjunct ecological region, distinguished from surrounding regions by its fine-textured, clayey soils and predominantly prairie potential natural vegetation. This region now contains a higher percentage of cropland than adjacent regions, and pasture and forage production for livestock is common. Large areas of the region are being converted to urban and industrial uses.

33. East Central Texas Plains

Also called the Post Oak Savanna or the Claypan Area, this region of irregular plains was originally covered by post oak savanna vegetation, in contrast to the more open prairie-type regions to the north, south, and west and the pine forests to the east. The boundary with Ecoregion 35 is a subtle transition of soils and vegetation. Many areas have a dense, underlying clay pan affecting water movement and available moisture for plant growth. The bulk of this region is now used for pasture and range.

34. Western Gulf Coastal Plain

The principal distinguishing characteristics of the Western Gulf Coastal Plain are its relatively flat coastal plain topography and mainly grassland potential natural vegetation. Inland from this region the plains are older, more irregular, and have mostly forest or savanna-type vegetation potentials. Largely because of these characteristics, a higher percentage of the land is in cropland than in bordering ecological regions. Urban and industrial land uses have expanded greatly in recent decades, and oil and gas production are common.

35. South Central Plains

Locally termed the "piney woods," this region of mostly irregular plains represents the western edge of the southern coniferous forest belt. Once blanketed by a mix of pine and hardwood forests, much of the region is now in loblolly and shortleaf pine plantations. Only about one sixth of the region is in cropland, primarily within the Red River floodplain, while

about two thirds of the region is in forests and woodland. Lumber, pulpwood, oil, and gas production are major economic activities.

36. Ouachita Mountains

The Ouachita Mountains ecological region is made up of sharply defined east-west trending ridges, formed through erosion of compressed sedimentary rock formations. The Ouachitas are structurally different from the Boston Mountains (38), more folded and rugged than the lithologically distinct Ozark Highlands (39), and physiographically unlike the Arkansas Valley (37), South Central Plains (35), and Mississippi Alluvial Plain (73). Potential natural vegetation is oak-hickory-pine forest, which contrasts with the oak-hickory forest that dominates Ecoregion 39 and the northern part of the Boston Mountains (38). Most of this region is now in loblolly and shortleaf pine. Commercial logging is the major land use in the region.

37. Arkansas Valley

A region of mostly forested valleys and ridges, the physiography of the Arkansas Valley is much less irregular than that of the Boston Mountains (38) to the north and the Ouachita Mountains (36) to the south but is more irregular than the ecological regions to the west and east. About one fourth of the region is grazed and roughly one tenth is cropland. In the Arkansas Valley, even streams that have been relatively unimpacted by human activities have considerably lower dissolved oxygen levels, and hence support different biological communities, than those of most of the adjacent regions.

38. Boston Mountains

In contrast to the nearby Ouachita Mountains (36) region which comprises folded and faulted linear ridges mostly covered by pine forests, the Boston Mountains ecological region consists of a deeply dissected sandstone and shale plateau, originally covered by oak-hickory forests. Red oak, white oak, and hickory remain the dominant vegetation types in this region, although shortleaf pine and eastern red cedar are found in many of the lower areas and on some south- and west-facing slopes. The region is sparsely populated, and recreation is a principal land use.

39. Ozark Highlands

The Ozark Highlands ecoregion has a more irregular physiography and is generally more forested than adjacent regions, with the exception of the Boston Mountains (38) to the south. Soils are mostly derived from cherty carbonate rocks. Cambrian and Ordovician dolomite and sandstone comprise the dominant bedrock in the interior of the region with Mississippian limestone underlying the western outer regions. Karst features, including caves, springs, and spring-fed streams are found throughout most of the Ozark Highlands. The majority of the region is forested; oak is the predominant forest type, but mixed stands of oak and pine are also common, with pine concentrations greatest to the southeast. Less than one fourth of the core of this region has been cleared for pasture and cropland, but half or more of the periphery, while not as agricultural as bordering ecological regions, is in cropland and pasture.

40. Central Irregular Plains

The Central Irregular Plains have a mix of land use and are topographically more irregular than the Western Corn Belt Plains (47) to the north, where most of the land is in crops. The region, however, is less irregular and less forest covered than the ecoregions to the south and east. The potential natural vegetation of this ecological region is a grassland/forest mosaic with wider forested strips along the streams compared to Ecoregion 47 to the north. The mix of land use activities in the Central Irregular Plains includes mining operations of high-sulfur bituminous coal. The disturbance of these coal strata in southern Iowa and northern Missouri has degraded water quality and affected aquatic biota.

41. Canadian Rockies

As its name indicates, most of this region is located in Canada. It straddles the border between Alberta and British Columbia in Canada and extends southeastward into northwestern Montana. The region is generally higher and more ice-covered than the Northern Rockies, and portions are strongly influenced by moist maritime air masses. Vegetation is mostly Douglas-fir, Engelmann spruce, subalpine fir, and lodgepole pine in the forested elevations, with treeless alpine conditions at higher elevations. A large part of the region is in national parks where tourism is the major land use. Forestry and mining occur on the nonpark lands.

42. Northwestern Glaciated Plains

The Northwestern Glaciated Plains ecoregion is a transitional region between the generally more level, moister, more agricultural Northern Glaciated Plains (46) to the east and the generally more irregular, dryer, Northwestern Great Plains (43) to the west and southwest. The western and southwestern boundary roughly coincides with the limits of continental glaciation. Pocking this ecoregion is a moderately high concentration of semi-permanent and seasonal wetlands, locally referred to as Prairie Potholes.

43. Northwestern Great Plains

The Northwestern Great Plains ecoregion encompasses the Missouri Plateau section of the Great Plains that is mostly unglaciated. It is a semiarid rolling plain of shale, siltstone, and sandstone punctuated by occasional buttes and badlands. Rangeland is common, but spring wheat and alfalfa farming also occur; native grasslands, persist in areas of steep or broken topography. Agriculture is restricted by the erratic precipitation and limited opportunities for irrigation.

44. Nebraska Sandhills

The Nebraska Sandhills comprise one of the most distinct and homogenous ecoregions in North America. One of the largest areas of grass stabilized sand dunes in the world, this region is generally devoid of cropland agriculture and except for some riparian areas in the north and east, the region is treeless. Large portions of this ecoregion contain numerous lakes and wetlands and have a lack of streams. The area is sparsely populated; however, large cattle ranches are found throughout the region.

45. Piedmont

Considered the nonmountainous portion of the old Appalachians Highland by physiographers, the northeast-southwest trending Piedmont ecoregion comprises a transitional area between the mostly mountainous ecoregions of the Appalachians to the northwest and the relatively flat coastal plain to the southeast. It is a complex mosaic of Precambrian and Paleozoic metamorphic and igneous rocks, with moderately dissected irregular plains and some hills. The soils tend to be finer-textured than in coastal plain regions (63, 65). Once largely cultivated, much of this region has reverted to successional pine and hardwood woodlands, with an increasing conversion to an urban and suburban land cover.

46. Northern Glaciated Plains

The Northern Glaciated Plains ecoregion is characterized by a flat to gently rolling landscape composed of glacial drift. The subhumid conditions foster a grassland transitional between tall and shortgrass prairie. High concentrations of temporary and seasonal wetlands create favorable conditions for waterfowl nesting and migration. Although the till soils are very fertile, agricultural success is subject to annual climatic fluctuations.

47. Western Corn Belt Plains

Once mostly covered with tallgrass prairie, over 80 percent of the Western Corn Belt Plains is now used for cropland agriculture and much of the remainder is in forage for livestock. A combination of nearly level to gently rolling glaciated till plains and hilly loess plains, an average annual precipitation of 26 to 37 inches, which occurs mainly in the growing season, and fertile, warm, moist soils make this on of the most productive areas of corn and soybeans in the world. Agricultural practices have contributed to environmental issues, including surface and groundwater contamination from fertilizer and pesticide applications as well as concentrated livestock production.

48. Lake Agassiz Plain

Glacial Lake Agassiz was the last in a series of proglacial lakes to fill the Red River valley in the three million years since the beginning of the Pleistocene. Thick beds of lake sediments on top of glacial till create the extremely flat floor of the Lake Agassiz Plain. The historic tallgrass prairie has been replaced by intensive row crop agriculture. The preferred crops in the northern half of the region are potatoes, beans, sugar beets, and wheat; soybeans, sugar beets, and corn predominate in the south.

49. Northern Minnesota Wetlands

Much of the Northern Minnesota Wetlands is a vast and nearly level marsh that is sparsely inhabited by humans and covered by swamp and boreal forest vegetation. Formerly occupied by broad glacial lakes, most of the flat terrain in this ecoregion is still covered by standing water.

50. Northern Lakes and Forests

The Northern Lakes and Forests is a region of relatively nutrient-poor glacial soils, coniferous and northern hardwood forests, undulating till plains, morainal hills, broad lacustrine basins, and extensive sandy outwash plains. Soils in this ecoregion are thicker than in those to the north and generally lack the arability of soils in adjacent ecoregions to the south. The numerous lakes that dot the landscape are clearer and less productive than those in ecoregions to the south.

51. North Central Hardwood Forests

The North Central Hardwood Forests ecoregion is transitional between the predominantly forested Northern Lakes and Forests (50) to the north and the agricultural ecoregions to the south. Land use/land cover in this ecoregion consists of a mosaic forests, wetlands and lakes, cropland agriculture, pasture, and dairy operations. The growing season is generally longer and warmer than that of Ecoregion 50 and the soils are more arable and fertile, contributing to the greater agricultural component of land use. Lake trophic states tend to be higher here than in the Northern Lakes and Forests, with higher percentages in eutrophic and hypereutrophic classes.

52. Driftless Area

The hilly uplands of the Driftless Area easily distinguish it from surrounding ecoregions. Much of the area consists of a deeply dissected, loess-capped, bedrock dominated plateau. The region is also called the Paleozoic Plateau because the landscape's appearance is a result of erosion through rock strata of Paleozoic age. Although there is evidence of glacial drift in the region, its influence on the landscape has been minor compared to adjacent ecoregions. In contrast to adjacent ecoregions, the Driftless Area has few lakes, most of which are reservoirs with generally high trophic states. Livestock and dairy farming are major land uses and have had a major impact on stream quality.

53. Southeastern Wisconsin Till Plains

The Southeastern Wisconsin Till Plains support a mosaic of vegetation types, representing a transition between the hardwood forests and oak savannas of the ecoregions to the west and the tallgrass prairies of the Central Corn Belt Plains (54) to the south. Like Ecoregion 54, land use in the Southeastern Wisconsin Till Plains is mostly cropland, but the crops are largely forage and feed grains to support dairy operations, rather than corn and soybeans for cash crops. The ecoregion has a higher plant hardiness value and a different mosaic of soils than ecoregions to the north and west.

54. Central Corn Belt Plains

Extensive prairie communities intermixed with oak-hickory forests were native to the glaciated plains of the Central Corn Belt Plains; they were a stark contrast to the hardwood forests that grew on the drift plains of Ecoregions 55 and 56 to the east. Ecoregions 40 and 47 to the west were mostly treeless except along larger streams. Beginning in the nineteenth century, the natural vegetation was gradually replaced by agriculture. Farms are now extensive on the dark, fertile soils of the Central Corn Belt Plains and mainly produce corn

and soybeans; cattle, sheep, poultry, and, especially hogs, are also raised, but they are not as dominant as in the drier Western Corn Belt Plains (47) to the west. Agriculture has affected stream chemistry, turbidity, and habitat.

55. Eastern Corn Belt Plains

The Eastern Corn Belt Plains ecoregion is primarily a rolling till plain with local end moraines; it had more natural tree cover and has lighter colored soils than the Central Corn Belt Plains (54). The region has loamier and better drained soils than the Huron/Erie Lake Plain (57), and richer soils than the Erie Drift Plain (61). Glacial deposits of Wisconsinan age are extensive. They are not as dissected nor as leached as the pre-Wisconsinan till which is restricted to the southern part of the region. Originally, beech forests were common on Wisconsinan soils while beech forests and elm-ash swamp forests dominated the wetter pre-Wisconsinan soils. Today, extensive corn, soybean, and livestock production occurs and has affected stream chemistry and turbidity.

56. Southern Michigan/Northern Indiana Drift Plains

Bordered by Lake Michigan on the west, this ecoregion is less agricultural than those (54, 55) to the south, it is better drained and contains more lakes than the flat agricultural lake plain (57) to the east, and its soils are not as nutrient poor as Ecoregion 50 to the north. The region is characterized by many lakes and marshes as well as an assortment of landforms, soil types, soil textures, and land uses. Broad till plains with thick and complex deposits of drift, paleobeach ridges, relict dunes, morainal hills, kames, drumlins, meltwater channels, and kettles occur. Oak-hickory forests, northern swamp forests, and beech forests were typical. Feed grain, soybean, and livestock farming as well as woodlots, quarries, recreational development, and urban-industrial areas are now common.

57. Huron/Erie Lake Plains

The Huron/Erie Lake Plains ecoregion is a broad, fertile, nearly flat plain punctuated by relic sand dunes, beach ridges, and end moraines. Originally, soil drainage was typically poorer than in the adjacent Eastern Corn Belt Plains (55), and elm-ash swamp and beech forests were dominant. Oak savanna was typically restricted to sandy, well-drained dunes and beach ridges. Today, most of the area has been cleared and artificially drained and contains highly productive farms producing corn, soybeans, livestock, and vegetables; urban and industrial areas are also extensive. Stream habitat and quality have been degraded by channelization, ditching, and agricultural activities.

58. Northeastern Highlands

The Northeastern Highlands cover most of the northern and mountainous parts of New England as well as the Adirondacks and higher Catskills in New York. It is a relatively sparsely populated region characterized by hills and mountains, a mostly forested land cover, nutrient-poor soils, and numerous high-gradient streams and glacial lakes. Forest vegetation is somewhat transitional between the boreal regions to the north in Canada and the broadleaf deciduous forests to the south. Typical forest types include northern hardwoods (maple-beech-birch), northern hardwoods/spruce, and northeastern spruce-fir

forests. Recreation, tourism, and forestry are primary land uses. Farm-to-forest conversion began in the 19th century and continues today. In spite of this trend, alluvial valleys, glacial lake basins, and areas of limestone-derived soils are still farmed for dairy products, forage crops, apples, and potatoes. Many of the lakes and streams in this region have been acidified by sulfur depositions originating in industrialized areas upwind from the ecoregion to the west.

59. Northeastern Coastal Zone

Similar to the Northeastern Highlands (58), the Northeastern Coastal Zone contains relatively nutrient poor soils and concentrations of continental glacial lakes, some of which are sensitive to acidification; however, this ecoregion contains considerably less surface irregularity and much greater concentrations of human population. Landforms in the region include irregular plains, and plains with high hills. Appalachian oak forests and northeastern oak-pine forests are the natural vegetation types. Although attempts were made to farm much of the Northeastern Coastal Zone after the region was settled by Europeans, land use now mainly consists of forests, woodlands, and urban and suburban development, with only some minor areas of pasture and cropland.

60. Northern Allegheny Plateau

The Northern Allegheny Plateau is made up of horizontally bedded, erodible shales and siltstones, and moderately resistant sandstones of Devonian age. It is generally lower and less forested than the adjacent unglaciated North Central Appalachians (62). Its rolling hills, open valleys, and low mountains are covered by till from Wisconsinan Age glaciation and the landscape is a mosaic of cropland, pastureland, and woodland. Historically, the natural vegetation was primarily Appalachian oak forest dominated by white oak and red oak, with some northern hardwood forest at higher elevations. The Northern Allegheny Plateau has more level topography and more fertile, arable land than the more rugged and forested North Central Appalachians (62).

61. Erie Drift Plain

Once largely covered by a maple-beech-birch forest in the west and northern hardwoods in the east, much of the Erie Drift Plain is now in farms, many associated with dairy operations. The Eastern Corn Belt Plains (55), which border the region on the west, are flatter, more fertile, and therefore more agricultural. The glaciated Erie Drift Plain is characterized by low rounded hills, scattered end moraines, kettles, and areas of wetlands, in contrast to the adjacent unglaciated ecoregions (70, 62) to the south and east that are more hilly and less agricultural. Areas of urban development and industrial activity occur locally. Lake Erie's influence substantially increases the growing season, winter cloudiness, and snowfall in the northernmost areas bordering the strip of the Eastern Great Lakes Lowland (83) which fringes the lake.

62. North Central Appalachians

More forest-covered than most adjacent ecoregions, the North Central Appalachians ecoregion is part of a vast, elevated plateau composed of horizontally bedded sandstone,

shale, siltstone, conglomerate, and coal. It is made up of plateau surfaces, high hills, and low mountains, which, unlike the ecoregions to the north and west, were largely unaffected by continental glaciation. Only a portion of the Poconos section in the east has been glaciated. Land use activities are generally tied to forestry and recreation, but some coal and natural gas extraction occurs in the west.

63. Middle Atlantic Coastal Plain

The Middle Atlantic Coastal Plain ecoregion stretches from Delaware to the South Carolina/Georgia border and consists of low elevation flat plains, with many swamps, marshes, and estuaries. Forest cover in the region, once dominated by longleaf pine in the Carolinas, is now mostly loblolly and some shortleaf pine, with patches of oak, gum, and cypress near major streams, as compared to the mainly longleaf-slash pine forests of the warmer Southern Coastal Plain (75). Its low terraces, marshes, dunes, barrier islands, and beaches are underlain by unconsolidated sediments. Poorly drained soils are common, and the region has a mix of coarse and finer textured soils compared to the mostly coarse soils in the majority of Ecoregion 75. The Middle Atlantic Coastal Plain is typically lower, flatter, more poorly drained, and marshier than Ecoregion 65. Less cropland occurs in the southern portion of the region than in the central and northern parts.

64. Northern Piedmont

The Northern Piedmont is a transitional region of low rounded hills, irregular plains, and open valleys in contrast to the low mountains of Ecoregions 58, 66, and 67 to the north and west and the flatter coastal plains of Ecoregions 63 and 65 to the east. It is underlain by a mix of metamorphic, igneous, and sedimentary rocks, with soils that are mostly Alfisols and some Ultisols. Potential natural vegetation here was predominantly Appalachian oak forest as compared to the mostly oak-hickory-pine forests of the Piedmont (45) ecoregion to the southwest. The region now contains a higher proportion of cropland compared to the Piedmont.

65. Southeastern Plains

These irregular plains have a mosaic of cropland, pasture, woodland, and forest. Natural vegetation was predominantly longleaf pine, with smaller areas of oak-hickory-pine and Southern mixed forest. The Cretaceous or Tertiary-age sands, silts, and clays of the region contrast geologically with the older metamorphic and igneous rocks of the Piedmont (45), and with the Paleozoic limestone, chert, and shale found in the Interior Plateau (71). Elevations and relief are greater than in the Southern Coastal Plain (75), but generally less than in much of the Piedmont. Streams in this area are relatively low-gradient and sandy-bottomed.

66. Blue Ridge

The Blue Ridge extends from southern Pennsylvania to northern Georgia, varying from narrow ridges to hilly plateaus to more massive mountainous areas, with high peaks reaching over 6600 feet. The mostly forested slopes, high-gradient, cool, clear streams, and rugged terrain occur primarily on metamorphic rocks, with minor areas of igneous and

sedimentary geology. Annual precipitation of over 100 inches can occur in the wettest areas, while dry basins can average as little as 40 inches. The southern Blue Ridge is one of the richest centers of biodiversity in the eastern U.S. It is one of the most floristically diverse ecoregions, and includes Appalachian oak forests, northern hardwoods, and, at the highest elevations, Southeastern spruce-fir forests. Shrub, grass, and heath balds, hemlock, cove hardwoods, and oak-pine communities are also significant.

67. Ridge and Valley

This northeast-southwest trending, relatively low-lying, but diverse ecoregion is sandwiched between generally higher, more rugged mountainous regions with greater forest cover. As a result of extreme folding and faulting events, the region's roughly parallel ridges and valleys have a variety of widths, heights, and geologic materials, including limestone, dolomite, shale, siltstone, sandstone, chert, mudstone, and marble. Springs and caves are relatively numerous. Present-day forests cover about 50% of the region. The ecoregion has a great diversity of aquatic habitats and species of fish.

68. Southwestern Appalachians

Stretching from Kentucky to Alabama, these open low mountains contain a mosaic of forest and woodland with some cropland and pasture. The eastern boundary of the ecoregion, along the more abrupt escarpment where it meets the Ridge and Valley (67), is relatively smooth and only slightly notched by small, eastward flowing streams. Much of the western boundary, next to the Interior Plateau (71), is more crenulated, with a rougher escarpment that is more deeply incised. The mixed mesophytic forest is restricted mostly to the deeper ravines and escarpment slopes, and the upland forests are dominated by mixed oaks with shortleaf pine. Ecoregion 68 has less agriculture than the adjacent Ecoregion 71. Coal mining occurs in several parts of the region.

69. Central Appalachians

The Central Appalachian ecoregion, stretching from central Pennsylvania to northern Tennessee, is primarily a high, dissected, rugged plateau composed of sandstone, shale, conglomerate, and coal. The rugged terrain, cool climate, and infertile soils limit agriculture, resulting in a mostly forested land cover. The high hills and low mountains are covered by a mixed mesophytic forest with areas of Appalachian oak and northern hardwood forest. Bituminous coal mines are common and have caused the siltation and acidification of streams.

70. Western Allegheny Plateau

The hilly and wooded terrain of the Western Allegheny Plateau was not muted by glaciation and is more rugged than the agricultural till plains of Ecoregions 61 and 55 to the north and west but is less rugged and not as forested as Ecoregion 69 to the east and south. Extensive mixed mesophytic forests and mixed oak forests originally grew in the Western Allegheny Plateau and, today, most of its rounded hills remain in forest; dairy, livestock, and general farms as well as residential developments are concentrated in the valleys. Horizontally bedded sedimentary rock underlying the region has been mined for bituminous coal.

71. Interior Plateau

The Interior Plateau is a diverse ecoregion extending from southern Indiana and Ohio to northern Alabama. Rock types are distinctly different from the coastal plain sediments and alluvial deposits of ecoregions to the west, and elevations are lower than the Appalachian ecoregions (66, 67, 68) to the east. Mississippian to Ordovician-age limestone, chert, sandstone, siltstone, and shale compose the landforms of open hills, irregular plains, and tablelands. The natural vegetation is primarily oak-hickory forest, with some areas of bluestem prairie and cedar glades. The region has a diverse fish fauna.

72. Interior River Valleys and Hills

The Interior River Lowland is made up of many wide, flat-bottomed terraced valleys, forested valley slopes, and dissected glacial till plains. In contrast to the generally rolling to slightly irregular plains in adjacent ecological regions to the north (54), east (55) and west (40, 47), where most of the land is cultivated for corn and soybeans, a little less than half of this area is in cropland, about 30 percent is in pasture, and the remainder is in forest. Bottomland deciduous forests and swamp forests were common on wet lowland sites, with mixed oak and oak-hickory forests on uplands. Paleozoic sedimentary rock is typical and coal mining occurs in several areas.

73. Mississippi Alluvial Plain

This riverine ecoregion extends from southern Illinois, at the confluence of the Ohio River with the Mississippi River, south to the Gulf of Mexico. It is mostly a broad, flat alluvial plain with river terraces, swales, and levees providing the main elements of relief. Soils are typically finer-textured and more poorly drained than the upland soils of adjacent Ecoregions 35 and 74, although there are some areas of coarser, better-drained soils. Winters are mild and summers are hot, with temperatures and precipitation increasing from north to south. Bottomland deciduous forest vegetation covered the region before much of it was cleared for cultivation. Presently, most of the northern and central parts of the region are in cropland and receive heavy treatments of insecticides and herbicides. Soybeans, cotton, and rice are the major crops.

74. Mississippi Valley Loess Plains

This ecoregion stretches from near the Ohio River in western Kentucky to Louisiana. It consists primarily of irregular plains, some gently rolling hills, and near the Mississippi River, bluffs. Thick loess is one of the distinguishing characteristics. The bluff hills in the western portion contain soils that are deep, steep, silty, and erosive. Flatter topography is found to the east, and streams tend to have less gradient and more silty substrates than in the Southeastern Plains ecoregion (65). To the east, upland forests dominated by oak, hickory, and both loblolly and shortleaf pine, and to the west on bluffs some mixed and southern mesophytic forests, were the dominant natural vegetation. Agriculture is now the typical land cover in the Kentucky and Tennessee portion of the region, while in Mississippi there is a mosaic of forest and cropland.

75. Southern Coastal Plain

The Southern Coastal Plain consists of mostly flat plains, but it is a heterogeneous region containing barrier islands, coastal lagoons, marshes, and swampy lowlands along the Gulf and Atlantic coasts. In Florida, an area of discontinuous highlands contains numerous lakes. This ecoregion is lower in elevation with less relief and wetter soils than the Southeastern Plains (65). It is warmer, more heterogeneous, and has a longer growing season and coarser textured soils than the Middle Atlantic Coastal Plain (63). Once covered by a variety of forest communities that included trees of longleaf pine, slash pine, pond pine, beech, sweetgum, southern magnolia, white oak, and laurel oak, land cover in the region is now mostly slash and loblolly pine with oak-gum-cypress forest in some low lying areas, citrus groves in Florida, pasture for beef cattle, and urban.

76. Southern Florida Coastal Plain

The frost-free climate of the Southern Florida Coastal Plain makes it distinct from other ecoregions in the conterminous United States. This region is characterized by flat plains with wet soils, marsh and swamp land cover with everglades and palmetto prairie vegetation types. Relatively slight differences in elevation and landform have important consequences for vegetation and the diversity of habitat types. Although portions of this region are in parks, game refuges, and Indian reservations, a large part of the region has undergone extensive hydrological and biological alteration.

77. North Cascades

The terrain of the North Cascades is composed of high, rugged mountains. It contains the greatest concentration of active alpine glaciers in the conterminous United States and has a variety of climatic zones. A dry continental climate occurs in the east and mild, maritime, rainforest conditions are found in the west. It is underlain by sedimentary and metamorphic rock in contrast to the adjoining Cascades (4) which are composed of volcanics.

78. Klamath Mountains and California High North Coast Range

This physically and biologically diverse ecoregion covers the highly dissected ridges, foothills, and valleys of the Klamath and Siskiyou mountains. It also extends south in California to include the mixed conifer and montane hardwood forests that occur on mostly mesic soils in the North Coast Range mountains. The region's mix of granitic, sedimentary, metamorphic, and extrusive rocks contrasts with the predominantly volcanic rocks of the Cascades (4) to the east. It was unglaciated during the Pleistocene epoch, when it served as a refuge for northern plant species. The regions diverse flora, a mosaic of both northern Californian and Pacific Northwestern conifers and hardwoods, is rich in endemic and relic species. The mild, subhumid climate of the Klamath Mountains is characterized by a lengthy summer drought.

79. Madrean Archipelago

Also known as the Sky Islands in the United States, this is a region of basins and ranges with medium to high local relief, typically 3000 to 5000 feet. Native vegetation in the region is mostly grama-tobosa shrubsteppe in the basins and oak-juniper woodlands on the ranges,

except at higher elevations where ponderosa pine is predominant. The region has ecological significance as both a barrier and bridge between two major cordilleras of North America, the Rocky Mountains, and the Sierra Madre Occidental. Its exceptional species richness and endemism are also influenced by both western desert and mid-continent prairie biogeography.

80. Northern Basin and Range

The Northern Basin and Range consists of dissected lava plains, rocky uplands, valleys, alluvial fans, and scattered mountain ranges. Overall, it is cooler and has more available moisture than the Central Basin and Range (13) to the south. Ecoregion 80 is higher and cooler than the Snake River Plain (12) to the northeast in Idaho. Valleys support sagebrush steppe or saltbush vegetation. Cool season grasses, such as Idaho fescue and bluebunch wheatgrass are more common than in Ecoregion 13 to the south. Mollisols are also more common than in the hotter and drier basins of the Central Basin and Range (13) where Aridisols support sagebrush, shadscale, and greasewood. Juniper woodlands occur on rugged, stony uplands. Ranges are covered by mountain brush and grasses (e.g., Idaho fescue) at lower and mid-elevations; at higher elevations aspen groves or forest dominated by subalpine fir can be found. Most of Ecoregion 80 is used as rangeland. The western part of the ecoregion is internally drained, its eastern stream network drains to the Snake River system.

81. Sonoran Basin and Range

Similar in topography to the Mojave Basin and Range (14) to the north, this ecoregion contains scattered low mountains and has large tracts of federally owned lands, a large portion of which are used for military training. However, the Sonoran Basin and Range is slightly hotter than the Mojave and contains large areas of palo verde-cactus shrub and giant saguaro cactus, whereas the potential natural vegetation in the Mojave is largely creosote bush. Other typical Sonoran plants include white bursage, ocotillo, brittlebush, creosote bush, catclaw acacia, cholla, desert saltbush, pricklypear, ironwood, and mesquite. Winter rainfall decreases from west to east, while summer rainfall decreases from east to west. Aridisols and Entisols are dominant with hyperthermic soil temperatures and extremely aridic soil moisture regimes.

82. Acadian Plains and Hills

This mostly forested region, with dense concentrations of continental glacial lakes, is less rugged than the Northeastern Highlands (58) to the west and considerably less populated than Ecoregion 59 to the south. Vegetation here is mostly spruce-fir on the lowlands with some patches of maple, beech, and birch on the hills. Soils are predominantly frigid Spodosols. By contrast, the forests in the Northeastern Coastal Zone (59) to the south are mostly Appalachian oak or northeastern oak-pine and the soils are generally mesic Inceptisols and Entisols.

83. Eastern Great Lakes Lowlands

This glaciated region of irregular plains bordered by hills generally contains less surface irregularity and more agricultural activity and population density than the adjacent Northeastern Highlands (58) and Northern Allegheny Plateau (60). Although orchards, vineyards, and vegetable farming are important locally, a large percentage of the agriculture is associated with dairy operations. The portion of this ecoregion that is in close proximity to the Great Lakes experiences an increased growing season, more winter cloudiness, and greater snowfall.

84. Atlantic Coastal Pine Barrens

This is a transitional ecoregion, distinguished from the coastal ecoregion (63) to the south by its coarser-grained soils, cooler climate, and Northeastern oak-pine potential natural vegetation. The climate is milder than the coastal ecoregion (59) to the north that contains Appalachian oak forests and some northern hardwoods forests. The physiography of this ecoregion is not as flat as that of the Middle Atlantic Coastal Plain (63), but it is not as irregular as that of the Northeastern Coastal Zone (59). The shore characteristics of sandy beaches, grassy dunes, bays, marshes, and scrubby oak-pine forests are more like those to the south, in contrast to the more rocky, jagged, forested coastline found to the north.

85. Southern California/Northern Baja Coast

This ecoregion includes coastal and alluvial plains and some low hills in the coastal area of Southern California, and it extends over 200 miles south into Baja California. Coastal sage scrub and chaparral vegetation communities with many endemic species were once widespread before overgrazing, clearance for agriculture, and massive urbanization occurred. Coastal sage scrub includes chamise, white sage, black sage, California buckwheat, golden yarrow, and coastal cholla. The chaparral-covered hills include ceanothus, buckeye, manzanita, scrub oak, and mountain-mahogany. Coast live oak, canyon live oak, poison oak, and California black walnut also occur. A small area of Torrey pine occurs near San Diego.