

Oklahoma Military Operational Areas & Considerations for Renewable Energy and Vertical Development



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The Oklahoma Military Airspace Compatibility Assessment Mapping Portal (OMACAMP) project was developed collaboratively with representatives from a variety of stakeholders. The Steering Committee, which included representatives from key stakeholder groups, provided direction, project oversight, and recommendations. The following identifies those individuals who formally participated in the development of the OMACAMP project.

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Matrix Design Group, Inc. was the project consultant team hired to conduct tasks through coordination with and assistance from the Oklahoma Aeronautics Commission, the Steering Committee, and other stakeholders.

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Introduction

The ability for the military to train beyond the limits of its fenceline is critical to the military's mission and national security. Military operations require vast land and air space to test and train in real-world situations. However, conducting military operations beyond the installation fenceline leaves the military more susceptible to incompatible development in training locations where protections such as aviation (or airspace) easements on private property do not exist. Conversely, the potential for private development and renewable energy development can be impacted by the presence of military operations.

As metropolitan areas continue to expand, the possibility of incompatible vertical development in the form of buildings, telecommunications towers, and communications lines may increase. While verticle and renewable energy development continues in Oklahoma, it is critical to mitigating potential incompatible development while preserving and sustaining the viability and use of military operational areas, including airspace.

Renewable energy development opportunities continue to increase, potentially creating compatibility concerns with military operational areas, requiring more significant levels of coordination. Coordination of renewable energy siting in Oklahoma generally occurs through existing local, state, and federal processes described in this report. Early coordination is necessary to ensure military missions and renewable energy and economic development continue to thrive throughout the state. Oklahoma's military installations provide value to the economy, representing \$6.6 billion of the total state output, according to an annual report from the Office of Local Defense Community Cooperation (OLDCC)¹.

Oklahoma is ranked third in the United States for installed wind capacity and sixth for solar potential². According to a fact sheet from American Clean Power, approximately \$17 billion of capital was invested in wind, solar, and energy storage projects within the state. Currently, 40% of Oklahoma's energy is generated from renewable sources, adding up to a capacity of nearly 10,300 MW at the end of 2020. While the state has exceeded its renewable energy portfolio goals, there are still plans to expand its capabilities.

The Department of Defense (DoD) also recognizes the value of renewable energy. DoD Directive 4715.21, *Climate Change Adaptation and Resilience*³, acknowledges the need to incorporate climate considerations into infrastructure and operations planning to manage risks associated with the impacts of the changing climate. Renewable energy development directly aids in achieving this goal by reducing overall carbon emissions, emphasizing the importance of collaboration and communication through the development processes. The DoD views climate change as a national security risk, and the impacts of climate change may affect military facilities

¹ https://oldcc.gov/sites/default/files/defense-spending-rpts/OLDCC_DSBS_FY2020_FINAL_WEB.pdf

² <https://www.eia.gov/state/analysis.php?sid=OK>

³ <https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodd/471521p.pdf>

or operations in Oklahoma. This report further elaborates on the importance of early communication efforts and tools to assure the achievement of this goal while protecting military operational areas.

The Oklahoma Aeronautics Commission is charged with encouraging, fostering, and assisting in the development of aeronautics. As such, the commission and other state partners see the importance of coordination efforts to ensure renewable energy and vertical development continues to thrive while protecting military operational areas and airspace. These goals precipitated the creation of this report and the Oklahoma Military Airspace Compatibility Assessment Mapping Portal (OMACAMP). This portal will provide vertical and renewable energy developers with information on military operational areas, fostering early communication and coordination with military partners in Oklahoma to ensure both industries continue to thrive in the state. While military operational areas are not exclusionary to development, the tool can facilitate early coordination between developers and the military by providing developers with points of contact for those operational areas.

An overview of Oklahoma's military operational areas essential to training and operations conducted within the state is shown in **Section 1** of this report. Renewable energy and future development potential, with relation to potential effects on military operational areas in the state, are further elaborated in **Section 2**. A review of the current laws guiding these efforts may be found in **Section 3**. To understand the current planning, zoning, and ordinances that enable or prohibit renewable energy and vertical development, **Section 4** provides a statewide overview of which jurisdictions within military operational areas undergo these efforts. Examples of mitigation strategies relevant to addressing Department of Defense (DoD) concerns may be found in **Section 5**. However, whether a specific mitigation option is appropriate or feasible in a particular situation will be discussed between the DoD and the project proponent. Because military operations are prevalent throughout Oklahoma, the locations of these operational areas do not represent areas of automatic exclusion for siting development but rather emphasize the need for continued and improved information sharing and coordination efforts. These enhanced efforts are addressed as recommended actions in **Section 6**. While the recommendations were developed in concert with the project steering committee, which comprised of renewable energy developers, state entities, and other key stakeholders, not all stakeholders supported each recommendation. **Appendix A** provides any feedback from committee members on the recommendations, regardless of support.



1.0 Military Operational Areas in Oklahoma

This section provides a snapshot of the military installations and heliport/helipads throughout Oklahoma. The Army, Air Force, National Guard Bureau, and Oklahoma Military Department operate in 11 locations within the state. The presiding authority, location, and size of each of the ten installations are depicted in **Table 1** and **Figure 1**.

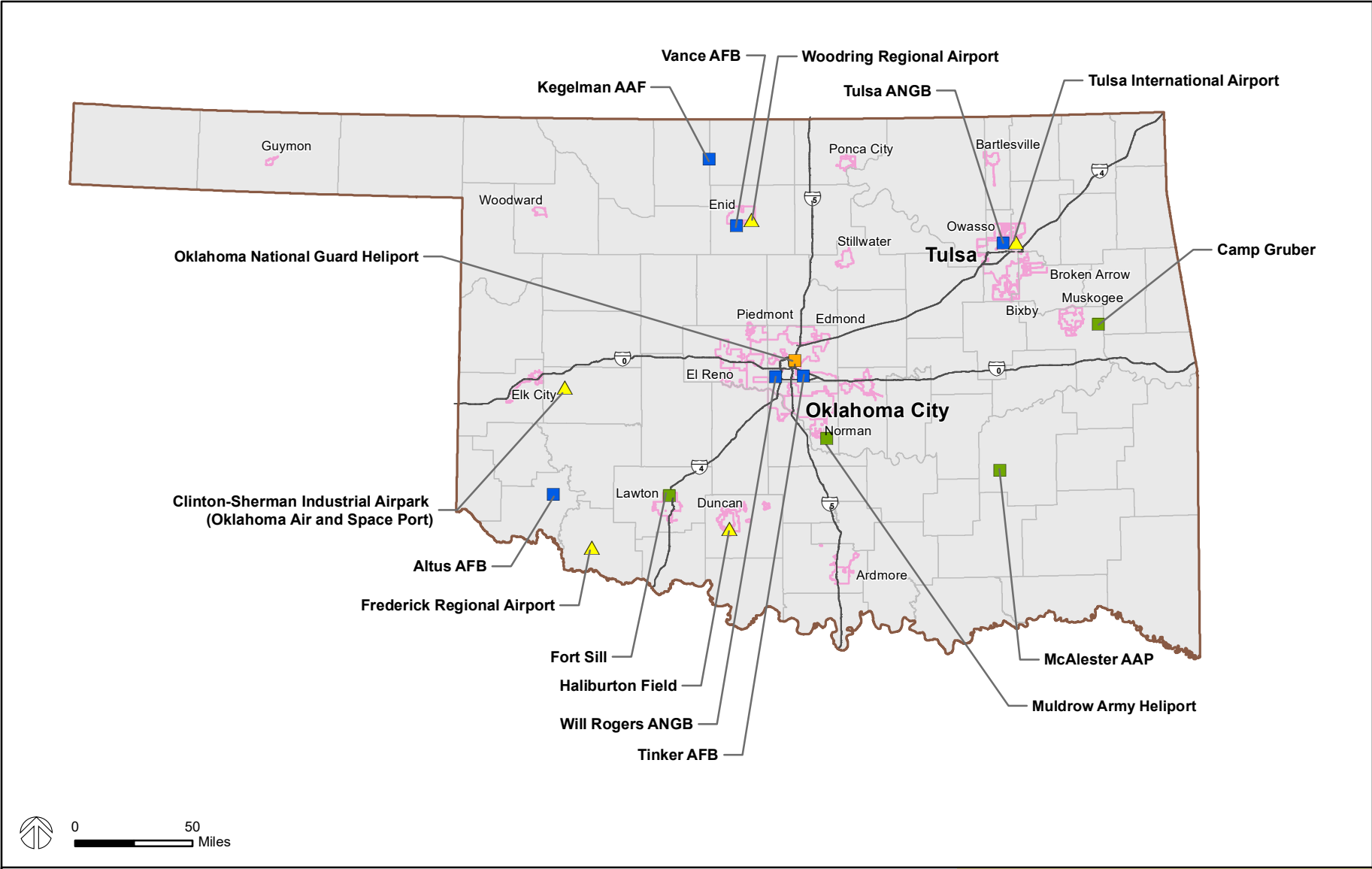
Table 1. Military Installations and Heliports/Helipads in Oklahoma

Military Installations and Heliports/Helipads in Oklahoma			
Military Installations/ Heliports/Helipads	U.S. Armed Forces Branch	Location	Area
Altus Air Force Base (AFB)	Air Force	Altus, OK	3,500 Acres
Tinker AFB	Air Force	Oklahoma City, OK	5,424 Acres
Vance AFB	Air Force	Enid, OK	2,122 Acres
Kegelman Air Force Auxiliary Field	Tinker AFB, OK	Cherokee, OK	1,066 acres
Fort Sill	Army	Lawton, OK	93,400 Acres
Camp Gruber Training Center (Helipad)	Oklahoma Army National Guard	Muskogee, OK	55,680 Acres
Muldrow Army Heliport	Oklahoma Army National Guard	Lexington, OK	250 acres
Oklahoma National Guard Heliport	Oklahoma Army National Guard	Oklahoma City, OK	0 acres
McAlester Army Ammunition Plant	Army	Pittsburg County, OK	44,964 Acres
Tulsa Air National Guard Base	Air National Guard	Tulsa, OK	81 Acres
Will Rogers Air National Guard Base	Air National Guard	Oklahoma City, OK	8,081 acres

Additional public use airfields around Oklahoma directly link to military training operations. While these airfields are primarily for public use, the military retains joint agreements to train and operate on these airfields. Like the Air National Guard, most users reside in Oklahoma, while others are from neighboring states, such as Sheppard AFB in Texas. Each airfield and user are described below in **Table 2** and depicted in **Figure 1**.

Table 2. Civilian Airfields Used by the Military in Oklahoma

Civilian Airfields Used by the Military in Oklahoma		
Civilian Airfield	Military User	Airfield Location
Clinton-Sherman Industrial Airpark (Oklahoma Air & Space Port)	Air Force (Multiple OK Installations)	Burns Flat, OK
Lawton-Ft. Sill Regional Airport	Army	Lawton, OK
Frederick Regional Airport	Sheppard AFB, TX	Tillman County, OK
Halliburton Field	Sheppard AFB, TX	Duncan, OK
Enid-Woodring Municipal Airport	Vance AFB, OK	Enid, OK



- Air Force Installation
- Army Installation
- Oklahoma Military Department Military Use,
- ▲ Publicly Owned Airport

Military Installations and Civilian Airfields

Figure 1

Source: Office of the Assistant Secretary of Defense for Sustainment, Matrix Design Group

1.1 Overview of Military Operational Areas in the State

Most military partners throughout the state have operational requirements and geographic areas outside the installation boundary to support training, testing, and operations necessary to accomplish the mission. Military operational areas in Oklahoma include, but are not limited to, Military Training Routes (MTRs), Special Use Airspace (SUA), imaginary surfaces associated with airfields, and radar viewsheds. Though these areas are critical to maintaining the military mission, they may be negatively impacted by renewable energy development and overall land use development without proper coordination. Though specific land uses are not recommended for areas beyond the airfield, MTRs, SUAs, radar viewsheds, and the spaceflight corridors are not as protected unless an aviation easement is acquired, or other agreements are made to promote compatible development.

The military services must train in a wide range of airborne tactics to be proficient. One phase of this training involves “low-level” combat flights. The required maneuvers and high speeds are such that they may occasionally make the see-and-avoid aspect of Visual Flight Rules (VFR) more difficult without increased vigilance in areas containing such operations. To protect these crucial training and operations areas, land use regulations or coordination processes should be in place to ensure compatibility and sustainability of current and future planned military training and operations. At the federal level and in the state of Oklahoma, the existing processes that facilitate coordination are summarized in Sections 1.4, 3.0 to 3.4, and 4.0 later in this report. Sustaining the military mission means preserving these critical areas of operation for current and future use. The following areas are described as part of the Oklahoma study:

- Military Training Routes
- Special Use Airspace
- Testing Areas
- Imaginary Surfaces
- Radar Viewsheds

1.2 Military Training Routes

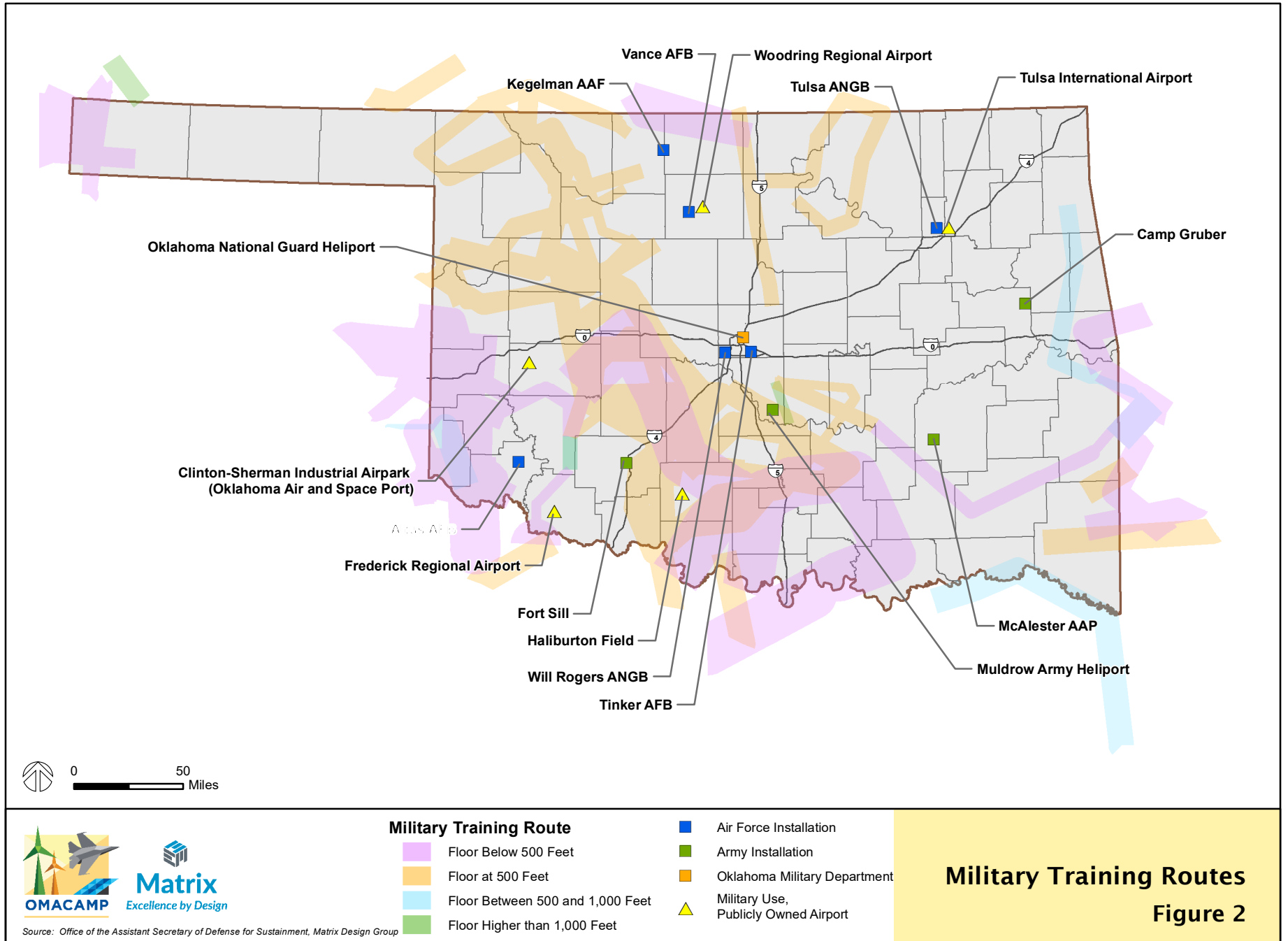
An MTR is a designated airspace corridor with defined vertical and lateral dimensions used for military flight training. MTRs can be characterized as a complex network of interrelated and interdependent highways in the sky to conduct low-altitude navigation and tactical training. As such, these highways have associated rules for conducting operations.

- **Instrument Flight Rules** refer to flying, using instruments on an aircraft where navigation is accomplished by electronic signals, regardless of the weather.
- **Visual Flight Rules** mean the aircraft is intended to operate in visual conditions, i.e., nice and clear weather that a pilot can see where they are flying. Clouds, heavy precipitation, low visibility, and otherwise adverse weather conditions are not conducive to flying under VFR.

MTRs are comprised of segments that can have different minimum and maximum flight altitudes. MTRs also are characterized by type, described as follows:

- **Instrument Route (IR):** Aircraft operations conducted in accordance with Instrument Flight Rules at a maximum ceiling (altitude) of 1,000 feet Above Ground Level (AGL) and/or with visibility less than 3 miles.
- **Visual Route (VR):** Aircraft operations conducted in accordance with Visual Flight Rules (VFR) where visibility must be ≥ 5 statute miles and with flight occurring above 3,000 feet AGL.
- **Slow Route (SR):** Operations are conducted at speeds less than 250 knots and altitudes as low as 250 feet AGL.

Figure 2 shows the MTRs within Oklahoma, most of which are controlled by the entities listed in **Table 1**. However, a few MTRs extend from other state boundaries into Oklahoma and are designated for installations outside the state. MTRs may be used by any branch of the U.S. Armed Forces, provided they coordinate flight operations with the controller of that MTR.



Military Training Routes
Figure 2

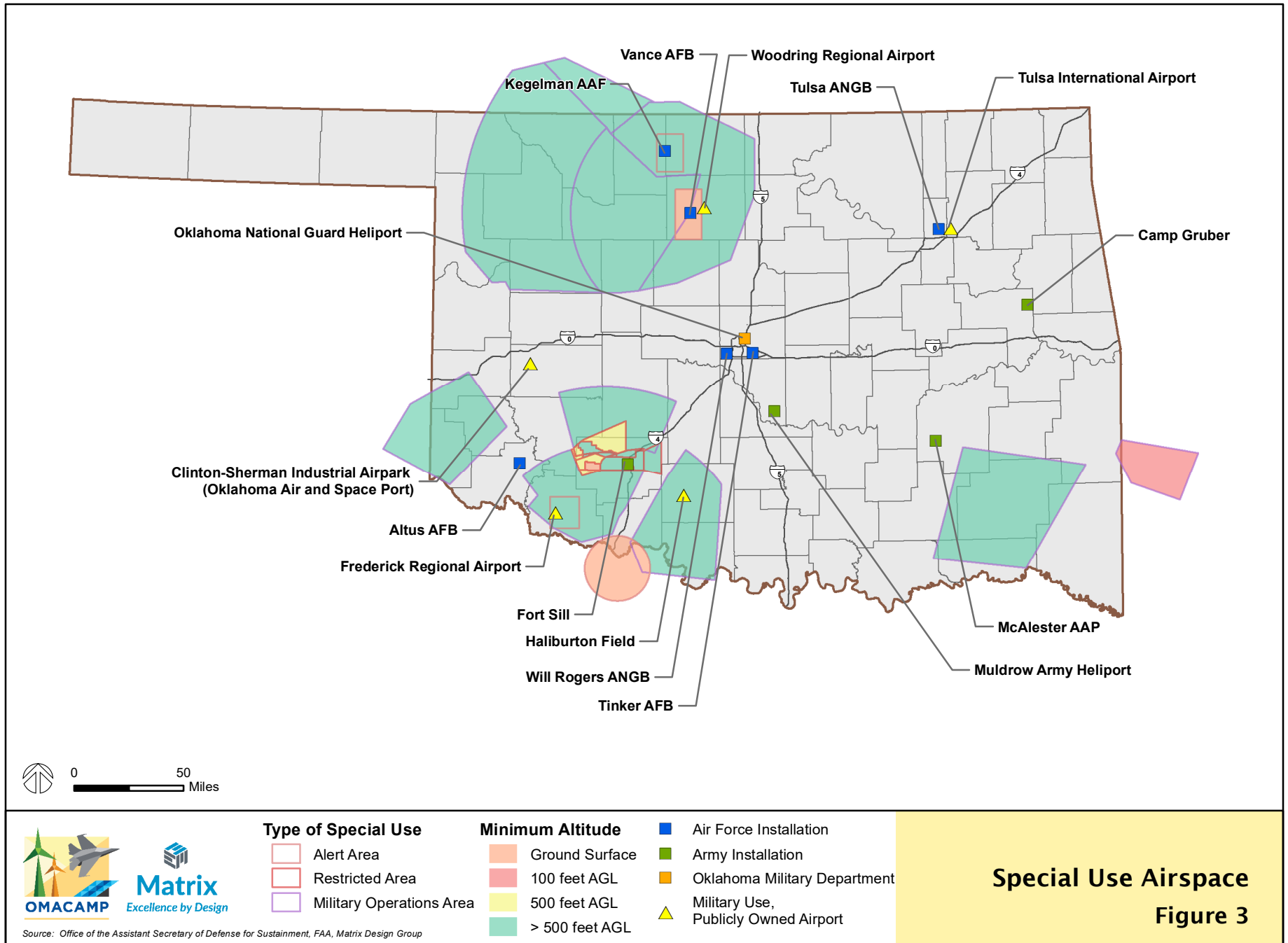


Source: Office of the Assistant Secretary of Defense for Sustainment, Matrix Design Group

1.3 Special Use Airspace

As defined by 14 CFR Part 73, Special Use Airspace (SUA) consists of specified dimensions identified by an area on the ground to which activities are confined due to the nature of operations. Limitations are placed on aircraft operations not associated with the activities taking place. This airspace designation serves to alert nonparticipating aircraft, or any aircraft (military or civilian) without authorization to operate within a specified SUA, to the possible presence of these activities. Entering any SUA without permission from the controlling agency may be extremely hazardous to the aircraft. A depiction of Oklahoma SUAs is in **Figure 3**. Of the various types of SUAs, the state of Oklahoma has three:

- **Alert Areas:** Alert areas inform nonparticipating pilots of areas that may contain a high volume of pilot training or an unusual type of aerial activity. All activity within an alert area must be conducted following the Code of Federal Regulations.
- **Restricted Areas:** Restricted areas are airspace identified by an area on land within which aircraft flight is subject to restrictions. Activities in these areas are confined due to the nature or limitations imposed on outside aircraft operations that are not a part of the activities. Typically, this airspace includes the existence of unusual or often invisible hazards to aircraft.
- **Military Operations Areas (MOAs):** MOAs are defined by vertical and lateral limits established to separate certain military training activities from VFR and IFR traffic. When in use, these temporarily restricted airspaces may clear nonparticipating air traffic if an IFR separation can be provided by air traffic control; otherwise, nonparticipating traffic may be subject to rerouting or restricted use of the airspace.



Special Use Airspace

Figure 3



Source: Office of the Assistant Secretary of Defense for Sustainment, FAA, Matrix Design Group



1.4 Imaginary Surfaces

Military Airfield Imaginary Surfaces

Imaginary surfaces are three-dimensional airspace surrounding airfields and heliports/helipads where natural and man-made structures can create vertical obstructions to pilot navigation if these structures penetrate the height of the imaginary surfaces. Imaginary surface heights are based on 14 CFR Part 77 and Unified Facilities Criteria 3-260-01. In addition to the three-dimensional surfaces, Department of Defense Instruction (DoDI) 4165.57 defines Clear Zones (CZs) and Accident Potential Zones (APZs) at military-owned and operated airfields and heliports/helipads. Recommendations from this instruction include guidance for appropriate land uses within these zones to protect the military mission and the health and safety of the surrounding community.

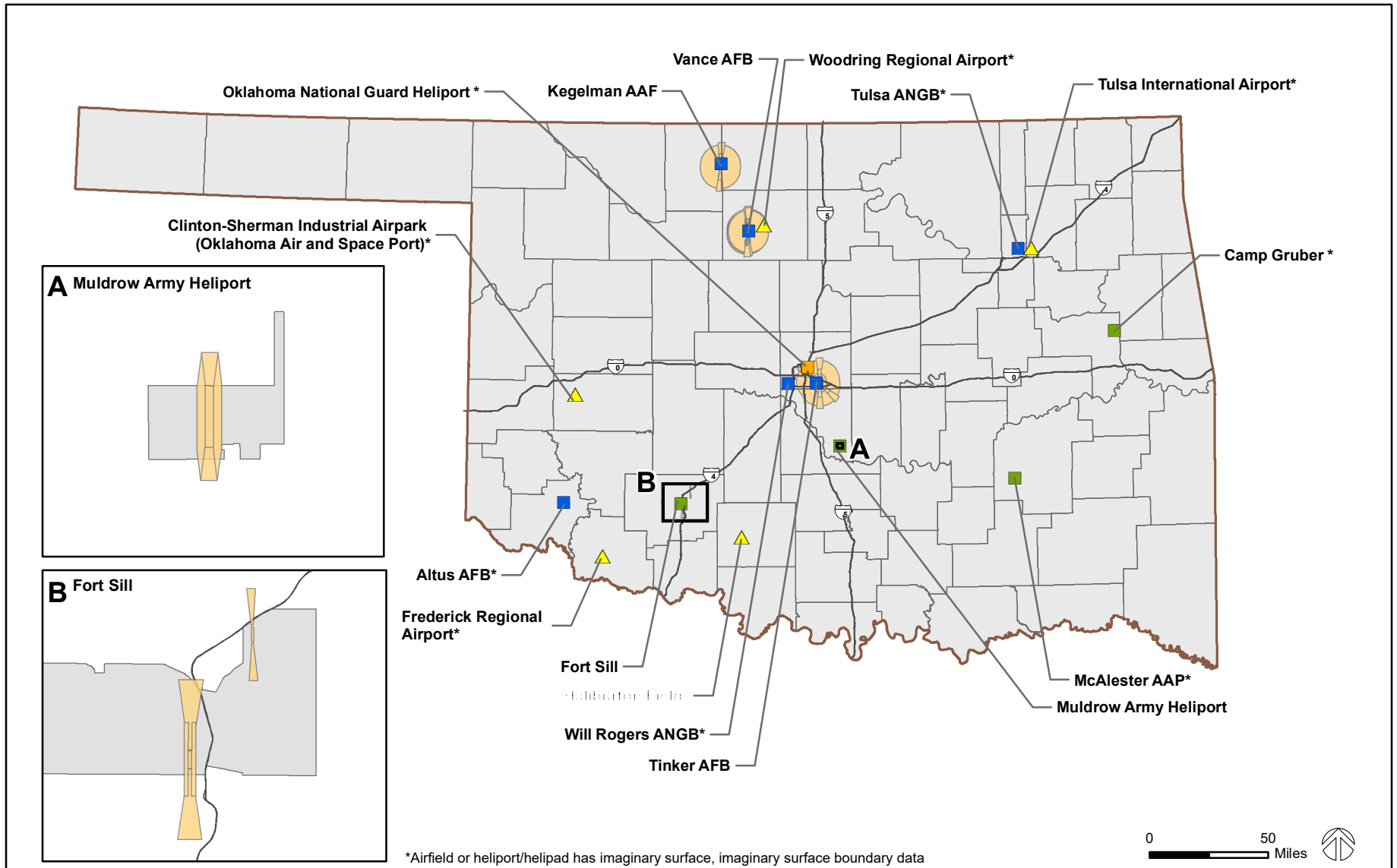
Under DoDI 4165.57, the department requires the military to delineate and render three-dimensional imaginary surfaces for all active runways and helipads, further explained in **Sections 3.3**. Any identified vertical obstructions may present flight risk to aircraft and, if man-made, require safety of flight determination by the Federal Aviation Administration (FAA) under Part 77 regulations. The FAA recognizes published military imaginary surfaces. In addition to these three-dimensional surfaces and designated SUAs, military airfields and heliports/helipads are also required to publish CZs and APZs with land use and zoning recommendations to inform local jurisdictions on best practices to safeguard against potential health and safety hazards to the public. **Figure 4** depicts all locations with associated imaginary surfaces throughout the state.

Civilian Airfield Imaginary Surfaces

Based on 14 CFR Part 77 criteria, civilian airfields have similar imaginary surfaces to safeguard against incompatible development near the runways. The FAA requires certain civilian airports, airfields, and heliports/helipads to render similar three-dimensional airspace surfaces and CZs. These surfaces are established based on the category of each runway according to the type of approach available or planned for that runway. Some civilian airfields have military users, such as the Enid-Woodring Regional Airport, where DoDI guidance does not apply since local municipalities own the land. The DoD recognizes the imaginary surfaces published following FAA guidelines at these airfields.

1.5 Spaceflight Corridor

Airspace not covered under Special Use includes the newly established Spaceflight Corridor, located at the Oklahoma Air & Space Port as part of the Clinton-Sherman Industrial Airpark in Burns Flat, Oklahoma. This airspace is an FAA-approved, 152-mile long and 50-mile-wide corridor, shown in **Figure 5**, with a northern polar trajectory providing rapid horizontal launch to high inclination near-polar orbits ideal for global weather, resource surveillance, and monitoring.



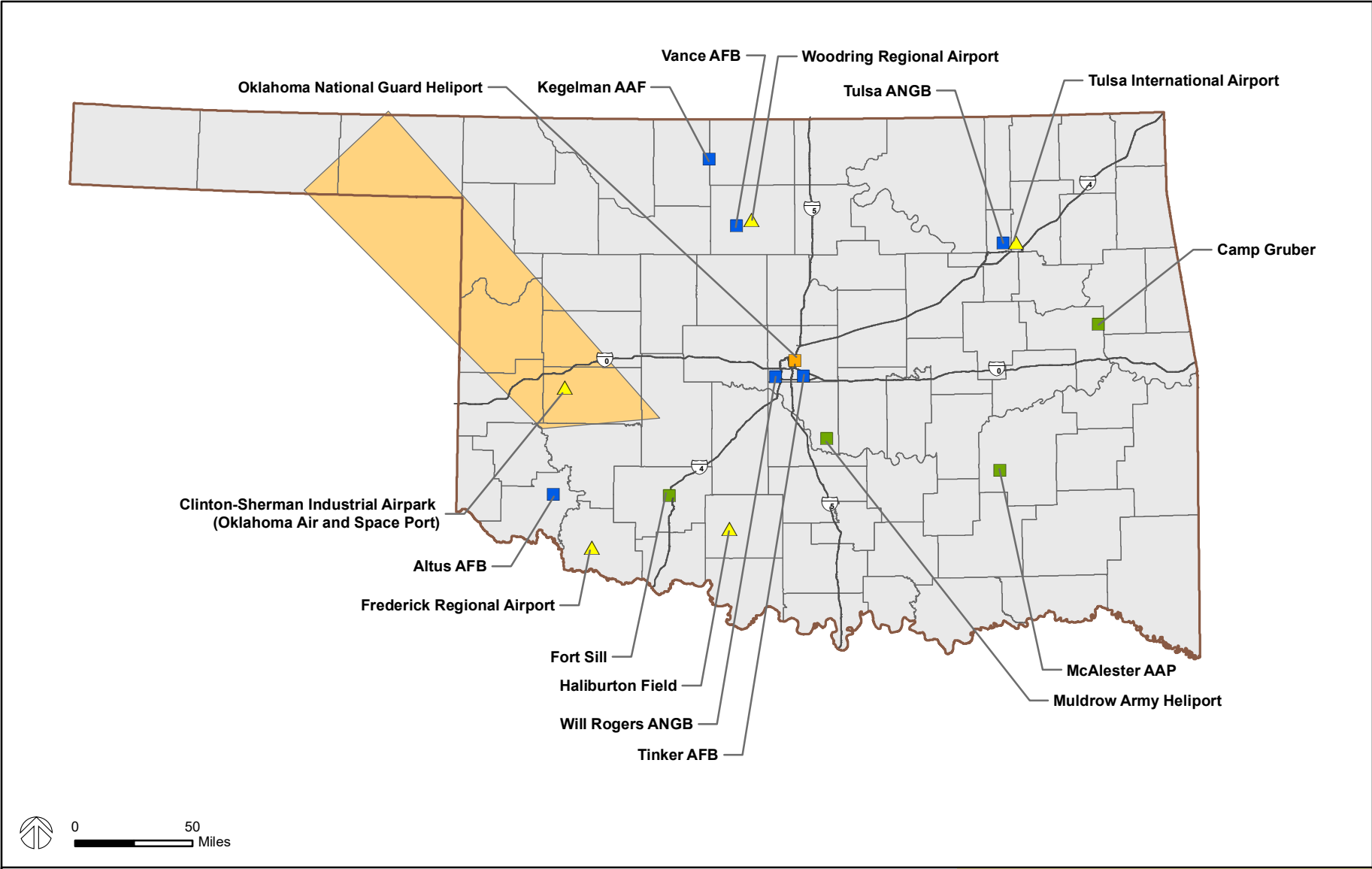
- Military Airfield or Heliport/ Helipad Imaginary Surface
- Air Force Installation
- Army Installation
- Oklahoma Military Department
- Military Use, Publicly Owned Airport

Airfields and Heliports/Helipads with Imaginary Surfaces

Figure 4



Source: Office of the Assistant Secretary of Defense for Sustainment, DoD Unified Facilities Criteria 3-260-01 2019, Tinker AFB, Fort Sill, Matrix Design Group



Source: Office of the Assistant Secretary of Defense for Sustainment, Fort Worth ATRC, Oklahoma Space Industry Development Authority, Matrix Design Group

- Infinity One Spaceflight Corridor**
- Minimum altitude ground level to infinity
 - Air Force Installation
 - Army Installation
 - Oklahoma Military Department
 - Military Use, Publicly Owned Airport

Spaceflight Corridor
Figure 5

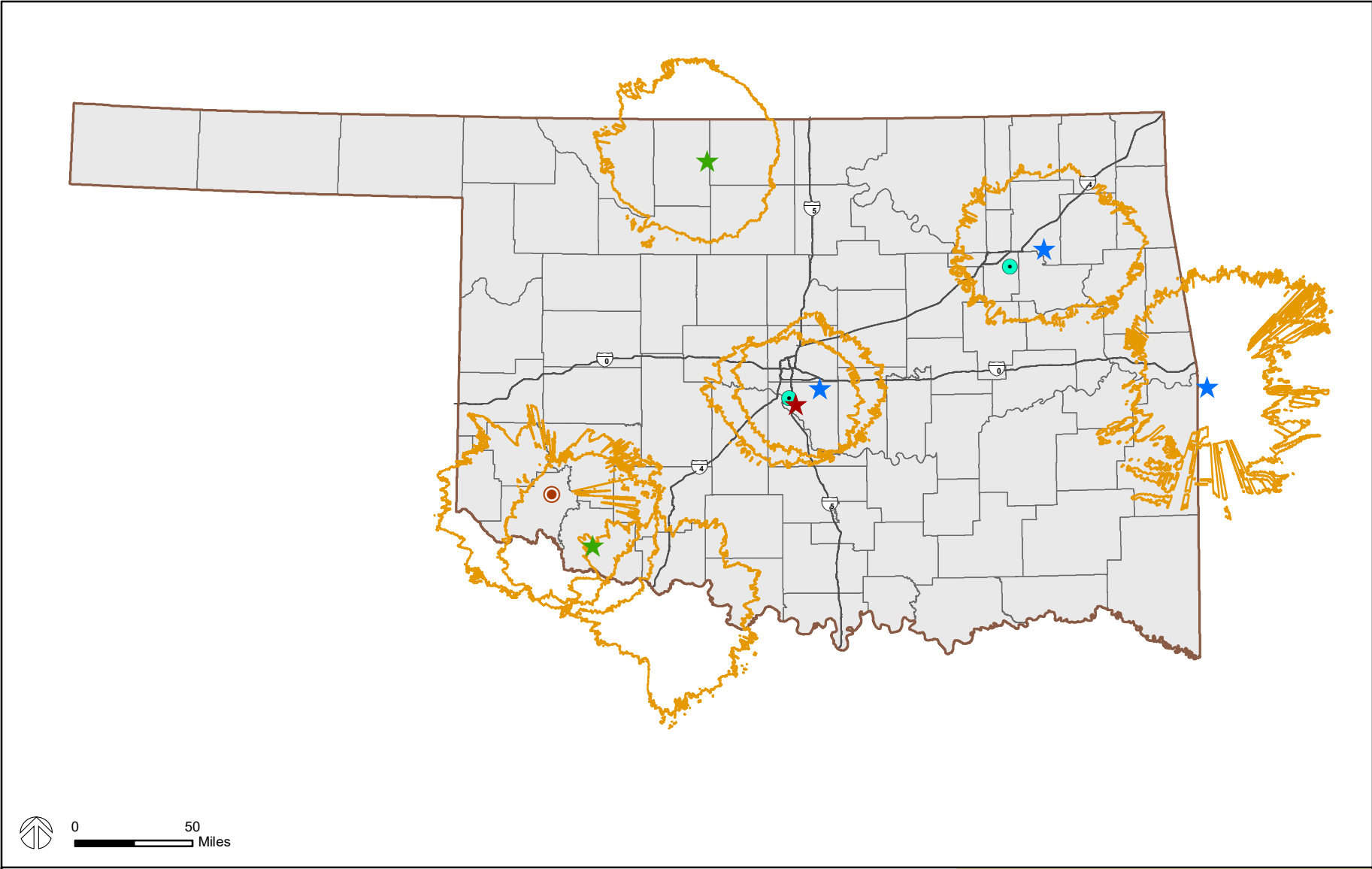
1.6 Radar Viewsheds

Radars locate an object's position by emitting electromagnetic waves which reflect off objects such as planes, birds, and mountains. The electromagnetic waves returned to the radar provide the information needed to calculate an estimated size, location, speed, and direction of an object.






The radar viewshed, or field of view, is the area within the range of a radar's electromagnetic waves. This range is influenced by multiple factors, including the radar's look angle, terrain, weather, and natural and man-made objects. Natural and man-made structures within a radar's viewshed, that is, line-of-sight, can impact the integrity and usefulness of radar in identifying and locating aircraft, watercraft, weather, or other objects such as missiles. Additionally, other electromagnetic activity, such as radio waves or microwaves, in the vicinity of a radar (typically within eight to 10 miles) can interfere with the electromagnetic waves emitted by the radar. Additionally, other electromagnetic activity, such as radio waves or microwaves, in the vicinity of a radar transmitter and/or receiver (typically within eight to 10 miles) can interfere with the electromagnetic waves emitted by the radar.

A highly crucial component of the radar viewshed is the line-of-sight, which is the linear path between the transmitter and receiver (when not the same antenna). A vertical obstruction to this linear path may result in a loss of communication signals between the transmitter and receiver, rendering the radar ineffective. As shown in **Figure 6**, Oklahoma currently has eight radars within the state and one radar in Arkansas, with a viewshed extending into the state of Oklahoma. The types of radars located within the state include:

- **Airport Surveillance Radars (ASRs):** ASRs are short-range systems that provide visibility of air traffic in the vicinity of airports and airfields. Additionally, these radars can aid in instrument approach to runways.
- **Long-Range Radars (LRRs):** LRRs are capable of surveilling airspace at ranges of up to 1200 miles and provide wide-area situational awareness for air traffic management and aviation safety.
- **Next Generation Weather Radar:** Also referred to as NEXRAD, these radars are a network of 160 high-resolution doppler weather radars jointly operated by the National Weather Service (NWS), the FAA, and the Air Force. The NEXRAD system detects precipitation and wind and maps precipitation patterns and movement.



Source: Office of the Assistant Secretary of Defense for Sustainment, DoD Unified Facilities Criteria 3-260-01 2019, Tinker AFB, Fort Sill, Matrix Design Group

-  Radar Viewshed
- Agency**
-  NEXRAD FAA
-  NEXRAD NOAA
-  Air Force Airport Surveillance Radar
-  Terminal Doppler Weather Radar FAA
-  NEXRAD DoD

Radar Viewsheds
Figure 6

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2.0 Future Renewable Energy & Vertical Development Considerations within Military Operational Areas

The following sections provide potential impacts on military operations by assessing the types of development in the state and how sitings may pose a risk to military training and readiness. These types of development include vertical obstructions, wind energy, solar energy, transmission lines, and communications towers.

2.1 Vertical Obstructions

Impacts on Military Missions

Vertical obstructions are buildings, trees, structures, and other features that encroach into the navigable airspace or a radar's line of sight used by the military. These obstructions can be a safety hazard to both the public and military personnel and potentially impact military readiness. Vertical obstructions can compromise the value of low-level flight training by limiting the areas where such activity can occur. Vertical obstructions can also interfere with radar transmissions, compromising the integrity of data transmission between the transmitter and receiver. Though most critical near the transmitter, the geographic area impacting the transmissions, or radar viewshed, can be broad depending on the distance between the transmitter and receivers.

Buildings

In areas of high population, such as Oklahoma City or Tulsa, planned vertical development in the form of buildings poses potential risks to low-level military training routes (MTRs) or imaginary surfaces. As urban areas continue to grow and expand, the need for high density and vertical development may increase. Consulting with nearby military partners on the siting of certain tall buildings will help ensure the facility does not affect a low-level MTR or imaginary surface while still promoting economic development.

Wind Turbines

Large-scale wind turbine heights continue to increase to reach more significant wind potential at higher altitudes—some extending more than 500 feet above ground level (AGL). Existing project review processes at the federal and state level address the potential for cumulative impacts and ensure that any aggregation of wind turbines or other tall structures within a single MTR does not degrade the utility of the route to the point it is no longer viable.

Communications Towers

Communication towers generally range between 50-400 feet in height. When built near installations or military operational areas, these towers potentially impact imaginary surfaces, low-level MTRs, and radar frequencies. Imaginary surfaces extend up to 45,000 feet, or 8.5 miles, from the primary surface of the runway, potentially extending beyond the installation boundary. Like turbines, the height of communications towers built in rural areas where military operations exist can degrade the utility of low-level training. Siting these towers away from imaginary surfaces or MTRs ensures the preservation of airspace for military operations.

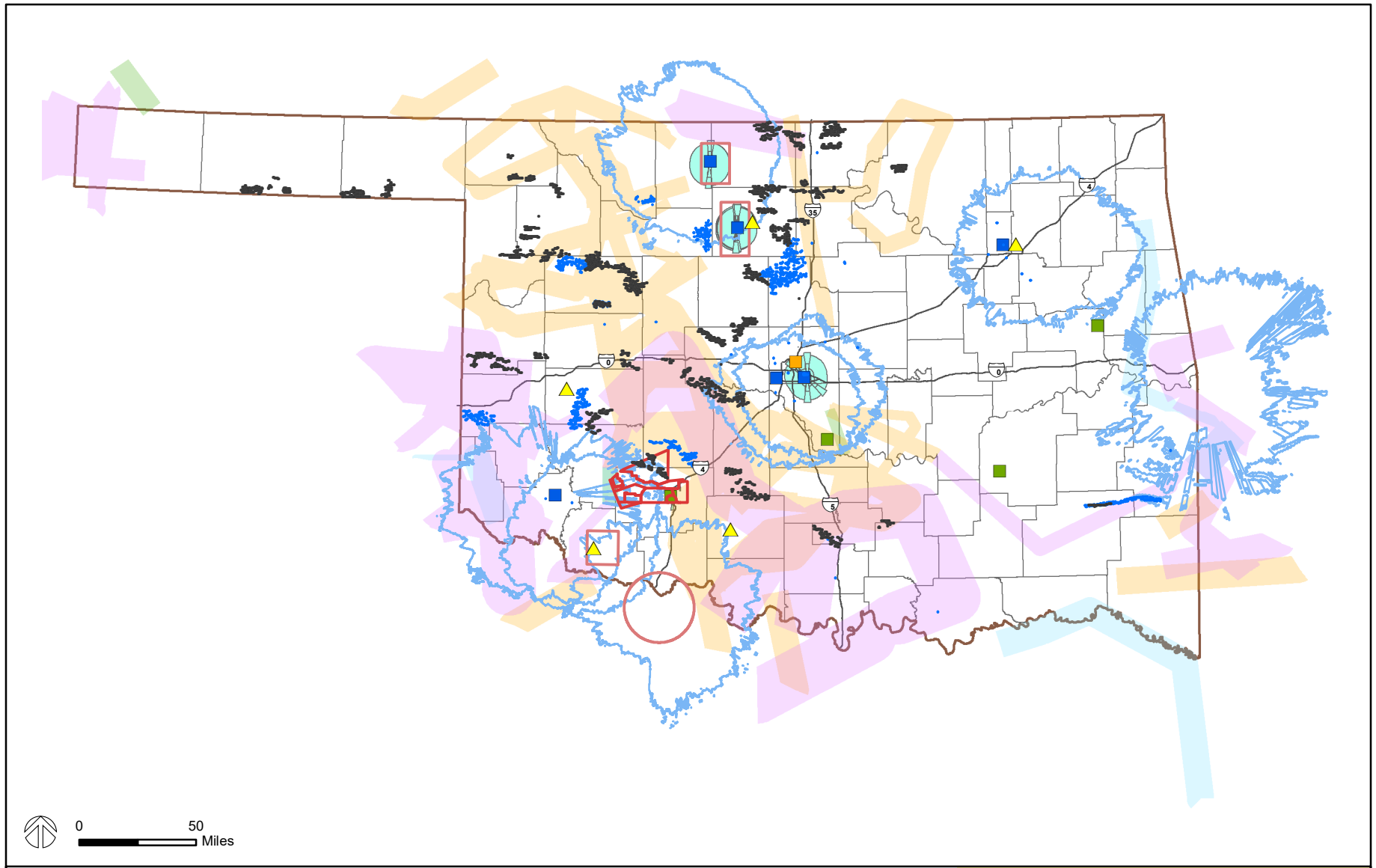
2.2 Wind Energy

Existing Projects

Most of the state's current and proposed wind turbine projects are west of Interstate 35. Additionally, many existing turbines are located within MTRs below 500 feet AGL. These turbines were sited in coordination with the military per federal and state requirements described in this report and, as a result, are compatible with military missions. Most of the current and proposed wind turbines are located outside radar viewsheds, restricted areas, and alert areas. **Figure 7** depicts existing and proposed wind turbine locations and the military operational areas throughout the state.

Impacts on Military Missions

Wind energy development positively impacts the community and the military by creating economic opportunity, providing a renewable energy source, and creating realistic training environments for the military. Although there are many benefits to wind energy development, there are also impacts on military operational areas, primarily when wind energy development is located within the low level (<500 AGL) MTRs, SUA, radar viewsheds, and nearby airfields. Potential negative impacts on military operational areas are described in the following section.



- | | | | | |
|-------------------------|------------------------------------|-----------------------------|-------------------------------|--|
| Wind Turbine | Military Training Route | Special Use Airspace | Other Operational Area | Air Force Installation |
| • Existing Wind Turbine | ■ Floor Below 500 Feet | ▭ Restricted Area | ▭ Imaginary Surface | ■ Army Installation |
| • Proposed FAA Case | ■ Floor at 500 Feet | ▭ Alert Area | ▭ Radar Viewshed | ■ Oklahoma Military Department |
| | ■ Floor Between 500 and 1,000 Feet | ▭ Other Operational Area | | ▲ Military Use, Publicly Owned Airport |
| | ■ Floor Higher than 1,000 Feet | | | |

Source: DoD Clearinghouse, FAA, USGS, Matrix Design Group.

Existing Wind Turbines and FAA Cases Within Military Operational Areas
Figure 7

Potential impacts on low-level flight training and testing

- Currently, wind turbines can reach heights of over 600 feet AGL, and as technology evolves, the heights of turbines will increase. When multiple wind turbines are located within a confined area, they can degrade the overall quality of airspace by reducing navigable corridors for low-level flight operations. Existing project review processes at the federal and state level described in this report currently assess and protect against harmful impacts to military operational areas.
- Wind farms can also affect training airspace unpublished by the FAA, including areas around landing zones and low altitude operational areas, by creating hazards in flight training and testing areas at this height.

Potential impacts on radars

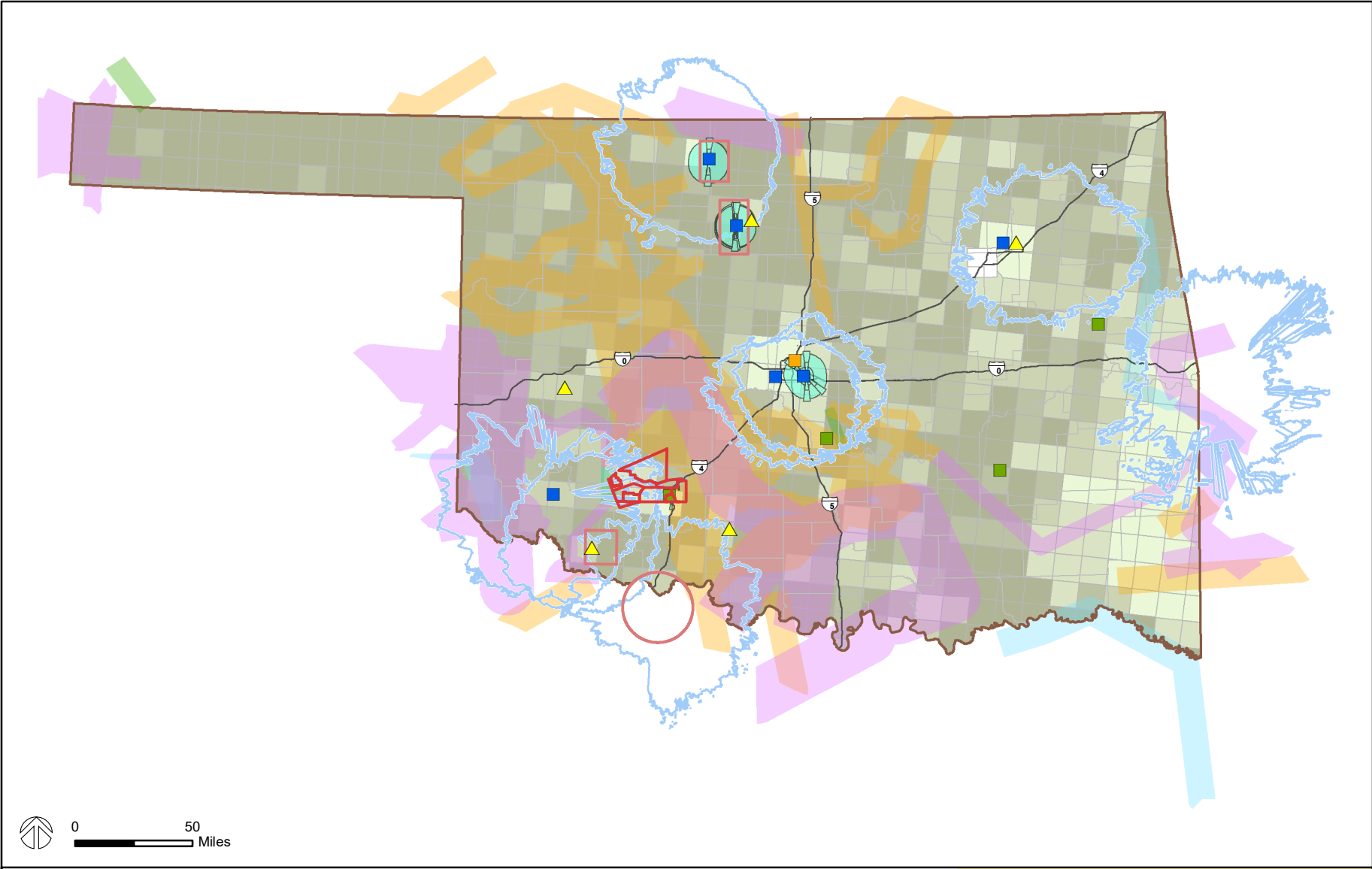
- Wind turbines impact ground-based radar systems by creating clutter. Clutter is an unwanted signal produced by wind turbines due to their height and spinning blades. In addition, wind turbines can reduce radar detection sensitivity, obscure potential radar targets, and scatter signal returns due to viewshed obstructions and frequency interference.

Potential impacts on airfield systems and range instrumentation

- When turbines are located close to an airfield, the objects can affect the reliability of conventional navigational aids, including unreliable readings from a Very-high-frequency Omni-directional Range (VOR). This potential impact can be assessed and, if necessary, mitigated through the FAA obstruction evaluation process.
- If located in the line of sight between transmitters and receivers, wind turbines may affect instrumentation used on military ranges, including telemetry, microwave facilities, and communications.

Potential Growth and Impacts

Figures 8-10 show military operational areas over the current wind energy potential throughout Oklahoma. These maps and analyses are based on wind turbines with a hub height of 80 meters, 110 meters, and 140 meters available to run at 30% capacity on different acreages. As indicated on the maps, areas with the most significant potential for wind energy development are located throughout the entire state. This can potentially impact additional MTRs, SUAs, and radar viewsheds throughout the state, with a higher concentration of potential impacts situated in the central and southwestern portions of the state.



Matrix
Excellence by Design

Source: DoD Clearinghouse, NREL, U.S. Census, Matrix Design Group.

Developable Area at 30% Capacity

- 0 to 100 acres
- 100 to 200 acres
- 200 to 250 acres
- 250 to 300 acres
- 300 to 400 acres

Military Training Route

- Floor Below 500 Feet
- Floor at 500 Feet
- Floor Between 500 and 1,000 Feet
- Floor Higher than 1,000 Feet

Special Use Airspace

Restricted Area

Alert Area

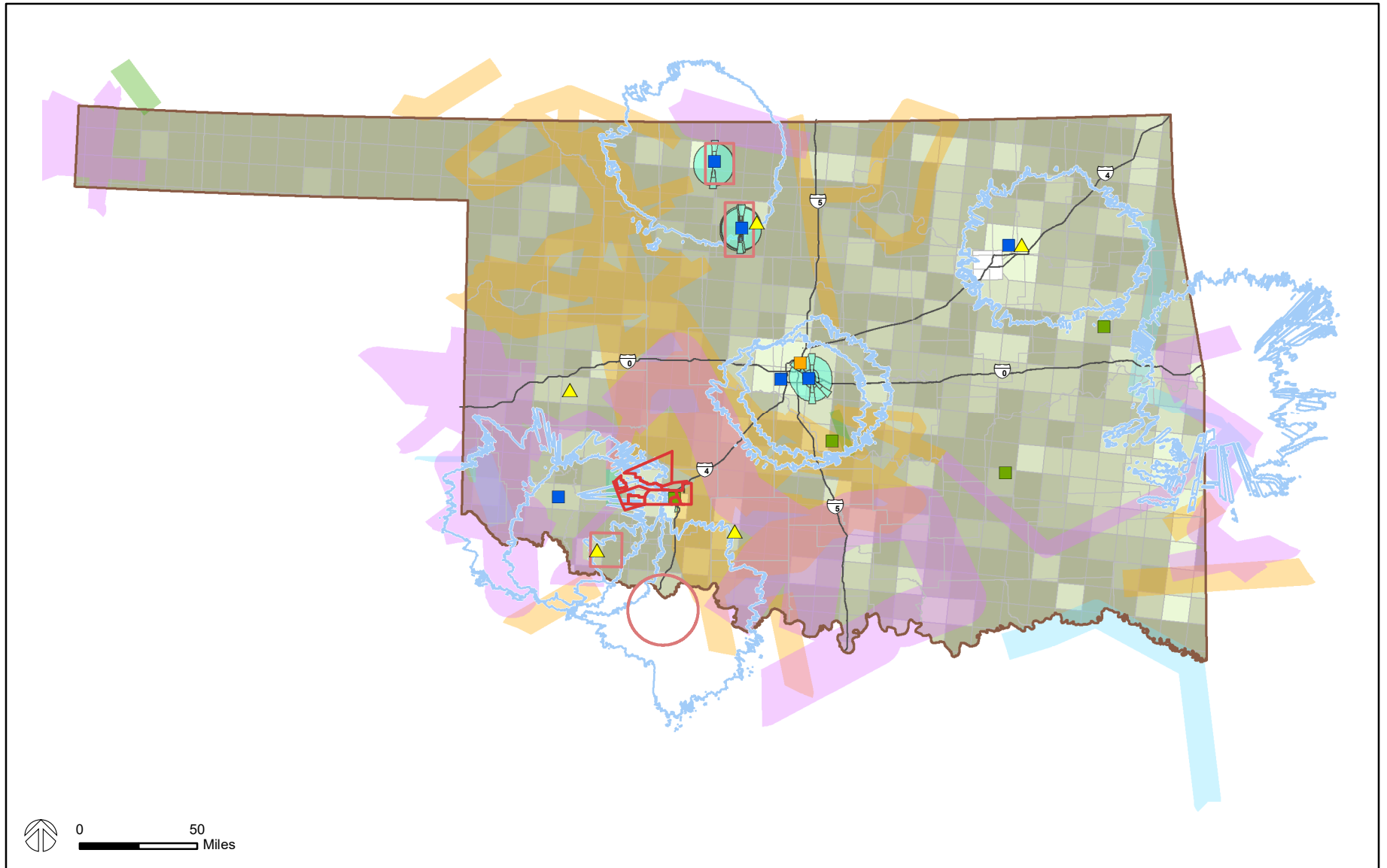
Other Operational Area

- Imaginary Surface
- Radar Viewshed

- Air Force Installation
- Army Installation
- Oklahoma Military Department
- Military Use, Publicly Owned Airport

Wind Potential at 80m Within Military Operational Areas

Figure 8



0 50 Miles

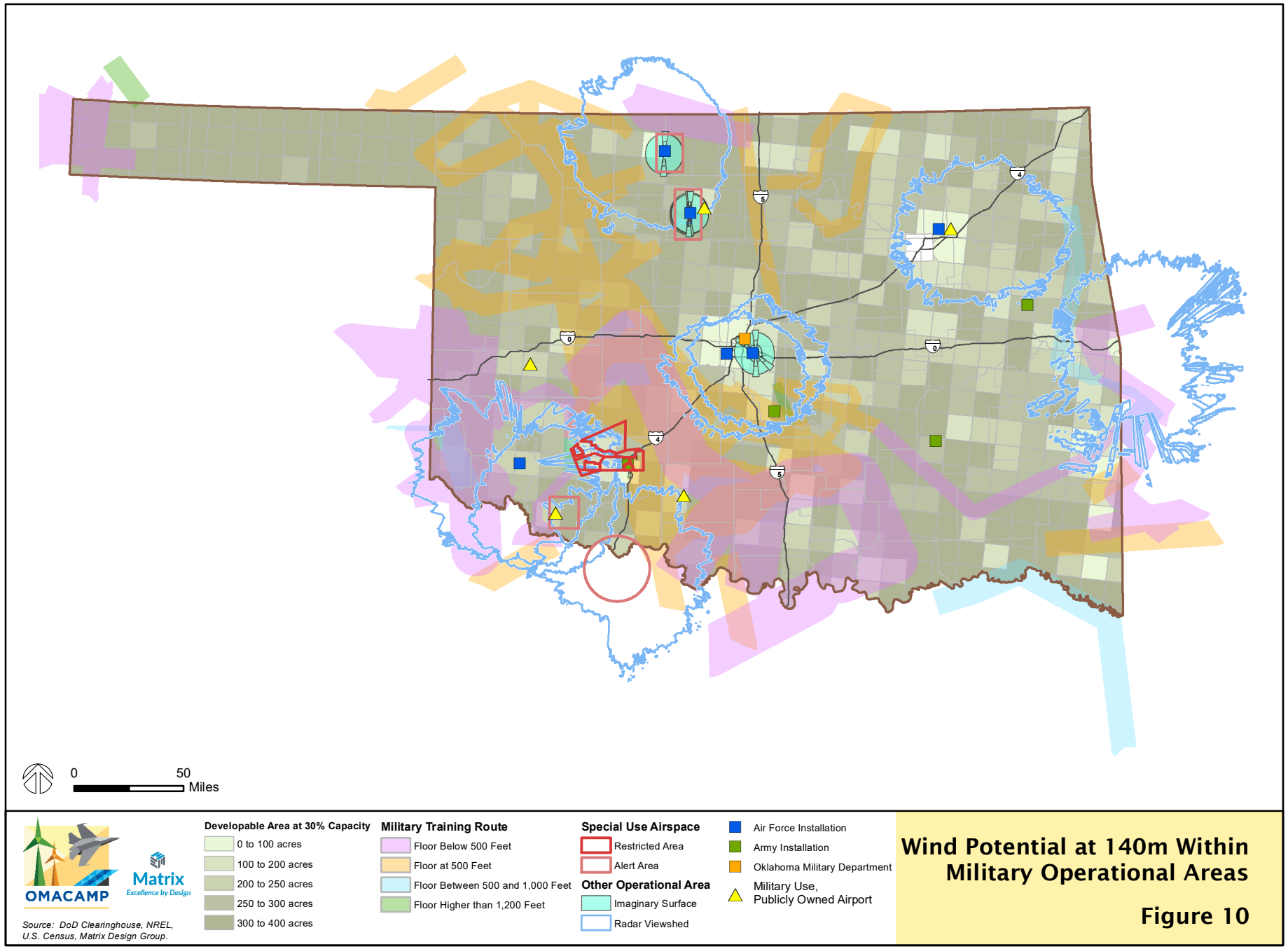


Source: DoD Clearinghouse, NREL, U.S. Census, Matrix Design Group.

<p>Developable Area at 30% Capacity</p> <ul style="list-style-type: none"> 0 to 100 100 to 200 200 to 250 250 to 300 300 to 400 	<p>Military Training Route</p> <ul style="list-style-type: none"> Floor Below 500 Feet Floor at 500 Feet Floor Between 500 and 1,000 Feet Floor Higher than 1,000 Feet Restricted Area 	<ul style="list-style-type: none"> Imaginary Surface Radar Viewshed Alert Area Air Force Installation Army Installation Oklahoma Military Department Military Use, Publicly Owned Airport
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Wind potential at 110m Within Military Operational Areas

Figure 9



2.3 Solar Energy

Potential Impacts on Military Missions

Glint and Glare

In certain circumstances, solar energy facilities on or near an airfield can impact military operations for Air Traffic Control Tower (ATCT) personnel. Photovoltaic (PV) panels used to collect solar energy are made of reflective materials with the potential to create a glint – a quick reflection or glare – a more extended reflection. PVs generate electricity by absorbing sunlight and converting it to electricity. Modern PV panels reflect as little as two percent of incoming sunlight and, as such, do not generally represent a risk to pilots, who already encounter various sources of glint and glare from buildings, bodies of water, rooftops, or parking lots.

The Federal Aviation Administration (FAA) policy *Review of Solar Energy System Projects on Federally Obligated Airports*⁴ identifies concerns for ATCT personnel visibility along the viewing angle. As such, glint and glare are often a concern when solar energy facilities are sited in proximity to or on airports, mainly when ATCT personnel are crucial to military operations. In the case of facilities on or near airports with an ATCT, the FAA recommends conducting an ocular analysis of potential impacts on ATCTs before submitting *FAA Form 7460-1, Notice of Proposed Construction or Alteration*.

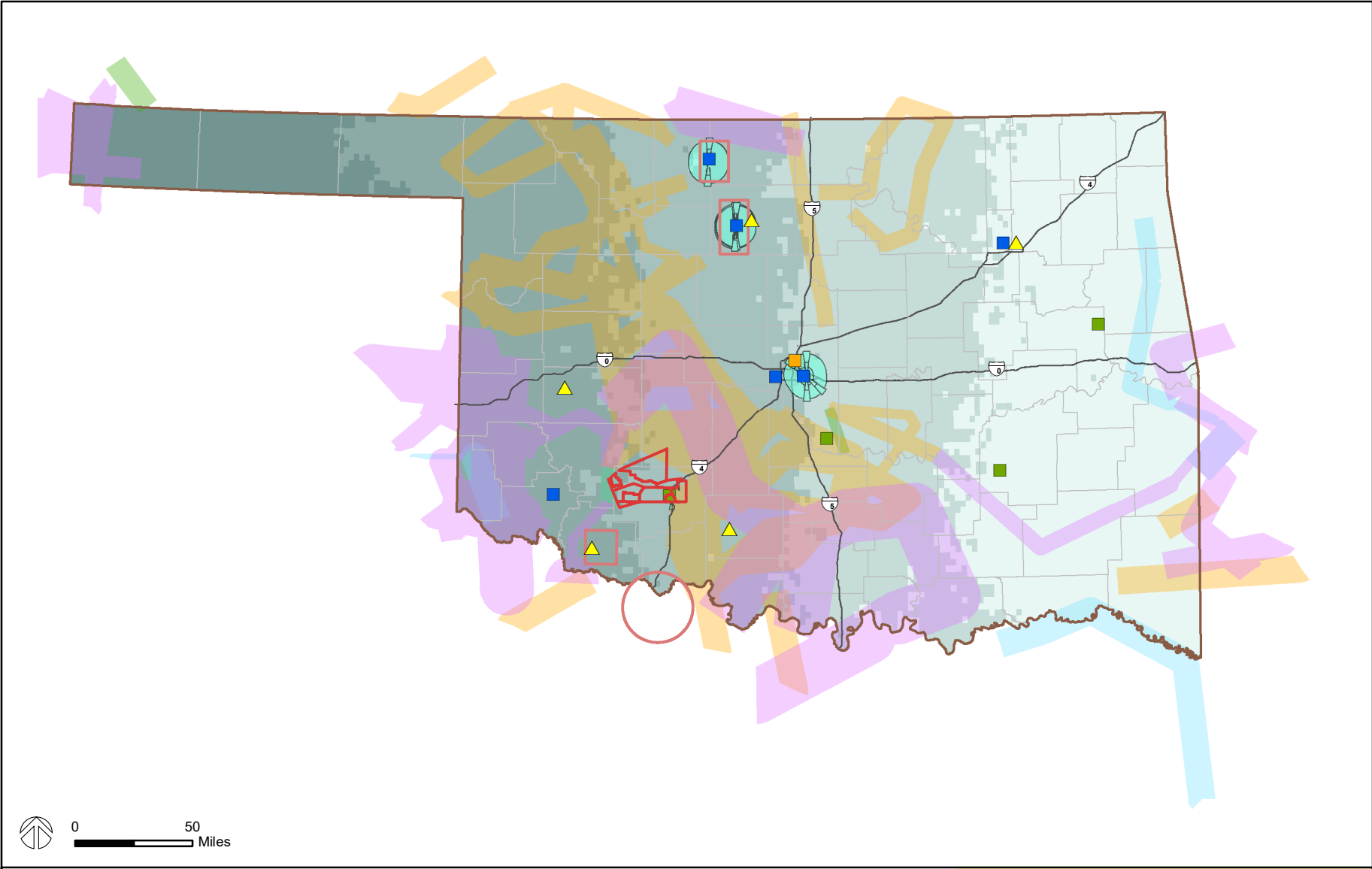
Radar Impacts

Equipment used in solar energy facilities, including switching power supplies, charge controllers, DC light ballasts, and inverters, emits electromagnetic noise. According to a report from the National Renewable Energy Laboratory, equipment built within 150 feet of frequency-reliant systems may pose impacts. Shielding, noise cancellation, filtering using capacitors or inductors, or suppression methods such as ferrites are mitigation measures for these potential impacts.

Potential Growth

As depicted in **Figure 11**, the potential increase in future solar energy projects exists throughout the state, with a higher concentration west of I-35. According to the Oklahoma Department of Commerce, Oklahoma is the sixth highest state for solar energy potential. Though currently, only .3% of the state's energy comes from solar resources, there may be an increase in the market due to the high number of sunlight hours, especially in the western portions of the state.

⁴ <https://www.govinfo.gov/content/pkg/FR-2021-05-11/pdf/2021-09862.pdf>



0 50 Miles



Matrix
Excellence by Design

Military Training Route
 Floor Below 500 Feet
 Floor at 500 Feet
 Floor Between 500 and 1,000 Feet
 Floor Higher than 1,000 Feet

Direct Normal Irradiance kWh/sqm/day
 Up to 5.25
 5.25 to 5.6
 5.6 to 5.95
 5.95 to 6.38
 6.38 to 6.96

Special Use Airspace
 Restricted Area
 Alert Area
Other Operational Area
 Imaginary Surface

Blue Square: Air Force Installation
 Green Square: Army Installation
 Orange Square: Oklahoma Military Department
 Yellow Triangle: Military Use, Publicly Owned Airport

Source: DoD Clearinghouse, NREL, U.S. Census, Matrix Design Group.

Solar Potential Within Military Operational Areas

Figure 11

2.4 Transmission Lines

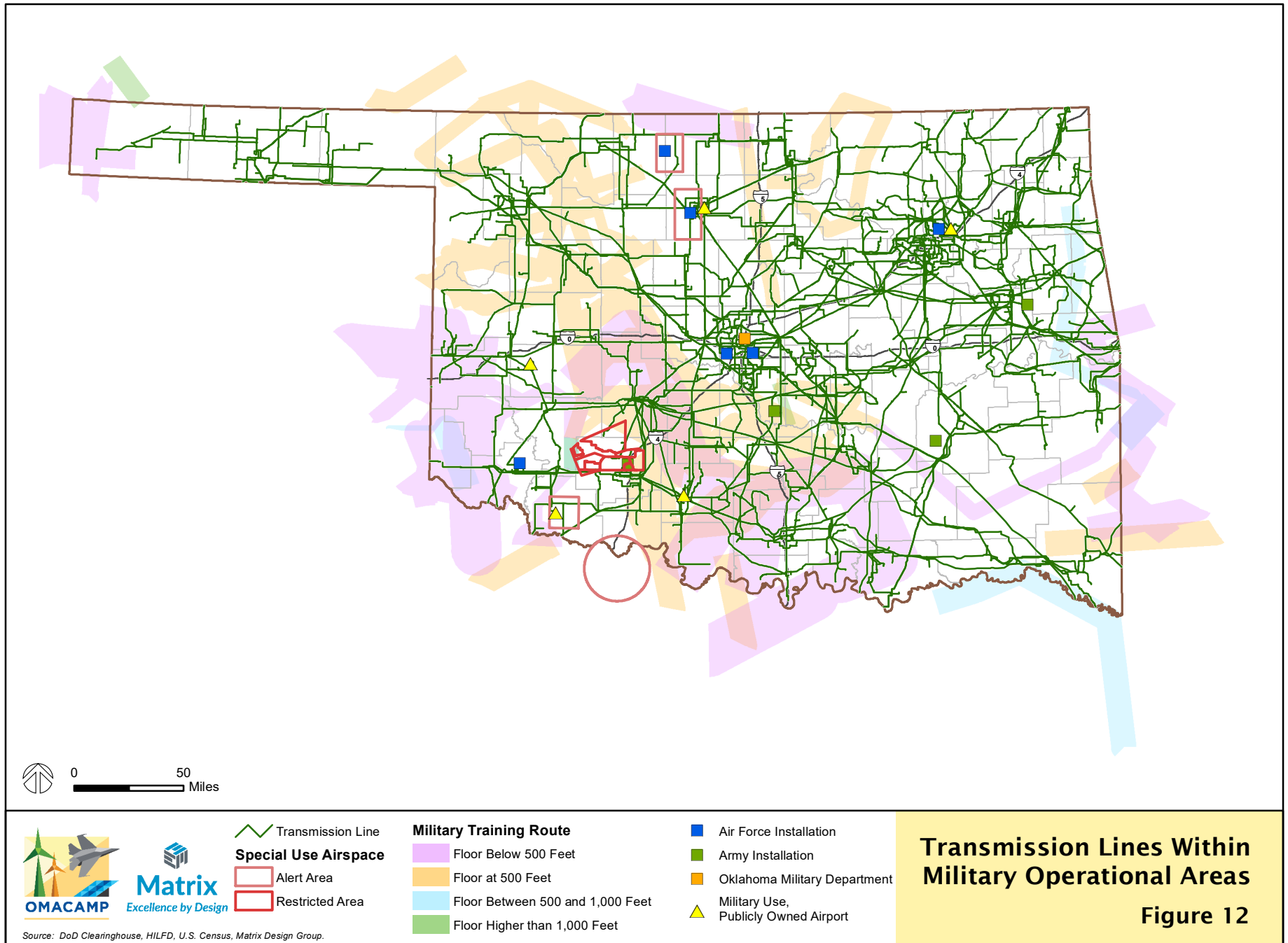
Potential Impacts on Military Missions

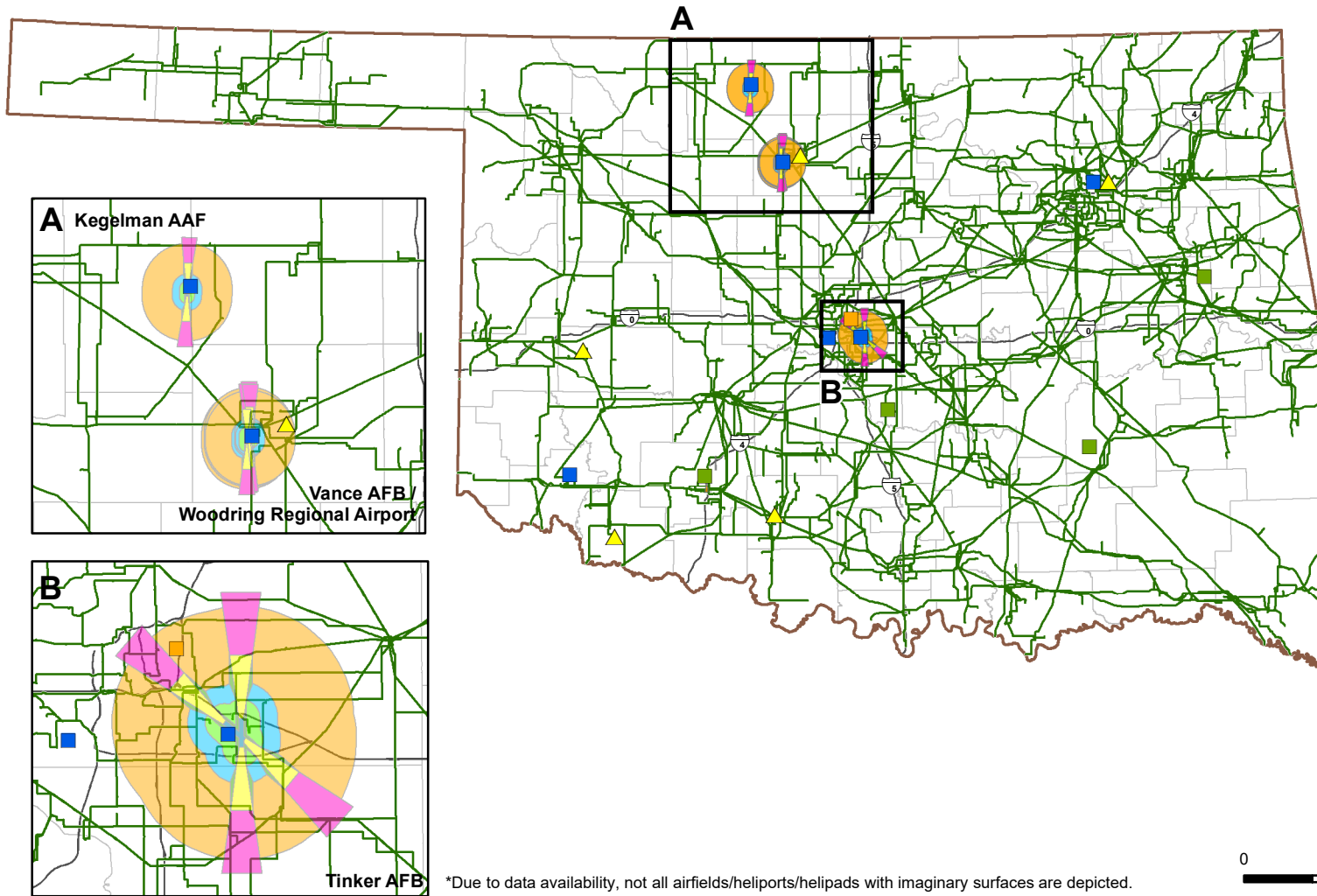
At the height of 55-150 feet on average, transmission lines and towers can pose hazards to aircraft if within low-level flight areas and imaginary surfaces. Although the size of transmission lines is typically below the minimum flight altitudes of MTRs and SUAs, safety regulations specify that aircraft operate at least 500 feet away from transmission lines. As such, transmission lines located near lower altitude MTRs and SUA may require military operations and training to be altered. Additionally, transmission lines located near an airport or heliport/helipads, whether military or civilian, can pose obstruction hazards to flight safety within the imaginary surfaces of the airfield. High voltage transmission lines (300 kV or greater) can emit electromagnetic interference, impacting radar and communication frequencies. Recent studies indicate that several factors, including the power levels of lines and tower incident angles, types, and numbers, can influence radar signal loss. A separation distance of 1.36 miles (2,200 meters) is recommended between power transmission lines and radars⁵. **Figure 12** depicts current transmission lines with military operational areas. **Figures 13 and 14** show different regions of the state with transmission lines located near or within imaginary surfaces.

Proposed Expansion

According to the Southwest Power Pool (SPP) 2022 20-Year Assessment Scope, “The objective of the 20-year assessment is to develop a long-range extra-high voltage (EHV), 300 kV and above, transmission road map for the SPP region.” Under this plan, approximately three new projects are sited for the state. Upgrades to current transmission lines are planned to increase the voltages to over 300 kV, also posing concerns for radar frequency interference. According to the 2021 SPP Transmission Expansion Plan Report, most projects will be located near or southwest of the Oklahoma City region and in the northeast portions of the state. Many proposed projects may affect low-level flying routes, radar viewsheds, and an alert area in these portions of the state.

⁵ T. Bo, Y. Jiawei, H. Li and H. Bin, "Determination of Permissible Distance Between Air Defense Surveillance Radar and UHVAC Power Transmission Lines," in IEEE Transactions on Applied Superconductivity, vol. 29, no. 2, pp. 1-5, March 2019, Art no. 0500105, doi: 10.1109/TASC.2018.2890589.





*Due to data availability, not all airfields/heliports/helipads with imaginary surfaces are depicted.

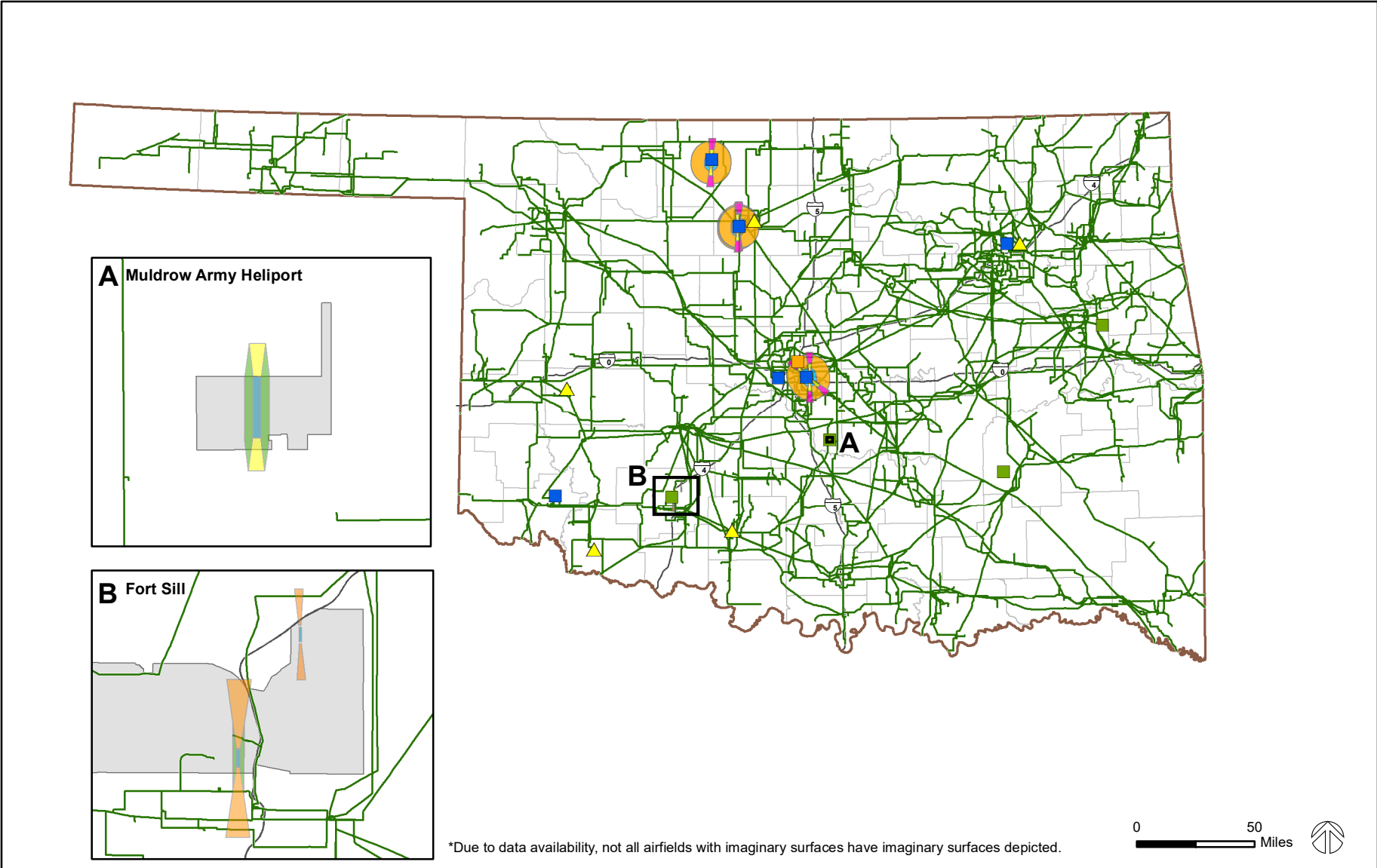


- Transmission Line
- Airfield Imaginary Surfaces**
- Primary Surface (0 ft)
- Approach/Departure Clearance Surface (50:1)
- Approach/Departure Clearance Surface (Horizontal)
- Inner Horizontal Surface (150 ft)
- Conical Surface (20:1)
- Outer Horizontal Surface (500 ft)
- Transitional Surface (7:1)
- Air Force Installation
- Army Installation
- Oklahoma Military Department
- Military Use, Publicly Owned Airport

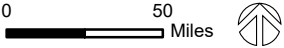
Transmission Lines Within Imaginary Surfaces

Figure 13

Source: DoD Clearinghouse, HIFLD, U.S. Census, Matrix Design Group.



*Due to data availability, not all airfields with imaginary surfaces have imaginary surfaces depicted.



- Transmission Line
- Airfield Imaginary Surfaces**
 - Primary Surface (0 ft)
 - Approach/Departure Clearance Surface (50:1)
 - Approach/Departure Clearance Surface (Horizontal)

- Inner Horizontal Surface (150 ft)
- Conical Surface (20:1)
- Outer Horizontal Surface (500 ft)
- Transitional Surface (7:1)

- Air Force Installation
- Army Installation
- Oklahoma Military Department
- Military Use, Publicly Owned Airport

Transmission Lines Within Imaginary Surfaces

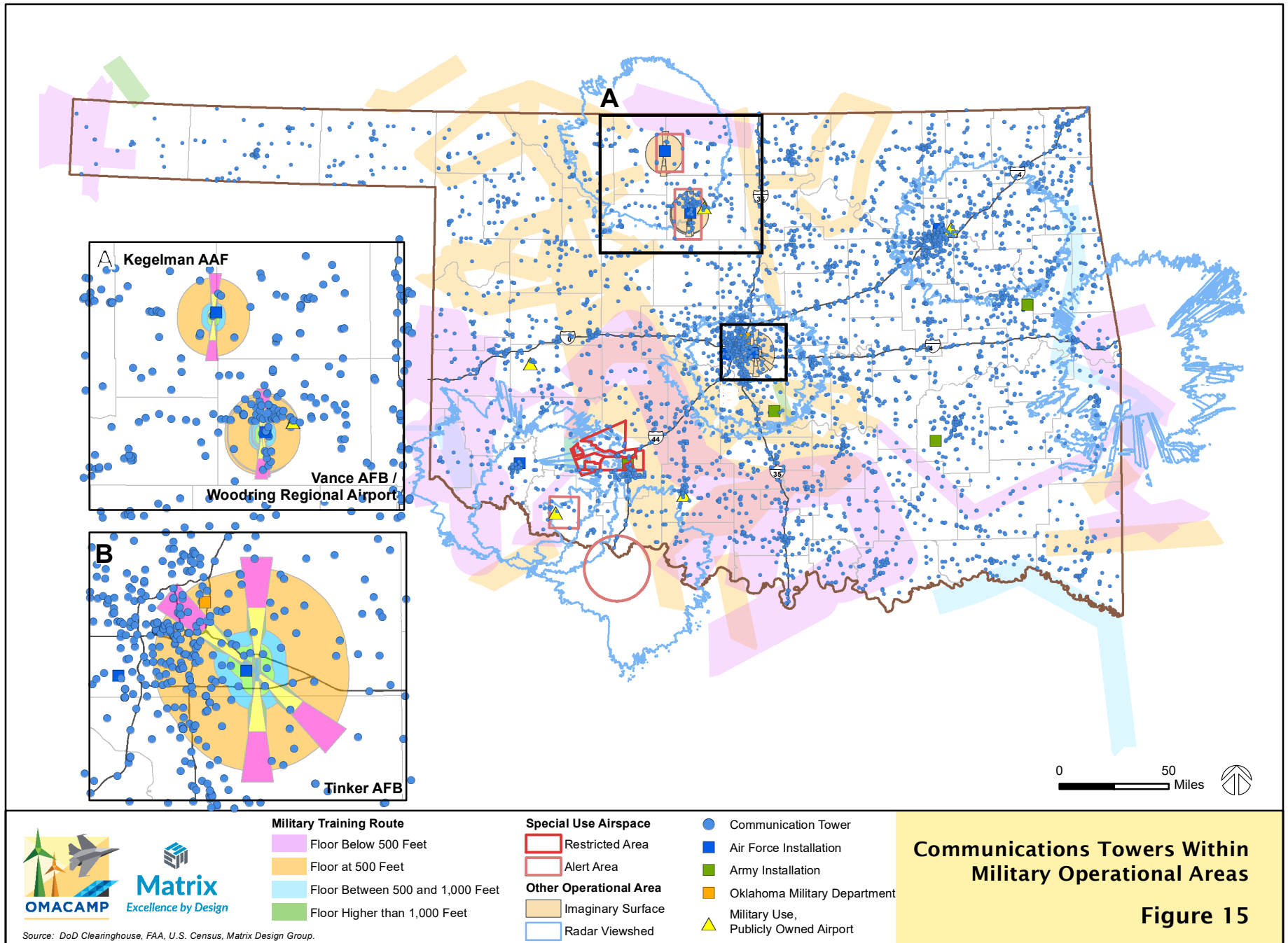
Figure 14

Source: DoD Clearinghouse, HIFLD, U.S. Census, Matrix Design Group.

2.5 Communications Towers

Impacts to Frequency

Communication towers emit electromagnetic radio waves, known commonly as radio frequencies. As communication towers emit frequencies, the potential impact on radars increases due to interference. In 2014 a communication tower caused this impact in southwest Oklahoma, creating false precipitation readings on a National Weather Service radar. Siting communications towers, which range from 50-400 feet tall away from airport and heliport/helipad safety zones, and military operational areas, ensures airspace preservation throughout the state. Current communications towers with military operational areas are shown in **Figure 15**. As described in Section 2.1, *Vertical Obstructions*, communication towers can also create vertical obstruction concerns for military operational areas.



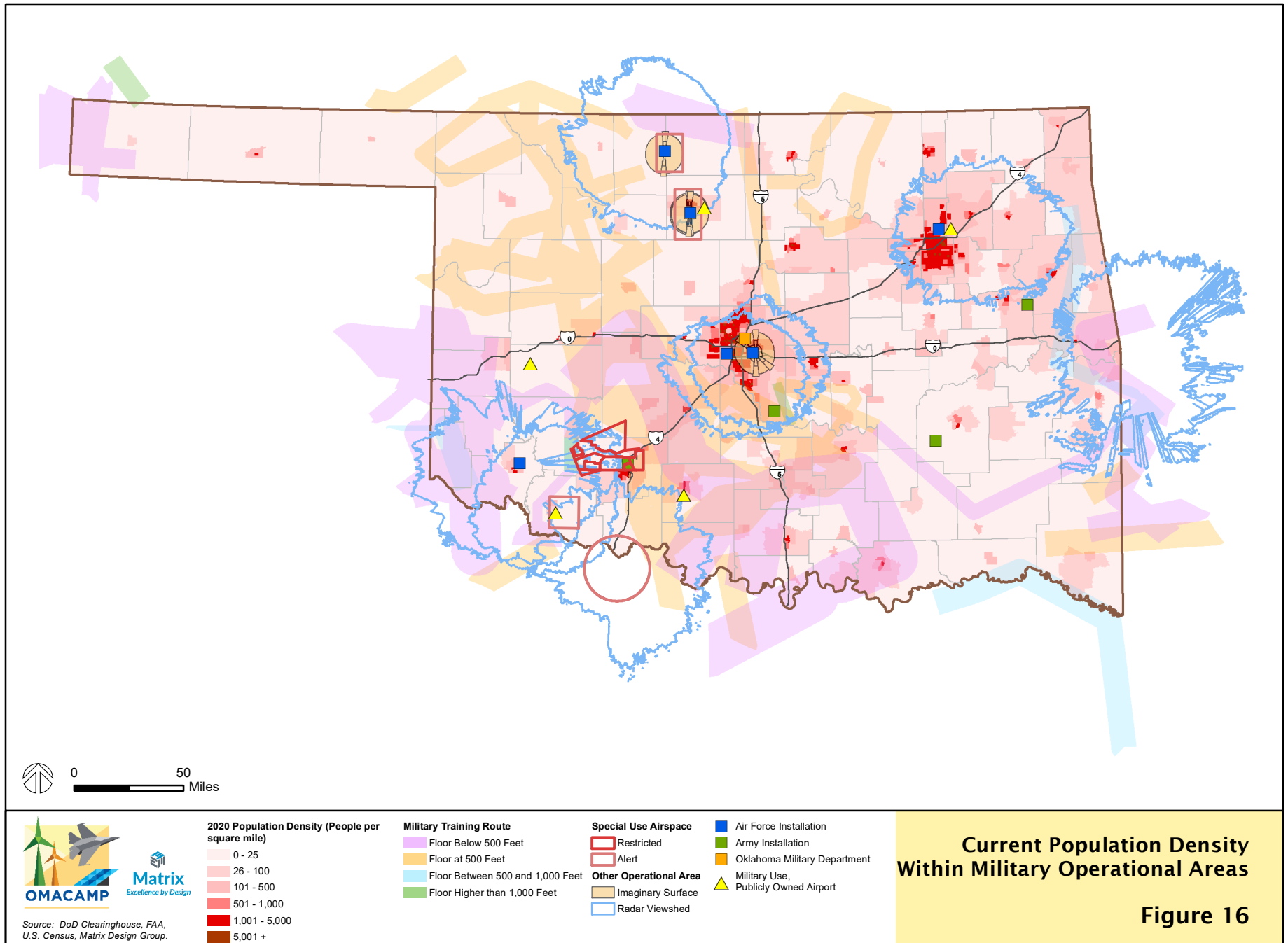
Communications Towers Within Military Operational Areas

Figure 15

2.6 Population Growth

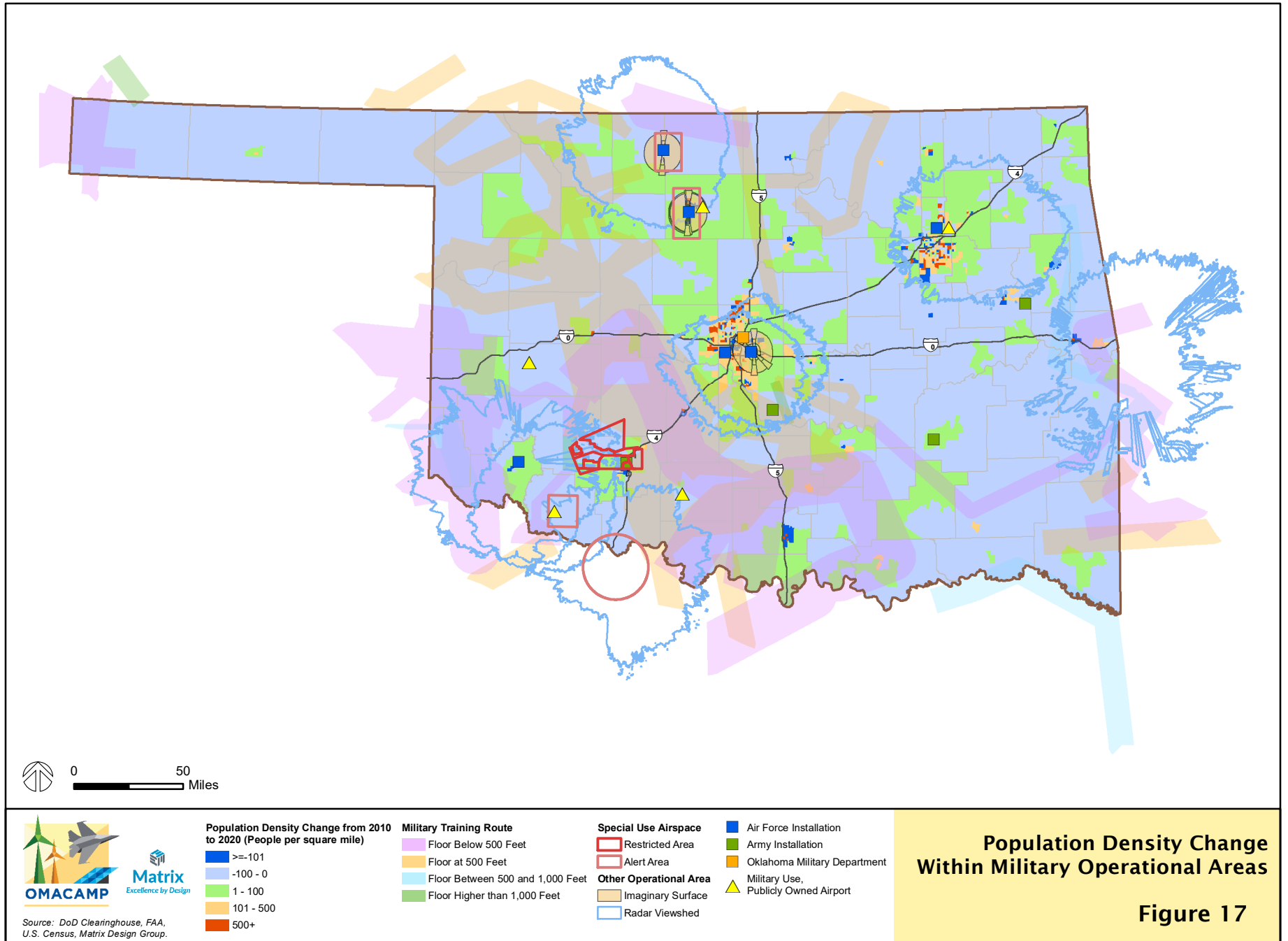
As population growth continues, so will the potential for increased density and intensity of development, energy requirements, and communications needs across the state. Increased development and potentially new energy or communications projects may directly impact MTRs, imaginary surfaces, and radar viewsheds. According to the Oklahoma Department of Commerce, the state is expected to experience population growth of approximately 0.73% annually through 2050. Some of the highest affected areas will be the counties surrounding Tulsa and Oklahoma City. In the same report, the Department of Commerce explains the 14 counties surrounding Tulsa and Oklahoma City Metropolitan Statistical Areas represent nearly 60% of the entire state's population, which is only expected to increase into 2050⁶. **Figure 16** shows the current population density, while **Figure 17** shows the change in population density with MTRs, SUAs, imaginary surfaces, and radar viewsheds.

⁶ <https://www.okcommerce.gov/wp-content/uploads/Population-Projections-Report-2012.pdf>



Current Population Density Within Military Operational Areas

Figure 16



Population Density Change Within Military Operational Areas

Figure 17

3.0 Current Military Coordination

A review of existing policy and regulations in Oklahoma provides a holistic understanding of protections currently in place for military installations and operational areas. The following sections will provide summaries of federal laws and regulations, state laws and regulations, and military regulations aimed at bolstering military coordination efforts.

3.1 Federal Regulatory Coordination

This section summarizes Oklahoma's federal laws and regulations for military coordination efforts. As required by federal law, and explained in detail below, structures that may pose potential hazards to military missions or operational areas must be reviewed by the DoD's Military Aviation and Installation Assurance Siting Clearinghouse (Clearinghouse) through the FAA's obstruction evaluation and airport analysis process.

Title 49 U.S. Code § 44718

This statute addresses structures interfering with air commerce or national security. Title 49 U.S. Code § 44718 outlines the FAA's obstruction evaluation and airport analysis (OE/AAA). This analysis requires an applicant to give adequate public notice of the construction, alteration, establishment, or expansion of the proposed structures or a sanitary landfill when the notice promotes safety in air commerce, the efficient use, and preservation of navigable airspace for airport traffic capacity, public-use airports and heliports/helipads, and the interests of national security. Should the proposed construction potentially impact aviation safety, the FAA will conduct an aeronautical study. This study is also reviewed by the Clearinghouse, which will determine if the proposed development has adverse impacts or cause unacceptable risk to national security at military airports and heliports/helipads having at least one instrument approach procedure. Findings are sent to the FAA, which may necessitate further action to ensure military readiness and operations compatibility.

Obstruction Evaluation/Airport Airspace Analysis (OE/AAA)

Aeronautical studies are conducted based on information provided by an applicant via FAA Form 7460-1, Notice of Proposed Construction or Alteration, to promote air safety and the efficient use of navigable airspace. Requirements for filing Form 7460-1 on proposed structures are based on several factors: height, proximity to an airport or heliport/helipad, location, and frequencies emitted from the development. Per the FAA's wind turbine FAQ, the administration requests wind energy developers file Form 7460-1 at least 90-120 days before planned construction⁷. The FAA requires a filing at least 45 days before construction for all other development. A filing for a proposed project is required if the:

⁷ <https://oeaaa.faa.gov/oeaaa/external/searchAction.jsp?action=showWindTurbineFAQs>

- Height exceeds 200 feet AGL
- Location is near or within an airport or heliport/helipads, instrument approach area, or navigation facility that may impact assurance of navigation and signal reception
- Emitted frequencies do not meet FAA co-location policy
- Filing has been requested directly by the FAA

Title 14 CFR Part 77

Part 77 contains the FAA regulations that implement Title 49 U.S. Code § 44718. These regulations include all required items to provide notice to the FAA, and subsequently the Clearinghouse, to include implementation of FAA Form 7460-1, *Notice of Proposed Construction or Alteration*. Per this regulation, applicants must submit the FAA Form at least 45 days before the start date of the proposed construction or when a construction permit is filed. The FAA requests filing at least 90-120 days before construction for wind energy projects. Additionally, the types of construction or alteration that require notice are outlined in this instruction, including structures above 200 feet AGL or near specified distances of airport or heliport/helipad imaginary surfaces. Subpart C of this regulation provides standards for determining obstruction to air navigation or navigational aids or facilities. Sections 77.19-23 identify civilian airports, DoD airports, and heliports/helipads imaginary surfaces as areas where applicant notification to the FAA is required.

Title 10 U.S. Code § 183a

Section 183a of the U. S. Code establishes the Clearinghouse requirements for reviewing proposed energy projects filed with the FAA, impacting the overall review process for this type of development. Per this code, the Clearinghouse reviews applications for energy projects filed with the FAA under Title 49 U.S. Code § 44718. This code also defines DoD finding of unacceptable risk to national security and parties which require notification should the DoD come to this determination. Any DoD hazard assessment on potential obstructions caused by energy projects is not a substitute for hazard determination from the FAA but rather supplemental to the administration's findings.

Military Aviation and Installation Assurance Siting Clearinghouse Process

Documented in Title 32 CFR Part 211, the DoD structured a process for developers to request a mission compatibility evaluation of proposed energy projects. Per 10 U.S. Code § 183a (c)(6), if an energy project proposal is located within a military training route (MTR) or in a radar viewshed that the DoD owns or operates in, then the project must be filed at least one year before construction.



Formal Review

The Clearinghouse formal review process, described in Title 32 CFR § 211.6, applies to projects filed with the secretary of transportation. This process addresses all energy projects with heights greater than 199 feet AGL proposed for construction within MTRs or special use airspace regardless of the underlying land ownership. The Clearinghouse then provides information about proposed projects to experts in various military departments and DoD components. Once technical and operational studies are complete, the Clearinghouse submits a unified DoD position of findings to the FAA as part of the OE/AAA review.

If DoD findings state that a project may pose unacceptable impacts to national security, the Clearinghouse will seek to mitigate those impacts before submitting a negative recommendation to the FAA. The applicant is then asked to participate with the DoD in a partnership called a Mitigation Response Team (MRT) to explore potential mitigation opportunities while ensuring the continuation of DoD operations, testing, training, and energy development.

Informal Review

Highly encouraged by the Clearinghouse, Title 32 CFR § 211.7 establishes the informal review process. These reviews are typically initiated by the developer and recommended in the early stages of the siting process for energy facilities. Though there may be no definitive plans, early engagement is key to this review process. The goal is to identify areas of potential impact and once identified, refer the applicant to the appropriate DoD stakeholder for further discussion within five days of receiving the request.

Informal review requests are sent to the Clearinghouse email address with information about the developer, the type of project, geographic locations (including latitude and longitude), and as much information as possible on the nature of the project. All comments and recommendations received require Clearinghouse evaluation no later than 50 days after receiving the request to determine if the project has an adverse impact on military operations and readiness. If the project poses a concern, the Clearinghouse will also define the next steps to mitigate potential hazards. The following points outline the values and limits of the informal review process:

- A project proponent can utilize the informal review process to get the DoD's preliminary assessment of a project before going through the formal review triggered when a project is publicly filed with the FAA
- The Clearinghouse initial assessment is generally non-binding during informal reviews, and it could change during the subsequent formal review, but it does provide early notice of concerns DoD may have and the potential need for mitigation

- The Clearinghouse is willing to sign mitigation agreements regarding projects reviewed during informal reviews that do result in DoD clearance of the project if the mitigation agreement is adhered to when the formal review is triggered

Title 32 CFR Part 211

Supplemental to Title 49 USC 44718, this code of federal regulations establishes procedures for the Clearinghouse project evaluation process. The formal review process of a proposed project begins with receipt of the initial application filed with the FAA. The Clearinghouse is required to respond with one of three determinations:

- No adverse impact on military operations and readiness
- Adverse impacts on military operations, not requiring mitigation
- Adverse impacts on military operations and readiness requiring additional mitigation

In the event of the third determination, the Clearinghouse initiates a formal review of the proposed project once the applicant is notified. Within five days of receiving the notification from the Clearinghouse, applicants are required to provide an agreement to discuss the possibility of mitigation. If no such agreement is provided, or mitigation efforts do not reach an agreement within 90 days of notification, a determination of unacceptable risk to national security would be provided by the Clearinghouse to the FAA in its findings. However, many developers often seek mitigation efforts to reduce risks to national security by working directly with the Clearinghouse to determine the best way forward for that specific project, as seen in the [“mitigation agreements” tab here](#).

Another option includes a proactive measure—informal reviews—initiated by the requestor to provide as much information as is available on the specific project. Within five days of receipt, the Clearinghouse conveys the information to stakeholders which the project may impact. No later than 50 days after receiving data from the requestor, the Clearinghouse provides one of the three determinations listed above.

3.2 State Regulatory Coordination

Oklahoma has robust laws for coordination efforts regarding construction near airports, as described in Title 3 and Title 11 below. State Statute Title 17 contains the Oklahoma Wind Energy Act, which codifies notification and communication procedures for wind energy construction. Further elaboration of the communication/notification requirements may be found in **Section 5**.

Oklahoma State Statute Title 3. Airports and Aircraft Statutes

Okla. Stat. Title 3 § 83 establishes the Oklahoma Aeronautics Commission, which consists of seven governor-appointed members. The commission is empowered and directed to encourage, foster, and assist in developing the state. This is completed by promoting



growth in the state aviation industry, thus focusing on aviation safety by conducting duties outlined in Okla. Stat. Title 3 § 102, *Permit for the Erection, Alteration, or Modification of Structures*. Okla. Stat. Title 3 § 116 explains the commission's role in providing technical assistance to subdivisions wishing to establish an airport zoning code to ensure further compatible land uses.

Okla. Stat. Title 3 § 102 aims to prevent the erection of structures dangerous to air navigation, subject to several provisions. This statute states that all persons should secure a permit for the erection, alteration, or modification of any structure that exceeds the federal obstruction standards in Title 14 CFR Part 77. Local airport zoning authority permits are required if the proposal is within airport hazard areas where federal standards are exceeded and within:

- A 10-nautical mile radius of a public or military airport with published instrument approach procedures
- A 6-nautical mile radius of a public or military airport with no published instrument approach procedures but with runways more than 3,200 feet in length., or
- A 2.5-nautical mile radius of the geographical center of a public or military airport without published instrument approaches or runways shorter than 3,200 feet in length

Oklahoma State Statute Title 11. Cities and Towns

Under Okla. Stat. Title 11 § 43-101.1 any municipality that is partially or wholly within specified military installation areas is granted the right to enact a city ordinance restricting or prohibiting future incompatible uses. The Air Installation Compatible Use Zone (AICUZ) study area, Joint Land Use Study (JLUS) area, Army Compatible Use Buffer (ACUB), or Environmental Noise Management Plan (ENMP) of active duty, national guard, or military reserve installation is included in the definition of area. Also considered are areas with accident potential that could affect the public's health, safety, and welfare or interfere with military operations. Ordinances are enacted to restrict or prohibit future uses within the AICUZ or JLUS areas which:

- Release into the air any substance which would impair visibility or otherwise interfere with military operations, including ground operations, such as steam, dust, or smoke unless the substance is generated from agricultural use
- Produce light emissions, either directly or indirectly or by reflective light, which would interfere with pilot vision, and aerial or ground-based night vision training
- Produce electrical emissions which would interfere with military ground and aircraft communications and navigation equipment
- Attract birds including, but not limited to, operation of sanitary landfills and maintenance of feeding stations
- Provide for structures within 10 feet of defined aircraft approach, departure, or transitional surfaces; or 100 feet beneath a low-level military aircraft training route as provided by the FAA

- Expose persons to noise greater than sixty-five (65) DNL, or
- Detract from the aesthetic appearance, or otherwise create or promote an unsightly, unsanitary, or unhealthy appearance of any entrance into a military installation including, but not limited to, automobile or truck salvage yards, equipment storage sites, or solid waste storage or disposal sites.

Oklahoma State Statute Title 17. Corporation Commission

Also known as the Oklahoma Wind Energy Development Act, Okla. Stat. Title 17 § 160.11-22 codifies regulations on wind energy siting and notification requirements throughout the state. Additionally, the Act states that any individual turbine part of a wind energy facility shall not encroach upon or significantly impact military operational areas as determined by the Clearinghouse. The main aim is to promote the development of wind energy sources while reinforcing notification requirements for siting approval from the FAA and Clearinghouse. This process is further elaborated on in the following section. Furthermore, this act requires developers to take additional action in informing the public, as shown in **Table 3**. No individual wind turbine or any other individual structure that requires an FAA 7460-1 form and is part of a wind energy facility may be constructed or expanded unless there is an active Determination of No Hazard from the FAA and evidence that adverse impacts to the DOD have been resolved, according to Title 32 of the Code of Federal Regulations, Section 211.6. The Mission Compatibility Certification Letter or successor form may serve as evidence of adverse impacts being resolved with the Department of Defense or successor agency.

Oklahoma Wind Energy Development Act Process

The Wind Energy Development Act aims to increase coordination between wind energy developers, state entities, and the military. In addition to setback requirements, notification and coordination requirements are outlined in **Table 1**, which goes in chronological order by action and timeframe from initial notification to final determination before construction.



Table 3. Oklahoma Wind Energy Development Act Coordination

Action	Timeframe
1. Applicant notifies Oklahoma Corporation Commission (OCC) of intent to build	Within 6 months of the initial filing of 7460-1 with the FAA
2. Applicant notifies all affected counties and cities	Within 24 hours of filing with the OCC
3. Applicant notifies Oklahoma Aeronautics Commission (OAC)	Within 30 days of the initial filing of 7460-1 with the FAA
4. OAC notifies the OSMPC	Within 10 days of receipt of FAA filing
5. OSMPC notifies base commanders	Upon receipt of notification from OAC
6. OSMPC receives input from base commanders and submits letters to Clearinghouse, OCC, OAC, Applicant	Within 30 days of receipt of notification from OAC
7. Applicant submits notification in local newspaper and proof to OCC	Within 6 months of submitting the notice to OCC
8. Applicant submits notification to affected property owners via certified mail	Within 6 months of submitting the notice to OCC
9. Applicant holds public meeting	Within 60 days of notification in the local newspaper
10. Applicant submits notice of intent to construct via certified mail	Prior to 60 days of construction
11. Applicant submits Determination from FAA / DoD with OCC and OAC	Prior to the start of construction

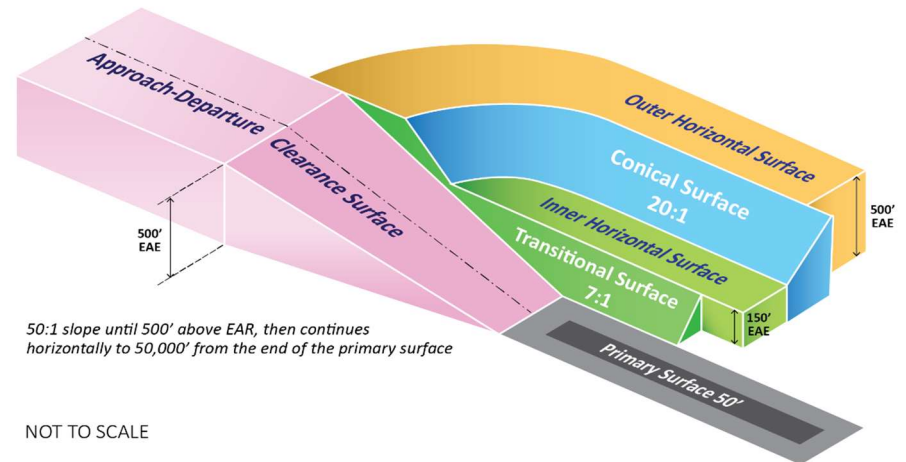
3.3 Policy Coordination

This section summarizes military policies that apply to military use airports and heliports/helipads or civilian use airports and heliports/helipads with military presence. Imaginary Surfaces, CZs, and APZs are areas where it is imperative to coordinate with local military personnel before the erection or amendment of any vertical construction. Reducing hazards in these areas is intended to protect the public's health, safety, and welfare.

Imaginary Surfaces

Department of Defense Instruction (DoDI) 4165.57 describes the purpose of imaginary surfaces at military-operated airfields and heliports/helipads. UFC 03-260-01 specifies technical criteria for the establishment of these surfaces and zones. Imaginary surfaces consist of multiple two- and three-dimensional areas built upon one another designed to avoid incompatible land uses around crucial air navigation and operations, as indicated in the graphic. The dimension or size of an imaginary surface depends on the runway or heliport/helipad classification. Imaginary surfaces must be kept clear of objects that may pose a safety threat to aviation activities. Man-made or natural objects are considered flight obstruction and safety hazards if they project above an imaginary surface. Oklahoma currently has five civilian airfields supporting military activities with associated imaginary surfaces according to Title 14 CFR 77.19, six DoD-owned airfields with imaginary surfaces under Title 14 CFR 77.21, and three heliports/helipads with imaginary surfaces identified in Title 14 CFR 77.23. These airfields are listed below and illustrated in **Figure 4**:

- Clinton-Sherman Industrial Airpark
- Frederick Regional Airport
- Lawton-Ft. Sill Regional Airport
- Halliburton Field
- Enid-Woodring Regional Airport
- Altus AFB
- Kegelman Air Force Auxiliary Field
- Tinker AFB
- Tulsa Air National Guard Base
- Vance AFB
- Will Rogers Air National Guard Base
- Camp Gruber Training Center (Helipad)
- Muldrow Army Heliport
- Oklahoma National Guard Heliport

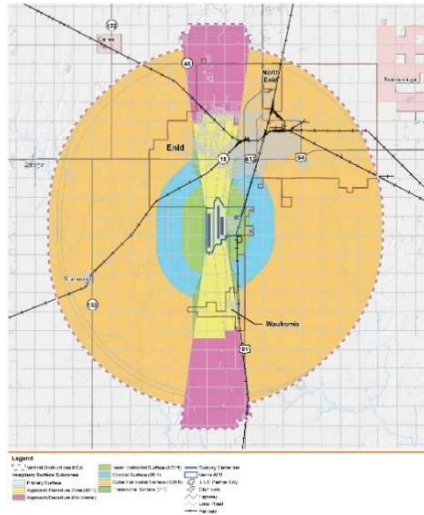


Example: Three-Dimensional Rendering of Imaginary Surfaces

Clear Zones and Accident Potential Zones

These zones are two-dimensional areas on the ground, located beyond the edge of each runway and adjust in size depending on the runway classification. Clear Zones (CZs) are areas on the ground located at the ends of each runway. They possess a high potential for accidents, and their use is restricted to be compatible with aircraft operations. Runway CZs are required for the runway and should be owned or protected under a long-term lease. Accident Potential Zones (APZs) are areas on the ground located beyond the CZ of each runway and possess a potential for accidents. Recommended land uses in the APZs are governed by DoDI 4165.57⁸;

section 3.4 contains CZ and APZ information for fixed-wing aircraft and section 3.5 for rotary-wing aircraft (heliports/helipads). Further guidance on APZs, CZs, and appropriate land use is also located in Unified Facilities Criteria (UFC) 3-260-01⁹. Airfields subject to these additional regulations in the state of Oklahoma are listed below and are also illustrated in **Figure 4**:



- Altus AFB
- Camp Gruber Training Center (Helipad)
- Kegelman Air Force Auxiliary Field
- Muldrow Army Heliport
- Oklahoma National Guard Heliport
- Tinker AFB
- Tulsa Air National Guard Base
- Vance AFB
- Will Rogers Air National Guard Base

3.4 Informal Coordination

While the state and DoD have many regulatory and policy coordination requirements in place in Oklahoma, this does not preclude developers or the military from engaging in other forms of informal coordination. Informal coordination may include proactive outreach from project developers to potentially affected military installations in the form of a meeting with subject matter experts and leadership. This coordination typically occurs early in the planning process for development. It may aid in avoiding additional costs to a developer while potentially reducing timeframes in the existing Oklahoma regulatory measures for military coordination.

⁸ <https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodi/416557p.pdf?ver=2019-04-15-094510-673>

⁹ https://www.wbdg.org/FFC/DOD/UFC/ufc_3_260_01_2019_c1.pdf

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4.0 Current Land Use Controls and Economic Development within Military Operational Areas

The local government planning framework is relevant for counties, cities, and towns falling within military operational areas, including military training routes, special use airspace, imaginary surfaces, and radar viewsheds. This section summarizes the state's current planning efforts, such as comprehensive planning and economic development planning. Additional discussion on current zoning ordinances indicates which jurisdictions currently reinforce coordination efforts or zoning regulations, leading to collaborative efforts between future development and military operational areas.

4.1 Planning Policies

Comprehensive Plans

There are no statewide mandates for counties and cities to plan in Oklahoma. Whether and how long-range planning is conducted is at the discretion of each county and city. The primary method for long-range planning is a comprehensive plan that outlines the community's long-range needs involving subjects from land use to infrastructure to housing and contains capital improvements projects for a target time frame of typically 15-20 years.

Comprehensive plans are relevant to military compatibility in two ways—they direct areas where growth occurs that can impact the intensity (and height) of development within certain areas, and they can acknowledge military installations, their needs and coordinate with them to ensure community growth does not have an adverse impact on military operations. Typically, though not a rule, the more urban a county or city is, the greater the likelihood they have a comprehensive plan. Many jurisdictions surrounding or near military installations, heliports/helipads, and civilian airports with military use in Oklahoma have comprehensive plans to guide future development. On the contrary, most jurisdictions within military operational areas typically do not have a comprehensive plan to guide long-term development. Counties and cities with comprehensive plans containing indicators of military land use considerations are depicted in **Table 4**. The table also identifies whether the comprehensive plan acknowledges the military installation, heliport/helipad, or civilian airport and whether it contains goals and policies to address military needs and references coordination with the military installation or heliport/helipad.

Table 4. Jurisdictions Near Military-use Airports and Heliports/Helipads with Comprehensive Plans

Jurisdictions Near Military-use Airports and Heliports/Helipads with Comprehensive Plans					
Military Installation/ Heliport/Helipad	Adjacent Counties/Cities	Has Comprehensive Plan	Installation Identified in Plan	Installation Requirements Identified	Requires Coordination Efforts w/Installation
Altus AFB	City of Altus Town of Blair Town of Martha Jackson County Kiowa County Tillman County	■	■	■	■
Tinker AFB	City of Oklahoma City of Del City City of Midwest City	■ ■ ■	■ ■ ■	■ ■ ■	■ ■
Vance AFB	City of Enid Garfield County	■	■	■	■
Kegelman Air Force Auxiliary Field	Alfalfa County Grant County				
Fort Sill	City of Lawton Comanche County	■	■	■	■
Camp Gruber Training Center (Helipad)	City of Muskogee Town of Fort Gibson Muskogee County	■			
Muldrow Army Heliport	Cleveland County				
	City of Lexington				
Oklahoma National Guard Heliport	City of Oklahoma Town of Forest Park	■			

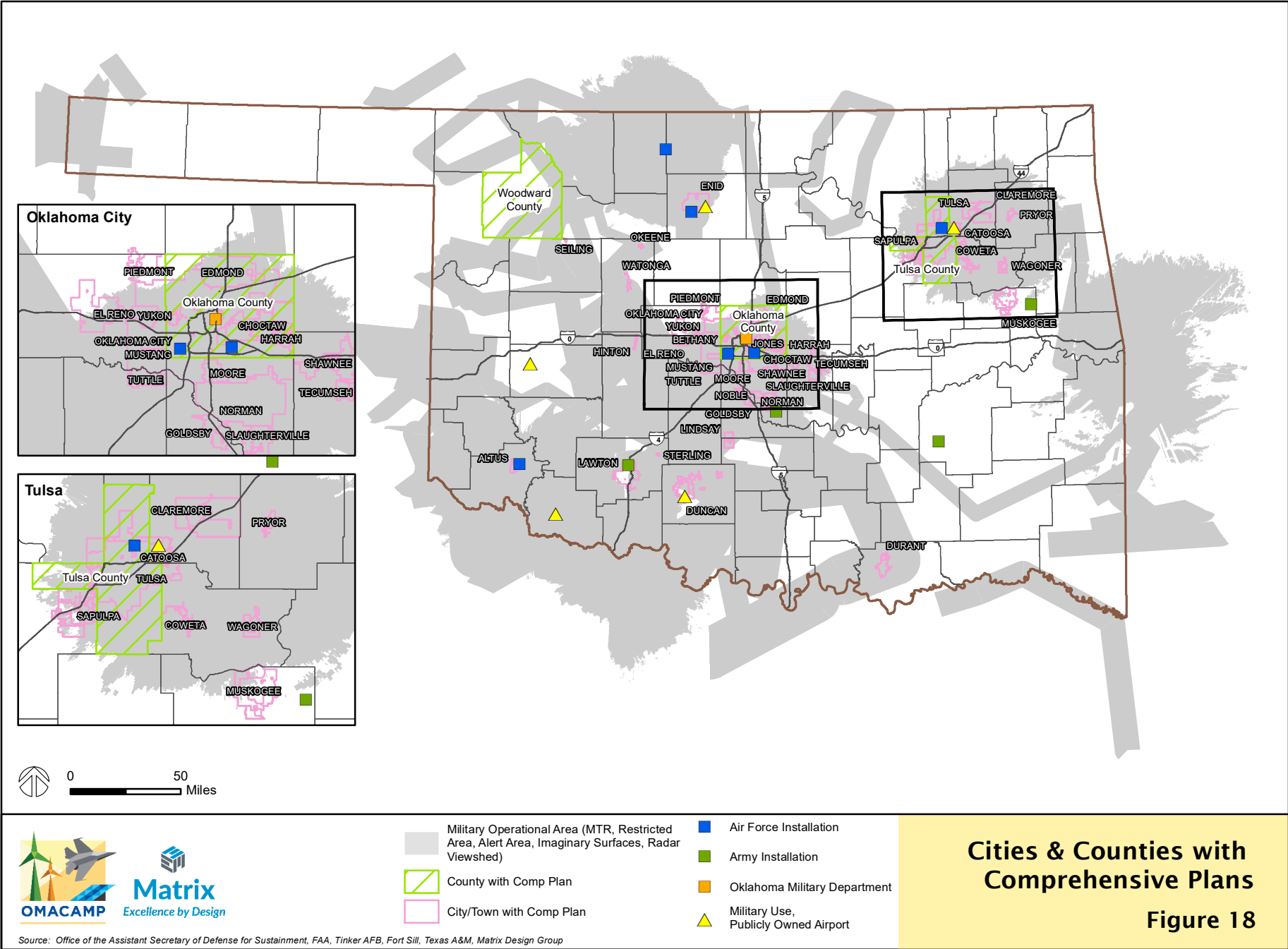


Jurisdictions Near Military-use Airports and Heliports/Helipads with Comprehensive Plans Continued					
Military Installation/ Heliport/Helipad	Adjacent Counties/Cities	Has Comprehensive Plan	Installation Identified in Plan	Installation Requirements Identified	Requires Coordination Efforts w/Installation
McAlester Army Ammunition Plant	City of McAlester Town of Savanna Pittsburgh County	■	■		
Tulsa Air National Guard Base	City of Owasso City of Tulsa Rogers County Tulsa County	■ ■ ■			
Will Rogers Air National Guard Base	City of Oklahoma	■			
Civilian Airport with Military Use	Adjacent Counties/Cities	Has Comprehensive Plan	Installation Identified in Plan	Installation Requirements Identified	Requires Coordination Efforts w/Installation
Clinton-Sherman Industrial Airpark (Oklahoma Air & Space Port)	Burns Flat Washita County Elk City City of Clinton				
Lawton-Ft. Sill Regional Airport	City of Lawton Comanche County	■	■		
Frederick Regional Airport	City of Frederick Tillman County				
Halliburton Field	City of Duncan Stephens County	■	■	■	■
Enid-Woodring Municipal Airport	City of Enid Garfield County	■	■	■	■

Jurisdictions located further away from major metropolitan areas and not near any airport, military airfield, or heliport/helipad may not acknowledge the military presence or the need to protect low-level MTRs, SUAs, or radar viewsheds in their comprehensive planning documents. Though they are technically under these military operational areas, the economic impact of the military may not reach these areas. However, renewable energy and other land use development will positively affect the local economy. Proactive outreach measures in these areas and involvement in the planning process by the military may help mitigate vertical obstruction hazards to military operational areas. **Table 5** and **Figure 18** show jurisdictions under military operational areas, away from major installations and airports with comprehensive development plans.

Table 5. Jurisdictions Under Military Operational Areas with Comprehensive Plans

Jurisdictions Under Military Operational Areas with Comprehensive Plans				
County (1 of 72 total)				
Oklahoma County				
City/Township (45 of 354 total)				
Altus	Ardmore	Bethany	Bixby	Broken Arrow
Catoosa	Choctaw	Claremore	Coweta	Duncan
Durant	Edmond	El Reno	Enid	Glenpool
Goldsby	Harrah	Hinton	Jenks	Jones
Lawton	Lindsay	Midwest City	Moore	Muskogee
Mustang	Noble	Norman	Okeene	Oklahoma City
Owasso	Piedmont	Pryor	Sand Springs	Sapulpa
Seiling	Seminole	Shawnee	Slaughterville	Sterling
Tecumseh	Tulsa	Tuttle	Wagoner	Yukon



Economic Development Plans

Economic development plans provide an overview of a jurisdiction’s vision to accomplish strategic goals set forth by the plan. Understanding these goals helps the public and affected entities understand future increased development. While growth and increased development do not immediately indicate encroachment with military activities, it is essential to know if a jurisdiction wishes to promote development goals that may lead to encroachment concerns. **Table 6** depicts jurisdictions with economic development plans near a civilian airport, military-use airport, or heliport/helipad. Currently, only four jurisdictions have economic development plans within military operational areas. These include Oklahoma County, the City of Lawton, Tulsa, and Oklahoma City.

Table 6. Jurisdictions Near Military-use Airports and Heliports/Helipads with Economic Development Plans

Jurisdictions With Economic Development Plans		
Military Installation / Heliport / Helipad	Adjacent Counties/Cities	Has Economic Development Plan
Altus AFB	City of Altus Town of Blair Town of Martha Jackson County Kiowa County Tillman County	
Tinker AFB	Oklahoma City City of Del City City of Midwest City Oklahoma County	■ ■
Vance AFB	City of Enid Garfield County	
Kegelman Air Force Auxiliary Field	Alfalfa County Grant County	
Fort Sill	City of Lawton Comanche County	■



Jurisdictions With Economic Development Plans Continued		
Military Installation / Heliport/ Helipad	Adjacent Counties/Cities	Has Economic Development Plan
Camp Gruber Training Center (Helipad)	City of Muskogee Town of Fort Gibson Muskogee County	
Muldraw Army Heliport	Cleveland County City of Lexington	■
Oklahoma National Guard Heliport	Oklahoma City Town of Forest Park	■
McAlester Army Ammunition Plant	City of McAlester Town of Savanna Pittsburgh County	
Tulsa Air National Guard Base	City of Owasso City of Tulsa Rogers County Tulsa County	■
Will Rogers Air National Guard Base	Oklahoma City	■
Civilian Airport with Military Use	Adjacent Counties/Cities	Has Economic Development Plan
Clinton-Sherman Industrial Airpark (Oklahoma Air & Space Port)	Burns Flat Washita County Elk City City of Clinton	■
Lawton-Ft. Sill Regional Airport	City of Lawton Comanche County	■
Frederick Regional Airport	City of Frederick Tillman County	
Halliburton Field	City of Duncan Stephens County	
Enid-Woodring Municipal Airport	City of Enid	

4.2 Zoning Ordinances

As part of this study, an evaluation of all local zoning and land development regulations provided further insight into siting processes across the state. The following maps and tables depict jurisdictions with zoning and development codes, building height regulations, renewable energy regulations, and telecommunication tower regulations near current airports or within military operational areas. Understanding where local zoning may be strengthened to protect military missions while promoting renewable energy is key to reducing impacts, especially in less populated areas of the state where low-level MTRs, radar viewsheds, and alert areas exist. **Table 7** and **Figure 19** show all Oklahoma jurisdictions with zoning ordinances and the types of military operational areas located in the area.

Table 7. Jurisdictions with Zoning and Military Operational Areas

Jurisdictions With Zoning						
Jurisdiction	Radar Notification Area	MTR- Visual Route	MTR- Slow Route	MTR- Instrument Route	Special Use Airspace	Imaginary Surfaces
Counties						
Beckham County	■		■	■		
Creek County	■					
Garfield County	■	■			■	■
Oklahoma County	■	■				■
Rogers County	■					
Cities/Towns						
Ada		■	■			
Altus	■					■
Alva	■					
Anadarko		■	■			
Ardmore		■				
Bethany	■					
Broken Bow		■				
Cache	■				■	
Catoosa	■					
Chickasha	■	■	■			

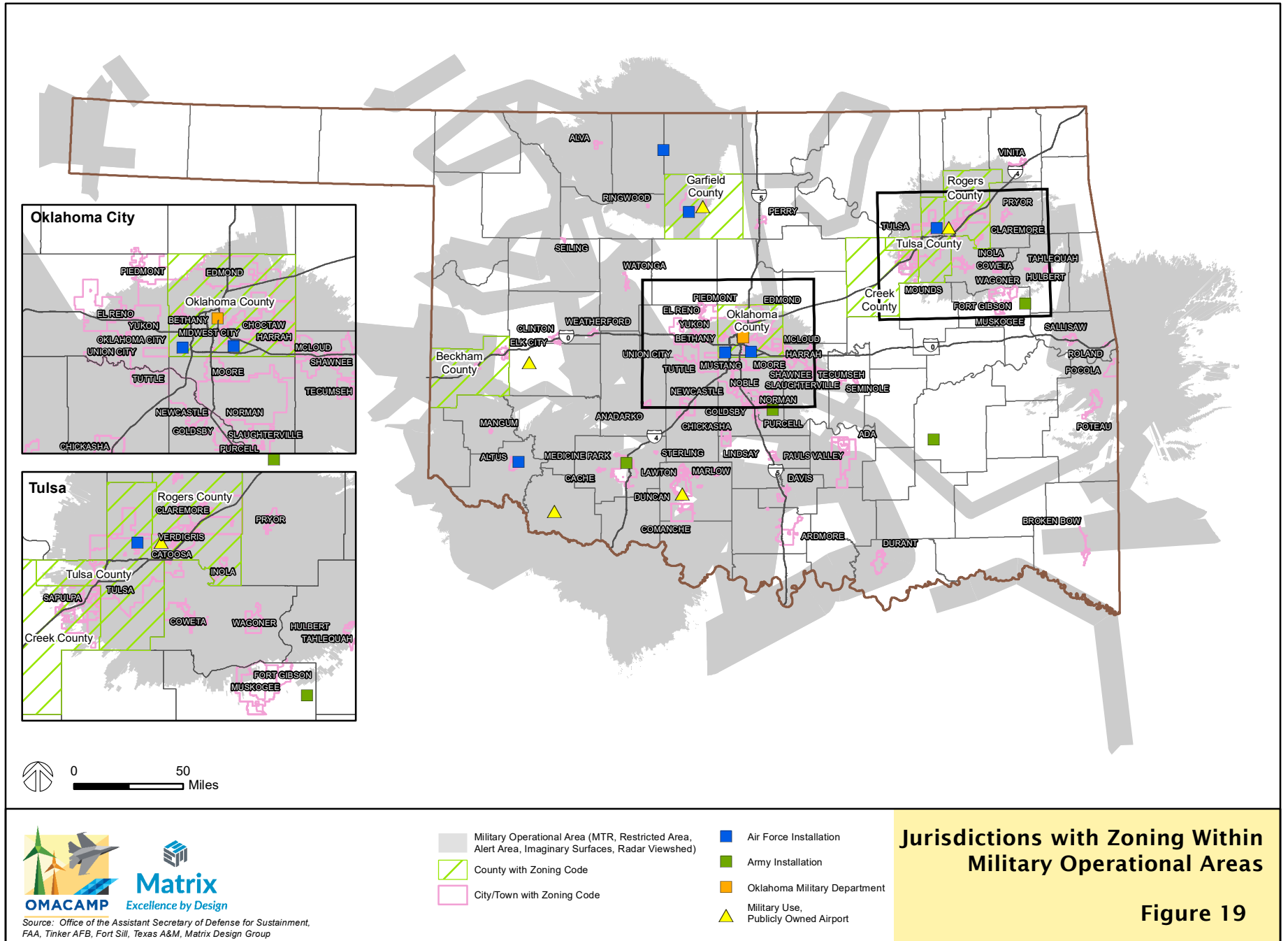


Jurisdictions With Zoning Continued						
Jurisdiction	Radar Notification Area	MTR- Visual Route	MTR- Slow Route	MTR- Instrument Route	Special Use Airspace	Imaginary Surfaces
Cities/Towns						
Choctaw	■					■
Claremore	■					
Clinton			■			
Comanche	■	■	■			
Coweta	■					
Davis		■	■			
Del City	■					■
Duncan	■	■	■			
Durant		■				
Edmond	■					
El Reno	■		■			
Elk City		■				
Enid	■				■	■
Forest Park						■
Fort Gibson	■					
Goldsby	■		■			
Harrah	■					
Hulbert	■					
Inola	■					
Jones	■					■
Lawton	■		■		■	■
Lindsay	■		■			
Mangum	■	■		■		
Marlow		■	■			
McLoud	■					
Medicine Park	■				■	■
Midwest City	■					■

Jurisdictions With Zoning Continued						
Jurisdiction	Radar Notification Area	MTR- Visual Route	MTR- Slow Route	MTR- Instrument Route	Special Use Airspace	Imaginary Surfaces
Cities/Towns						
Moore	■					■
Mounds	■					
Muskogee	■					
Mustang	■					
Newcastle	■		■			
Nichols Hills	■					
Nicoma Park	■					■
Noble	■		■			
Norman	■	■	■	■		■
Oklahoma City	■					■
Oologah	■					
Piedmont	■					
Paul's Valley		■	■			
Perry		■				
Pocola	■		■			
Poteau	■					
Pryor	■					
Purcell	■		■			
Ringwood	■					
Roland			■			
Sallisaw	■		■			
Sapulpa	■					
Sayre		■	■			
Seiling				■		
Seminole		■				



Jurisdictions With Zoning Continued						
Jurisdiction	Radar Notification Area	MTR- Visual Route	MTR- Slow Route	MTR- Instrument Route	Special Use Airspace	Imaginary Surfaces
Cities/Towns						
Shawnee	■					
Slaughterville	■		■			
Sterling		■	■			
Tahlequah	■					
Tecumseh	■					
The Village	■					
Tulsa	■					
Tuttle	■		■			
Union City	■					
Verdigris	■					
Vinita	■					
Wagoner	■					
Watonga			■			
Warr Acres	■					
Weatherford		■	■			
Yukon	■					





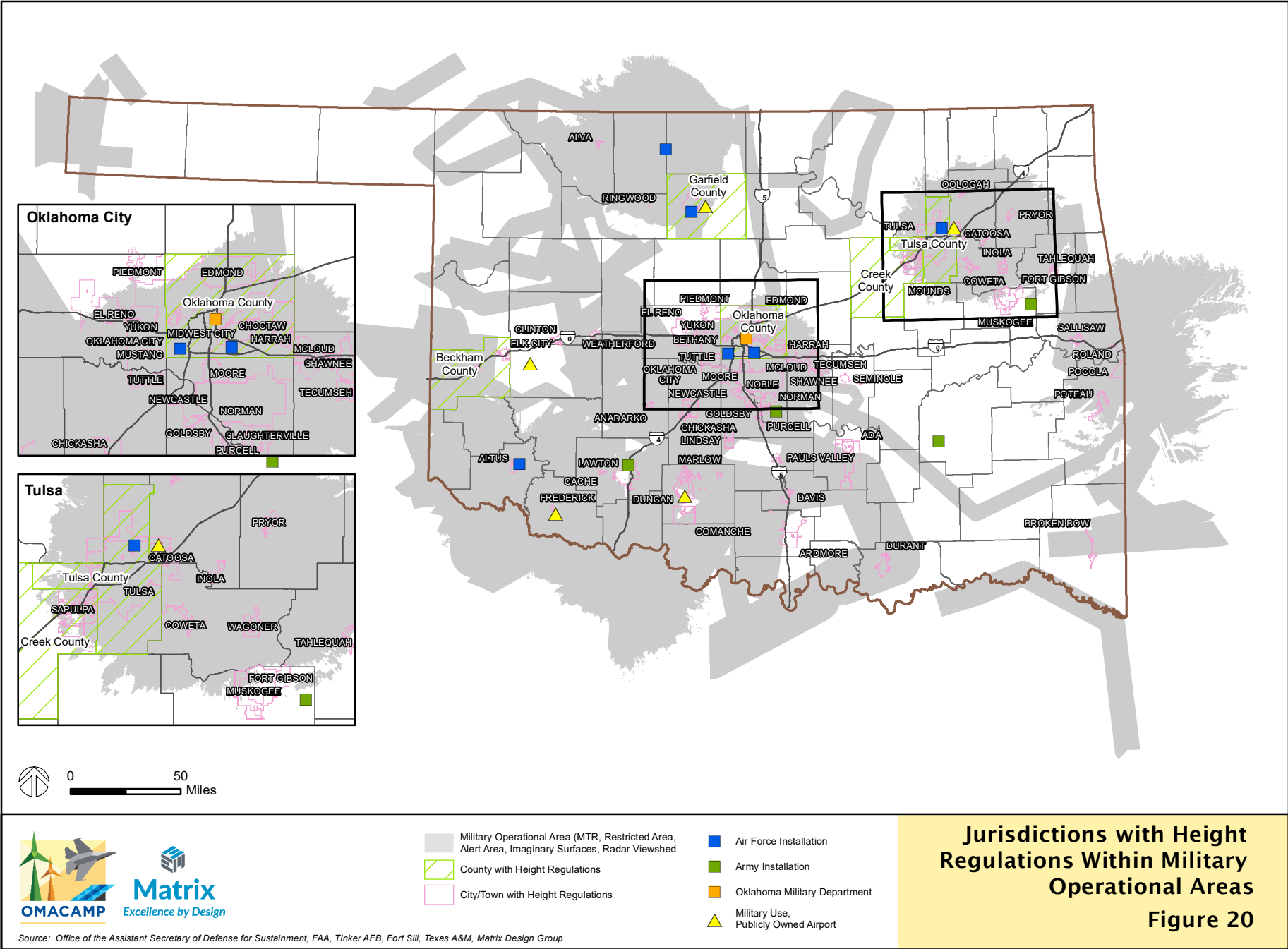
Building Height Regulations

As discussed earlier in this report, vertical obstructions near an airport, imaginary surfaces, or under low-level MTRs may pose safety hazards to military training and readiness. Vertical obstructions include but are not limited to tall buildings, wind turbines, and telecommunications towers. **Table 8** and **Figure 20** depict jurisdictions near military installations or heliports/helipads within the state which regulate height and those which allow unrestricted height in certain zoning districts.

Table 8. Jurisdictions with Height Regulations Near Military-Use Airports and Heliports/Helipads

Military Installation / Heliport/Helipad	Adjacent Counties/Cities	Regulate Height in Zoning Ordinance	Allow Unrestricted Height in Some Districts
Altus AFB	City of Altus Town of Blair Town of Martha Jackson County Kiowa County Tillman County	■	
Tinker AFB	Oklahoma City City of Del City City of Midwest City Oklahoma County	■ ■ ■ ■	■ ■ ■ ■
Vance AFB	City of Enid Garfield County	■ ■	■ ■
Kegelman Air Force Auxiliary Field	Alfalfa County Grant County		
Fort Sill	City of Lawton Comanche County	■	■
Camp Gruber Training Center (Helipad)	City of Muskogee Town of Fort Gibson Muskogee County	■ ■	■ ■
Muldrow Army Heliport	Cleveland County City of Lexington		

Jurisdictions with Height Regulations Near Military-use Airports / Heliports / Helipads Continued			
Military Installation / Heliport/Helipad	Adjacent Counties/Cities	Regulate Height in Zoning Ordinance	Allow Unrestricted Height in Some Districts
Oklahoma National Guard Heliport	Oklahoma City	■	■
	Town of Forest Park		
McAlester Army Ammunition Plant	City of McAlester		
	Town of Savanna		
	Pittsburgh County		
Tulsa Air National Guard Base	City of Owasso		
	City of Tulsa	■	■
	Rogers County		
	Tulsa County		
Will Rogers Air National Guard Base	Oklahoma City	■	■
Civilian Airport with Military Use	Adjacent Counties/Cities	Regulate Height in Zoning Ordinance	Allow Unrestricted Height in Some Districts
Clinton-Sherman Industrial Airpark (Oklahoma Air & Space Port)	Burns Flat		
	Washita County		
	Elk City	■	■
	City of Clinton		
Lawton-Ft. Sill Regional Airport	City of Lawton	■	■
	Comanche County		
Frederick Regional Airport	City of Frederick	■	■
	Tillman County		
Halliburton Field	City of Duncan	■	■
	Stephens County		
Enid-Woodring Municipal Airport	City of Enid	■	■
	Garfield County	■	■

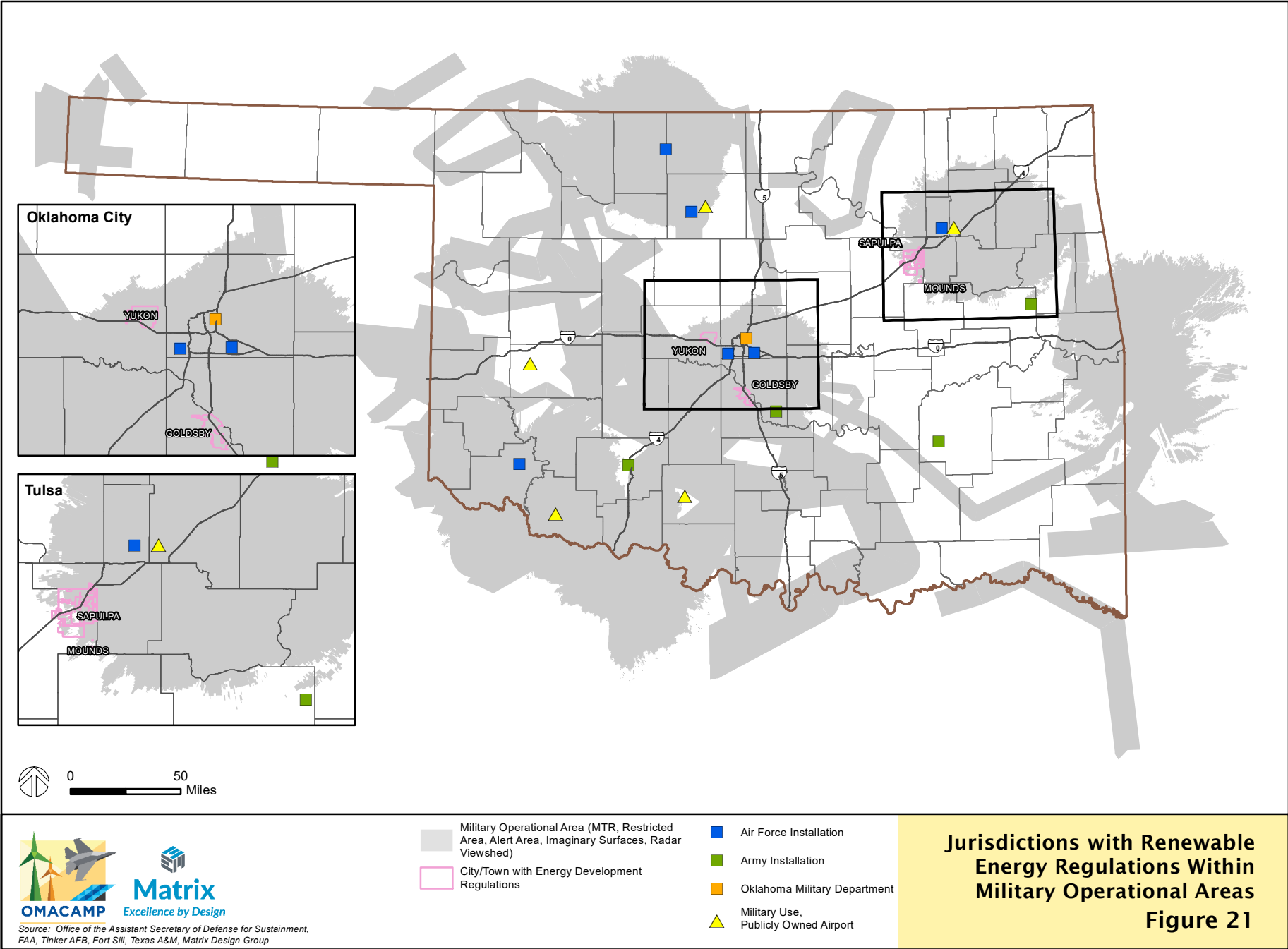


Renewable Energy Regulations

Renewable energy development is a growing industry within the state of Oklahoma. As such, jurisdictions around the state should consider developing regulations or ordinances that protect key military operational areas by requiring consultation with local partners or certain modifications to renewable energy construction to minimize encroachment concerns. **Table 9** and **Figure 21** show four jurisdictions with renewable energy regulations or ordinances within their zoning codes. Also depicted are the types of military operational areas located in the area.

Table 9. Jurisdictions with Renewable Energy Regulations Within Military Operational Areas

Jurisdictions With Renewable Energy Regulations						
Jurisdiction	Radar Notification Area	MTR- Visual Route	MTR- Slow Route	MTR- Instrument Route	Special Use Airspace	Imaginary Surfaces
Cities/Towns						
Goldsby	■		■			
Mounds	■					
Sapulpa	■					
Yukon	■					

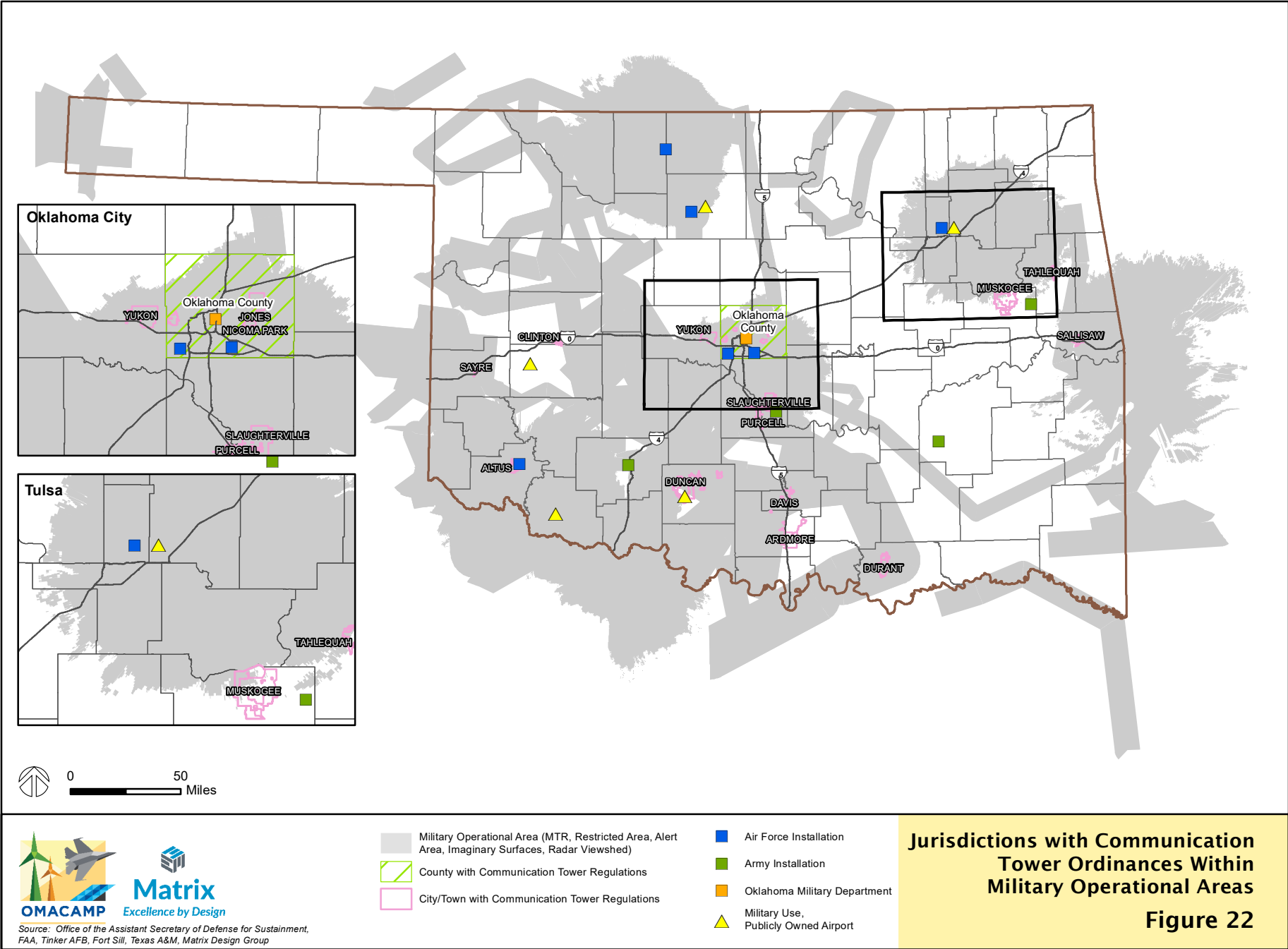


Telecommunication Tower Regulations

Telecommunication towers have the potential to be built to a height that may interfere with military training and readiness. In addition to height, frequency interference may pose concerns for radars viewsheds depending on the tower's location. **Table 10** and **Figure 22** depict jurisdictions with various telecommunication tower regulations.

Table 10. Jurisdictions With Telecommunication Tower Regulations Located in Military Operational Areas

Jurisdictions With Telecommunication Tower Regulations						
Jurisdiction	Radar Notification Area	MTR- Visual Route	MTR- Slow Route	MTR- Instrument Route	Special Use Airspace	Imaginary Surfaces
Counties						
Catoosa County	■					
Oklahoma County		■				■
Cities/Towns						
Altus	■					■
Ardmore		■				
Bethany	■					
Clinton			■			
Davis		■	■			
Duncan	■	■	■			
Durant		■				
Jones	■					■
Muskogee	■					
Nicoma Park	■					■
Purcell	■			■		
Sallisaw	■			■		
Sayre		■	■			
Slaughterville	■			■		
Tahlequah	■					
The Village	■					
Yukon	■					



Building Codes and Subdivision Ordinances

Building codes prescribe means and construction methods but do not control the height of development. As the mechanism for issuing permits for construction, they address life and safety code requirements and development parameters specified in a zoning or land development code. Building codes do not influence whether a development will impact military operations.

Subdivision ordinances control land division in anticipation of new developments, including the layout of lots, roads, and open space. The zoning and land development codes promulgated uses and development standards applicable to subdivisions. Subdivision ordinances do not influence whether a development will impact military operations.

5.0 Examples of Deconfliction Mitigation Strategies

There are various methods for mitigating the adverse impacts of renewable energy on military operations. The following are examples of opportunities for mitigation between the military and renewable energy developers. Whether a specific mitigation option is relevant or feasible in a particular situation will be discussed between DoD and the project proponent. To the extent DoD concerns cannot be addressed, experience demonstrates developers cancel the proposed projects.

5.1 Adjustments to Proposed Construction

The relocation of proposed vertical obstructions, to include renewable energy, transmission lines, and communications towers, could mitigate impacts on military operations if coordinated early in the development process. These obstructions may be relocated outside military airspace or radar viewsheds to a less critical airspace location for military operations. Additionally, developers may propose to reduce the number of structures that overlap with military interests or adjust the location of proposed facilities within military airspace or radar viewsheds based on local inputs from installations to ensure military missions can still be performed. Early engagement in the planning process has proven successful in the past. As described earlier in this report, prior experience indicates that DoD concerns can often be addressed in mitigation discussions with project developers.

See the “mitigation agreements” tab [here](#) for examples of more than 40 agreements signed between DoD and project developers.

5.2 Coordinated Suspension of Renewable Energy Operations

In partnership with wind energy operators, the military has developed agreements whereby the project operators agree to temporarily suspend (or “curtail”) spinning turbines and electric generation during specific military testing, training, and operations events. These partnerships or agreements should include coordination protocols, including points of contact and the number of hours per year in which the military can request the suspension of energy-generating activities.

5.3 Adding or Reprogramming Radars

Mitigating radar impacts requires financial investment but will increase the overall radar viewsheds impeded by renewable energy projects. Title 10 USC 183a(f) authorizes DoD to “request and accept” a voluntary contribution of funds from an energy project proponent to offset the cost to the DoD of mitigating adverse impacts from energy development. Additionally, radars can be reprogrammed to ignore doppler interference at a specific location if correctly identified. Radar interference working groups, including military and renewable energy development partners, may help establish the best way to mitigate radar interference.

5.4 Military Installation Buffer Zones

Counties or cities can recognize military buffer zones in local zoning regulations. While Oklahoma's state and federal coordination requirements are robust, creating buffer zones around military installations can protect those immediate areas around the installation in local zoning regulations. These buffer zones add an extra layer of protection by identifying areas where further land-use protections are required to protect the public's safety and reduce potential encroachment impacts on military missions. These buffer zones typically add a step to coordinate directly with the local installation before new or redevelopment within an identified radius around installations. These buffer zones are not exclusionary areas for development but rather highlight the importance of early coordination.

5.5 MTR Realignment

MTR realignment may be possible to avoid key areas for renewable energy development, as identified earlier in this report. However, this option is limited due to the cost and lengthy processes/regulatory requirements to complete such actions. Realignment of MTRs or SUAs involves extensive efforts that may take years to complete including environmental analysis, the federal process for notifying the public, hearings, meetings, and more.



6.0 Coordination Enhancement Recommendations

As part of the Oklahoma Military Airspace and Compatibility Assessment Portal project, recommendations were developed to enhance coordination for renewable energy siting between the military, state agencies, local governments, and renewable energy developers. To develop these recommendations, renewable energy policies and legislation at the state level were reviewed with those from across the United States. The policies and legislation were evaluated for comprehensiveness, capacity to address coordination with the military, and overall effectiveness in achieving coordination. The recommendations are organized by three topic areas:

- Wind energy development
- Vertical development (excluding wind turbines)
- Transmission line planning

While steering committee members had the opportunity to comment on the recommendations, not all steering committee members supported each recommendation—the OAC made the final decision on recommendations. The recommendations and responses do not express the views or opinions of all Steering Committee members and do not comprise actions for the Steering Committee to take. This report does not take a position on the recommendations based on the Steering Committee feedback but rather **impartially presents the feedback for consideration of the owner who controls the process subject to each recommendation for their evaluation and implementation and determination as to whether recommendations become guidance or mandates.**

The views shared by Steering Committee members on the recommendations are captured in **Appendix A**. Of the 28 Steering Committee members, comments were received by 6 members. The following organizations provided comments:

- Oklahoma Aeronautics Commission
- American Clean Power Association
- Advanced Power Alliance
- Enel Green Power North America
- Muldrow Army Heliport
- Vance AFB

6.1 Wind Energy

Currently, the Oklahoma Wind Energy Act does not require pre-application or scoping meetings with military installation subject matter experts (SMEs) or leadership that may be affected by a proposed development. Military stakeholders on the Steering Committee identified that the current requirement to invite potentially affected military installations to a public meeting does not close the existing communication gaps. Invitations may be sent to the wrong personnel or installation leadership, which does not give SMEs enough time to provide comments or attend public meetings. The following notification enhancements were discussed with the Steering Committee:

- Amend the Oklahoma Wind Energy Act to require a scoping meeting between developers and SMEs from affected military installations; to include those installations with low-level MTRs in the proposed project location
- Require applicants to provide a copy of any comments received during scoping meetings to the OSMPC for awareness as part of the current application process

6.2 Vertical Development

As shown in **Table 8** and **Figure 20** in Section 4.2, a minority of jurisdictions enforce zoning regulations for vertical development (excluding wind turbines). Vertical development may pose concerns near military airfields and under low-level MTRs. While zoning regulations may be in place for major installations, the Steering Committee discussed areas for improvement in current legislation and future education opportunities.

- Amend 3 OK Stat §3-102.1. to require jurisdictions with either a civilian airfield used for military operations or a military-owned and operated airfield to establish local airport land use authority¹⁰
 - Each authority would adopt height restriction zoning ordinances for structures to meet DoD imaginary surface requirements
- Work with the Oklahoma Council of Governments (COGs) to educate the public on the use of the OMACAMP tool, with a focus on rural communities

¹⁰ The purpose of an airport land use authority is to conduct compatibility planning to protect public health, safety, and welfare. These authorities typically develop land use regulations to reduce noise exposure and safety hazards within areas around public or military use airfields.



6.3 Transmission Lines

Since the Southwest Power Pool (SPP) is the formal planning entity for transmission corridors, the key to assuring early coordination before establishing new corridors is to establish a working relationship between SPP and local military installations. However, since SPP is not a state entity, policy changes to Oklahoma legislation will not aid in the establishment of this working relationship. The Steering Committee discussed the following recommendations to address coordinated transmission expansion planning with military operations.

- Encourage local utility companies to utilize the tool in early scoping efforts for transmission line corridors
- Consider establishing a memorandum of understanding (MOU) between the local utility authorities and the military to require coordination of new corridors

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Conclusion

Oklahoma is home to 16 total military installations, airports, and heliports/helipads utilized for military operations, as described in **Section 1**. There are five different military operational areas within the state, including military training routes, special use air space, testing areas, imaginary surfaces, and radar viewsheds. Most military operational areas outside major installations are in rural portions of the state, typically more desirable for renewable energy development. While military operational areas are not exclusionary to development, the OMACAMP tool can facilitate early coordination between developers and the military by providing developers with points of contact for those operational areas. Additionally, major metropolitan areas within the state, such as Oklahoma City, are projected to grow in population, potentially expanding, which can create other types of vertical development impacts on military installations. As expanded upon in **Section 3**, many existing policies and regulations applicable to Oklahoma promote compatibility with military operations, including the Oklahoma Wind Development Energy Act.

While state legislation is robust, enhancements to coordination efforts with local military installations in the state will close the gap in communication to protect the military while also promoting development within compatible locations. This can be completed by increased requirements for local comprehensive plans or zoning ordinances which recognize local/state-wide military operations. As seen in **Tables 7-10**, not all jurisdictions near installations or within military operational areas have zoning ordinances that would protect the local military installation or operational areas within the jurisdiction. Establishing simple regulations like those in the City of Altus, which protects the airport by applying an overlay protection zone, helps sustain military operations by regulating land uses and development standards in areas that may conflict with military operations.

As identified in the report, the state has many measures for wind energy projects to comply with federal regulations for development while also increasing notification requirements for applicants. While Oklahoma's state-level process exceeds other states, local jurisdictions should focus on coordination enhancements to promote development while protecting military operational areas. Recommendations on specific enhancements are further elaborated on in **Section 6**. The views shared by committee members on the recommendations are in **Appendix A**. Since military operational areas are not automatic areas of exclusion for development, coordination and communication are vital to protecting national security while promoting future development opportunities in Oklahoma.

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Appendix A. Recommendation Responses

Recommendations for coordination enhancements were discussed during Steering Committee meetings in February and April 2022, allowing the Steering Committee opportunity to provide verbal feedback. Additional time to provide feedback on recommendations occurred during the final draft report review period from February to March 2022. **Steering Committee members who did not provide comments are not assumed to imply support or objection to the recommendations.** Table A-1 presents the Steering Committee responses as they were received, regardless of support or opposition. Each recommendation identified correlates with those in **Section 6**.

Table A-1. Recommendations Responses

Wind Energy Recommendation: **Amend the Oklahoma Wind Energy Act to require a scoping meeting between developers and SMEs from affected military installations; to include those installations with low-level MTRs in the proposed project location**

- Require applicants to provide a copy of any comments received during scoping meetings to the OSMPC for awareness as part of the current application process

Committee Member(s)	Response
American Clean Power Association + Advanced Power Alliance	ACP and APA oppose the recommendations to amend the Oklahoma Wind Energy Act to require pre-scoping meetings with military installations and sharing of notes on comments made during public meetings with those installations and request that these recommendations be removed from the final report. Developers already coordinate with local military installations through the DoD Clearinghouse process. Imposing additional procedural and timeline hurdles at the State level creates additional regulatory red tape with no discernable improvement to the protection of military missions given this coordination already happens under the federal process. Further, with respect to the sharing of notes from public meetings, representatives from local installations are, of course, free to attend public meetings if they'd like. However, per the Clearinghouse process, their impact assessments of proposed projects should be based on mission-specific, site-specific, and project-specific technical evaluations. The project-specific information they need to do such evaluations is provided by developers through the Clearinghouse process. So, there is no improvement to the protection of military missions from the recommendation to impose a potentially burdensome requirement on reporting out on public meetings to local installations, or for the installations to spend time reviewing such notes when most, if not all, concerns raised are unlikely to relate to military interests.

Table A-1. Recommendations Responses (Continued)

Wind Energy Recommendation: **Amend the Oklahoma Wind Energy Act to require a scoping meeting between developers and SMEs from affected military installations; to include those installations with low-level MTRs in the proposed project location**

- Require applicants to provide a copy of any comments received during scoping meetings to the OSMPC for awareness as part of the current application process

Committee Member(s)	Response
Advanced Power Alliance	Do agree with the idea to go host a scoping meeting with the military, not in a public setting.
ENEL Green Power North America	There is not a need to have a "pre-application" meeting. That is the whole point of all the steps that come next. The base commanders and their staff will not want to meet with anyone before anything has been sent in officially. They will not have time or interest in this. This is the point of the process in place. No need for a pre-meeting to discuss what's about to be sent.
ENEL Green Power North America	The military is not going to want to attend a public meeting that might happen years before a project is ever built. Again, the process and steps are already in place to take care telling them all they care about and need to know. They are not going to send staff this early in the process, hours away to a rural Oklahoma community. We are already required by law to advertise for the public meeting in a paper of circulation in the County, so that part needs to be edited.
ENEL Green Power North America	We cannot possibly document everything that is said in a casual public meeting. That would require hours of someone taking and editing notes, ALL of which will have nothing to do with the military (most landowners do not even know about these training routes that encumber the air above their land) and will be a huge and unreasonable administrative burden when the meetings are not even formal. Its coffee and snacks and casual conversation. They are not formal hearings where someone can record everything that is said. And the bases and DoD are not going to care what is said with farmers asking about crops and land leases/cattleguards etc. The point of the processes already in place are to tell the bases and the DoD/FAA what they need to know.
Muldrow Army Heliport	This would be a helpful notification requirement. Subject Matter Experts (SMEs) sometimes don't receive the information necessary to respond in time to wind energy projects. The web mapping tool POC needs to be the SME, not leadership.
Muldrow Army Heliport + Vance AFB	The key is early notification and discussing scoping. If SMEs are not involved early, it's too late,



Table A-1. Recommendations Responses (Continued)

Vertical Development Recommendation: Amend 3 OK Stat §3-102.1. to require jurisdictions with either a civilian airfield used for military operations or a military-owned and operated airfield to establish local airport land use authority

- Each authority would adopt height restriction zoning ordinances for structures to meet DoD imaginary surface requirements

Committee Member(s)	Response
American Clean Power Association + Advanced Power Alliance	ACP and APA oppose the recommendations that the State impose a requirement on local authorities with military-related airfields (military owned, or civilian-owned by utilized by the military) to establish local airport land use authority and to adopt height restrictions in zoning rules. Such rules potentially conflict with and pre-judge the federal Clearinghouse review process. Just because a project is proposed within certain airspace does not mean it is going to have a problematic impact (as evidenced by the number of wind turbines underneath military airspace that are cited in the report and which received DoD clearance). Identifying exclusion zones with no site-specific, project-specific, mission-specific technical review and consideration of mitigation options is inappropriate in ACP's and APA's view.
ENEL Green Power North America	[These recommendations] will cause huge issues with the already multi-layered and strenuous process in place with the federal DoD Siting Clearinghouse/OSMPC/OAC/OCC and FAA. There is a huge risk that local jurisdictions totally blow up the working, sound processes in place at this time. Puts another layer and burden on local airfields (that already have protection through the current process). [This will] just adding more processes, rules and regulations that already exist.
Oklahoma Aeronautics Commission	The recommendations are a good idea, and something that the state should aim for in the long term, but there is a lot of personnel required to get this started.

Vertical Development Recommendation: Work with the Oklahoma Council of Governments (COGs) to educate the public on the use of the OMACAMP tool, with a focus on rural communities

Committee Member(s)	Response
Muldrow Army Heliport + Vance AFB	Having the rural areas know about the tool and how to use it would be helpful.

Table A-1. Recommendations Responses (Continued)

Transmission Lines Recommendation: **Consider establishing a memorandum of understanding (MOU) between the local utility authorities and the military to require coordination of new corridors**

Committee Member(s)	Response
Advanced Power Alliance	All transmission lines are published and available to the public but concur that some type of coordination would be great. Conducting transmission planning in areas of known no adverse impact would be helpful.



