DOE/EA-2000
FINAL

Environmental Assessment

Property Transfer to Develop a General Aviation Airport at the East Tennessee Technology Park Heritage Center, Oak Ridge, Tennessee

Date Issued—February 2016

U.S. Department of Energy
Oak Ridge Office of Environmental Management
Oak Ridge, Tennessee

15-026(E)/022416

Finding of No Significant Impact
Property Transfer to Develop a General Aviation Airport at the East Tennessee Technology Park Heritage Center, Oak Ridge, Tennessee

AGENCY: U.S. Department of Energy

ACTION: Finding of No Significant Impact.

SUMMARY: The U.S. Department of Energy (DOE) has completed an Environmental Assessment (EA) (DOE/EA-2000) for the title transfer of U.S. Department of Energy (DOE) property located at the East Tennessee Technology Park (ETTP) Heritage Center to the Metropolitan Knoxville Airport Authority (MKAA) for the purpose of constructing and operating a general aviation airport. The MKAA submitted a request for transfer of approximately 170 acres of ETTP property in June 2013, DOE responded in August 2013, agreeing to evaluate the transfer. The proposed airport's primary purpose would be the expansion of general aviation services by the MKAA. An ancillary benefit to the airport would be the ability to leverage the extensive assets in place at the ETTP. These assets include land, power, rail, and water, and when combined with an airport would offer the potential to support regional economic development in the form of industrial investment.

The MKAA has determined that the proposed Oak Ridge airport is needed for improvement of air service in the region. The need for an airport requires an endorsement by the Federal Aviation Administration (FAA) through the National Plan of Integrated Airport Systems (NPIAS) evaluation process. The proposed Oak Ridge airport received FAA approval for inclusion in the NPIAS in January 2015. By definition, inclusion in the NPIAS signifies the Secretary of Transportation has determined the airport "necessary to provide a safe, efficient, and integrated system of public-use airports adequate to anticipate and meet the needs of civil aeronautics." The FAA evaluated current regional airports (Rockwood, McGee Tyson, and Knoxville Downtown Island) when evaluating the inclusion of the Oak Ridge airport in the NPIAS.

Based on the results of the analysis reported in the EA, DOE has determined that the proposed action, the title transfer of the property, is not a major federal action that would significantly affect the quality of the human environment within the meaning of the National Environmental Policy Act (NEPA) of 1969. Subsequent to DOE's property transfer action, the FAA would initiate a separate NEPA review in accordance with FAA Orders and requirements once the MKAA Master Plan for the proposed airport is finalized, which would include analysis of potential effects associated with construction and operation of the airport in its final design configuration. Prior to the General Services Administration (GSA) executing the deed for the transfer of this property, GSA, using its own NEPA regulations, may also conduct a NEPA analysis of the GSA's proposed action of property disposal by way of deed. The GSA's analysis would be conducted in light of the NEPA determinations made by both the DOE and FAA. Therefore, the preparation of an Environmental Impact Statement (EIS) is not necessary, and DOE is issuing this Finding of No Significant Impact (FONSI).

PUBLIC AVAILABILITY: The EA and FONSI may be viewed at and copies of the documents obtained from:

U.S. Department of Energy
Information Center
Building 1916-T1
1 Science.gov Way
Oak Ridge, Tennessee 37831
Phone: (865) 241-4780

The EA and FONSI can also be viewed at http://www.oakridge.doe.gov/info_cntr/index.html.

FURTHER INFORMATION ON THE NEPA PROCESS: For further information on the NEPA process, contact:

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DESCRIPTION OF PROPOSED ACTION: DOE proposes to transfer approximately 170 acres of property located at the ETTP Heritage Center. The property to be transferred includes Parcel ED-13, Parcel ED-16, a portion of Parcel ED-3, and Victorius Boulevard. DOE currently plans to transfer the property to the MKAA using the GSA "Public Benefit Conveyance" process, which allows for property transfer at no cost. Once the initial transfer of the 170 acres is made, additional property would need to be obtained by the MKAA to accommodate the airport. This additional property was previously transferred by DOE to the Community Reuse Organization of East Tennessee (CROET) and includes Bldg. K-1330, Bldg. K-1580, portions of Parcel ED-4, and Parcel ED-8.

The proposed airport design features a 5,000-ft runway that would allow the facility to accommodate a variety of general aviation aircraft including but not limited to corporate jets, private airplanes, and emergency medical services aircraft. The final airport design will be part of a Master Plan being developed by the MKAA. The airport design will fluctuate slightly as the final plans for the facility are developed, but for the purposes of this EA, these changes should only impact the facility and not impact its location within the proposed Heritage Center site. However, if the final design for the airport includes substantial changes that are outside of the scope of what was analyzed in the EA, additional NEPA analysis would be completed. Additionally, the MKAA would be responsible for seeking and obtaining any applicable federal, state, and/or local permits and licenses for construction activities and operations associated with the airport. Examples include building permits, permits for air emissions, water quality permits, National Pollutant Discharge Elimination System (NPDES) permits, etc.

Development and construction activities would include land clearing, grading, placement and compaction of earth backfill to establish required building elevations within approximately 132 acres of the airport property. Construction activities would also include excavation for the installation of concrete foundations/footings and utility connections. Infrastructure development would include the runway, taxiway and apron space, vehicle access roads, parking, terminal and hangar buildings, walkways, fuel farm, and fire protection facilities and equipment. Development of the airport would also require closure and removal of a portion of Victorius Boulevard and the demolition of Bldgs. K-1330 and K-1580. Construction of the proposed airport would also impact existing Haul Road and Blair Road. Options have been developed for rerouting Haul Road and a portion of Blair Road to accommodate the proposed airport layout. Depending on which options are selected, additional DOE property would be impacted outside of the 132-acre airport construction limit boundary.

General aviation at the Oak Ridge airport would include local and itinerant operations. Local operations are those arrivals or departures performed by aircraft that remain within the airport traffic pattern, or those that occur within sight of the airport. Local operations are most often associated with training activity and flight instruction (e.g., touch-and-goes). Itinerant operations are arrivals or departures that do not remain within the airport traffic pattern and/or are originating from another airport (i.e., visiting aircraft), and typically include business/corporate, air taxi, and some private travel. Operations are also discrete events, either a take-off or a landing. Consequently, two operations may be considered to count as a complete flight. The average annual operations are estimated to be 49,713 with 25,472 local operations and 24,241 itinerant operations.

The operational fleet mix forecast for the Oak Ridge airport was conducted for three aircraft types: (1) turbine-powered fixed-wing aircraft, (2) helicopters, and (3) piston-powered, fixed-wing aircraft.

Turbine operations are estimated to be 5% of the total operations, helicopters are estimated to be 3%, and piston-powered, fixed-wing aircraft comprise the remainder of operations (92%).

ALTERNATIVES: In addition to the proposed action, impacts were also evaluated for the no action alternative. Under the no action alternative, the 170 acres of DOE property (Parcel ED-13, ED-16, a portion of ED-3, and Victorius Boulevard) would not be transferred to the MKAA for the development of a general aviation airport. However, except for about 51 acres of Parcel ED-16, these areas were previously analyzed for transfer and development in the *Transfer of Land and Facilities within the ETTP and Surrounding Area EA*, DOE/EA-1640 completed in 2011. Under the no action alternative, this property would continue to be retained by DOE unless other requests for transfer of the parcels were made. Title transfer activities presently underway at the ETTP for all facilities and land areas included in previous NEPA decision documents will continue. Ongoing environmental restoration and waste management activities at the ETTP will also continue.

Since the majority of the property being considered for transfer to the MKAA was previously evaluated in the 2011 EA (DOE/EA-1640), no other alternatives to the proposed action and no action alternative were evaluated. However, alternative locations on the Oak Ridge Reservation (ORR) for the proposed airport were considered by the MKAA but eliminated from further analysis. In 2009, the MKAA started the process to conduct a preliminary assessment of the potential to construct a new general aviation airport on the ORR. The MKAA, in coordination with DOE and the CROET considered three sites large enough to warrant a study of airport feasibility (Heritage Center, Parcel ED-3, and Horizon Center). Between the three sites, the MKAA evaluated a total of 14 different airport alignments. Based on a number of factors, including the potential for significant environmental and closer proximity to residential areas, the Parcel ED-3 and the Horizon Center sites were deemed to be unfeasible. Based on the priority ranking of the multiple alternative layouts, it was concluded that the Heritage Center site was most favorable.

ENVIRONMENTAL IMPACTS: The EA assessed the potential impacts of the proposed action and no action alternatives on the following resources: airspace, air quality, noise, safety, land use, socioeconomics, geology and soils, water resources, ecological resources, cultural resources, infrastructure, waste management, and intentional destructive acts. Potential cumulative impacts were also assessed.

Airspace

The proposed airport and its anticipated level of operations would enhance aviation capabilities in this region while having little effect on the overall manner in which this airspace environment is structured and managed by the Federal Aviation Administration (FAA) for its various uses. To accommodate Instrument Flight Rules (IFR) air traffic at the airport, initial plans include non-precision instrument approach capabilities that would provide general lateral navigational guidance to the runway. Future plans include upgrading this capability to a precision approach that would provide precise vertical and lateral guidance to a runway using an Instrument Landing System or a GPS. The FAA Atlanta Air Route Traffic Control Center or Knoxville Terminal Radar Approach Control would provide required separation among all IFR aircraft, including those operating at this airport, while all Visual Flight Rules (VFR) aircraft are responsible for remaining clear of all aircraft within the Class E/G airspace in which they operate.

Air Quality

Air quality analysis focused on emissions associated with construction activities, road construction, aircraft emissions, and evaporative emissions from fuel storage tanks. The percent of Roane County emissions from airport construction and operations were calculated to amount to approximately 3.8% or less for each criteria pollutant. PM_{10} emissions associated with grading operations (i.e., fugitive dust) would be the greatest contributor but would be temporary in nature, occurring only during the early phases of construction, and would not contribute negatively to air quality in the long-term. Greenhouse gases primarily associated with carbon dioxide emissions from aircraft operations would be less than 25,000 metric tons per year, and thus potential impacts on climate change associated with the proposed action would be minimal. Control measures for lowering fugitive dust emissions (i.e., covers and water or chemical dust suppressants) would minimize these emissions. The airport would be required to obtain air quality construction and operating permits (non-Title V) from the Tennessee Department of Environment and Conservation (TDEC) for minor sources of air emissions. A Title V permit for major sources of air emissions would be required if airport operations had the potential to emit more than 100 tons per year of any regulated air pollutant, 10 tons per year of any hazardous air pollutant, and/or 25 tons per year of any combination of hazardous air pollutants.

Noise

Construction noise would generate localized temporary increases in noise levels at and near the construction. The area surrounding the proposed airport is used for industrial purposes and a transportation corridor and is not considered to be noise sensitive and the noise would not result in any adverse impacts. Workers associated with the construction activities would be expected to wear appropriate hearing protection as required by the Occupational Safety and Health Administration (OSHA).

Calculated noise levels for proposed aircraft operations were compared to measured noise levels under baseline conditions to assess impacts. In accordance with FAA Order 5050.4B, *NEPA Implementing Instructions for Airport Projects*, the Integrated Noise Model was used to calculate noise levels. This program accounts the noise levels emitted by different aircraft types at and near the proposed airport as well as the effect of local terrain on propagation of noise. Aircraft noise levels were calculated to remain below 65 decibels (dB) day-night average sound level (DNL) at all noise-sensitive locations (i.e., residential, educational, health, and religious structures, as well as sites with cultural, religious, or natural value) as defined in FAA Order 5050.4B. At the Wheat Church, noise levels would increase by a noticeable amount (7 dB). However, the church is only used on one day of each year. Furthermore, the noise level at the church would only increase to 56 dB DNL, the EPA threshold below which no impacts to human health and welfare are likely to occur.

Due to a number of comments and questions received during the EA public comment period regarding potential noise impacts, DOE performed a supplemental noise analysis[1] for the final version of the EA. The supplemental noise analysis includes Noise Power Distance Data, which are the maximum noise levels of various types of aircraft using varying power settings and at varying distances and the maximum predicted noise levels (L_{max}) of various types of aircraft at various locations. The analysis has determined noise levels will not create adverse impacts.

Safety

Construction workers would be subject to typical hazards and occupational exposures faced at other industrial construction sites. Falls, spills, vehicle accidents, confined-space incidents, and injuries from tool and machinery operation could occur; similar accidents could occur during airport operations. Workers would be expected to receive applicable training, be protected through appropriate controls and oversight, and be afforded the same level of safety and health protection found at similar developments. The MKAA and any companies that they might contract with for airport construction and operations would be required to follow applicable OSHA requirements.

If an accident does occur within the airport area, the MKAA would ensure that resources would be available to respond. These would include having trained fire response personnel as well as required firefighting equipment. The MKAA would also enter into mutual-aid agreements with local fire departments, such as the Oak Ridge, Kingston, and Harriman Fire Departments. These agreements would provide for mutual

[1] This type of analysis is not normally a requirement for a general aviation airport EA.

training of personnel in aircraft firefighting techniques and establishment of procedures and responsibilities in case of an aircraft accident. The City of Oak Ridge Fire Department has a fire station (Station 4), which is located at the Heritage Center less than a half-mile from the proposed airport runway.

Land Use

The existing land use and visual character of the area would change from a mix of industrial use and open space with the development of the airport and associated roads. Approximately 132 acres of property needed for the development of the airport would be cleared and graded for the construction of the runway directly impacting the existing land use of the area. Runway Protection Zone (RPZ) requirements would require that additional property at each end of the runway be controlled to protect encroachment by incompatible land uses that may be unsafe. Ownership of the property within the RPZs would be preferable but negotiated land use agreements with property owners could also be utilized. Depending on which of the Haul Road and Blair Road options are selected, there would be a minor impact on the existing land use since new sections of road would need to be constructed within areas where the land use is presently undeveloped open space. Operation of the airport would not cause any significant noise increase in the surrounding area and there would not be any adverse land use compatibility impacts.

Socioeconomics

The Oak Ridge airport would have a minor, positive employment and income impact from temporary construction employment and a small number of full time direct jobs for airport operations. Beneficial fiscal impacts would include increased revenue from real estate or sales taxes. Based on the small number of new jobs that would be created, no impact on population is anticipated, and no disproportionate adverse health or environmental impacts would occur to any low-income or minority populations. DOE would not continue the in-lieu-of-tax payments on the property that is transferred to the MKAA.

Geology and Soils

Many of the affected areas are within currently or previously disturbed areas used for industrial applications. Potentially affected geology and soils are generally stable and acceptable for standard construction requirements. Geotechnical investigations conducted prior to construction would likely identify any significant karst conditions, if present. If appropriate, shallow footings, micro piles, etc., would be used to minimize any potential disturbance of underlying geological resources. Ground disturbance would be conducted incrementally to limit the potential for soil erosion and best management practices (i.e., erosion prevention and sediment control) will be implemented. No significant impacts to geology or soils would occur.

Water Resources

Airport construction would directly and indirectly impact five streams and approximately 6 acres of wetlands. An additional 1.4 acres of wetlands and three streams could be impacted depending on which road option is selected and the final road alignment. Erosion and sedimentation controls would limit potential impacts on surface water. No significant adverse impacts on surface water or groundwater are anticipated from construction and normal airport operations. Use of groundwater would be prohibited via a lease restriction or condition of the deed for title transfer. The addition of new impervious surfaces would increase the rate and volume of storm water runoff within the affected area. Increases in surface water runoff as a result of new construction would be attenuated through the use of temporary or permanent storm water controls, such as detention or retention basins and other structures, use of permeable pavement, and stabilization of disturbed areas through landscaping and vegetation. Storm water runoff after construction activities are completed and any discharge from facility operations to surface water would be in accordance with limitations established under the applicable TDEC NPDES permit. Applicable federal, state, and local laws and regulations would apply to activities affecting wetlands.

Ecological Resources

Development of the airport would result in the removal of native vegetation and minor habitat fragmentation but adverse environmental impacts to existing habitat and wildlife would be limited because the construction activities would primarily occur within existing or previously disturbed areas. No federal- or state-listed species are known to occur within the construction footprint, although there is potential for occurrence of some species including the Indiana bat, gray bat, and Northern long-eared bat. Since there are no caves in the project area, there should be no impacts to gray bats. Forest and other vegetation removal could displace Indiana and Northern long-eared bats from the impacted area. To avoid disturbance of roosting Indiana and Northern long-eared bats, it is recommended that prior to any construction acoustic monitoring be conducted according to FWS guidance, the construction zone should be surveyed for the presence of potential roost trees, and tree removal would not occur between March 31 and November 15 to the extent practical. The potential for wildlife-aircraft strikes could be minimized with the implementation of a wildlife hazard management plan.

Cultural Resources

Other than the Wheat Community Historic District (40RE224), no other prehistoric or historic archaeological resources would be affected by the proposed action. Construction of the proposed airport would not have any direct impacts on the proposed K-25 building footprint facilities stipulated as part of the final Memorandum of Agreement or have an adverse impact on the creation of the Manhattan Project National Historic Park. This would also include no adverse impacts from noise and air emissions associated with the airport. Four sites considered to be contributing properties to the potentially National Register of Historic Places-eligible Wheat Community Historic District could be adversely affected from airport construction. Once the Master Plan being developed by the MKAA is finalized, they and the FAA would determine which resources would be impacted. Additional Section 106 consultation with the TN State Historic Preservation Officer (SHPO) would be initiated by the MKAA to determine if there would be adverse effects and if any mitigation would be required. A deed restriction would require that if an unanticipated discovery of cultural materials is made during any development activities, all ground-disturbing activities in the vicinity of the discovery would be halted immediately. The MKAA would be responsible for contacting DOE and the TN SHPO, prior to any further disturbance of the discovery-site area.

Infrastructure

Existing utilities have adequate capacity to support the development of the Oak Ridge airport, but minor utility upgrades, modifications, and relocations could be needed. Electricity would be purchased from the city of Oak Ridge, and natural gas would be purchased from the Oak Ridge Utility District. Telecommunication services could be provided from the fiber-optic system that serves the ETTP. Existing water and sewer lines currently exist along SR 58. Transport of construction materials and vehicle traffic from airport operations would have a negligible effect on existing traffic since it would occur over regional and local roadways that have sufficient design capacity and level of service. If necessary, installing turn lanes, additional traffic signals, and frontage roads could mitigate any potential impacts. At this time it is not known which of the Haul Road and Blair Road options would be implemented. The timing of the continued need for the Haul Road and start date of the airport construction could require an interim detour (less than 6 months), short-term detour (longer than 6 months, less than 2 years), or long-term (longer than 2 years) detour of traffic from Blair Road.

Waste Management

Solid non-hazardous waste would be recycled or transported to an appropriate licensed landfill for disposal. Minor quantities of hazardous waste may be generated from airport operations. These wastes would be handled and stored according to applicable state and federal regulations and transported to an approved, licensed, off-site facility for further treatment and/or disposal. The MKAA would use safety procedures and implement a spill prevention, control, and countermeasures plan and/or an emergency response plan to help prevent or limit impacts should a release or accidental spill of hazardous materials (to any environmental medium—air, surface water, groundwater, or soils) occur.

Intentional Destructive Acts

The likelihood of sabotage and terrorism is extremely low. However, it is possible but highly unlikely that random acts of vandalism could occur. A variety of measures to control access and maintain security would be used. Operations at the Oak Ridge Airport would not change the current airspace restrictions over the Y-12 Complex. Additionally, the airport's presence would not materially affect the current ability to use an airplane to conduct an intentionally destructive act at DOE facilities in Oak Ridge. DOE has engaged in discussion of this issue with the National Nuclear Security Administration, which has raised no objection to the proposed Oak Ridge Airport.

Cumulative Impacts

The proposed action could have a minor and incremental cumulative impact on air quality, noise, safety, water resources, and transportation in the ETTP Heritage Center area, but these impacts would still be below the levels experienced during large employment periods at the site (e.g., 1993–1996). Further NEPA analysis would be available as subsequent Federal decisions leading up to the approval of airport construction are considered. Consequently, potential impacts on the various environmental resources from the proposed action when added with the impacts of other past, present, and reasonably foreseeable future action in the Oak Ridge area would not be significant.

DETERMINATION: Based on the findings of this FONSI, and after careful consideration of all public and agency comments, DOE has determined that the proposed transfer of land within the ETTP for the development of a general aviation airport does not constitute a major federal action that would significantly affect the quality of the human environment within the context of NEPA. Therefore, preparation of an EIS is not required.

Issued at Oak Ridge, Tennessee, this 19th day of February 2016.

S. M. Cange

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U.S. Department of Energy
Oak Ridge Office of Environmental Management

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FIGURES

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ACRONYMS

AC	Advisory Circular
ACAM	Air Conformity Applicability Model
ACHP	Advisory Council on Historic Preservation
ACS	American Community Survey
AIP	Airport Improvement Program
APC	Air Pollution Control
APE	Area of Potential Effects
ARA	Aquatic Reference Area
ARAP	Aquatic Resources Alteration Permit
ARC	Airport Reference Code
ATC	air traffic control
AvGas	aviation gasoline
bgs	below ground surface
BMAP	Biological Monitoring and Abatement Program
BMP	Best Management Practice
C&D	construction and demolition
CAA	Clean Air Act of 1970
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	*Code of Federal Regulations*
CO_2e	carbon dioxide equivalent
CRMP	Cultural Resources Management Plan
CROET	Community Reuse Organization of East Tennessee
D&D	decontamination and decommissioning
dB	decibel
dBA	A-weighted decibel
DNL	day-night average sound level
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EA	Environmental Assessment
EIS	Environmental Impact Statement
EM	Environmental Management
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act of 1973
ETTP	East Tennessee Technology Park
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FICON	Federal Interagency Committee on Noise
FICUN	Federal Interagency Committee on Urban Noise
FONSI	Finding of No Significant Impact
FWS	U.S. Fish and Wildlife Service
FY	fiscal year
GAMA	General Aviation Manufacturers Association
GHG	greenhouse gas
GPS	Global Positioning System
GSA	General Services Administration
GWP	global warming potential

HAP	hazardous air pollutant
Hz	Hertz
IFR	Instrument Flight Rules
ILS	Instrument Landing System
LBP	lead-based paint
L_{eq}	equivalent sound level
$L_{eq\text{-}24}$	equivalent sound level in a 24-hour period
L_{max}	maximum noise level
LESA	Land Evaluation and Site Assessment
LPA	LPA Group Associates
LPV	Localizer Performance with Vertical Guidance
MBTA	Migratory Bird Treaty Act of 1918
MGD	million gallons per day
MKAA	Metropolitan Knoxville Airport Authority
MOA	Memorandum of Agreement
mph	miles per hour
MSL	mean sea level
MT	metric ton
MVA	megavolt-ampere
NAAQS	National Ambient Air Quality Standards
NAS	National Airspace System
NAVAIDS	Navigational Aids
NEI	National Emissions Inventory
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Act of 1966
NPD	Noise-Power-Distance
NPDES	National Pollutant Discharge Elimination System
NPIAS	National Plan of Integrated Airport Systems
NTSB	National Transportation Safety Board
ORGDP	Oak Ridge Gaseous Diffusion Plant
ORNL	Oak Ridge National Laboratory
ORO	Oak Ridge Office
ORR	Oak Ridge Reservation
ORWMA	Oak Ridge Wildlife Management Area
PCE	tetrachloroethene
PILOT	payment-in-lieu-of-tax
$PM_{2.5}$	particulate matter $\leq$ 2.5 microns diameter
RCRA	Resource Conservation and Recovery Act of 1976
RNAV	Area Navigation (routes)
ROD	Record of Decision
ROI	Region of Influence
ROW	Right-of-way
RPZ	Runway Protection Zone
SIP	State Implementation Plan
SR	State Route
System Plan	*Tennessee State Airport System Plan*
T&E	threatened and endangered
TCA	Tennessee Code Annotated
TCE	trichloroethene
TDEC	Tennessee Department of Environment and Conservation
TDOT	Tennessee Department of Transportation

TN SHPO	Tennessee State Historic Preservation Officer
TRACON	Terminal Radar Approach Control
TVA	Tennessee Valley Authority
TWRA	Tennessee Wildlife Resources Agency
USACE	U.S. Army Corps of Engineers
VFR	Visual Flight Rules
VOC	volatile organic compound
WHMP	Wildlife Hazard Management Plan
WWTP	wastewater treatment plant
Y-12 Complex	Y-12 National Security Complex

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1. INTRODUCTION

1.1 PURPOSE AND NEED FOR ACTION

The proposed action evaluated in this Environmental Assessment (EA) is the title transfer of U.S. Department of Energy (DOE) property located at the East Tennessee Technology Park (ETTP) Heritage Center (Fig. 1.1) to the Metropolitan Knoxville Airport Authority (MKAA) for the purpose of constructing and operating a general aviation airport. The MKAA submitted a request for transfer of approximately 170 acres of ETTP property in June 2013. DOE responded in August 2013, agreeing to evaluate the transfer. The proposed airport would address two distinct and important needs in the greater Oak Ridge region. The airport's primary purpose would be the expansion of general aviation air services by the MKAA. Sustained population growth over the last three decades has placed a strain on general aviation capacity for corporate and private aircraft services. This strain would be relieved by the presence of a new general aviation airport in Oak Ridge that could house private aircraft and provide service to the surrounding corporate community. An ancillary benefit to the airport would be the ability to leverage the extensive assets already at place at the ETTP. These assets include land, power, rail, and water, and when combined with an airport would offer the potential to support regional economic development in the form of industrial investment.

The 3,500-ft runway length at Knoxville Downtown Island Airport limits operations to small general aviation aircraft. Because the airport has a waiting list of 125 persons requesting hangar space and limited room for additional hangars, the MKAA has determined that the proposed Oak Ridge airport is needed for improvement of air service in the region. The need for an airport requires an endorsement by the Federal Aviation Administration (FAA) through the National Plan of Integrated Airport Systems (NPIAS) evaluation process. The proposed Oak Ridge airport received FAA approval for inclusion in the NPIAS in January 2015. By definition, inclusion in the NPIAS signifies the Secretary of Transportation has determined the airport "necessary to provide a safe, efficient, and integrated system of public-use airports adequate to anticipate and meet the needs of civil aeronautics." The FAA evaluated current regional airports (Rockwood, McGee Tyson, and Knoxville Downtown Island) when evaluating the inclusion of the Oak Ridge airport in the NPIAS.

1.2 BACKGROUND

In 1996, DOE began a Reindustrialization Program to make land, facilities, and equipment at ETTP available for use by private-sector businesses and industries. As part of the reindustrialization effort, DOE and the Community Reuse Organization of East Tennessee (CROET) have been transitioning the former gaseous diffusion plant to the Heritage Center private industrial/business park. CROET is the DOE-recognized community reuse organization engaged in furtherance of economic development for Oak Ridge, including the Oak Ridge Reservation (ORR). DOE has made some of its underutilized facilities and land parcels at ETTP available for lease or title transfer and, in turn, they have been subleased or sold to private-sector firms. DOE has also been transferring facilities and utility infrastructure to the city of Oak Ridge. More information about DOE's Reindustrialization Program is available on the web at: http://www.ettpreuse.com.

In 2011, DOE completed an EA titled *Transfer of Land and Facilities within the East Tennessee Technology Park and Surrounding Area, Oak Ridge, Tennessee*, DOE/EA-1640 (DOE 2011), for the conveyance (lease, easement, and/or title transfer) of approximately 1,800 acres of DOE property located at the ETTP and surrounding area for mixed-use economic development (Fig. 1.2). The area evaluated in the 2011 EA included the majority of the main ETTP plant area, Duct Island, a portion of the former

Fig. 1.1. Vicinity map.

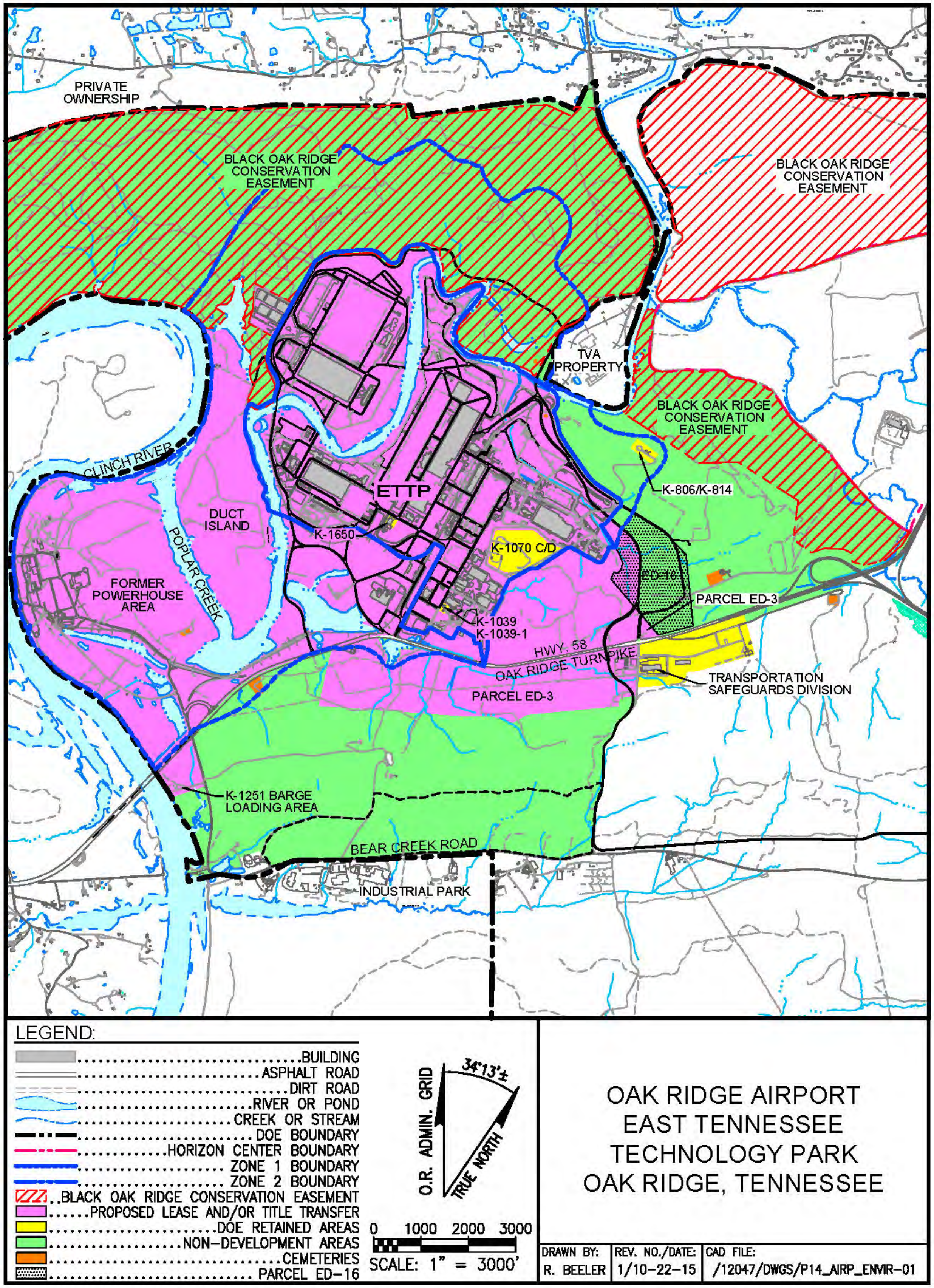

Fig. 1.2. 2011 EA Area including Parcel ED-16.

K-25 Powerhouse Area, the K-1251 Barge Loading Area and the land adjacent to it, and land identified as Parcel ED-3. In the 2011 EA, DOE recognized the feedback from the land use planning process conducted in 2001 for the northwest portion of the ORR, documented in the *Final Report of the Oak Ridge Land Use Planning Focus Group* (2002), which considered four land use scenarios, with a varied balance between development and conservation. Approximately 119 of the 170 acres of property that is part of the proposed action for the current EA were part of the area previously evaluated for transfer and development in the 2011 EA. The 51 acres not evaluated for development/transfer in the 2011 EA are located within a portion of Parcel ED-16 to the east of Haul Road. One of the purposes of this current EA is to assess impacts from development of these 51 acres, along with the future impacts associated with construction and operation of an airport associated with the land transfer. In the 2011 EA, DOE acknowledged that the MKAA was performing a preliminary feasibility study to evaluate locations for a general aviation airport and identified an airport as a reasonably foreseeable future land use. The EA acknowledged that additional National Environmental Policy Act of 1969 (NEPA) review would be necessary if a proposed airport location were identified.

The ETTP area has also been the subject of previous NEPA decisions and land use planning efforts. NEPA decisions include the *Final Environmental Assessment for the Lease of Land and Facilities Within the East Tennessee Technology Park*, DOE/EA-1175 (DOE 1997), and the *Final Environmental Assessment Addendum for the Title Transfer of ETTP Land and Facilities*, DOE/EA-1175-A (DOE 2003). Land use planning efforts include the *Oak Ridge Reservation Ten-Year Site Plan: Integrating Multiple Land Use Needs*, DOE/ORO-TYSP2007 (DOE 2007), and the land use planning process conducted in 2001 documented in the *Final Report of the Oak Ridge Land Use Planning Focus Group* (2002) and *Land Use Technical Report*, ORNL/TM-2002/132 (ORNL 2002).

The MKAA is charged with meeting the aviation needs of East Tennessee. The MKAA, established in 1978, is an independent, non-profit agency that owns and operates McGhee Tyson Airport and Downtown Island Airport. As part of its mission, MKAA is working with community partners toward the successful development of a general aviation airport located in Oak Ridge.

In September of 2009, the MKAA agreed to sponsor a study (Phase I) to conduct a preliminary assessment of the potential to construct a new general aviation airport on one of three sites (Heritage Center, Parcel ED-3, and Horizon Center) on the ORR (Fig. 1.3). The preliminary study was prepared in coordination with DOE and CROET (LPA 2010). In March 2012, a Phase II preliminary planning study and programming report was completed (LPA 2012). Based on a priority ranking of multiple alternative layouts, the Phase II study concluded that the Heritage Center Site – Concept 3 was most favorable for constructing a new general aviation airport in Oak Ridge. The MKAA, as the sponsor of the proposed airport project, completed a Phase III study to illustrate the justification for a new airport in accordance with FAA guidelines (LPA 2013). This study identifies the FAA criteria for a new airport to be included in the NPIAS and describes how the proposed airport can satisfy the associated criteria. In January 2015, the proposed Oak Ridge airport received official inclusion from the FAA in the NPIAS. By becoming part of the NPIAS, the airport project becomes eligible for Airport Improvement Program (AIP) grants for the planning and development of the airport. In Tennessee, AIP grants are administrated by the Tennessee Aeronautics Commission as a participant in the State Block Grant Program.

The proposed Oak Ridge airport would fall into the NPIAS category of a *Reliever Airport* to the Knoxville area's McGhee Tyson Airport. As a Reliever Airport, the proposed Oak Ridge facility would offer an alternative for general aviation aircraft over the use of McGhee Tyson in order to help relieve congestion and provide improved general aviation access to the overall community. The proposed airport would also complement McGhee Tyson's other general aviation reliever airport, Knoxville Downtown

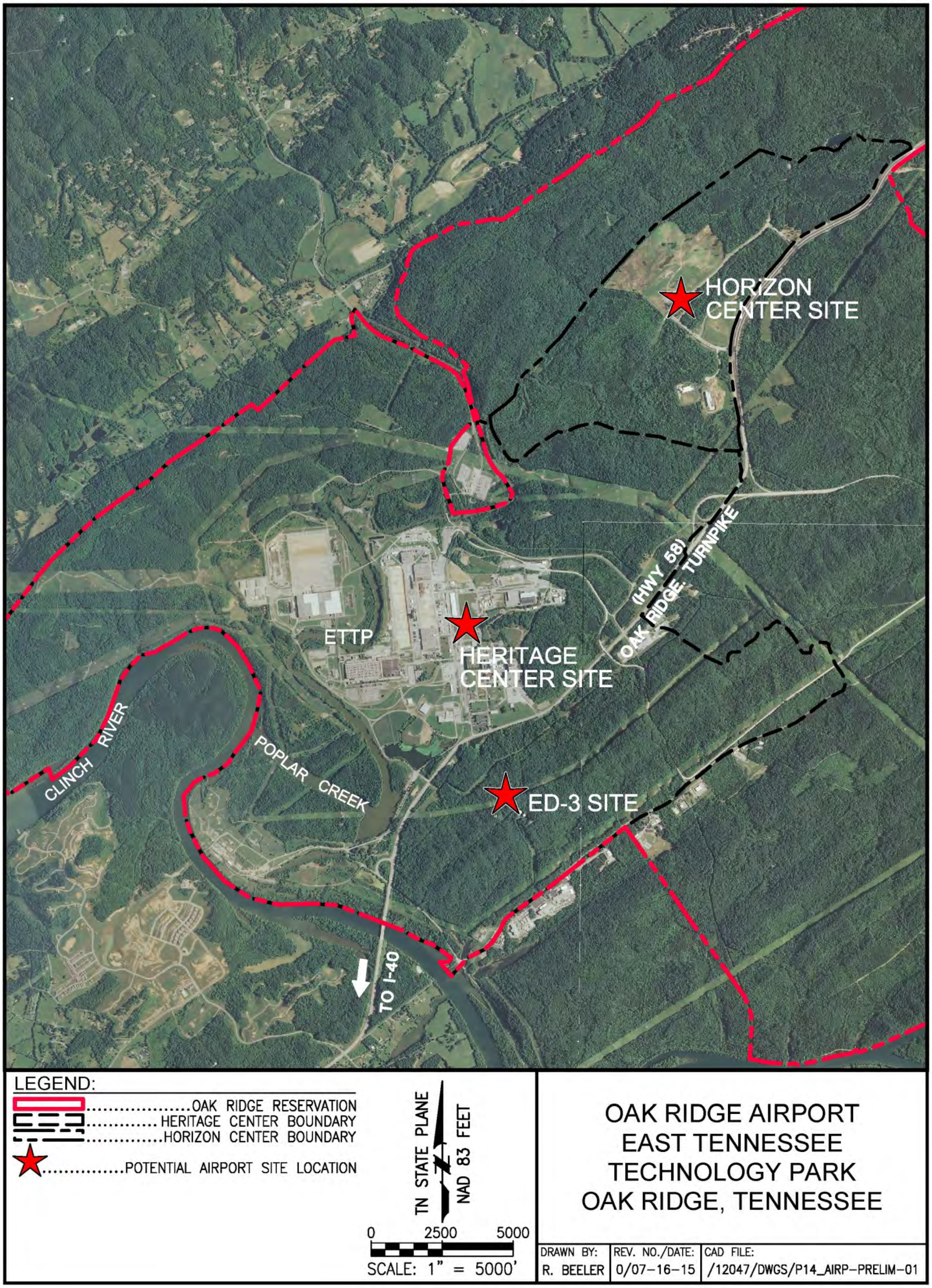

Fig. 1.3. Potential Oak Ridge airport site locations evaluated by the MKAA.

Island Airport (LPA 2012). The driving distance from the proposed Oak Ridge airport to McGhee Tyson and Downtown Island is approximately 35 miles.

At the state level, roles are defined by the *Tennessee State Airport System Plan* (System Plan). Its purpose is "to provide a framework for the orderly, ongoing, and timely development of a system of airports that is adequate to meet the current and future aviation needs of the state." Airports included in the System Plan are classified according to four categories. For each category, the System Plan recommends specific attributes including suggested runway length, taxiway configuration, navigational aids, and weather reporting equipment. It is the intent to construct the proposed Oak Ridge airport as a *Community Business Airport*. Community Business Airports are Tennessee public use airports that serve an important role in business aviation within the state, but community population and employment growth is not as significant as Regional Airports (LPA 2012).

1.3 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

DOE has prepared this EA to assess the potential consequences (impacts) of the proposed action on the human environment in accordance with the Council on Environmental Quality (CEQ) regulations (40 *Code of Federal Regulations* [*CFR*] Parts 1500–1508) implementing the NEPA and the DOE NEPA Implementing Procedures (10 *CFR* 1021). If the impacts associated with the proposed action are not identified as significant as a result of this EA, DOE may issue a Finding of No Significant Impact (FONSI) and proceed with the action. If impacts are identified as potentially significant, an Environmental Impact Statement (EIS) may be prepared.

For this EA, the proposed action is the title transfer of DOE land. Because the transfer is to support the MKAA's intended use of constructing and operating an airport, the reasonably anticipated reuse of the land is for an airport. NEPA requires analysis of reasonably foreseeable actions in addition to the proposed action. The impact analysis conducted within the EA is a "bounding analysis" in that it represents a reasonable upper end of operational activity and is intended to determine whether the reasonably foreseeable future use would have significant environmental impacts. Thus, DOE is analyzing the potential environmental impacts associated with constructing and operating an airport to determine if the land transfer is appropriate for a FONSI or if the preparation of an EIS is warranted.

Additionally, the FAA will initiate a separate NEPA review in accordance with FAA Orders and requirements when the MKAA Master Plan for the proposed airport is finalized. Prior to GSA executing the deed for the transfer of this property, GSA, using its own NEPA regulations, may also conduct a NEPA analysis of GSA's proposed action of property disposal by way of deed. GSA's analysis will be conducted in light of the NEPA determinations made by both DOE and the FAA.

This EA (1) describes the existing environment; (2) analyzes potential environmental impacts that could result from the proposed action and alternatives; and (3) identifies and characterizes cumulative impacts that could result from the conveyance of DOE property in relation to other ongoing or proposed activities within the surrounding area.

Certain aspects of the proposed action have a greater potential for creating adverse environmental impacts than others. For this reason, CEQ regulations (40 *CFR* 1502.1 and 1502.2) recommend a "sliding-scale" approach so that those actions with greater potential effect can be discussed in greater detail in NEPA documents than those that have little potential for impact.

2. DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

Under the proposed action, DOE would transfer approximately 170 acres of property located within the ETTP Heritage Center (Fig. 2.1). The property to be transferred includes Parcel ED-13, Parcel ED-16, a portion of Parcel ED-3, and Victorius Boulevard. DOE currently plans to transfer the property to the MKAA using the General Services Administration (GSA) "Public Benefit Conveyance" process, which allows for property transfer at no cost. In the 2011 EA (DOE 2011), approximately 119 of the 170 acres of the property were evaluated for transfer and development. The 51 acres not evaluated in the previous EA are located within a portion of Parcel ED-16 to the east of Haul Road.

Once the initial property transfer of the 170 acres of DOE property is made to the MKAA, additional property would need to be obtained by the MKAA to accommodate the airport footprint (Fig. 2.1). This additional property was previously transferred by DOE to CROET and includes Bldg. K-1330, Bldg. K-1580, portions of Parcel ED-4, and Parcel ED-8.

The proposed Heritage Center Site airport design (Fig. 2.2) features a 5,000-ft runway that would allow the facility to accommodate a variety of general aviation aircraft including but not limited to corporate jets, private airplanes, and emergency medical services aircraft. The final airport design will be part of a Master Plan being developed by the MKAA. The airport design will fluctuate slightly as the final plans for the facility are developed, but for the purposes of this EA, these changes should only impact the facility and not impact its location within the proposed Heritage Center site. However, if the final design for the airport includes substantial changes that are outside of the scope of what is analyzed in this EA, additional NEPA analysis would need to be completed. Additionally, the MKAA would be responsible for seeking and obtaining any applicable federal, state, and/or local permits and licenses for construction activities and operations associated with the airport. Examples include building permits, permits for air emissions, water quality permits, National Pollutant Discharge Elimination System (NPDES) permits, etc.

Development and construction activities would include land clearing, grading, placement and compaction of earth backfill to establish required building elevations within approximately 132 acres of the airport property. Construction activities would also include excavation for the installation of concrete foundations/footings and utility connections. Infrastructure development would include the runway, taxiway and apron space, vehicle access roads, parking, terminal and hangar buildings, walkways, fuel farm, and fire protection facilities and equipment. Development of the airport would also require the closure and removal of a portion of Victorius Boulevard and the demolition of Bldgs. K-1330 and K-1580. Construction of the proposed airport would also impact existing Haul Road and Blair Road. Options have been developed (see Sect. 2.1.4) for rerouting Haul Road and a portion of Blair Road to accommodate the proposed airport layout. Depending on which options were selected, additional DOE property would be impacted outside of the 132-acre airport construction limit boundary.

2.1.1 Airport Geometrical Requirements

Airports receiving the State's Vision 100 funds are required to be built according to FAA airport design guidelines through grant assurances. These guidelines translate into geometrical requirements that are based upon the operating characteristics, sizes, and weights of the airplanes expected to use the airport. A key to developing these requirements is selection of the airport's desired Airport Reference Code (ARC). The ARC correlates airport activity to the appropriate airport design standards found in FAA Advisory Circular (AC) No. 150/5300-13, *Airport Design*. The ARC has two components relating to the airport design aircraft. The first component, depicted by a letter, is the "approach category" and is based on

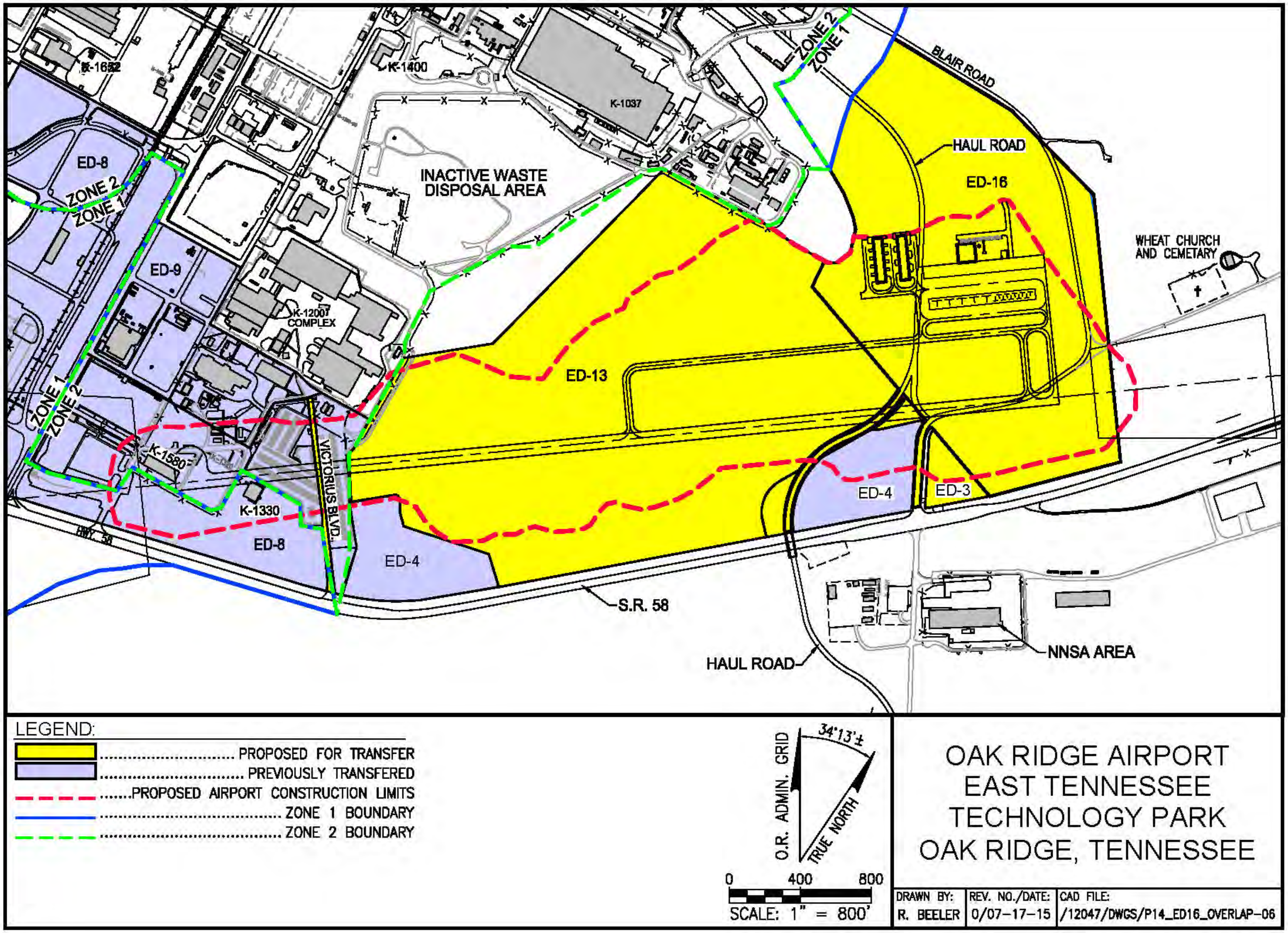

Fig. 2.1. Property transfer status for the proposed Oak Ridge airport.

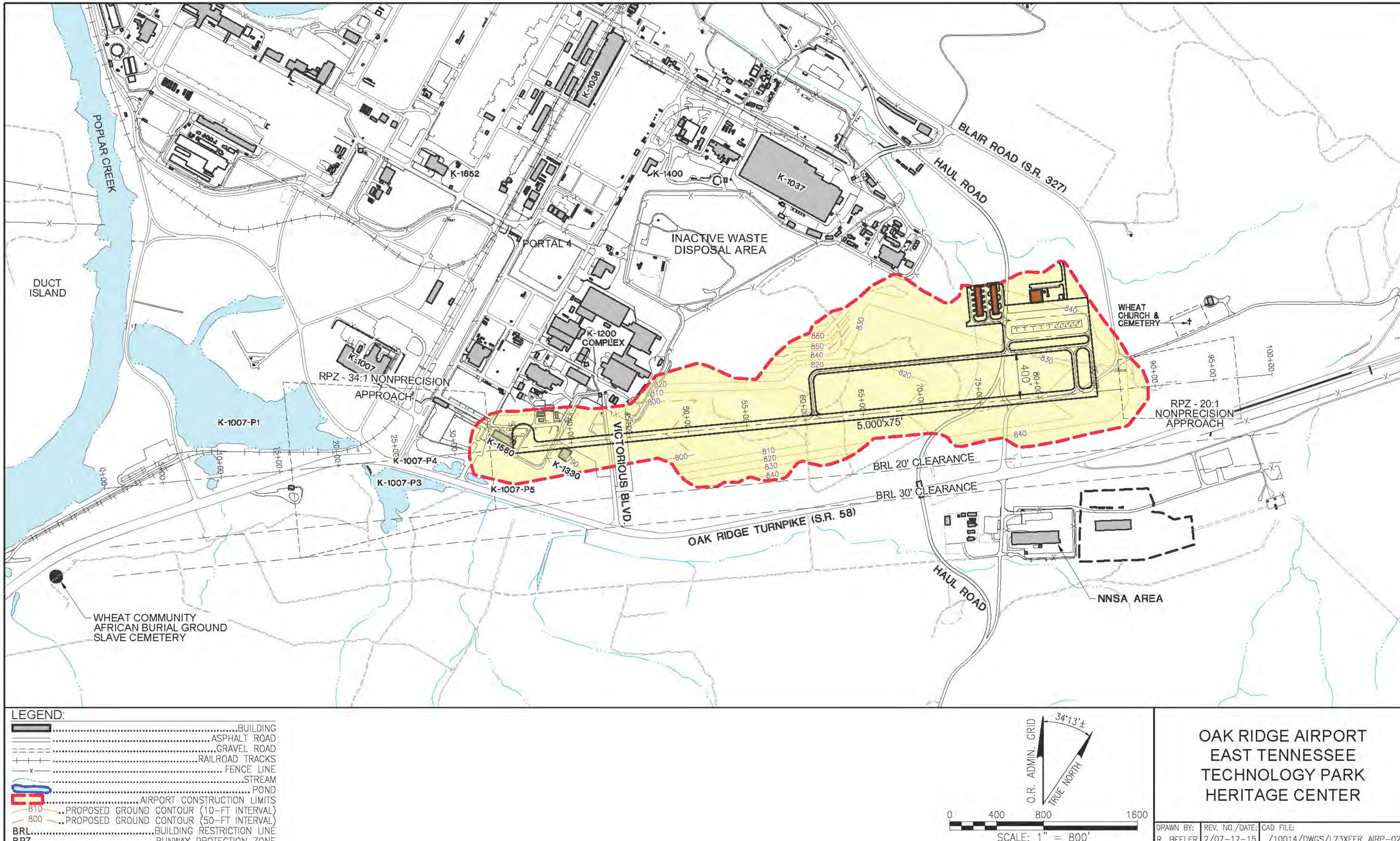

Fig. 2.2. Heritage Center Site airport development plan.

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aircraft approach speed. The second component, depicted by a Roman numeral, is the airplane "design group" and is based on airplane wingspan. Generally, aircraft approach speed applies to runways and runway length-related features. Airplane wingspan primarily relates to separation-of-aircraft criteria and width-related features. Airports expected to accommodate single-engine airplanes normally fall into ARC A-I or B-I. Airports serving larger general aviation and commuter-type planes are usually ARC B-II or B-III. Small to medium-sized airports serving air carriers are usually ARC C-III, while larger air carrier airports are usually ARC D-V or D-VI. Based upon the desired role of the proposed airport, it is recommended that it be constructed to B-II design standards. However, for some airport development components, C-II standards could be achieved during construction, which would provide substantial cost savings in the future if upgrades were ever implemented (LPA 2012). The selected dimensional standards that would be applied to the proposed airport template are presented in Table 2.1.

Table 2.1. Selected dimensional standards

Dimensional standard	Initial
Airport Reference Code (ARC)	B-II
Lowest Visibility Minimus	> ¾ mile
Runway Length	5,000 ft
Runway Width	75 ft
Taxiway Width	35 ft
Runway Safety Area Width	150 ft
Runway Safety Area Length Prior to Landing Threshold	300 ft
Runway Safety Area Length Beyond Runway End	300 ft
Obstacle Free Zone Width	400 ft
Obstacle Free Zone Length	200 ft
Runway Object Free Area Width	500 ft
Runway Object Free Area Length Beyond Runway End	300 ft
Runway Centerline to Taxiway Holdline	200 ft
Runway Centerline to Taxiway/Taxilane Centerline	240 ft
Runway Centerline to Aircraft Parking Area	200 ft

Source: Federal Aviation Administration Advisory Circular (AC) No. 150/5300-13, *Airport Design*.

2.1.2 Airspace and Runway Protection Zone Requirements

Airspace requirements begin with the establishment of civil airport imaginary surfaces as described in 14 *CFR*, Part 77, "Safe, Efficient Use, and Preservation of the Navigable Airspace." Part 77 regulations also explain notice requirements for proposed construction or alteration of existing structures and the process for conducting aeronautical studies related to potential airspace obstructions. Composition of airspace surfaces is dependent upon the type of instrument approaches planned at the airport. For the Oak Ridge airport, non-precision instrument approaches are proposed upon opening day, followed by an upgrade to a precision approach to one runway end in the future. The precision approach may be an Instrument Landing System (ILS) approach or a Global Positioning System (GPS)-based "near precision" Localizer Performance with Vertical Guidance (LPV) approach (LPA 2012).

Runway Protection Zones (RPZs) are trapezoidal boundaries beyond the ends of each runway that are intended to protect encroachment by incompatible land uses that may be unsafe. Incompatible land uses within RPZs are those creating a congregation of people such as residential areas, churches, schools, hospitals, and commercial development. It is desirable that the airport owns the RPZ in order to protect such encroachment. RPZ dimensions are dictated by the type of approaches planned to a runway and the lowest visibility minima of those approaches. Table 2.2 depicts the size and dimensions of the RPZs required for the Oak Ridge airport. Once the final airport design was completed and prior to the start of construction, the RPZs and other areas outside of the airport construction limits would be surveyed and evaluated for potential obstacles (terrain features, tree, towers, utilities, etc.) that might need to be removed to protect navigable airspace according to 14 *CFR* Part 77.

Table 2.2. Runway protection zone requirements

	Initial requirements	
Dimensional standard	**Preferred runway end**	**Opposite runway end**
Approach Category	B	B
Distance From Runway End	200 ft	200 ft
Inner Width	1,000 ft	500 ft
Outer Width	1,510 ft	700 ft
Length	1,700 ft	1,000 ft
Acreage	~ 49 acres	~ 14 acres
Instrument Approach	Non-precision	Visual or Non-precision
Lowest Visibility Minimums	> ¾ mile	1 mile
Part 77 Slope	34:1	20:1

Source: 14 *Code of Federal Regulations*, Part 77, "Safe, Efficient, Use, and Preservation of Airspace."

2.1.3 Recommended Aeronautical Facilities

In addition to geometrical, airspace, and runway protection zone requirements, and based upon the stated role of the airport as a general aviation facility that meets or exceeds the attributes of a Community Business Airport within the System Plan, a set of proposed aeronautical facilities has been developed. Table 2.3 provides a summary of the proposed aeronautical facilities that would be proposed for construction at the Oak Ridge airport. These facilities represent those commonly found at general aviation airports of similar size. Figure 2.3 depicts the airspace surfaces and aeronautical facilities.

2.1.4 Roads

Construction of the proposed Oak Ridge airport under the Heritage Center Site – Concept 3 airport development plan would result in the airport footprint overlapping Haul Road and Blair Road (Fig. 2.2). The Haul Road was built and owned by DOE for transportation of decontamination and decommissioning (D&D) waste to a special landfill at the Y-12 National Security Complex (Y-12 Complex); Haul Road is not a public access road. Blair Road (State Route [SR] 327) connects the Oak Ridge Turnpike (SR 58) with SR 61. A portion of Blair Road in the vicinity of ETTP is owned by DOE. Under a bilateral agreement with the state, a permanent easement for this section is maintained by the Tennessee Department of Transportation (TDOT). Blair Road also currently provides access to the Wheat Church and cemetery. Additionally, construction of the airport would require that a portion of Victorius Boulevard be closed.

Table 2.3. Recommended aeronautical facilities

Dimensional standard	Initial requirements
Runway	5,000-ft by 75-ft Runway ARC B-II Grade RSA to C-II if practical
Taxiways	Apron Access near Centerfield Turnaround/Bypass Each End
Apron Space	26,412 yd^2 Local/Itinerant Apron 15 Tiedown Positions
Lighting and Navigational Aids (NAVAIDS)	Non-precision Approach to Preferred Runway End Airport Rotating Beacon Automated Weather Observing System Medium Intensity Runway Lights Medium Intensity Taxiway Lights Lighted Wind Cone & Segmented Circle Precision Approach Path Indicators
Buildings	Fixed Base Operator with Public Space and Maintenance Hangar Two T-Hangar Rows (16 units) Auto Parking and Entrance Road
Fuel Farm	10,000 gal aviation gasoline (AvGas) and Jet A Self-Service Fueling

Source: The LPA Group Incorporated 2012.

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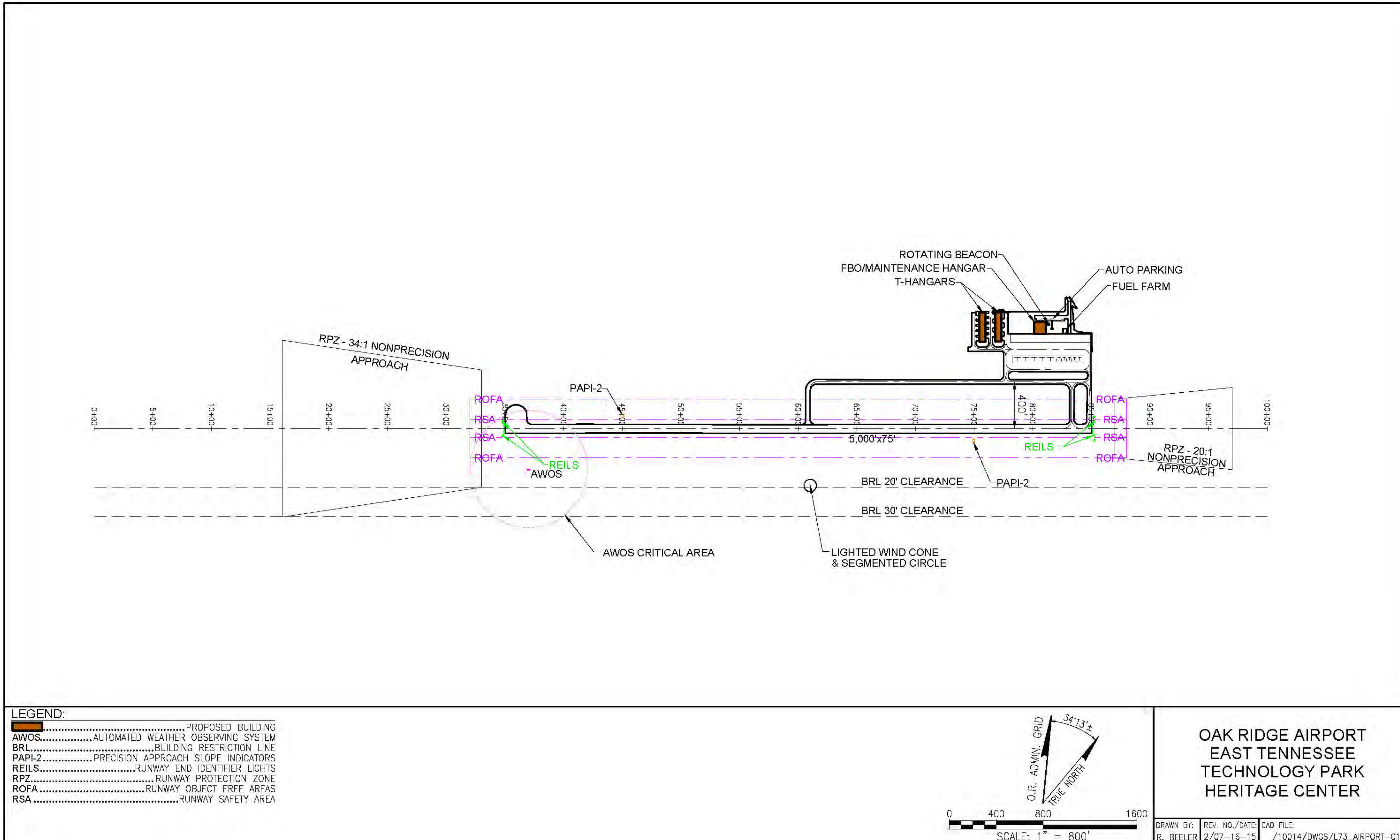

Fig. 2.3. Airspace surfaces and aeronautical facilities.

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The Haul Road would continue to be needed for the transport of waste after construction of the airport begins, which is anticipated to be sometime in 2017. As a result, DOE and TDOT are considering options for rerouting Haul Road and a portion of Blair Road to accommodate the proposed airport layout. These options are considered to be sub-alternatives to the proposed action, though it is not currently known which of these would be implemented. The timing of the continued need for the Haul Road and the airport construction start date could require an interim detour (less than 6 months); short-term detour (longer than 6 months, less than 2 years); or long-term (longer than 2 years) detour of traffic from Blair Road. The configuration of each option is described below and their respective impacts evaluated later in the EA.

2.1.4.1 Haul Road Options

Because the airport construction footprint overlaps the current Haul Road, the Haul Road must be rerouted in a configuration that connects Haul Road to the Haul Road bridge that overpasses SR 58 (as shown in Figs. 2.4 and 2.5) in order to get to the landfill at the Y-12 Complex. Two options are being considered to accomplish connecting to the bridge, as described below, and both options have common elements.

Option 1: Use Blair Road for portion of Haul Road

This option requires that existing Haul Road be rerouted to utilize a section of existing Blair Road. The affected section of Blair Road (~1,600 ft) would need to be closed to public access and existing Blair Road traffic would need to be rerouted (i.e., Blair Road Options 1, 2, or 3). Connecting from the existing Haul Road to Blair Road would occur at the section labeled as Segment A, which is approximately 1,180 ft in length. Segment A would be needed for both Haul Road reroute options. A second segment, labeled as Segment B and 2,550 ft in length, is needed to bypass the airport footprint and connect to the existing Haul Road bridge over SR 58. This segment is common to both options as well. These new sections would be built to the same specification as the existing road (i.e., 30-ft-wide roadway with an 18-in.-thick gravel roadbed). In addition, a new 910-ft access road from SR 58 may need to be constructed to provide access to the Wheat church and cemetery. The proposed changes associated with Haul Road Option 1 are depicted in Fig. 2.4.

Option 2: Construct a new Haul Road segment

This option would require construction of a new 5,123-ft section of Haul Road that would avoid the eastern end of the proposed airport and run parallel to Blair Road (shown in red on Fig. 2.5). Connecting from the existing Haul Road to the newly constructed section of Haul Road would include a section that is nearly identical to Segment A described in Option 1. Segment B, as described in Option 1, is also needed for this option to bypass the airport footprint and connect to the Haul Road bridge. The middle section (~1,400 ft) that connects Segments A and B to create a continuous new section of Haul Road is the portion of this option that is unique to Option 2. Even though this option would keep Blair Road open, a new section would need to be built in order to avoid the proposed airport and connect with SR 58 (see Blair Road Option 4).

2.1.4.2 Blair Road Options

If Haul Road is rerouted onto Blair Road and/or the airport footprint overlaps Blair Road, then Blair Road would no longer be connected to SR 58, and thus a rerouting alternative is needed. There are several viable options being considered to connect traffic traveling between Blair Road and SR 58. Each of these options is described below.

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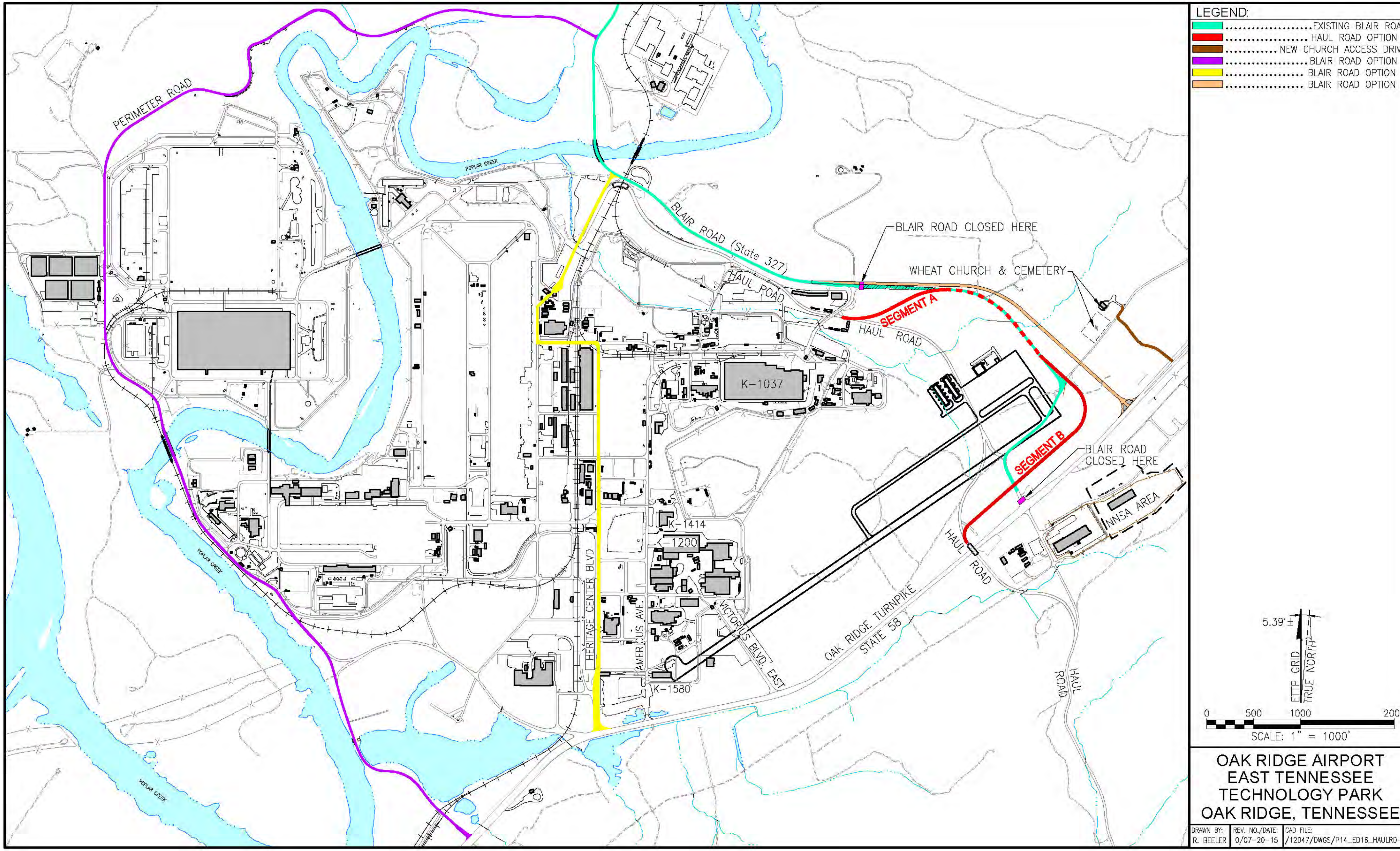

Fig. 2.4. Haul Road Option 1 and Blair Road Options 1, 2, and 3.

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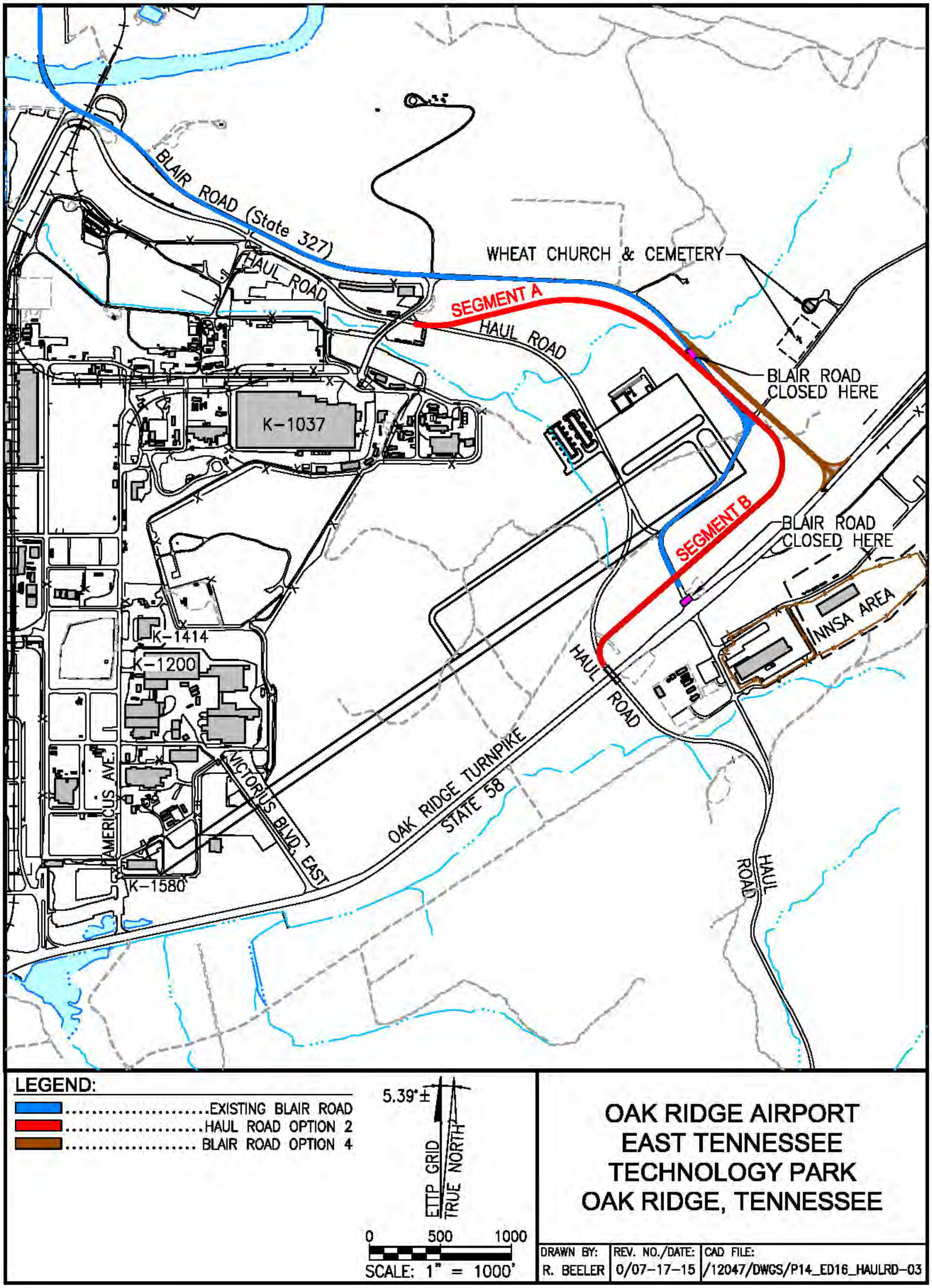

Fig. 2.5. Haul Road Option 2 and Blair Road Option 4.

Option 1: Use of Perimeter Road

If Haul Road Option 1 were to be implemented, this option for Blair Road would reroute Blair Road traffic for a distance of about 2.3 miles around the northern and western sides of the Heritage Center onto Perimeter Road, which is currently owned by DOE, and shown in purple on Fig. 2.4. Use of Perimeter Road as a public road would likely be conducted under an easement between DOE and TDOT similar to the existing easement agreement for Blair Road. Blair Road Option 1 involves improving Perimeter Road to bring traffic around the site, tying back into SR 58 west of Heritage Center Boulevard (Fig. 2.4). This option would require upgrades to Perimeter Road to eliminate current deficiencies. This option may also be implemented as a temporary option if closure of Blair Road for use as a Haul Road is only for a few months.

Option 2: Use of Heritage Center Boulevard

Blair Road Option 2 involves rerouting Blair Road down the middle of the Heritage Center site using Heritage Center Boulevard, which already ties into SR 58 (shown in yellow on Fig. 2.4). As Blair Road crosses Poplar Creek, it would turn to the right before crossing the railroad tracks and join with Heritage Center Boulevard. The intersection of Heritage Center Boulevard with existing Blair Road would need to be improved and other deficiencies within the Heritage Center site would likely be required by TDOT. The existing length of Heritage Center Boulevard from Blair Road to SR 58 is approximately 1.3 miles. This option for rerouting Blair Road would also require that Haul Road Option 1 be implemented.

Option 3: Construct New Blair Road (implemented with Haul Road Option 1)

This is the third possible alternative for connecting Blair Road to SR 58 if the Haul Road is rerouted onto existing Blair Road. It would only be implemented if Options 1 or 2 were not used, although use of Perimeter Road or Heritage Center Boulevard as a temporary option could be implemented in conjunction with this option. The new section of Blair Road would run parallel to the existing Blair Road for the northern portion of road, and then would deviate to connect to SR 58 in a manner similar to Option 4 below. The concept is shown in tan on Fig. 2.4.

Option 4: Extension of Existing Blair Road (implemented with Haul Road Option 2)

This option for Blair Road would only be required if Haul Road Option 2 (build a new section of Haul Road) was implemented. Blair Road Option 4 requires construction of a new 1,530-ft section of Blair Road starting north of the church access road to a new intersection with SR 58 (shown in brown on Fig. 2.5). Under this option the existing access road to the Wheat Church and cemetery could continue to be used and a new access road from SR 58 would not be required.

2.1.5 Airport Operations

A summary of the preliminary annual operations forecast, operational fleet mix, and identification of the critical aircraft is presented below.

2.1.5.1 Annual operations forecast

General aviation operations are divided into the categories of local or itinerant. Local operations are those arrivals or departures performed by aircraft that remain within the airport traffic pattern, or those that occur within sight of the airport. Local operations are most often associated with training activity and flight instruction (e.g., touch-and-goes). Itinerant operations are arrivals or departures that do not remain within the airport traffic pattern and/or are originating from another airport (i.e., visiting aircraft), and typically include business/corporate, air taxi, and some private travel. Operations are also discrete events, either a take-off or a landing. Consequently, two operations may be considered to count as a complete flight. Table 2.4 presents the local and itinerant operations forecast for the proposed Oak Ridge airport. The total operations forecast represent an average of the aircraft operations for five regional airports that are similar in size to what is proposed for Oak Ridge and were chosen to conduct a bounding analysis. The airport operational statistics were obtained from AirNav (2015) and are based on reported FAA records.

Table 2.4. Oak Ridge local and itinerant operations forecast

Airport	Local	Itinerant	Total	Local %	Itinerant %
Knoxville Downtown Island	36,175	32,080	68,255	53	47
Crossville	15,089	13,381	28,470	53	47
Sevierville	34,843	46,187	81,030	43	57
Morristown	22,834	26,806	49,640	46	54
Sparta	18,418	2,752	21,170	87	13
Totals	127,359	121,206	248,565		
Average	25,472	24,241	49,713	51	49

Source: AirNav 2015.

2.1.5.2 Operational fleet mix

The operational fleet mix forecast for the proposed Oak Ridge airport was conducted for three aircraft types: (1) turbine-powered fixed-wing aircraft, (2) helicopters, and (3) piston-powered, fixed-wing aircraft. Table 2.5 presents the estimated aircraft type forecast. Turbine operations are estimated to be 5% of the total operations, helicopters are estimated to be 3%, and piston-powered, fixed-wing aircraft comprise the remainder of operations.

Table 2.5. Oak Ridge operations by aircraft type forecast

Fixed-wing turbine	Helicopter	Fixed-wing piston	Total
2,486	1,491	45,736	49,713
5%	3%	92%	

2.1.5.3 Identification of the critical aircraft

According to FAA Order 5100.38C, Airport Improvement Program Handbook, “a critical design aircraft is that airplane using (or is highly likely to use) the airport on a regular basis. A regular basis is at least 500 annual itinerant operations.” Based on the proposed Oak Ridge airport being designed to be constructed to Runway Design Code B-II standards, the critical aircraft (typical) was determined to be the Beechcraft King Air 350i.

2.2 NO ACTION ALTERNATIVE

The no action alternative provides an environmental baseline with which impacts of the proposed action and alternatives can be compared, and is required by the CEQ and DOE NEPA regulations.

Under the no action alternative, Parcel ED-13, ED-16, a portion of ED-3, and Victorius Boulevard would not be transferred to the MKAA for the development of a general aviation airport. However, except for about 51 acres of Parcel ED-16, these areas were analyzed for transfer and development in the *Transfer of Land and Facilities within the ETTP and Surrounding Area EA* (DOE 2011). The property would continue to be retained by DOE unless other requests for transfer of the parcels were made. Title transfer activities presently underway at the ETTP for all facilities and land areas included in previous NEPA decision documents would continue. Ongoing environmental restoration and waste management activities at the ETTP would also continue.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED

To date, DOE has not received any other requests for the property requested by the MKAA for the proposed Oak Ridge airport. Alternatives for DOE property located at the ETTP and surrounding area for mixed-use economic development were analyzed in the 2011 EA.

As stated in Sect. 1.2, the MKAA, in 2009, agreed to sponsor a study (Phase I) to conduct a preliminary assessment of the potential to construct a new general aviation airport on the ORR. This necessitated identifying viable sites within the approximately 33,000 acres within the ORR owned by the DOE. The MKAA, in coordination with DOE and CROET, completed the evaluation of proposed sites on the ORR for the potential to accommodate a new airport (LPA 2010). This study consisted of preliminary site planning criteria, primarily to evaluate site constraints as well as obvious constructability, operational, and environmental issues. As shown on Fig. 1.3, CROET and DOE considered three sites large enough to warrant a study of airport feasibility (Heritage Center, Parcel ED-3, and Horizon Center).

Parcel ED-3 is located south of SR 58 and the study examined an “upper site” at the top of the Pine Ridge, and a “lower site” located adjacent to SR 58 near the bottom of the ridge. Both sites had the advantage of having few existing facilities that would need to be moved. However, both sites would have required substantial amounts of earth removal to make them viable for the airport. It was determined that the potential for significant environmental degradation, when added to an estimated cost that was approximately twice that of the other sites, made Parcel ED-3 an impractical option.

The Horizon Center industrial park site is located to the east of the ETTP and north of SR 95. While the site’s topography made it appealing in terms of cost, previous covenants with DOE specifically precluded the construction of an airport. Based on a number of factors, including potential environmental impacts and closer proximity to residential areas, the Horizon Center site was deemed to be unfeasible.

The site selection process examined two distinct runway options at the Heritage Center site located at the ETTP. One option placed the runway on an alignment that ran roughly north-northeast. This proposal encountered serious concerns from DOE about the need to cross a classified burial ground on the ETTP. This option would have also necessitated the demolition of seven existing buildings. Largely for these two reasons, this option was eliminated. The second option and the one eventually adopted had the runway alignment running northeast and required demolition of only two smaller buildings.

In March 2012, a Phase II preliminary planning study and programming report was completed (LPA 2012). Between the Phase I and Phase II studies, a total of 14 different airport alignments were evaluated. Based on a priority ranking of the multiple alternative layouts, the Phase II study concluded that the Heritage Center Site – Concept 3 was most favorable for constructing a new general aviation airport in Oak Ridge.

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter provides the existing conditions and background information for evaluating the potential environmental impacts of the proposed action and alternatives. This chapter also includes the impact analysis and discussion of project attributes that could have the potential for significant impacts.

3.1 AIRSPACE

Section 2.1.2 addresses those Part 77 regulatory requirements that provide for the safe design of the runway airspace environment so as to be protected from encroachment of any incompatible land uses, obstacles, and other such factors that could affect airfield operations and flight safety. This section addresses use of those components of the National Airspace System (NAS) that are designated, regulated, and managed by the FAA to serve all aircraft and air traffic operational needs. The NAS consists of different airspace types and classifications where FAA rules and regulations govern aircraft operations, pilot responsibilities, and air traffic control (ATC) services within each category. The airspace discussions focus on those designated airspace areas within this region of influence (ROI) considered relevant to the proposed Oak Ridge airport and its use by both Instrument Flight Rules (IFR) and Visual Flight Rules (VFR) aircraft operations.

The ROI consists primarily of the designated airspace classes that exist around and between the different airports located throughout this region as well as those Federal Airways, Jet Routes, and Area Navigation (RNAV) routes used by ATC to transit IFR aircraft across this region while en route to their destination airports.

3.1.1 Existing Conditions

The proposed Oak Ridge airport site is situated nearly midway between the Rockwood Municipal and Knoxville McGhee Tyson Airports. The higher use McGhee Tyson airport, 20 nautical miles east of the proposed airport site, has two parallel runways serving both civil and military (Air National Guard) aircraft operations. Over 102,000 aircraft operations were conducted at this airport in 2013 for an average of 280 operations per day. An FAA control tower and the Knoxville Terminal Radar Approach Control (TRACON) provide full-time ATC services to all aircraft operating at this airfield and the surrounding airspace. This airport has several published instrument approach procedures used by IFR aircraft while navigating to the different runways as air traffic and/or weather conditions dictate. As depicted on the Atlanta Sectional Aeronautical Charts, McGhee Tyson is located within Class C airspace, which is an area that extends from the surface to 5,000 ft above the airport elevation within a 5 nautical mile radius of the airport with an outer subdivided area within a 10 nautical mile radius that extends from 2,500 or 3,500 ft to 5,000 ft. Class C airspace is normally established at higher use airports within which all IFR and VFR aircraft operating within its vertical/lateral boundaries must establish two-way communications with the control tower or TRACON so that ATC can more safely manage all flight activities within this designated airspace (FAA 2015).

The lower use Rockwood Municipal airport, about 15 nautical miles west of the proposed Oak Ridge site, serves both VFR and IFR aircraft operations with one runway. This airport does not have an operational control tower. About 17,500 aircraft operations were conducted at this airport in 2012 for an average of 48 daily operations. This airport has three published instrument approach procedures in support of

IFR aircraft operations. The FAA Atlanta Air Route Traffic Control Center (Atlanta Center) provides ATC services to IFR aircraft operating at this airport. Rockwood is surrounded by Class E airspace that begins at 700 ft above the airfield elevation within a 10-mile radius that also extends outward to the east. When Class E is established at that lower altitude around an airport (versus 1,200 ft in other areas) such as Rockwood and areas south of McGhee Tyson, its purpose is to provide more regulated control over this airspace for instrument approach procedures in higher use areas than what the underlying, uncontrolled Class G airspace provides. The Class G airspace underlying the Class E is less restrictive for VFR aircraft operations (FAA 2015).

The area between the McGhee Tyson and Rockwood airports where the Oak Ridge airport would be located consists of the standard Class E and G airspace structure that exists throughout the country below 18,000 ft mean sea level (MSL). There are a number of charted and uncharted private airfields throughout this region that typically have very limited based aircraft and aircraft operations. Several Federal Airways (Victor routes) cross this region with one (V16) located about 5 to 6 miles south of the proposed airport. Federal Airways are those lower altitude “highways” used by the ATC system for transiting en route IFR aircraft between their origin/destination airports. These routes extend from 1,200 ft up to, but not including, 18,000 MSL and are used primarily by those aircraft types normally operating within that altitude range. Most commercial and air carrier jet aircraft operate on the higher Jet and Area Navigation Routes established at 18,000 ft MSL and above. Of those different routes transiting across this region, one Jet Route (J46) crosses over the vicinity of the proposed airport.

The Atlanta Sectional Aeronautical Chart identifies a location about 5 miles northeast of the proposed airport where pilots are requested to avoid flight at or below 3,000 ft over a controlled portion of the Y-12 Complex. This no-fly zone has little effect on aircraft operations within this area.

Overall, the existing airspace environment for this proposed action is structured and managed by the FAA in a manner that effectively serves all VFR and IFR aviation interests. IFR aircraft are controlled by the Knoxville TRACON or Atlanta Center within their respective areas of responsibility to ensure those aircraft are safely integrated into the NAS during all phases of flight to/from the airports in this region. VFR aircraft operating throughout this region do so in accordance with those flight rules regulating their flight within the Class G and E airspace. To enhance their flight safety, VFR pilots can contact ATC as desired to request air traffic advisories that will help increase their awareness of other aircraft operations in this airspace environment.

3.1.2 Environmental Consequences

3.1.2.1 Proposed action

As discussed in Chap. 2, the Oak Ridge airport would be designed to accommodate a variety of general aviation aircraft supporting the needs of the different private, business, emergency services, and other interests in this area while also serving as a reliever airport for the Knoxville McGhee Tyson Airport. It is projected that VFR and IFR operations from both locally based aircraft and itinerant (visiting) aircraft would be approximately 49,713 annually.

To accommodate IFR air traffic at this airport, initial plans include non-precision instrument approach capabilities which would provide general lateral navigational guidance to the runway. Future plans include upgrading this capability to a precision approach that would provide precise vertical and lateral guidance to a runway using an Instrument Landing System or a GPS that have both localizer (lateral) and vertical guidance capabilities for appropriated equipped aircraft. As instrument approach capabilities and IFR operations may increase over time, consideration may be given in the future to designating lower altitude Class E airspace around this airport as currently exists for the Rockwood airport. While such action would require FAA review, it should have minimal effect on airspace uses around this airport area.

The initial development and potential growth of the proposed Oak Ridge airport would have no adverse effects on other airspace uses in this region. The proposed location is sufficiently distant from the McGhee Tyson and Rockwood airports so as not to affect those airport operations. Air traffic operating along the Federal Airways and Jet Routes through this area would be at higher altitudes where they would not be affected by the Oak Ridge airport operations. The Atlanta Center or Knoxville TRACON would provide required separation among all IFR aircraft, including those operating at this airport, while all VFR aircraft are responsible for remaining clear of all aircraft within the Class E/G airspace in which they operate. The addition of the proposed Oak Ridge airport and its anticipated level of operations would enhance aviation capabilities in this region while having little effect on the overall manner in which this airspace environment is structured and managed by the FAA for its various uses.

3.1.2.2 No action

The no action alternative would not have any effect on the current airspace environment surrounding the Oak Ridge area.

3.2 AIR QUALITY

Air quality is determined by the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions. The levels of pollutants are generally expressed on a concentration basis in units of parts per million or micrograms per cubic meter.

The baseline standards for pollutant concentrations are the National Ambient Air Quality Standards (NAAQS) and state air quality standards established under the Clean Air Act (CAA) of 1990. These standards represent the maximum allowable atmospheric concentration that may occur and still protect public health and welfare. The NAAQS provide both short- and long-term standards for the following criteria pollutants: carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter equal to or less than 10 and 2.5 micrometers, ozone, and lead.

All areas of the United States are designated as having air quality better than the NAAQS (attainment) or worse than the NAAQS (nonattainment). Areas where there are insufficient air quality data for the U.S. Environmental Protection Agency (EPA) to form a basis for attainment status are unclassifiable. Thus, such areas are treated as attainment areas until proven otherwise. “Maintenance areas” are those that were previously classified as nonattainment but where air pollution concentrations have been successfully reduced to levels below the standard. Maintenance areas are subject to special maintenance plans to ensure compliance with the NAAQS.

Hazardous air pollutants (HAPs) are chemicals that are known or suspected of causing cancer or other serious health effects. Unlike the criteria pollutants, HAPs currently do not have national ambient standards. Some volatile organic compounds (VOCs) are classified as HAPs. VOCs are also ozone precursors and include any organic compound involved in atmospheric photochemical reactions, except those designated by an EPA administrator as having negligible photochemical reactivity. HAPs are not covered by the NAAQS but may present a threat of adverse human health or environmental effects under certain conditions.

3.2.1 Existing Conditions

3.2.1.1 Air Quality

The proposed action would occur in Roane County, which is used as the ROI for the air quality analysis. According to EPA, a small portion of Roane County (located around the Tennessee Valley Authority [TVA] Kingston fossil plant) was named as part of the Knoxville nonattainment area for particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$) and in attainment for all other criteria pollutants (EPA 2015), so a conformity determination would be required.

Emissions that would be generated were compared with Roane County emissions obtained from EPA's 2011 National Emissions Inventory (NEI). The latest available NEI data for Roane County are presented in Table 3.1. The county data include emissions amounts from point sources, area sources, and mobile sources. *Point sources* are stationary sources that can be identified by name and location. *Area sources* are point sources from which emissions are too low to track individually, such as a home or small office building, or a diffuse stationary source, such as wildfires or agricultural tilling. *Mobile sources* are any kind of vehicle or equipment with gasoline or diesel engine, an airplane, or a ship. Two types of mobile sources are considered: on-road and non-road. On-road sources consist of vehicles such as cars, light trucks, heavy trucks, buses, engines, and motorcycles. Non-road sources are aircraft, locomotives, diesel and gasoline boats and ships, personal watercraft, lawn and garden equipment, agricultural and construction equipment, and recreational vehicles (EPA 2013).

Table 3.1. Baseline criteria pollutant emissions inventory (CY 2011) for Roane County, Tennessee

	Criteria pollutant (tons/year)					
	CO	**NO_X**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOCs**
Roane County	11,751	4,432	3,478	1,891	26,356	10,338

Source: EPA 2013.

CO = carbon monoxide; CY = calendar year; NO_x = nitrogen oxides; PM_{10} and $PM_{2.5}$ = particulate matter with a diameter of less than or equal to 10 microns and 2.5 microns, respectively; SO_2 = sulfur dioxide; VOC = volatile organic compound.

3.2.1.2 GHG Emissions/Baseline

Greenhouse gases (GHGs) are gases that trap heat in the atmosphere; the accumulation of these gases in the atmosphere has been attributed to the regulation of Earth's temperature. Human activity in the past century is "very likely" (90% chance) the cause of the observed increase in GHG concentrations (IPCC 2007). Thus, regulations to inventory and decrease emissions of GHGs have been promulgated. On October 30, 2009, the EPA published a rule for the mandatory reporting of GHGs from sources that, in general, emit 25,000 metric tons (MT) or more of carbon dioxide equivalent (CO_2e) per year in the United States. The EPA also recently promulgated the Prevention of Significant Deterioration and Title V GHG Tailoring Rule, which will impose GHG permitting requirements on existing major sources with major modifications and certain new major sources. At this time, a threshold of significance has not been established for the emissions of GHGs.

The six primary GHGs, defined in Sect. 19(i) of Executive Order (EO) 13514 and internationally recognized and regulated under the Kyoto Protocol, are carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Each GHG has an estimated global warming potential (GWP), which is a function of its atmospheric lifetime and its ability to absorb and radiate infrared energy emitted from the Earth's surface. The GWP allows GHGs to be compared with each other by converting the GHG quantity into the common unit "carbon dioxide equivalent." Baseline GHG emissions for Roane County, obtained from EPA's 2011 NEI, are summarized in Table 3.2.

Table 3.2. Baseline greenhouse gas emissions inventory (CY 2011) for Roane County, Tennessee

	Greenhouse gases (tons/year)			
	CO_2	**N_2O**	**CH_4**	**CO_2e**
Roane County	535,641	13	57	540,968

Source: EPA 2013.
CH_4 = methane; CO_2 = carbon dioxide; CO_2e = carbon dioxide equivalent; CY = calendar year; N_2O = nitrous oxide.

3.2.2 Environmental Consequences

The CAA Sect. 176(c), "General Conformity," requires federal agencies to demonstrate that their proposed activities would conform to the applicable State Implementation Plan (SIP) for attainment of the NAAQS. General conformity applies only to nonattainment and maintenance areas. If the emissions from a federal action proposed in a nonattainment area exceed annual *de minimis* thresholds identified in the rule, a formal conformity determination is required for that action. The thresholds are more restrictive as the severity of the nonattainment status of the region increases. The project region is designated as nonattainment for $PM_{2.5}$ and attainment for all other criteria pollutants (EPA 2015). The criteria pollutants were compared with Roane County annual emissions.

In order to evaluate air emissions and their impact on the overall ROI, the emissions associated with the project activities were compared with the total emissions on a pollutant-by-pollutant basis for the ROI's 2011 NEI data. Potential impacts to air quality are evaluated with respect to the extent, context, and intensity of the impact in relation to relevant regulations, guidelines, and scientific documentation. To provide a more conservative analysis, the county was selected as the ROI instead of the EPA-designated Air Quality Control Region, which is a much larger area.

The Air Conformity Applicability Model (ACAM) Version 5.0.1 was utilized to provide a level of consistency with respect to emissions factors and calculations. The ACAM provides estimated air emissions from proposed federal actions in areas designated as nonattainment and/or maintenance for each specific criteria and precursor pollutant as defined in the NAAQS. ACAM was utilized to calculate aircraft emissions. Also calculated were ground support equipment emissions associated with increased aircraft operations. The EPA's model TANKS 4.0.9d was used to estimate evaporative emissions from the tank farm. Equations and emission factors can be found in Appendix C.

The air quality analysis focused on emissions associated with construction and demolition of airport facilities, road construction, aircraft emissions, and evaporative emissions from fuel storage tanks.

GHGs were included in the analysis. The primary source of carbon dioxide emissions would be fuel combustion from aircraft emissions. The CEQ's *Revised Draft Guidance on the Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in NEPA Reviews* (CEQ 2014) recommends using a proposed action's GHG emissions as a proxy for assessing that action's potential climate change impacts. The guidance recommends that when considering when to disclose project quantitative GHG emissions, agencies use a reference point of 25,000 MT of CO_2e GHG emissions on an annual basis. The CEQ revised guidance also recommends that agencies consider the impacts of climate change on the proposed project. Air quality calculations are provided in Appendix C.

3.2.2.1 Proposed action

Emissions associated with the Proposed Action are calculated and summarized in Table 3.3. The percent of county emissions would amount to 3.78% or less for each of the criteria pollutants. PM_{10} emissions associated with grading operations (i.e., fugitive dust) would be the greatest contributor but would be temporary in nature, occurring only during the early phases of road construction, and would not contribute negatively to air quality in the long-term. GHG emissions would be less than 25,000 MT (27,558 tons) per year. Control measures for lowering fugitive dust emissions (i.e., covers and water or chemical dust suppressants) would minimize these emissions.

Table 3.3. Proposed action air emissions compared with Roane County emissions (tons per year)

	Emissions (tons/year)						
	CO	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**VOCs**	**CO_2e**
Roane County Baseline	**11,751**	**4,432**	**3,478**	**1,891**	**26,356**	**10,338**	**540,968**
Construction Emissions	8.53	11.83	126.46	0.59	0.02	8.69	1,732
Haul Road Construction	2.29	2.74	6.38	0.15	0.00	0.42	711
Aircraft Emissions	261.05	52.48	17.06	15.80	1.60	50.56	19,959
Tanks Emissions	0.00	0.00	0.00	0.00	0.00	5.17	36
Total	***271.87***	***67.04***	***149.90***	***16.54***	***1.63***	***59.68***	***22,402***
Percent of County Emissions	*2.31%*	*1.51%*	*4.31%*	*0.87%*	*0.01%*	*0.58%*	*4.14%*

Source: EPA 2013.

CO = carbon monoxide; CO_2e = carbon dioxide equivalent; NO_x = nitrogen oxides; PM_{10} and $PM_{2.5}$ = particulate matter with a diameter of less than or equal to 10 microns and 2.5 microns, respectively; SO_x = sulfur oxides; VOC = volatile organic compound.

During airport operation, emissions from ground support equipment (e.g., fuel truck), service/maintenance vehicles, and privately owned vehicles (employees and pilots) would be negligible. Based on air emissions modeling and analysis, the proposed action would not result in any substantial increase in air emissions. No applicable general conformity *de minimis* thresholds would be exceeded. Emissions from the airport would also not adversely impact any of the Oak Ridge sites associated with the proposed Manhattan Project National Historical Park.

Major sources of air emissions could be subject to a Title V operating permit. A Title V permit is required for any facility operations with the potential to emit more than 100 tons per year of any regulated air pollutant, 10 tons per year of any HAP, and/or 25 tons per year of any combination of HAPs. If required, the appropriate permits would be obtained. This regulatory process would prevent violations of air quality standards and mitigate the potential for adverse air quality impacts.

Implementation of any of the Haul Road and Blair Road options would result in the generation of additional air emissions. However, the percent of county emissions would amount to 0.5% or less for each criteria pollutant. PM_{10} emissions associated with grading operations would be the greatest contributor but would be temporary in nature, occurring only during the early phases of road construction, and would not contribute negatively to air quality in the long-term. GHG emissions are estimated to be approximately 22,400 tons/year, and thus potential impacts on climate change associated with the proposed action would be minimal.

3.2.2.2 No action

The no action alternative would not result in any additional impacts to air quality beyond the scope of normal conditions and influences within the ROI.

3.3 NOISE

Noise is considered to be unwanted sound that interferes with normal activities or otherwise diminishes the quality of the environment. Noise is any sound that impacts the resource being considered in this section—a sound environment that is quiet and/or desirable to the sound receptor (i.e., a person or animal hearing the sound). Responses to noise vary widely according to the characteristics of the sound source, the distance between the noise source and the receptor, and the time of day as well as the sensitivity and expectations of the receptor.

Sound intensity varies widely (from a soft whisper to a jet engine), and it is measured on a logarithmic scale to accommodate this wide range. The logarithm, and its use, is nothing more than a mathematical tool that simplifies dealing with very large and very small numbers. For example, the logarithm of the number 1,000,000 is 6, and the logarithm of the number 0.000001 is −6.

The frequency (or pitch) of sound is measured in cycles per second, or hertz (Hz). This measurement reflects the number of times per second the air vibrates from the acoustic energy. Low-frequency sounds are heard as rumbles or roars, and high-frequency sounds are heard as screeches. The human ear is most sensitive to sounds in the 1,000 to 4,000 Hz range. Sound levels that are “A-weighted” (denoted dBA) have been modified such that sound energy frequencies heard well by the human ear are mathematically emphasized whereas other sounds are de-emphasized. Examples of typical A-weighted sound levels of common sounds are shown in Fig. 3.1.

Several noise metrics have been defined to describe and quantify sound. The following metrics are used in this environmental analysis document.

Maximum sound level (L_{max}). The L_{max} is the highest sound level measured during a noise event. In many situations, noise levels vary over time for one reason or another. In the case of an aircraft overflight, the noise level varies as the aircraft moves closer to or farther away from the observer on the ground. L_{max} is a useful metric for judging a noise event’s interference with conversation and other common activities.

Equivalent continuous sound level (L_{eq}). The L_{eq} is the decibel average of the noise levels over a specified period of time. In this document, L_{eq} in a 24-h period (denoted $L_{eq\text{-}24}$) is used to describe baseline noise levels near the proposed airport.

Day-night average sound level (DNL). The DNL metric is the same as $L_{eq\text{-}24}$ except that, in calculation of DNL 10 dB are added to all noise events between 10:00 p.m. and 7:00 a.m. The 10 dB ‘penalty’ applied to late-night noise events accounts for the added intrusiveness of noise that occurs when most people are sleeping and ambient noise levels are typically low. It is fully recognized that the DNL metric does not provide specific information on the number of noise events or the specific individual sound levels that occur. For example, a DNL of 65 dB could result from a very few noisy events or a large number of quieter events. DNL does, however, provide a useful description of the total sound exposure at a location. Social surveys have found the DNL metric to be the best predictor of community annoyance resulting from transportation noise. Its use is endorsed by the scientific community and several governmental agencies (EPA 1974; Federal Interagency Committee on Urban Noise [FICUN] 1980; Federal Interagency Committee on Noise [FICON] 1992).

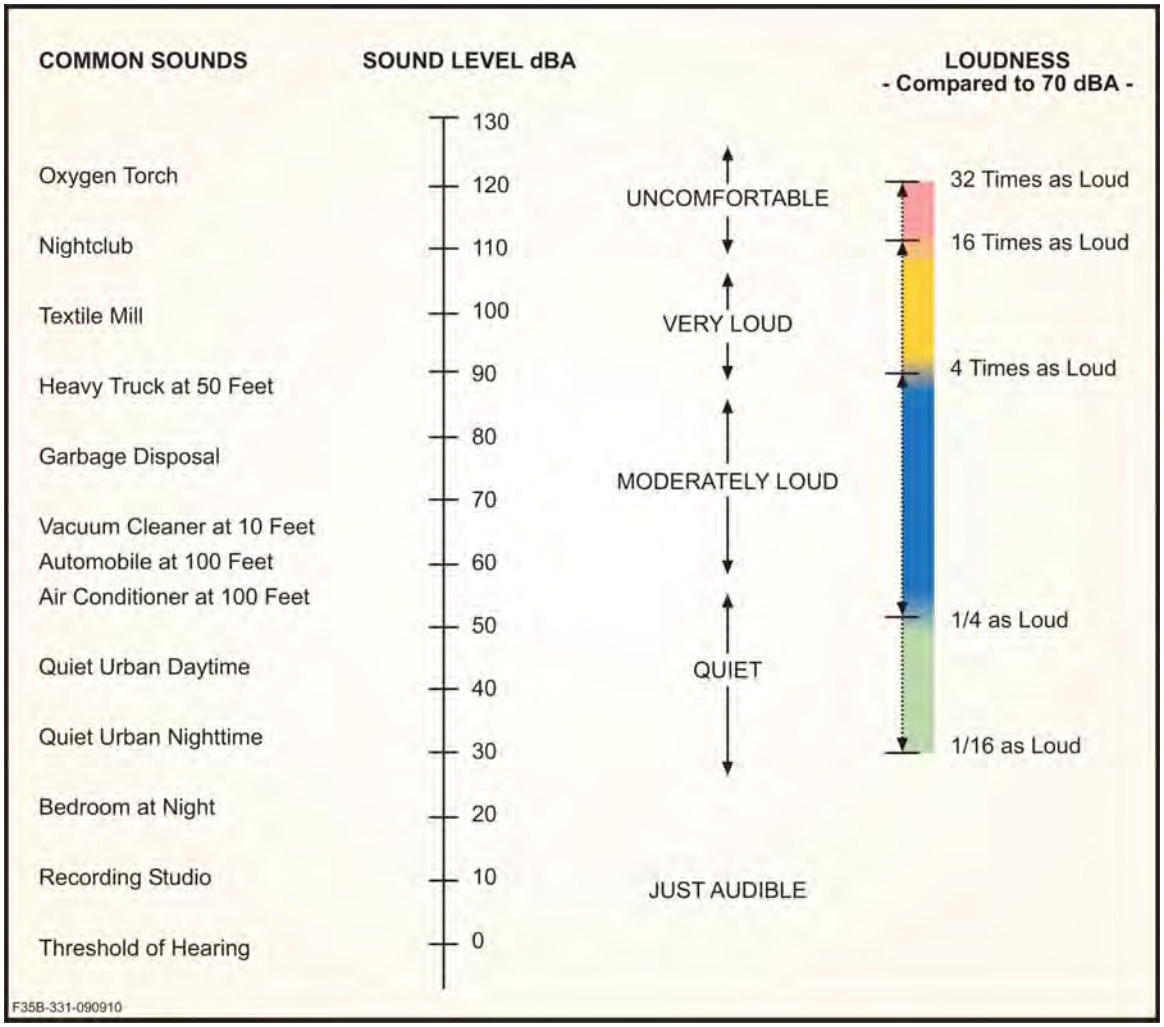

Fig. 3.1. Typical A-weighted levels of common sounds.

3.3.1 Existing Conditions

In March 2015, an ambient sound study was conducted near the proposed location for the airport to determine the baseline ambient sound environment (Appendix D). Noise levels were measured at three representative sites near the proposed airport (Table 3.4). Of the three sites, the Preserve at Clinch River (Rarity Ridge) community entrance site (Site 1) had the highest noise level at 53 dBA L_{eq24}. The primary contributor to the overall noise level at Site 1 was traffic on Route 58, which is located approximately 500 ft from the measurement location. The Wheat Church (Site 3), which is roughly 1,000 ft from Route 58, had the second highest level of sound at 48 dBA L_{eq24}. The Water Flow Station (Site 2) had the lowest measured noise level (43 dBA L_{eq24}) and is also the farthest site from Route 58. Noise levels at other locations in the vicinity of the proposed airport can be assumed to be similar to measured noise levels at Sites 1, 2, and 3.

Table 3.4. Measured current noise levels

Site number	Description	$L_{eq\text{-}24}$ (dBA)
1	Community Entrance	53
2	Water Flow Station	43
3	Wheat Church	48

Notes: Noise levels were measured over a 6-day period from March 12 through 17, 2015, including four full days and two partial days; measurements were performed using a Larson Davis 831 Type 1 Sound Level Meter.

dBA = A-weighted decibels.

L_{eq} = equivalent sound level.

As defined in FAA Order 5050.4B, a noise-sensitive area is any area where noise interferes with the area's typical activities or its uses. Noise-sensitive areas include residential, educational, health, and religious structures as well as sites with cultural, religious, or natural value. The nearest noise-sensitive areas to the proposed airport are the residences in the Preserve at Clinch River and the Wheat Church (and its surrounding area). The Wheat Church is used for a community reunion on one day of each year and is not occupied for the remainder of the year.

3.3.2 Environmental Consequences

The most common impact associated with exposure to elevated noise levels is public annoyance. As described in Sect. 3.3, annoyance due to aircraft noise can be predicted based on the noise metric DNL (Schultz 1978; Finegold et al. 1994). When subjected to DNL of 65 dBA, approximately 12% of persons so exposed will be "highly annoyed" by the noise. At levels below 55 dBA, the percentage of annoyance is correspondingly lower (less than 3%). The EPA has identified 55 dB DNL as a level below which any impacts to human health and welfare are unlikely to occur (EPA 1974). Based on numerous sociological surveys and recommendations of Federal interagency councils, the most common benchmark referred to is 65 dBA DNL. This threshold is often used to determine residential land use compatibility around airports, highways, or other transportation corridors. It is well below levels that are known to damage hearing or cause non-auditory health impacts (OSHA 1983).

Extremely high noise levels have the potential to cause damage to structures. While certain frequencies (such as 30 Hz for window breakage) may be of more concern than other frequencies, conservatively, only sounds lasting more than 1 second above a sound level of 130 dB are potentially damaging to structural components (CHABA 1977). A study directed specifically at low-altitude, high-speed aircraft showed that there is little probability of structural damage from such operations (Sutherland 1989). One finding in that study is that sound levels at damaging frequencies (e.g., 30 Hz for window breakage or 15 to 25 Hz for whole-house response) are rarely above 130 dB.

As prescribed in FAA Order 1050.1E, impacts would be considered to be significant if noise levels were to increase by 1.5 dB or more at a noise-sensitive location such that the final noise level is 65 dBA DNL or greater. Noise analyses conducted at locations where a quiet setting is a defining attribute (e.g., the Wheat Church) using metrics other than DNL are included in this EA to provide a more complete understanding of specific impacts.

3.3.2.1 Proposed action

Aircraft Noise

Calculated noise levels under the proposed action were compared to measured noise levels under baseline conditions to assess impacts. In accordance with FAA Order 5050.4B, *NEPA Implementing Instructions for Airport Projects*, the program Integrated Noise Model was used to calculate noise levels under the proposed action. This program accounts the noise levels emitted by different aircraft types at and near the proposed airport as well as the effect of local terrain on propagation of noise. Operational parameters used in noise modeling are described briefly below, and in more detail in Appendix D.

The analysis applied standard pre-defined flight profiles (i.e., altitude, engine power setting, and airspeed at points along the flight track) in calculating noise levels. Aircraft types used in noise modeling are representative of the expected operational fleet mix and include fixed-wing turbine (represented by Cessna Citation II), single-engine fixed-wing piston (represented by Cessna 172R), multi-engine fixed-wing piston (represented by Beechcraft Baron 58P), and helicopter (represented by Bell 206L Long Ranger).

As described in Table 2.4, approximately 50,000 annual airfield operations would be expected for the proposed airport. Roughly 75% of total aircraft operations would be conducted by single-engine fixed-wing piston aircraft and 17% would be conducted by multi-engine fixed-wing piston aircraft. The remaining 8% of operations would be expected to be conducted by turbine-powered fixed wing aircraft (5%) and by helicopters (3%). About 5% of total operations would be conducted in the late-night period between 10:00 p.m. and 7:00 a.m. Since instrument approach procedures would only be available from the west (Runway 06), approximately 60% of the total operations were assumed to be conducted on a west-to-east flow.

Noise contours reflecting expected operations are shown on Fig. 3.2. Adverse noise impacts are not expected to occur because the 65 dB DNL contour line does not extend more than about 250 ft from the extended runway centerline and would only affect the area that is dedicated to airfield-related uses. Although noise contours below 65 dB DNL are not typically shown in NEPA documents, the contours down to 40 dB DNL are also included on Fig. 3.2 for informational purposes. The areas affected by noise levels greater than 55 dB DNL are used for industrial purposes or transportation corridors and are not considered to be noise sensitive. Figure 3.2 also shows the locations of the nearest residential communities closest to the proposed airport. These include Westwood, Country Club Estates, former Rarity Oaks, and the Preserve at Clinch River.

Table 3.5 lists measured current noise levels and calculated proposed action aircraft noise levels for three representative sites that are shown on Fig. 3.2. The DNL and L_{eq} noise metrics are identical except that the DNL metric includes a 10 dB ‘penalty’ for noise events after 10:00 p.m. and before 7:00 a.m. At Site 1, aircraft noise would be below existing noise levels and would not be expected to be considered to be a defining element of the local sound environment. Aircraft noise at Site 2, which is located beneath the most commonly used approach to the runway, would be similar to the noise level under existing conditions and would be expected to be a more noticeable part of the sound environment than aircraft noise at Site 1. Site 3, the Wheat Church, is located about 600 ft west of the flight path most frequently used for aircraft departures. Aircraft noise level at Site 3 under the proposed action would be 7 dB higher than the existing noise level, and would be a defining element of the local sound environment. Noise levels at the church would increase to 55 dB DNL, the EPA threshold below which no impacts to human health and welfare are likely to occur, and would be well below this threshold at other locations.

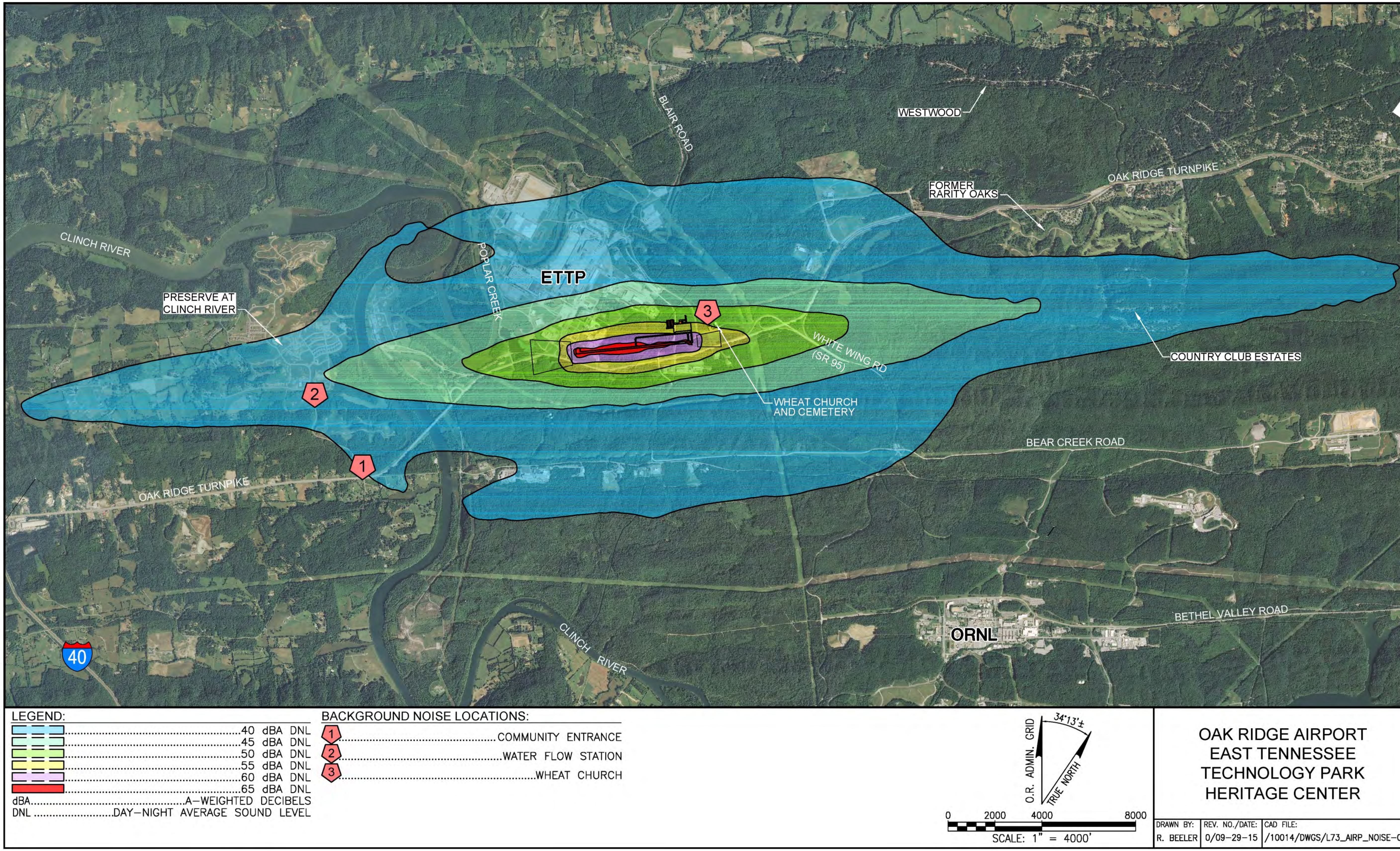

Fig. 3.2. Noise levels map.

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Table 3.5. Measured current noise levels and calculated noise levels under the proposed action

Site number	Description	Baseline L_{eq-24} (dBA)	Proposed action aircraft noise DNL (dBA)
1	Rarity Ridge Entrance	53	40
2	Rarity Ridge Water Flow Station	43	44
3	Wheat Church	48	56

dBA = A-weighted decibels.
DNL = day-night average sound level.
L_{eq} = equivalent sound level.

Because the noise level at the Wheat Church would increase substantially relative to baseline conditions, supplemental noise analysis was conducted at the site. On an average day during an average daytime hour, approximately four aircraft would pass by the Wheat Church. In this context, an "average day" is defined as a day in which 1/365th of total annual aircraft operations occur, an "average hour" is defined as an hour with 1/15th of the total operations occurring during 7:00 a.m. to 10:00 p.m., and "pass by" is defined as any aircraft that comes within 1,000 ft of the Wheat Church during initial approach, second approach, or departure. The maximum noise level (L_{max}) expected during pass-by would be 84 dBA. This noise level is loud enough to interrupt a normal conversation, but not loud enough to cause hearing damage or even discomfort. Noise levels would be well below intensities required to generate any risk of structural damage. Assuming conservative outdoor-to-indoor transmission losses (15 dB), interior noise levels could reach a maximum level of 69 dBA, the level of a loud conversation. The Wheat Church is used for a community reunion on one day of each year and is not occupied for the remainder of the year.

A supplement to the noise analysis was also prepared, which provides details about the projected maximum noise level (L_{max}) based on the defined operational descriptions (Appendix D). Figure 3.3 provides a summary of the maximum noise predicted around the proposed airport at nine receiver sites. At each of the nine sites, the maximum noise level is presented for each of the representative aircraft used in the noise modeling. In general, departures generate higher levels of noise than do approaches, and aircraft that fly directly over a receiver will produce a higher level of noise than aircraft that fly at some lateral distance from receivers. For example, aircraft that depart on Runway 06 fly close to locations northeast of the proposed airport (e.g., NE 45 DNL site) and generate the highest L_{max}. Alternatively, aircraft that depart on Runway 24 fly away from these locations and generate lower L_{max} at the same location.

In addition to the L_{max} analysis, the supplement in Appendix D also provides Noise-Power-Distance (NPD) data. The NPD data are organized in tables that provide the noise level for a given power output from the fixed-wing aircraft in the noise study and the total distance to the receiver. These tables are useful in estimating the maximum noise for an aircraft at various distances (vertical or horizontal) and any location. FAA regulations (14 *CFR* Part 91 – General Operating and Flight Rules) state that the minimum safe altitude over any congested area of a city, town, or settlement, or over any open air assembly of persons, is 1,000 ft above the highest obstacle within a horizontal distance of 2,000 ft of the aircraft. From the NPD data in Appendix D, the L_{max} for the Cessna Citation II at a maximum power setting would be 89 dBA at 400 ft and 79 dBA at 1,000 ft. At those same distances, the L_{max} for the Cessna 172R would be 78 dBA and 68 dBA. The L_{max} for the Beech Baron 58P would be 89 dBA and 81 dBA at 400 ft and 1,000 ft, respectively.

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Fig. 3.3. Lmax analysis locations.

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Construction Noise

Construction of the airport would require demolition of existing buildings, re-routing of existing roads, extensive site preparation, and finally construction of the airport facilities. Maximum noise levels generated by construction equipment types commonly used on this type of project are listed in Table 3.6 at a reference distance of 1,000 ft. At this distance, the highest noise level generated by the equipment types listed would be 64 dBA. Under a highly conservative scenario in which all of the listed equipment types are operating during a single day at a single location, the L_{eq} during workday hours at a distance of 1,000 ft would be 64 dBA. The area surrounding the proposed airport is used for industrial purposes or transportation corridor (SR 58) and is not considered to be noise sensitive.

Table 3.6. Noise levels of common construction equipment

Equipment type	L_{max} at 1,000 ft
Crane	55
Dozer	56
Dump Truck (low speeds)	50
Excavator	55
Fork Lift	49
Front End Loader	53
Concrete Saw	64
Street Sweeper	56
Water Truck	49
	L_{eq} during workday hours at 1,000 ft
Total	**64**

Source: FHWA Roadway Construction Noise Model (FHWA 2006).

Noise impacts under the Haul Road and Blair Road options would be similar to each other and uniformly minor. Under all options the proposed road work would take place in an industrial area that is relatively insensitive to noise. Construction noise would be temporary, lasting only for the duration of the project.

Combined Impacts

Aircraft operations would not begin until after major construction activities are complete and, therefore, the noise impacts of the two activities would not be additive at any time. Construction noise would generate localized temporary increases in noise levels at and near the construction. The noise would be generated in an industrial area and should not exceed any thresholds that could result in adverse impacts. Aircraft noise levels would remain below 65 dB DNL at all noise sensitive locations. At the Wheat Church, noise levels would increase by a noticeable amount (7 dB). However, the church is only used on one day of each year and can be considered to be relatively noise insensitive on the remaining 364 days of each year. Furthermore, the noise level at the church would only increase to 55 dB DNL, the EPA threshold below which no impacts to human health and welfare are likely to occur.

3.3.2.2 No action

Under the no action alternative, the airport would not be constructed and noise levels would remain the same as they are under existing conditions. No noise impacts would occur under the no action alternative beyond those associated with ongoing development and remedial actions taking place at the ETTP Heritage Center.

3.4 SAFETY

Flight safety is an important concern for all aviation activities and serves as the primary basis for all regulations, procedures, and practices that govern how, when, and where aircraft operations are conducted. The risks most prevalent to flight safety, as discussed in this section, include the potential for aircraft accidents from various causes (i.e., equipment malfunctions, weather conditions, or pilot error). Another aspect of flight safety discussed deals with the related accident risk posed by collisions between wildlife and aircraft. The FAA is the agency responsible for all aspects of aviation regulation and enforcement including regulating civil aviation to promote safety.

The ROI includes the local flight environment around the proposed airport where accidents could occur.

3.4.1 Existing Conditions

Aircraft Accidents

It is impossible to predict when and if an aircraft accident may occur. Various factors usually play a role in accidents. For general aviation, the most common cause is loss of aircraft control in flight. This is usually associated with bad weather conditions, lack of pilot experience, lack of situational awareness, or a combination of these factors. Other top causes of general aviation accidents include engine failure, low-altitude operations (e.g., crop dusting/firefighting), and running out of fuel.

As Table 3.7 shows, during the period from 1992 to 2011, there were over 35,200 accidents nationwide involving general aviation aircraft, resulting in over 12,000 fatalities (General Aviation Manufacturers Association [GAMA] 2012). This equates to an approximate accident rate of 7.2 accidents and 1.4 fatal accidents per 100,000 hours of flying time.

Table 3.7. Summary of general aviation accidents in the United States (1992 to 2011)[a]

Total accidents	Fatal accidents	Fatalities	Hours flown	Accident rate[b]	Fatal accident rate[b]
35,246	6,762	12,154	488,472,000	7.22	1.38

[a] Source: GAMA 2012.
[b] Per 100,000 flying hours.

In Tennessee, there were 47 general aviation accidents over the last 10 years (2005 to 2014), resulting in a total of 73 fatalities. The majority of these accidents (approximately 66%) were associated with recreational or personal flying. Other accident categories were business flying (approximately 8.5%), crop dusting (6.5%), flight instruction (6.5%), flight tests (4%), and other or unknown (8.5%) [National Transportation Safety Board (NTSB) 2015].

Major considerations in any accident are loss of life and damage to property. The probability of an aircraft crashing into a populated area is extremely low, but it cannot be totally discounted. Several factors are relevant in the case of Oak Ridge, Tennessee. The region around the city is made up, for the most part, of rural or natural areas and the limited amount of time that an aircraft is over any specific geographic area limits the probability that a disabled aircraft would crash into a populated area.

Wildlife-Aircraft Strike Hazards

Wildlife-aircraft strikes constitute a safety concern because of the potential for damage to aircraft or injury to aircrews or local populations if an aircraft crash should occur. The primary danger is posed by birds (primarily doves, pigeons, gulls, raptors, shorebirds, and waterfowl) and other animals (primarily deer, coyotes, skunks, and foxes) and constitutes only about 3% of total collisions (FAA et al. 2014). Although aircraft may encounter birds at altitudes of 30,000 ft above sea level or higher, most birds fly close to the ground. Approximately, 97% of reported bird strikes on general aviation aircraft occur while the aircraft is in the airport environment; i.e., during approach, climb, takeoff, land, and taxi.

Nationally, between 1990 and 2013, there were approximately 13,440 reported collisions of wildlife and general aviation aircraft (Table 3.8). During that same period, approximately 78,000 collisions were reported between wildlife and commercial aircraft. General aviation aircraft are typically smaller than commercial aircraft, presenting a smaller surface area to strike. Additionally, general aviation reporting rates tend to be lower than for commercial aviation (FAA et al. 2014).

Table 3.8. Wildlife strikes on general aviation aircraft (1990 to 2013)

Total reported strikes	Strikes with damage	Aircraft movements (× 1 million)[a]	Strikes/100,000 movements All strikes	Strikes/100,000 movements Strikes w/ damage
13,441	3,779	1906.77	0.70	0.20

[a] A movement is defined as an aircraft departure or arrival.
FAA et al. 2014 - Table 3. Wildlife Strikes to Civil Aircraft in the United States, 1990–2013.

During that same period, there were a total of 373 reported human injuries due to bird collisions with general aviation aircraft, resulting in 25 fatalities. Table 3.9 summarizes the types of birds associated with these collisions. Additionally, there were six injures and one fatality reported as a result of collisions between aircraft and terrestrial species (FAA et al. 2014).

Table 3.9. Human fatalities due to bird strikes (1990 to 2013)

Species of wildlife	No. of strikes	No. of humans fatalities
Unknown Bird	6	8
Red-tailed Hawk	1	8
American White Pelican	1	5
Canada Goose	1	2
Brown Pelican	1	1
Turkey Vulture	1	1
Total	**11**	**25**

Source: FAA and USDA 2014 - Table 3. Wildlife Strikes to Civil Aircraft in the United States, 1990–2013.

Established FAA procedures require that, in accordance with 14 *CFR* 139.337, each airport certificate holder shall take immediate action to alleviate wildlife hazards whenever they are detected. Public-use airport operators must be aware of any hazardous wildlife attractants on or near their airport, even if a wildlife strike has never been reported from the airport. Airport personnel must also have an understanding of wildlife hazard control issues.

New airports with documented wildlife of a size, or in numbers, capable of causing serious aircraft damage or the potential for multiple aircraft strikes, must also develop a Wildlife Hazard Assessment. The assessment must be conducted by a wildlife damage management biologist, and include the identification of the wildlife species observed and their numbers, locations, local movements, and daily and seasonal occurrences; description of the wildlife hazards to air carrier operations; and recommended actions for reducing identified wildlife. Once completed, the Wildlife Hazard Assessment is submitted to the FAA for evaluation and determination whether a Wildlife Hazard Management Plan (WHMP) needs to be developed for the airport.

3.4.2 Environmental Consequences

This section evaluates the potential for the proposed action to increase safety risks as well as the airport's operator capability to manage these risks. Potential impacts related to safety would be considered significant if proposed activities would create unusual risks involving endangerment to life or health or pose an unusual risk to the general public.

3.4.2.1 Proposed action

Construction workers would be subject to typical hazards and occupational exposures faced at other industrial construction sites. Falls, spills, vehicle accidents, confined-space incidents, and injuries from tool and machinery operation could occur. Similar accidents could occur at the proposed Oak Ridge airport during operations. Accidents could result from operator error, equipment malfunction, or from natural phenomena (e.g., earthquakes, tornadoes, flooding, fire, etc.). Potential hazards from the operation of the airport could include electrical energy, flammable materials, and toxic/corrosive/reactive materials. Other hazards include kinetic energy and stored energy. Examples of kinetic energy hazards include moving ventilation system components, forklifts, and other drum- or box-handling equipment. Stored energy hazards include elevated structures and equipment, stacked drums, and boxes. Workers would be expected to receive applicable training, be protected through appropriate controls and oversight, and be afforded the same level of safety and health protection found at similar developments. The MKAA and any companies that they might contract with for airport construction and operations would be required to follow applicable Occupational Safety and Health Act requirements. No unique occupational health and safety hazards are expected, and it would be the responsibility of each company to operate in a safe and protective manner.

The potential for facility fires and any resulting adverse impacts would likely be mitigated by the following: (1) most new building construction would consist of steel frames, concrete floors, noncombustible exterior walls, and metal roofs; (2) building design and materials would comply with all applicable National Fire Protection Association codes and standards; (3) buildings would be equipped with fire detection systems and fire-suppression equipment as applicable (e.g., fire alarms, portable fire extinguishers, and sprinkler systems); and (4) appropriate fire safety and emergency policies and procedures, including proper training, would be implemented.

Aircraft Accidents

As stated in Sect. 3.4.1, the historic accident rate for general aviation aircraft is 7.2 accidents per 100,000 flying hours or one accident every 13,888 hours. For accidents involving fatalities, the rate is 1.4 fatal accidents per 100,000 flying hours or one accident every 71,429 hours. Under the proposed action, projected annual operations (for all aircraft types) would be 49,713. An operation comprises a discrete event, either a take-off or a landing; therefore, two operations may be considered to count as a complete flight.

The average duration of a general aviation flight is approximately 1.4 hours (GAMA 2012). Consequently, it is calculated that approximately 34,800 hours of flying time would be recorded annually ([49,713 operations ÷ 2 operations per flight] × 1.4 hours per flight). At the accident rate presented above, this would equate to a non-fatal aircraft accident occurring once every 5 months, with a fatal accident occurring once every 2 years. These statistical calculations are based on projected airport usage rates and national accident averages and are not intended to represent a predicted outcome.

This analysis makes only a statistical prediction regarding the frequency of accidents and is not meant to be representative of real-world conditions. Many factors can play a role in creating the conditions necessary for an accident to occur, including pilot experience, local terrain, and prevailing weather conditions. The proposed airport would be equipped with equipment designed to enhance pilot awareness and improve safety, including automated weather observing system, runway and taxiway lighting, and precision approach path indicators. Additionally, the region around the proposed airport is made up, for the most part, of rural or natural areas and the limited amount of time that an aircraft is over any specific geographic area limits the probability that a disabled aircraft would crash into a populated area.

If an accident does occur within the airport area, the MKAA would ensure that resources would be available to respond. These would include having trained fire response personnel as well as required firefighting equipment. If an aircraft accident occurs on non-airport property, the agency initially responding would be the local fire department. The MKAA would also enter into mutual-aid agreements with local fire departments, such as the Oak Ridge, Kingston, and Harriman Fire Departments. These agreements would provide for mutual training of personnel in aircraft firefighting techniques and establishment of procedures and responsibilities in case of an aircraft accident. The City of Oak Ridge Fire Department has a fire station (Station 4), which is located at the Heritage Center less than a half-mile from the proposed airport runway.

Wildlife-Aircraft Strike Hazards

As shown in Sect. 3.4.1, the historic wildlife strike rate for general aviation aircraft is 0.7 strikes per 100,000 aircraft movements (a movement is defined as an aircraft arrival or departure). For accidents involving major damage to the aircraft, the rate is 0.2 strikes per 100,000 aircraft movements. Under the proposed action, there would be 49,713 operations per year. An operation is the same as an aircraft "movement," in that that they both comprise a discrete event like a take-off or a landing.

Consequently, it is calculated that a wildlife strike would occur approximately once every 2.9 years, with a damaging strike occurring once every 10.1 years. As with estimates for potential aircraft accidents, this analysis makes only a statistical prediction and is not meant to be representative of real-world conditions.

If the FAA determines that a WHMP is necessary, the airport operator would develop the plan based on the initial hazard assessment. If a WHMP is not ultimately required, the airport manager would still be required to develop and implement a plan to address the wildlife hazards identified in the assessment. In addition to increasing human safety, the WHMP or other comparable management plan would reduce the potential for impacts to wildlife populations. Although development and implementation of a wildlife management plan would not guarantee the absence of wildlife-aircraft strikes, it is expected that such a plan would reduce the number of potential impacts.

3.4.2.2 No action

Under the no action alternative, there would be no occupational health and safety hazards beyond those associated with ongoing DOE and contractor activities. There would be no aircraft accidents or potential for collisions of aircraft with wildlife.

3.5 LAND USE

Land use generally refers to the management and use of land by people. The attributes of land use include general land use patterns, land ownership, land management plans, and special use areas. General land use patterns characterize the types of uses within a particular area. Specific uses of land typically include residential, commercial, industrial, agricultural, military, and recreational. Land use also includes areas set aside for preservation or protection of natural resources, wildlife habitat, vegetation, or unique features. Management plans, policies, ordinances, and regulations determine the types of uses that protect specially designated or environmentally sensitive uses. Noise from aircraft operations is one of the major factors in determining appropriate land uses, since elevated noise levels are especially incompatible with sensitive noise receptors (e.g., residences, public buildings, schools, churches, hospitals, and certain recreational uses).

3.5.1 Existing Conditions

The approximately 170 acres of property that would be transferred by DOE includes Parcel ED-16, Parcel ED-13, a portion of Parcel ED-3, and Victorius Boulevard. Additional property needed for the airport was previously transferred by DOE to CROET and includes Bldg. K-1330, Bldg. K-1580, portions of Parcel ED-4, and Parcel ED-8 (Fig. 2.1). As part of the cleanup of ETTP, DOE's Environmental Management (EM) Program has divided the ETTP into two areas: Zone 1 – 1,400 acres and Zone 2 – 800 acres. Historically, Zone 1 was used for light industrial purposes and has some open areas and some areas of waste disposal. Zone 2 is the main plant area and has historically had a heavy industrial use. Parcels ED-16, ED-13, ED-3, ED-4, and Bldg. K-1330 are located outside of both the Zone 1 and Zone 2 boundaries. Building K-1580 and Victorius Boulevard are both located within the Zone 2 boundary and Parcel ED-8 is located in both Zone 1 and Zone 2 (Fig. 2.1).

Major changes to the land use within the Heritage Center have not occurred since the completion of the *Final Environmental Assessment for the Transfer of Land and Facilities within the East Tennessee Technology Park and Surrounding Area*, DOE/EA-1640 (DOE 2011). However, Parcel ED-16 was added to the property available for transfer. About 16 acres of ED-16 were evaluated in the 2011 EA (Fig. 1.2). The ETTP mission has been to remediate the site, as well as reindustrialize and reuse site assets through leasing and title transfer of underutilized facilities and land parcels. EM Program projects at ETTP have included both remedial action and D&D activities. Remedial action projects typically address contaminant releases to the environment by addressing contaminated soil, water, sediment, or biota. Remedial action projects are based on land use goals and the associated exposure risks as analyzed in a Record of Decision (ROD) document. In many instances, remediation efforts result in long-term controls on the use of land. D&D projects address contamination in facilities and structures and can also include demolition. Additional information on the ongoing environmental restoration and waste management activities at ETTP can be found in the 2013 ORR Annual Site Environmental Report, DOE/ORO-2473 (DOE 2014) and the fiscal year (FY) 2014 Cleanup Progress Report, DOE/ORO-2496 (DOE 2015).

Areas outside of Zone 1 include a large portion of McKinney Ridge east of Blair Road, Pine Ridge between SR 58 and Bear Creek Road, and the portion of Parcel ED-3 on the south side of SR 58. Except for a few roads, utility easements, and water tanks, much of the McKinney Ridge and Pine Ridge area is relatively undeveloped and is primarily used for a facility buffer, wildlife management, forestry, and environmental monitoring and research. The majority of Parcel ED-3 has been previously disturbed and is currently being used for roads and utility easements, facility buffer, and wildlife management. The Haul Road, currently used for truck transport of waste materials from ETTP, transects the eastern portion of the area from north to south.

The closest sensitive noise receptor to the proposed runway location is the Wheat Church and cemetery, which is located on DOE property just east of the proposed runway. The gravel road that runs from Blair Road to the church and cemetery is also open to pedestrians and bicyclists as a public greenway (Wheat Trail). The Wheat Trail continues past the church and connects with the North Boundary Trail.

Land use off of the ORR to the west is a mix of residential, limited commercial, agriculture, and open space. Existing residential closest to the proposed runway location includes The Preserve at Clinch River (former Rarity Ridge) and residences located along and adjacent to SR 58 west of the bridge across the Clinch River. The nearest residential neighborhoods to the east of the proposed airport include Westwood, Country Club Estates, and the former Rarity Oaks development (Fig. 3.2).

3.5.2 Environmental Consequences

The methodology to assess impacts on individual land uses requires identifying those uses and determining the degree to which they would be affected by the proposed action and the no action alternative. Potential land use impacts are also based on the level of land use sensitivity in affected areas and whether they would:

- Be inconsistent or in noncompliance with applicable land use plans or policies.
- Preclude the viability of existing land use.
- Preclude continued use or occupation of an area.
- Be incompatible with adjacent or land uses in the vicinity to the extent that public health or safety is threatened.
- Conflict with airfield planning criteria established to ensure the safety and protection of human life and property.

Analysis of land use impacts also considered the effects of aircraft operations and if the change in noise exposure would have an adverse impact on land use compatibility. Nearly all studies analyzing aircraft noise recommend that no sensitive noise receptors be located in land areas associated with noise exposures of 75 decibels (dB) day-night average sound level (DNL) or greater. Usually, no restrictions are recommended below 65 dB DNL. Between 65 and 75 dB DNL, there is currently no consensus on restrictions, but residential use is generally discouraged. Almost all land uses except manufacturing, agriculture, and mining are incompatible with noise exposures greater than 80 dB DNL (FICUN 1980). This is very similar to the compatible land use guidelines contained in the FAA Environmental Desk Reference for Airport Actions [Chapter 5 – Compatible Land Use (Table 1)] (FAA 2007).

3.5.2.1 Proposed action

Under the proposed action the affected property would be developed for a new general aviation airport. The change would be most evident in the areas that have had limited development or presently are primarily undeveloped. In these areas, the visual character of the property would change from a natural to a more man-made-looking environment.

Approximately 132 acres of property needed for the development of the airport would be cleared and graded for the construction of the runway directly impacting the existing land use of the area. However, RPZ requirements would require that additional property at each end of the runway be controlled to protect encroachment by incompatible land uses that may be unsafe (see Sect. 2.1.2). Ownership of the property within the RPZs would be preferable but negotiated land use agreements with property owners could also be utilized. Presently, a portion of this property is owned by CROET (i.e., Parcel ED-8) while DOE retains ownership of the rest. Cleanup activities within the transfer footprint have been completed and, thus, construction of the airport would not affect remaining cleanup activities within Zone 1 or Zone 2. Depending on which of the Haul Road and Blair Road options are selected, there would be a minor impact on the existing land use since new sections of road would need to be constructed within areas where the land use is presently undeveloped open space.

Construction of the proposed airport would displace existing commercial tenants within Bldgs. K-1330 and K-1580 and the transfer of DOE property to the MKAA would preclude any other type of commercial development within the affected area. However, there is sufficient nearby commercial office space to accommodate the displaced tenants and additional property at the Heritage Center and nearby Horizon Center to support continued commercial development at the west end of Oak Ridge. The deed that DOE would issue to the MKAA for the property transfer would contain a reversion clause that stipulates the return of the property from the MKAA to DOE in the event that the airport was not constructed.

The MKAA has made a commitment that access to the Wheat church and cemetery and Wheat Trail Greenway would be maintained. This would be accomplished by either constructing a new access road off of Highway 58 or by maintaining the current access point off of Blair Road.

Based on the results of the noise analysis (Sect. 3.3.2), noise levels generated by flight operations at the airport are not expected to reach 65 dBA DNL beyond the confines of the runway, and the operational tempo would need to increase by a factor of 45 before the closest sensitive noise receptor (Wheat Church and cemetery) would receive noise at this level. Consequently, operation of the Oak Ridge airport would not cause any substantial noise increase on the surrounding area, and there would be no adverse land use compatibility impacts.

3.5.2.2 No action

Under the no action alternative, the existing land use would continue, and the area would remain as DOE, CROET, and private property until any future disposition or other development could be decided or occurs. Ongoing and planned remedial actions and reindustrialization activities at the ETTP would continue.

3.6 SOCIOECONOMICS

3.6.1 Existing Conditions

The ROI for this analysis includes Anderson and Roane counties. The region includes the cities of Clinton, Oak Ridge, Lenoir City, Harriman, and Kingston.

3.6.1.1 Demographic and economic characteristics

Table 3.10 summarizes population, per capita income, and wage and salary employment from 2009 to 2013, the latest year for which county data are available. Population has decreased slightly over the 5-year period, mostly in Roane County. Employment for the region increased slightly from 72,920 in 2009 to 74,193 in 2013. Per capita income grew from $33,540 to $38,160 over the same period, generating a total regional income of $4.9 billion in 2013 (Bureau of Economic Analysis 2014). Based on the 2013 population estimates from the Bureau of the Census, minorities represent 9.9% of the population in Anderson County and 6.8% in Roane County (Census 2014a). This represents a limited change from the corresponding figures from the 2010 Census. For comparison, minorities represented an estimated 25.1% of the Tennessee population and 38.0% of the national population in 2013 (Census 2014a.) No federally recognized Native American groups live within 50 miles of the study area.

Table 3.10. Demographic and economic characteristics: Oak Ridge region of influence

County	2009	2010	2011	2012	2013	Annual growth 2009–2013 (%)
Anderson						
Population	75,031	75,147	75,195	75,401	75,542	0.17
Per Capita Income	34,261	35,464	37,394	38,576	39,148	3.39
Total Employment	50,948	52,609	53,921	52,415	52,923	0.96
Roane						
Population	54,367	54,129	53,804	53,479	53,047	-0.61
Per Capita Income	32,541	34,113	35,297	36,292	36,768	3.10
Total Employment	21,972	22,141	22,061	21,542	21,270	-0.81
Region totals						
Population	129,398	129,276	128,999	128,880	128,589	-0.16
Per Capita Income	33,540	34,894	36,520	37,632	38,160	3.28
Total Employment	72,920	74,750	75,982	73,957	74,193	0.43

Source: Bureau of Economic Analysis 2014.

The Census American Community Survey (ACS) provides 5-year demographic estimates for population characteristics in cities and towns. The most recent estimates are for the period from 2009 to 2013. Table 3.11 shows ACS estimates of the population in the city of Oak Ridge by race or ethnic characteristics during that period (Census 2014b). Minorities represent an estimated 19.7% of the Oak Ridge population during that time. Minorities include individuals classified by the U.S. Bureau of the Census as Black or African-American, American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, and Hispanic or Latino, and those classified under “Two or more races.” Hispanics may be of any race and are excluded from the totals for individual races to avoid double counting.

Inhabited tracts closest to the proposed site include 301, 302.01, and 309. Census tract 9801 has no residents. According to ACS estimates, minority populations in the first three tracts were 7.9%, 4.9%, and 5.9%, respectively, for the period 2009 through 2013 (Census 2104b).

Table 3.11. Race or ethnic distribution for the Oak Ridge City population: 2009–2013

Race/ethnic group	Number	Percent
Not Hispanic or Latino		
White	23,510	80.1%
Black or African American	2,689	9.2%
American Indian or Alaska Native	75	0.3%
Asian	802	2.7%
Native Hawaiian and Other Pacific Islander	0	0.0%
Some Other Race	37	0.1%
Two or More Races	790	2.7%
Hispanic or Latino[a]	1,437	4.9%
Total	29,340	100.0%

[a] May be of any race. Those classified as Hispanic or Latino are excluded from other categories to avoid double counting.

Source: Census 2014b.

According to the ACS, 17.6% of the Tennessee population and 15.4% of the U.S. population had incomes below the poverty level between 2009 and 2013 (Census 2014b). In this analysis, a low-income population consists of any geographic area in which the proportion of individuals below the poverty level exceeds the national average. Within Oak Ridge, 17.7% of the population had incomes below the poverty level during that period. The corresponding estimates for tracts 301, 302.01, and 309 were 3.9%, 9.7%, and 17.2%, respectively (Census 2014b).

3.6.1.2 Fiscal characteristics

Oak Ridge City general fund revenues and expenditures for FY 2013 and anticipated revenues and expenditures for FY 2015 are presented in Table 3.12. The general fund supports the ongoing operations of local governments as well as community services, such as police protection and parks and recreation. The largest revenue sources have traditionally been local taxes (which include taxes on property, real estate, hotel/motel receipts, and sales) and intergovernmental transfers from the federal or state government. Roughly 96% of the 2013 general fund revenue came from these combined sources (City of Oak Ridge 2014). For FY 2015, the property tax rate is $2.39 per $100 of assessed value. The assessment rate is 40% for industrial and commercial property and 25% for residential property (City of Oak Ridge 2014). The city also receives a payment-in-lieu-of-tax (PILOT) for ORR acreage that falls within the city limits. The payment is based on its value as farmland and assessed at the farmland rate of 25% (City of Oak Ridge 2014). In 2015, the city expects DOE PILOT funds and grants of approximately $1,960,000 (City of Oak Ridge 2014). The Roane County tax rate was $1.97 per $100 of assessed value in 2013 (City of Oak Ridge 2014).

Table 3.12. City of Oak Ridge revenues and expenditures, FY 2013 and budgeted FY 2015 ($)

	2013 Actual	2015 Budgeted
Revenues		
Taxes	32,584,159	33,431,268
Licenses and Permits	167,826	230,000
Intergovernmental Revenues	3,518,802	3,392,000
Charges for Services	367,081	312,568
Fines and Forfeitures	419,490	376,000
Other	562,679	547,286
Total Revenues	37,620,037	38,289,122
Expenditures and other financing		
Expenditures	18,980,338	20,517,510
Other Financing Uses[a]	17,822,390	18,076,363
Total Expenditures and Other Financing	36,802,728	38,593,873

[a] Includes items such as capital projects fund, solid waste fund, economic diversification fund, debt service, and schools.

Source: City of Oak Ridge 2014.

FY = fiscal year.

3.6.2 Environmental Consequences

3.6.2.1 Proposed action

This section addresses the potential socioeconomic impacts of the proposed action and its alternatives. Socioeconomic impacts are not only important in themselves, but also for the secondary environmental or distributional effects they may have. For example, economic growth can sometimes attract enough new people to an area that it places pressure on housing, schools, water supply, and other infrastructure. Environmental effects of any new construction, facility improvements required, or infrastructure overloads that result from such a population increase should also be evaluated as induced effects of the development. For this reason, the analysis below uses bounding assumptions to identify the range of potential impacts. The purpose here is not to forecast economic activity but to make sure that reasonably foreseeable indirect effects are appropriately identified and considered.

3.6.2.1.1 *Environmental Justice*

EO 12898, *Federal Action to Address Environmental Justice in Minority Populations and Low Income Populations*, requires agencies to identify and address disproportionately high and adverse human health or environmental effects its activities may have on minority and low-income populations. No high and adverse human health or environmental impacts are expected to result from the proposed action. Moreover, as discussed above in Sect. 3.6.1.1, neither the city of Oak Ridge nor the census tracts near the proposed site includes a higher proportion of minorities in the population than the state or national average. One low-income population is located in tract 309 near the proposed site. However, any adverse impacts that might affect this tract are also likely to affect the higher income populations. Based on the above discussion and analysis, the proposed action would not cause disproportionately high and adverse effects on any minority or low-income populations in accordance with the provisions of EO 12898, and no further environmental justice analysis is required.

3.6.2.1.2 *Employment and Income*

The proposed action is expected to employ up to five people as a steady state (MKAA 2015), which represents a negligible change in the region's employment and income. While final construction costs would depend on a number of factors still to be determined, preliminary estimates suggest that construction of the airport could cost between $32M and $50M over a period of about 3 years (LPA 2012). Compared to the ROI income for 2013, this represents a 1% increase over the 3-year period.

3.6.2.1.3 *Population*

Based on the limited employment impact, no change in population is anticipated as a result of the proposed action.

3.6.2.1.4 *Fiscal Impacts*

The direct impact of the proposed action would be the loss of tax or PILOT revenue on the land transferred to MKAA. However, the 170 acres of DOE property account for only 0.5% of the 32,908 acres for which DOE currently pays in-lieu-of-tax (City of Oak Ridge 2014), and the needed additional property owned by CROET and others is similarly small. Indirect fiscal impacts would include revenue from sales and property taxes on new business attributable to the airport. Although the airport is expected to support further development in the adjacent industrial parks, those impacts have already been considered in an earlier EA and are not discussed here (DOE 2011). In addition to industrial development, the airport could also help to increase tourism to the Oak Ridge area, which would have a small positive impact on sales tax revenues.

Minor adverse indirect impacts to other area airports and communities could occur from the proposed Oak Ridge airport. Indirect impacts could include decreases in based aircraft and activity which would lead to losses in revenue from diminished fuel sales and hangar rent. Three airports (Rockwood Municipal, McGhee Tyson, and Knoxville Downtown Island), which are part of the NPIAS, are located within approximately 25 to 35 miles of the proposed Oak Ridge airport. McGhee Tyson and Downtown Island are owned and managed by the MKAA, which is the sponsor of the proposed Oak Ridge airport.

The MKAA has stated that the proposed Oak Ridge airport would not compete with commercial service currently offered at McGhee Tyson and, at present, there is a waiting list for hangar space for private and corporate aircraft. The runway length at Downtown Island limits operations to small general aviation aircraft and the airport currently has a waiting list of 125 persons requesting hangar space for their private planes. Rockwood currently has 11 planes based at their facilities. Communication in the spring of 2015 with 10 of the 11 owners indicated that that none of them plan to move their planes to Oak Ridge. Additionally, none of the persons and companies contacted about keeping planes at the proposed Oak Ridge airport currently uses the Rockwood airport. The potential impact on the Rockwood airport was considered by the FAA prior to the inclusion of the proposed Oak Ridge airport in the NPIAS.

3.6.2.2 No action

Under the no action alternative, no change in employment, income, population, or local government revenues is anticipated beyond that which is generated through the current and planned reindustrialization activities.

3.7 GEOLOGY AND SOILS

3.7.1 Existing Conditions

A detailed description of the geology of the ETTP area is presented in *Geological Mapping of the Oak Ridge K-25 Site*, K/ER-111 (Lemiszki 1994) and is summarized here.

3.7.1.1 Geology

The geology of the study area is complex as a result of extensive thrust faults and folds, and the potential presence of karst features in the bedrock underlying a portion of the area. As shown in Fig. 3.4, the study area is primarily underlain by bedrock of the Chickamauga Group and the Rockwood Formation. Immediately adjacent to the study area are rocks of the Rome Formation and the Knox Group. Clastic bedrock of the older Rome Formation has been placed over the calcareous rocks of the Chickamauga Group and the younger clastic rocks of the Rockwood Formation by the Whiteoak Mountain thrust fault, which trends generally southwest to northeast in the vicinity of SR 58. The K-25 fault places the Rockwood Formation on the Chickamauga Group in the western portion of the study area and on the Knox Group to the northeast of the study area (Lemiszki et al. 2012). The K-25 fault trends generally south to north approximately 600 ft east of Victorius Boulevard and effectively splits the study area into a western third underlain by carbonates of the Chickamauga Group and an eastern two-thirds underlain by the clastics of the Rockwood Formation. One exception is at the southeastern corner of the study area where the Whiteoak Mountain fault has placed a small sliver of Chickamauga Group rocks beneath this corner.

Although major thrust faults are numerous in the vicinity of the study area, these faults are associated with mountain building episodes that ended more than 200 million years ago. These faults are no longer active, but stress stored up at depth in these rocks is periodically released as minor earthquakes (Stearns and Miller 1977). Figure 3.5 shows the U.S. Geological Survey earthquake probability map (USGS 2009) for the general study area. This map indicates that there is only a 4 to 6% probability that an earthquake of magnitude greater than 5[2] on the Modified Mercalli Intensity Scale would impact the study area within a 50-year time period, and within approximately 30 miles (50 km).

Pre-construction topographic maps and historical investigations indicate that karst conditions, such as enclosed drainage basins and sinkholes, are present in both the Knox Group and Chickamauga Group formations at the Heritage Center. Because the western portion of the study area is underlain by Chickamauga Group rocks, the possibility exists for karst conditions to be encountered. Small cavities have been reported in the drilling logs for several of the bedrock wells located near the western end of the study area. These cavities have ranged in width from 0.3 to 6.5 ft, and have generally been mud-filled. Bedrock conditions in the Chickamauga Group rocks present at the southeast corner of the property are unknown.

A summary of some key engineering properties of the rock units present at the study area are shown in Table 3.13. Although this information was derived for Knox County, Tennessee, these same bedrock units extend into the study area, with the exception of the Rockwood Formation. However, the Rockwood Formation lithologies are similar in characteristics to the Rome Formation and the engineering characteristics would also be similar.

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[2] An earthquake of magnitude 5 on the Modified Mercalli Intensity Scale is described as: Felt by nearly everyone, many awakened. Some dishes, windows, etc. broken. Unstable objects overturned. Pendulum clocks may stop.

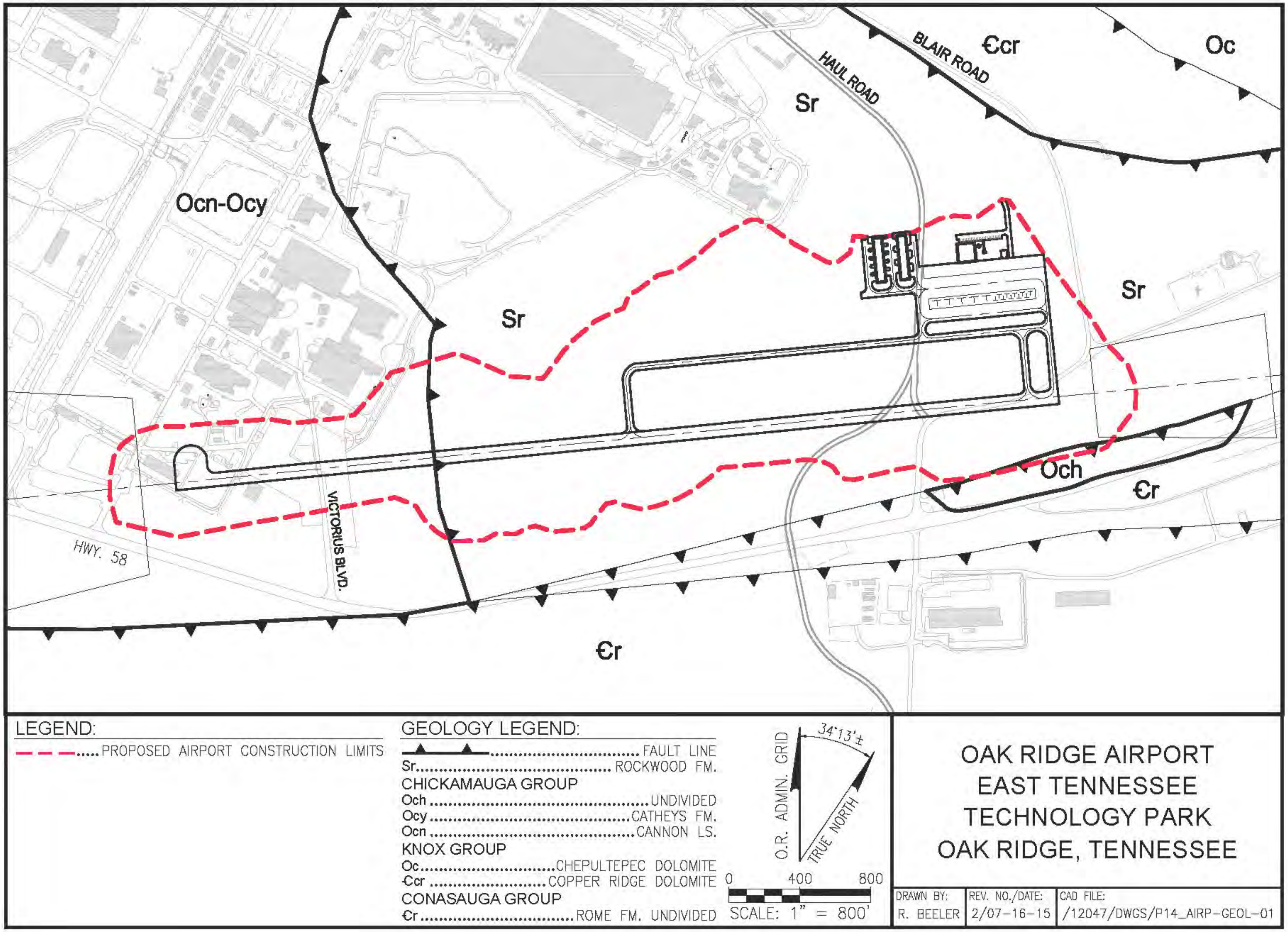

Fig. 3.4. Geologic map of the study area.

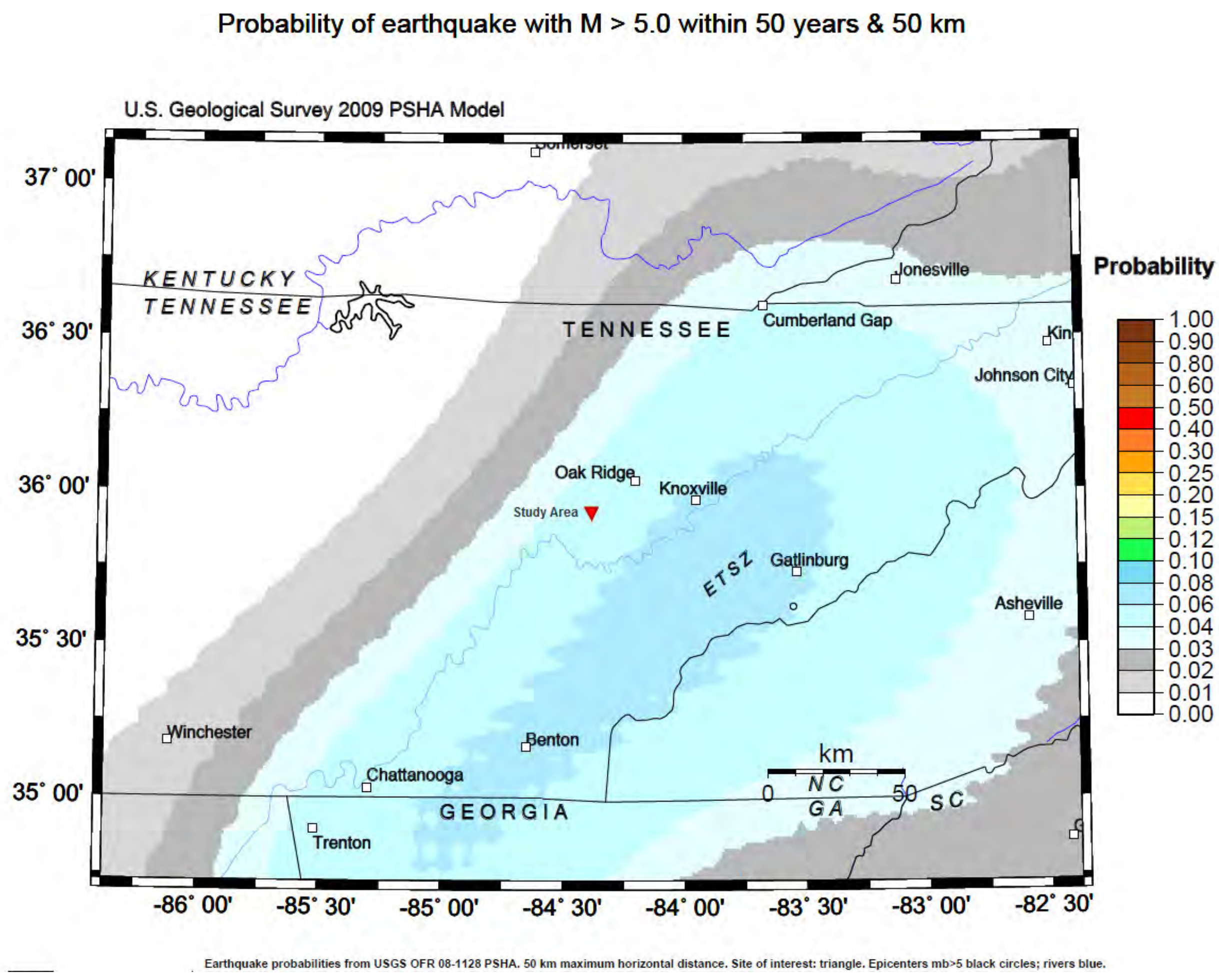

Fig. 3.5. Earthquake probability for the Heritage Center study area.

3.7.1.2 Soils

The heterogeneous soil overlying bedrock at the study area includes a mixture of fill, reworked soils, and native residual soils. Figure 3.6 shows the soil types present in the study area based on the 1942 Roane County Soil Survey prepared by the U.S. Department of Agriculture (USDA 1942). Although the Roane County Soil Survey was updated in 2009, the DOE property was not mapped during this effort (USDA 2009); thus, the 1942 survey is the only source for the study area soil types. These soil types generally represent the current soils for the eastern two-thirds of the study area where little, to no, disturbance of the soils from construction activities at ETTP has occurred. However, the soils in the western third of the study area have been extensively modified during construction by excavation and refilling of some areas, and most of the natural soil structure has been disturbed. Table 3.14 summarizes the soil types found in the study area based on the USDA soil survey (1942).

The native soils in the western portion of the study area in the vicinity and west of Victorius Boulevard have been reworked with some cut and fill occurring during construction of the former Oak Ridge Gaseous Diffusion Plant (ORGDP). Thus, native soils as indicated by the soil survey (USDA 1942) may or may not be present in this portion of the study area, and, if present, likely have been disturbed to some degree.

Table 3.13. Engineering characteristics for bedrock units in the study area

Formation	Rock type	Compressive strength (psi × 10^3)	Modulus of elasticity (psi × 10^6)	Range of depth of residual overburden (ft)	Excavation characteristics (bed thickness, ft)	Suitability as aggregate
Rockwood[a]	Sandstone and shale	Sandstone: 20 to 40 Shale: 1 to 6	2 to 6	0 to 10	Thin- to medium-bedded, shaley to blocky (0.1 to 1)	Poor
Chickamauga	Interbedded shale and limestone	5 to 20	5 to 8	0 to 15	Thin-bedded, slabby to blocky (0.1 to 0.3)	Poor
Knox	Dolomite and Limestone	10 to 40	6 to 10	0 to 150+	Medium-bedded to massive (0.5 to 3)	Good to excellent, depending on chert content
Rome	Sandstone and shale	Sandstone: 20 to 40 Shale: 1 to 6	2 to 6	0 to 10	Thin- to medium-bedded, shaley to blocky (0.1 to 1)	Poor

Source: *Geology of Knox County*, Bulletin 70, Tennessee Division of Geology (1973).

[a] Information for the Rockwood Formation is derived from the Rome Formation based on similarity in lithologic characteristics.

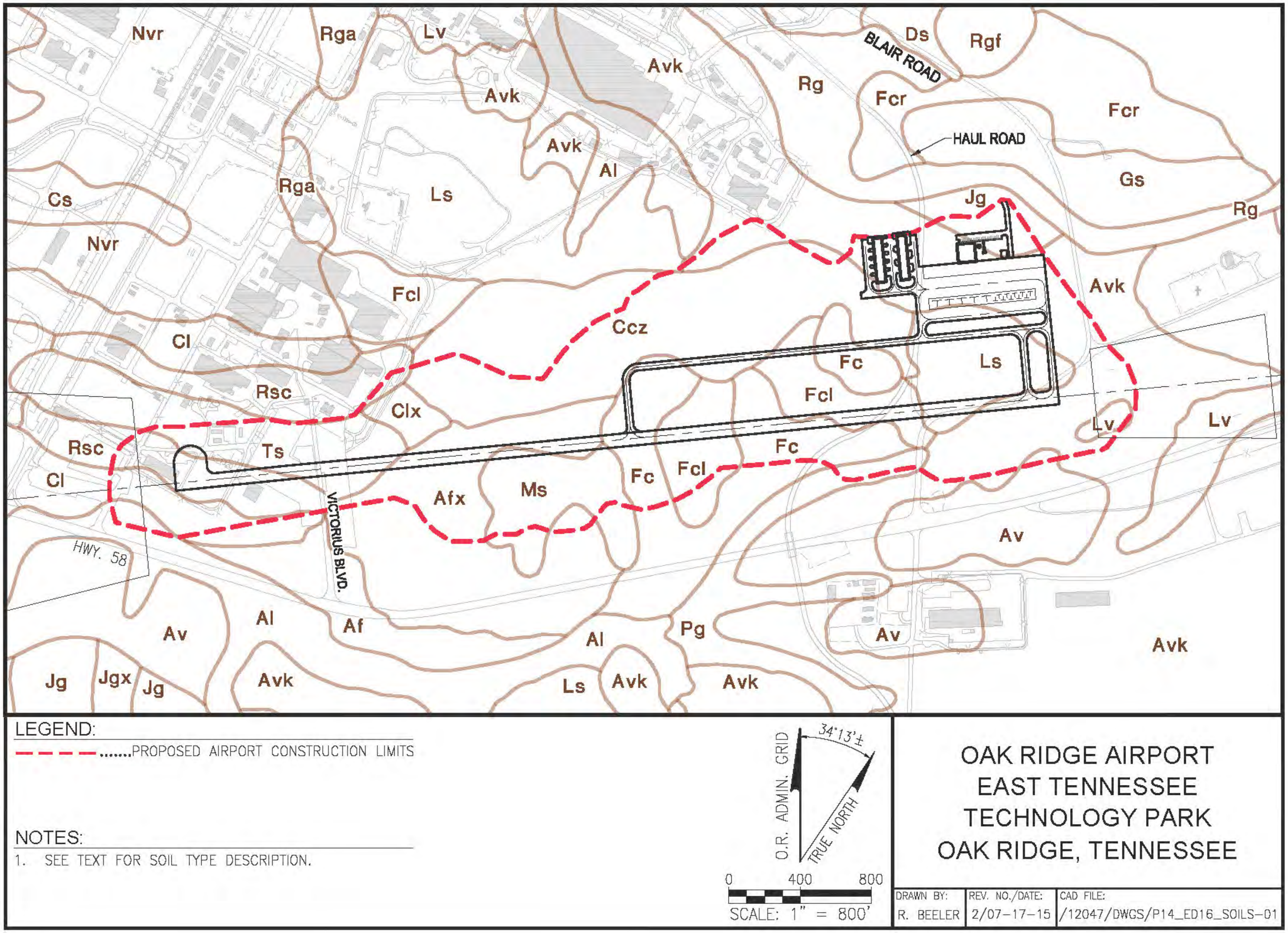

Fig. 3.6. Study area soils based on 1942 soil survey.

Table 3.14. Study area soil types

Soil code	Series	Texture	Phase
Af	Allen	Very fine sandy loam	
Afx	Allen	Very fine sandy loam	Slope
Al	Atkins	Very fine sandy loam	
Av	Apison	Very fine sandy loam	
Avk	Apison	Very fine sandy loam	Eroded slope
Ccz	Clarksville	Cherty silt loam	Steep
Cl	Colbert	Silt loam	
Clx	Colbert	Silt loam	Slope
Cs	Colbert	Silty clay loam	
Fc	Fullerton	Cherty silt loam	
Fcl	Fullerton	Cherty silt loam	Hilly
Gs	Greendale	Silt loam	
Jg	Jefferson	Gravelly fine sandy loam	
Jgx	Jefferson	Gravelly fine sandy loam	Slope
Ls	Lehew	Stony fine sandy loam	
Lv	Leadvale	Very fine sandy loam	
Ms	Muskingum	Stony fine sandy loam	
Nvr	Nolichucky	Very fine sandy loam	Eroded
Pg	Pope	Gravelly fine sandy loam	
Rg	Roane	Gravelly loam	
Rga	Rough gullied land	Apison soil material	Gullied
Rgf	Rough gullied land	Fullerton soil material	Gullied
Ts	Talbott	Silty clay loam	

Note: Soil codes are indicated on the soil map included as Fig. 3.6.

Potential soils contamination within the previously transferred properties in the westernmost portion of the study area was addressed under the Zone 1 and Zone 2 RODs (DOE 2002; DOE 2005). The study area soils within the proposed construction limits have either received EPA and Tennessee Department of Environment and Conservation (TDEC) concurrence for no further action to meet the protection goals of the Zone 1 and Zone 2 RODs for industrial use (DOE 2009), or concurrence as Clean Parcels (DOE 2008a; DOE 2008b; DOE 2012; DOE 2014).

A Farmland Conversion Impact Rating for the study area was not completed. The impact rating form is based on a Land Evaluation and Site Assessment (LESA) system, which measures the quality of farmland based on soil quality and other factors that would affect a farm's viability. No LESA was completed for the proposed action because the definition of prime farmland specifically excludes from consideration lands committed to urban development. Because the study area is within the city of Oak Ridge and has been zoned to include nonagricultural uses (i.e., industrial), the study area is exempt from consideration as prime farmland.

3.7.2 Environmental Consequences

3.7.2.1 Proposed action

Impacts to underlying geological resources would not be anticipated as a result of construction and operation of the proposed airport facilities. Hazards posed by geological conditions are expected to be minor, and bedrock at the study area is adequate to support structures using standard construction techniques. Grading, excavation, and other site development activities associated with the proposed action would partially occur within previously disturbed areas, which are currently used for industrial applications. Potential impacts to soil resources would generally be localized and of short duration. The primary potential impacts would be soil erosion and soil compaction, and these impacts would be effectively minimized through mitigation strategies such as, but not limited to, construction Best Management Practices (BMPs); development of a Storm Water Pollution Prevention Plan in accordance with the rules of the state of Tennessee, Division of Water Pollution Control; and implementation of the necessary erosion control measures. It would be the responsibility of the MKAA or their contractors to obtain any required permits and implement any mitigation strategies and controls. After construction, the potential impacts would diminish once the completed site has an established growth of grass and vegetation on the disturbed areas. The potentially affected soils are generally stable and acceptable for standard construction requirements, and due to their high clay content, are not susceptible to liquefaction resulting from a seismic event. Soil-supported foundations should remain stable against liquefaction both during and after a seismic event should one occur.

Depending on which Haul Road and Blair Road options were selected, new road construction would directly disturb soils within the affected areas. New sections of Haul Road or Blair Road would be constructed in a similar manner to the existing roadways. Potential impacts would be the same as those described for other construction activities under the proposed action—primarily the potential for soil erosion and soil compaction. Major improvements to correct existing deficiencies with Perimeter Road (e.g., widening) could result in a greater chance for adverse impacts to soils than the other Blair Road options. Because of the steep banks and drop-offs immediately adjacent to and along the upper portion of Perimeter Road, any disturbance could increase the potential for soil erosion to occur. Construction BMPs including appropriate erosion control measures would minimize the potential for adverse impacts.

3.7.2.2 No action

No impact to the local geology and soils would occur under the no action alternative. Ongoing environmental restoration and waste management activities at the Heritage Center would continue, and required studies would address any potential impacts to geologic and soils resources. Thus, there would be no difference from a geology and soils perspective.

3.8 WATER RESOURCES

3.8.1 Existing Conditions

3.8.1.1 Groundwater

The water table at the Heritage Center generally mimics topography with shallow groundwater flowing from higher topographic areas to the nearby surface water bodies (Fig. 3.7). Groundwater flow through bedrock is primarily controlled by fractures, bedding planes, and hydraulic gradient, and specific flow paths are difficult to discern; however, investigations on the ORR have shown that a primary flow direction is

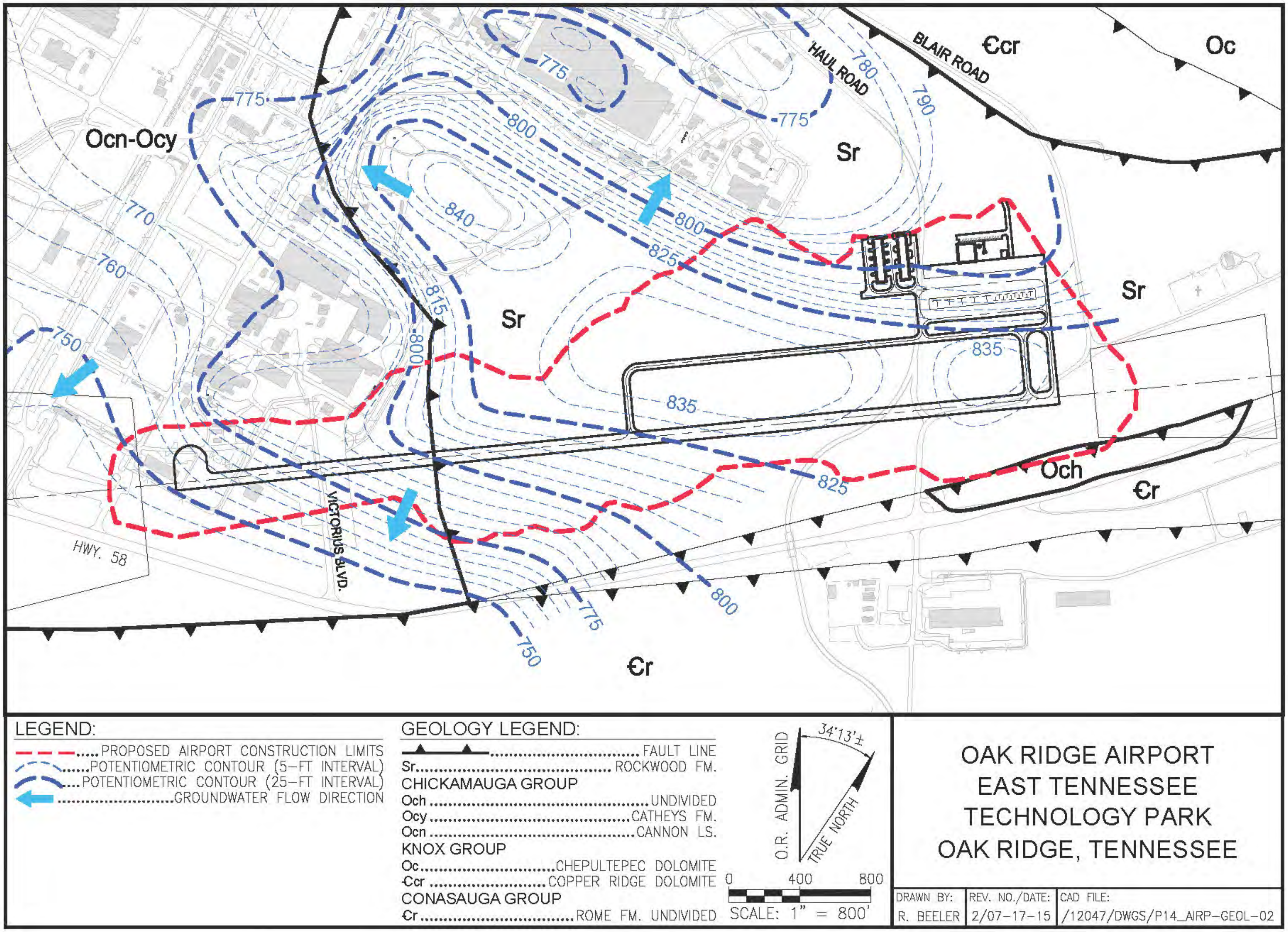

Fig. 3.7. Potentiometric map of the study area.

along geologic strike. Groundwater monitoring wells present within and in the vicinity of the study area are shown on Fig. 3.8. The hydrogeologic characterization data presented below for the study area are partly based on the data from these wells and partly based on interpolation from available Heritage Center information.

Due to the limited site-specific data available, the depth to bedrock and depth to groundwater is largely interpolated from the existing wells in the vicinity of the study area. Depth to bedrock, interpolated from the available data, is expected to be from 3 to 35 ft below ground surface (bgs). The depth to groundwater, interpolated from the available data, is expected to range from 5 to 25 ft bgs, depending on topographic position within the study area. Shallow groundwater flow is anticipated to generally be radial in nature from the higher topographic areas to the surrounding surface water features in this area of the Heritage Center. In the northern portion of the study area, shallow groundwater flow is anticipated to be to the north and northeast, and groundwater flow over most of the study area is anticipated to be to the south-southwest following the potentiometric surface contours (Fig. 3.7).

Monitoring wells, which are completed in bedrock, near the western end of the study area intercept a groundwater contaminant plume of VOCs. Figure 3.8 shows this plume and another nearby plume to the north that impacts both the overburden materials and bedrock. Although these are mapped as separate plumes, because the water table is primarily within bedrock in the southern plume area due to the minimal overburden present, the southern plume may represent an extension of the northern plume. However, there are potential historical sources in the southern plume area that could have produced this separate plume. The groundwater plumes indicated in Fig. 3.8 show the combined tetrachloroethene (PCE) and trichloroethene (TCE) concentrations and are shown as µmole per liter.

The northern plume shown in Fig. 3.8 contains high concentrations of PCE and lower concentrations of TCE, while the southern plume contains primarily TCE at lower concentrations than the northern plume. The exact source of the groundwater contamination in these two plumes is uncertain, but waste disposals in the K-1070-C/D area to the north of the study area are likely contributors to the observed groundwater plumes.

A groundwater investigation was conducted in 2010 in the central portion of the study area (Parcel 21d) as part of DOE’s National Priorities List boundary definition project (DOE 2012). Groundwater samples collected from two temporary piezometers (Fig. 3.8), which were subsequently removed, and the two existing monitoring wells (BRW-076 and UNW-102) located in the eastern portion of the study area indicated that there was no evidence of groundwater contamination from DOE activities at these locations.

3.8.1.2 Surface water

The ETTP is located in the Lower Clinch River watershed. The TVA manages this section of the Clinch River as a run-of-the-river impoundment. It is part of the upper reach of Watts Bar Reservoir. Poplar Creek, a major tributary to the Clinch River, flows through the center of the ETTP (Fig. 2.4). Power generation and release schedules at Melton Hill Dam (upstream) and Watts Bar Dam (downstream) influence water levels and flow patterns in the river and Poplar Creek.

The two primary tributary streams to Poplar Creek at the ETTP include Mitchell Branch and an unnamed tributary to Poplar Creek that flows along SR 58 (Fig. 3.9). Mitchell Branch originates on Pine Ridge and flows through the northeastern portion of the ETTP before discharging into Poplar Creek. The unnamed tributary to Poplar Creek originates on Pine Ridge east of ETTP, flows west adjacent to SR 58, and passes under SR 58 through a culvert before it enters the K-1007-P5 Pond. Much of the stream was

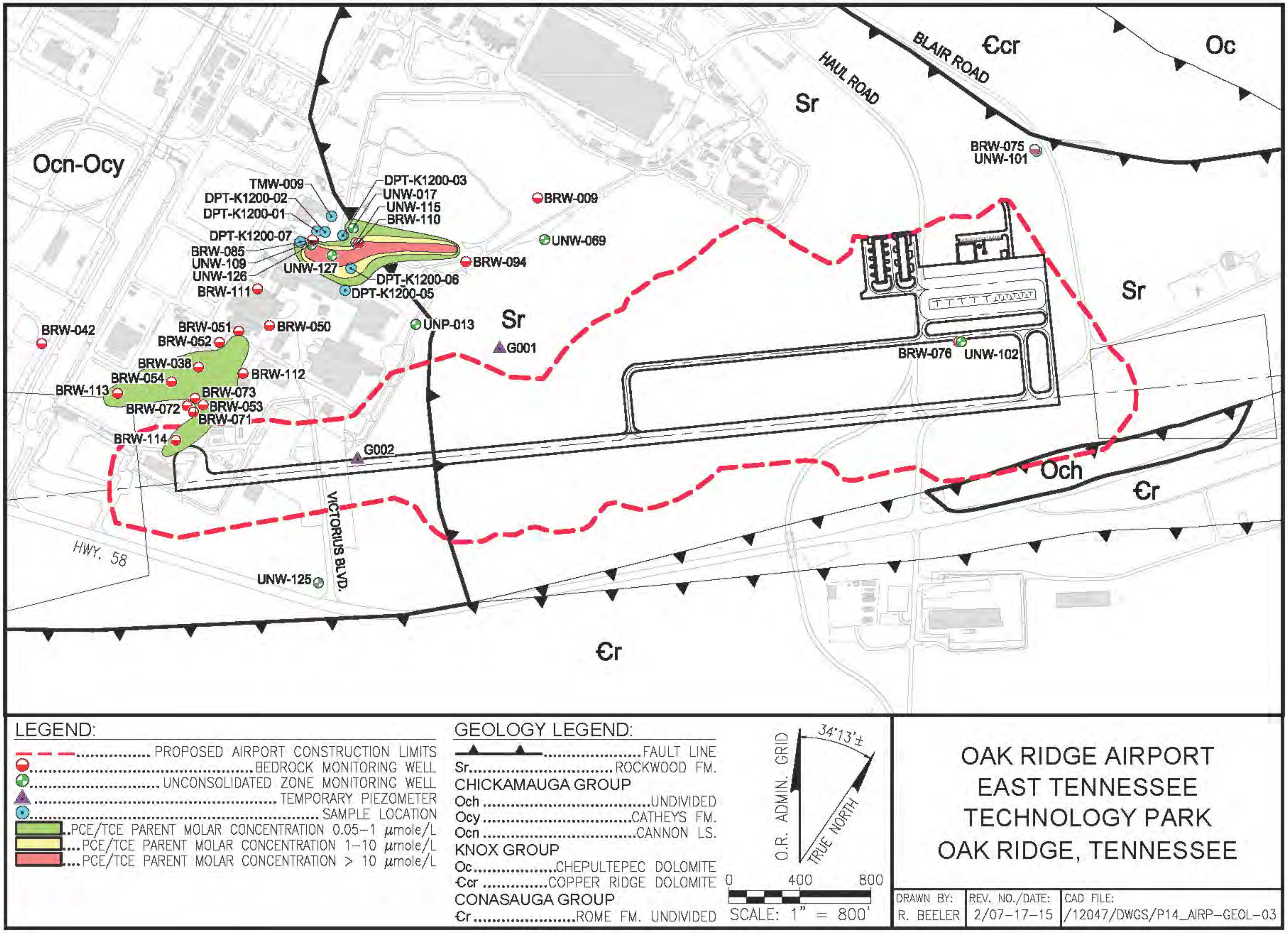

Fig. 3.8. Groundwater monitoring wells and contaminant plumes in the vicinity of the study area.

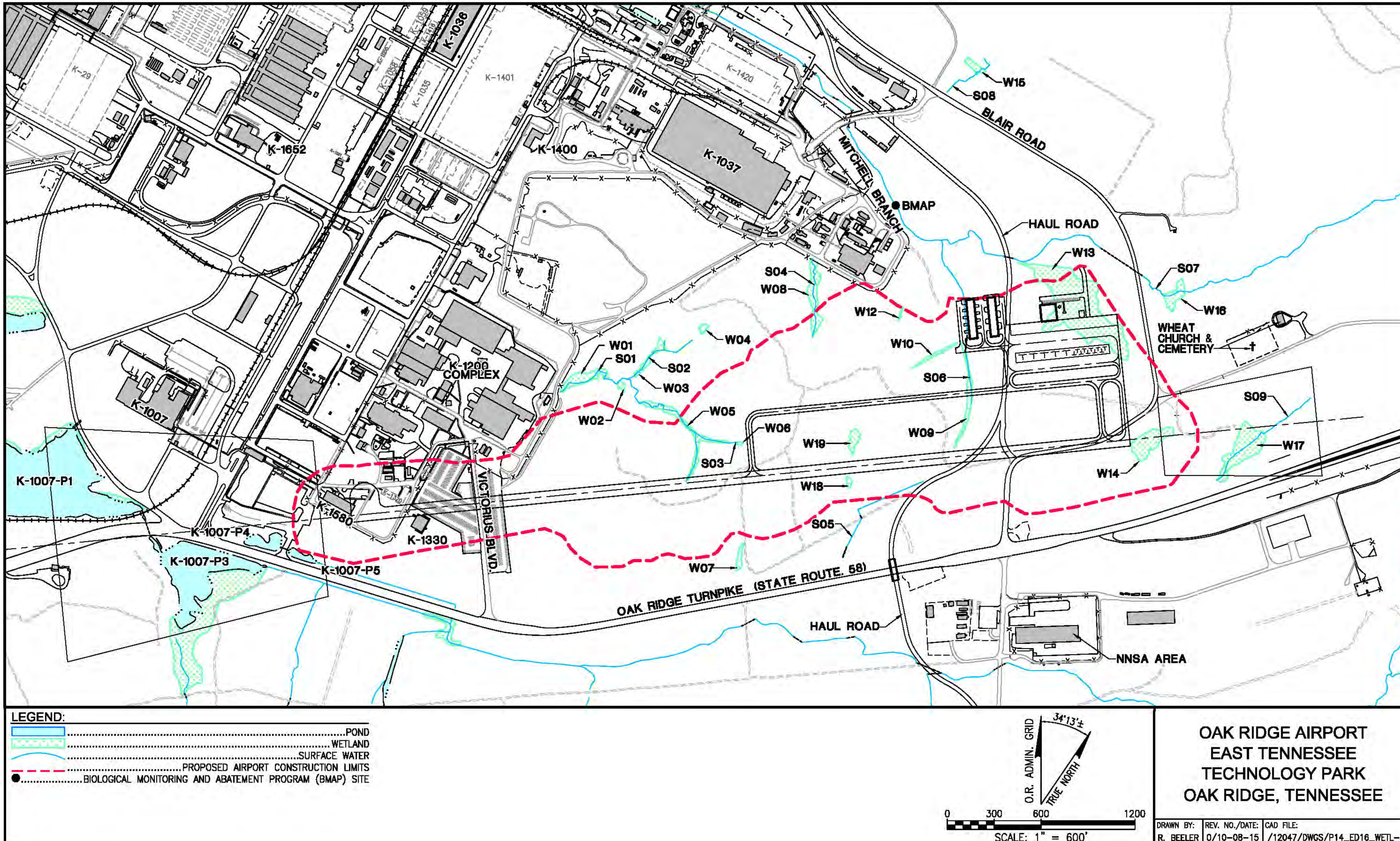

Fig. 3.9. Surface waters and wetlands in the vicinity of the proposed Oak Ridge airport.

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channelized during the widening of SR 58. Discharge from the K-1007-P5 Pond flows through the K-1007-P4 Pond, K-1007-P3 Pond, and K-1007-P1 Pond before it reaches Poplar Creek (Fig. 3.9).

A Biological Monitoring and Abatement Program (BMAP) site on Mitchell Branch is located downstream of the proposed airport construction limits (Fig. 3.9). The BMAP was established to document compliance with environmental regulations and help identify causes of adverse ecological impacts to aquatic environments. The BMAP consists of four tasks: (1) toxicity monitoring; (2) bioaccumulation monitoring; (3) assessment of fish health, and (4) instream monitoring of biological communities, including benthic macroinvertebrates and fish.

Surface water resources in the proposed airport site include nine streams designated S01 through S09 and the K-1007-P5 Pond (Table 3.15). Streams S01, S02, S03, and S05 are part the watershed of the unnamed tributary to Poplar Creek located along SR 58. Streams S01, S02, and S03 are part of a small subwatershed located in the forested area east of K-1220 that discharges into the ETTP stormwater drainage network. Stream S05 flows in a series of engineered channels associated with a long-abandoned railroad grade near the SR 58 Haul Road overpass. Stream S05 has two culverts (76 ft and 20 ft) associated with it. Streams S04 and S06 are tributaries to Mitchell Branch. S04 originates in a wetland in the forested area south of K-1435. Stream S06 flows in an old drainage ditch associated with an abandoned railroad grade east of the Haul Road. Stream S06 flows through a culvert that is approximately 103 ft in length. Stream S07 is the reach of Upper Mitchell Branch between the natural gas pipeline northeast of Blair Road and the Haul Road. Stream S08 is the reach of an unnamed tributary to Mitchell Branch between the natural gas pipeline northeast of Blair Road. Stream S09 is an unnamed tributary to Bear Creek located between SR 58 and the George Jones Baptist Church. The K-1007-P5 Pond is a 0.17-acre impoundment on an unnamed tributary to Poplar Creek beside SR 58 (Fig. 3.9).

Table 3.15. Summary of hydrologic determinations, proposed Heritage Center Airport Site, Oak Ridge, Tennessee

Stream ID	HD score[a]	Stream length[b] (ft)	Watershed
Stream 1	30	1608	Unnamed tributary to Poplar Creek
Stream 2	24.5	589	Unnamed tributary to Poplar Creek
Stream 3	23	282	Unnamed tributary to Poplar Creek
Stream 4	27	539	Unnamed tributary to Mitchell Branch
Stream 5	20	699	Unnamed tributary to Poplar Creek
Stream 6	25	665	Unnamed tributary to Mitchell Branch
Stream 7	24.5	324	Upper Mitchell Branch
Stream 8	22.8	416	Unnamed tributary to Mitchell Branch
Stream 9	21	829	Unnamed tributary to Bear Creek
Total		5,951	

[a] HD = Hydrologic determination (TDEC 2011).
[b] Stream lengths are for open-channel reaches only.
ID = identification.

3.8.1.3 Wetlands

The U.S. Army Corps of Engineers (USACE) defines wetlands as “those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions” (Environmental Laboratory 1987). Wetlands usually include swamps, marshes, bogs, and similar areas. In identifying a wetland, three characteristics should be met. First is the presence of hydrophytic vegetation that has morphological or physiological adaptations to grow, compete, or persist in anaerobic soil conditions. Second, hydric soils are present and possess characteristics that are associated with reducing soil conditions. Third, the area is influenced by wetland hydrology, meaning the area is inundated or saturated to the surface at some time during the growing season of the prevalent vegetation (Environmental Laboratory 1987; USACE 2012).

Previous surveys identified more than 70 acres of wetlands in selected areas of the ETTP area (Rosensteel and Awl 1995). These surveys identified a total of 47 wetlands that ranged in size from 0.3 to 10.7 acres. These wetlands occurred in association with springs and seeps along stream bottomlands, in areas of seasonally high groundwater tables and surface water levels on the alluvial islands and floodplains of Poplar Creek and the Clinch River, a beaver dam, and in and adjacent to areas of human disturbance (e.g., utility line right-of-ways [ROWs] and channelized streams).

A wetland delineation conducted during the spring of 2015 at the proposed airport site identified 18 wetlands totaling approximately 8.06 acres (Table 3.16). All but one of the wetlands identified are slope wetlands which formed in association with groundwater seeps located along streams at the site. One wetland formed in the bottom of an old pond that only temporarily holds water from late fall until early spring (Fig. 3.9). Wetland sizes ranged from 0.01 to 3.62 acres.

Table 3.16. Wetlands Summary, Proposed Heritage Center Airport Site, Oak Ridge, Tennessee

Wetland ID	Cowardin habitat type[a]	Acres	Watershed
Wetland 01	PFO1E	0.38	Unnamed tributary to Poplar Creek
Wetland 02	PFO1E	0.05	Unnamed tributary to Poplar Creek
Wetland 03	PFO1E	0.17	Unnamed tributary to Poplar Creek
Wetland 04	PFO1E	0.05	Unnamed tributary to Poplar Creek
Wetland 05	PFO1E	0.50	Unnamed tributary to Poplar Creek
Wetland 06	PFO1E	0.01	Unnamed tributary to Poplar Creek
Wetland 07	PFO1E	0.10	Unnamed tributary to Poplar Creek
Wetland 08	PFO1E	0.53	Mitchell Branch
Wetland 09	PFO1E	0.29	Mitchell Branch
Wetland 10	PFO1E	0.09	Mitchell Branch
Wetland 12	PFO1E	0.02	Mitchell Branch
Wetland 13	PSS1E/PFO1E	3.62	Mitchell Branch
Wetland 14	PFO1E	0.63	Unnamed tributary to Bear Creek
Wetland 15	PEM1E/PSS1E	0.12	Mitchell Branch
Wetland 16	PEM1E/PSS1E/PFO1E	0.29	Mitchell Branch
Wetland 17	PEM1E/PSS1E/PFO1E	1.00	Unnamed tributary to Bear Creek
Wetland 18	PFO1E	0.05	Unnamed tributary to Poplar Creek
Wetland 19	PFO1E	0.16	Unnamed tributary to Poplar Creek
Total		8.06	

Note: There is no Wetland 11.

[a] Classification codes as defined in Cowardin et al. (1979): PEM1E = Palustrine persistent emergent vegetation, seasonally flooded/saturated; PFO1E = Palustrine forested, broad-leaved deciduous vegetation, seasonally flooded/saturated; PSS1E = Palustrine scrub-shrub, broad-leaved deciduous vegetation, seasonally flooded/saturated; and PUBH = Palustrine unconsolidated bottom, permanently flooded.

ID = identification.

3.8.1.4 Floodplains

Floodplains are defined by EO 11988, *Floodplain Management*, as "the lowland and relatively flat areas adjoining inland and coastal waters, including flood-prone areas of offshore islands, including at a minimum, the area subject to a 1 percent or greater chance of flooding in any given year" (that area inundated by a hundred-year flood). EO 11988 requires federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative.

Flood Insurance Rate Maps prepared by the Federal Emergency Management Agency (FEMA) do not identify any floodplains at the proposed airport site (FEMA 2007a; FEMA 2007b; FEMA 2007c; FEMA 2007d). The entire project area occurs outside of the Poplar Creek floodplain.

3.8.2 Environmental Consequences

3.8.2.1 Proposed action

Groundwater

No impacts to groundwater are anticipated from construction activities or normal facility operations and groundwater use would be prohibited without prior regulatory approval. The groundwater plume closest to the western end of the construction footprint (Fig. 3.8) is naturally degrading and will continue to be monitored. The other plume (northeast of the first plume) is stable in that it is not migrating and will continue to be monitored to determine if remediation or mitigation is needed. Because there are no plumes under proposed airport building locations, vapor intrusion is not a concern. Any monitoring wells within the final airport construction footprint would be plugged and abandoned, and a determination would be made at that time as to whether new replacement monitoring wells would be installed. Existing potable water systems would likely be used and/or modified as part of any development to support the new facilities.

Potential impacts to groundwater quality could occur as a result of a fuel or hazardous material spill and subsequent migration through the soil column to groundwater. However, it is expected that the quantities of materials with the potential to affect groundwater (e.g., fuel) would be transported and stored during construction and during facility operations in the proper containers and according to all applicable regulations. The use of local, state, and federal permits; safety procedures; spill prevention plans; and spill response plans in accordance with state and federal laws would minimize the severity of potential impacts to groundwater from accidental releases.

Surface Water

All or a portion of streams S01, S03, S04, S05, and S06 are within the proposed airport construction limits (Fig. 3.9). Construction of the airport and associated facilities would likely require encapsulation of all of S01, S03, and some portion of S04, S05, and S06. The remaining sections of S04 and S06 that are not encapsulated, the free-flowing sections of S05, and the K-1007-P5 Pond would be vulnerable to other effects such as channelization and/or indirect effects from sedimentation and stormwater runoff. Construction activities would have no direct impact on the BMAP site located downstream on Mitchell Branch. However, temporary indirect impacts from increased sedimentation could occur. The use of BMPs, including appropriate erosion prevention and sediment control measures, would minimize indirect impacts to adjacent surface waters. The potential for adverse impacts to occur would exist until disturbed areas were stabilized.

It would be the responsibility of the MKAA or their contractors to follow the appropriate regulatory process and secure any required permits prior to any construction activities. This could include obtaining a construction storm water NPDES permit and an Aquatic Resources Alteration Permit (ARAP) from TDEC for work within or near surface waters. Any loss of streams or other aquatic habitat would require some form of compensatory mitigation. Stream mitigation could include restoration activities on suitable areas of the ORR or other nearby locations or through an in-lieu fee program administered by the Tennessee Stream Mitigation Program (Tennessee Stream Mitigation Program 2015).

Spills of fuel and/or other hazardous materials during construction or airport operations could also have an adverse impact on surface waters if not controlled or contained. DOE will retain responsibility for remediation of any site-related surface water contamination at the ETTP.

The addition of new impervious surfaces would increase the rate and volume of storm water runoff within the affected area. Increases in surface water runoff as a result of new construction would be attenuated through the use of temporary or permanent storm water controls, such as detention or retention basins and other structures, use of permeable pavement, and stabilization of disturbed areas through landscaping and vegetation. The use of these measures would also increase groundwater recharge through direct percolation, offsetting the loss of pervious surface due to construction and minimizing downstream effects. Storm water runoff after construction activities are completed and any discharge from facility operations to surface water would be in accordance with limitations established under the applicable TDEC NPDES permit.

Wetlands

All or a portion of wetlands W05, W06, W08, W09, W10, W12, W13, W14, W18, and W19 are located within the proposed airport construction limits (Fig. 3.9). Construction of the airport and associated facilities would likely have long-term adverse effects on the affected wetlands, resulting from filling all or part of these wetlands. Wetlands W01, W02, W07, and the remaining section of W08 would be vulnerable to other direct and indirect, short-term effects associated with airport construction such as sedimentation and accelerated stormwater runoff. Wetlands W03 and W04 are located outside of the proposed airport construction limits.

The potential for, and degree of, potential wetland impacts would ultimately depend upon the MKAA's final design for the proposed airport and adjacent property. Activities associated with development of the airport would largely be expected to have adverse long-term effects on wetlands located in the proposed construction area. Adverse impacts would include any activity (such as filling) that would adversely affect the survival, quality, and natural and beneficial values of wetlands. Effects on wetlands might result from activities occurring directly in wetlands or might result indirectly from activities that occur in areas adjacent to wetlands. The impacts of wetland alteration might last for decades (long-term or permanent effects) or be minor enough that wetlands could recover in a few years (short-term effects).

TDEC and the USACE jointly regulate wetlands-related activities. If any wetlands on the transferred property are deemed to be jurisdictional wetlands as determined by the Nashville District USACE, development activities would need to comply with the USACE wetlands construction restrictions contained in 33 *CFR*, Sects. 320 through 330, as amended, and any other applicable federal, state, or local wetlands regulations. Work within or near wetlands could also require that an ARAP be obtained from TDEC. It would be the responsibility of the MKAA or their contractors to consult with USACE and

TDEC and to secure any required permits prior to initiating work in any wetlands. Permit conditions would stipulate which activities could occur in or around the affected wetlands. Regulatory permits would also specify all required mitigative measures, including potential compensation. Wetland mitigation can be accomplished by restoring wetlands at other locations on or off the ORR, by purchasing credits in a wetland mitigation bank, or through the Tennessee Mitigation Fund, an in-lieu fee program for wetlands administered by the Tennessee Wildlife Federation (Tennessee Wildlife Federation 2015).

Surface water and wetland impacts associated with the various Haul Road and Blair Road options (see Sect. 2.1.4) would depend on which options were selected, which is not known at this time. Direct impacts to the streams and wetlands are associated with those options that would require new road construction (i.e., Haul Road Option 1/Blair Road Option 3 and Haul Road Option 2/Blair Road Option 4).

Construction of Haul Road Segment B, which is common to both Haul Road options, would directly affect W14. Under Haul Road Option 2, the new segment of roadway would involve an entirely new crossing over stream S07, but that section of the stream is already in a culvert. It is possible that the existing culvert would require reconditioning to handle the heavy truck traffic on the Haul Road. In that situation, construction of a new culvert would affect about 30 to 50 linear feet of stream S07 that are already in a culvert.

New construction associated with Blair Road Option 3 would require new stream crossings of S07, S08, and S09. The new roadway would also directly affect a portion of wetland W17. Construction of the new road segment could also have indirect effects to wetlands W15 and W16 depending on the final road alignment. However, all of wetland W15 and most of W16 occur in a natural gas line ROW, and the final road alignment would most likely avoid impacting the utility line. Potential effects associated with Blair Road Option 4 would be similar to those described for Option 3 except that the new road segment would only affect stream S09 and wetland W17.

3.8.2.2 No action

Under the no action alternative, ongoing and planned reindustrialization and cleanup activities would continue at the ETTP/Heritage Center. Potential impacts to groundwater and surface waters including wetlands are addressed under approved NEPA decisions and other applicable regulatory documents.

3.9 ECOLOGICAL RESOURCES

3.9.1 Existing Conditions

3.9.1.1 Vegetation

The study area encompasses several habitat types including hardwood and pine forest, pastureland/grassland, maintained/landscaped areas, and wetlands and surface waters. Vegetation in landscaped/maintained areas consists of mowed grasses along with sparse occurrence of shrubs and trees, some of which are ornamental. Similar vegetation occurs along the edges of established roadways such as Oak Ridge Turnpike (SR 58), Blair Road, Haul Road, and others.

Vegetation in the remaining portions of the study area has not been specifically surveyed. However, plant community types and species composition are likely similar to those that have been documented at adjoining or nearby areas. As part of the 2011 ETTP EA (DOE 2011), a habitat assessment was conducted in Parcel ED-3 (MRW Environmental LLC 2009). This parcel is located adjacent to the current study area, immediately south of Oak Ridge Turnpike. Parcel ED-3 is considered comparable to vegetated portions of the study area because both contain similar vegetation and have been subject to similar prior disturbance. A total of 15 different forest plant communities were identified in ED-3 during the site assessment. Habitats at the site consisted of a mixture of mature forest habitat, previously disturbed forest in various stages of succession, and mixed hardwood riparian areas. Previously disturbed areas were generally characterized by a dense early successional growth of small trees and shrubs. Older forest stands were characterized as oak-hickory (*Quercus-Carya*) communities and also contained sugar maple (*Acer saccharum*), yellow poplar (*Liriodendron tulipifera*), and American beech (*Fagus grandifolia*).

Similar habitats were documented during an environmental survey of the Haul Road corridor (Peterson et al. 2005), which bisects the eastern portion of the study area. Habitats encountered during the survey that were considered non-sensitive included mowed grasses, old fields, woody thickets, and planted loblolly pine (*Pinus taeda*) areas. Habitats considered more sensitive included bottomland, mixed deciduous, and mixed pine-deciduous forest. Habitats similar to those documented during previous surveys appear to be present in the study area, including large areas of deciduous forest, pine forest (including some row-planted pine), mixed deciduous-pine forest, mowed areas, and areas supporting shrub and tree occurrence of various densities.

Invasive plant species were found at most sites investigated on ED-3 and were often abundant. Similar to the discussion of forest and other vegetative habitats above, it is reasonable to conclude that similar species may be present in the study area. Nearly 170 non-native plant species have been documented on the ORR (Salk 2007).

3.9.1.2 Wildlife

The large areas of mature, unfragmented forest on the ORR, along with other habitats such as successional forest, grassland, and riparian areas, support a large diversity of wildlife ranging from common species found in urban and suburban environments to species with more restrictive requirements (e.g., interior forest birds). Over 340 wildlife species have been documented on the ORR, including over 200 bird, 49 mammal, 72 fish, and 68 reptile and amphibian species (Giffen et al. 2012; Salk and Parr 2006). Species from all major terrestrial vertebrate groups were documented during the habitat assessment for Parcel ED-3 and, due to habitat similarities, likely occur in the proposed airport area as well. Wildlife included 40 species of migratory, transient, and resident birds that were observed throughout the parcel. The authors noted that bird species not identified during the assessment are likely present at various times of the year (e.g., during migration). Six mammal species were identified, including Virginia opossum (*Didelphis virginiana*), gray squirrel (*Sciurus carolinensis*), eastern chipmunk (*Tamias striatus*), eastern cottontail rabbit (*Sylvilagus floridanus*), and raccoon (*Procyon lotor*). In addition, 14 reptile and amphibian species were documented. Similar to bird species, the authors considered it likely that greater numbers of mammal, reptile, and amphibian species occur in the area than were documented during the assessment. Landscaped/developed areas likely have limited value to wildlife species other than those typically associated with urban environments (e.g., rodents, rabbits, and bird species that are tolerant of human presence).

A relatively modest number of mammal, bird, and amphibian species were documented during the Haul Road route survey. Mammal species were comparable to those documented in other surveys and included white–tailed deer (*Odocoileus virginiana*), rabbit, raccoon, and woodchuck (*Marmota monax*). Bird species included those typical of edge and old field environments, such as common yellowthroat (*Geothlypis trichas*) and northern cardinal (*Cardinalis cardinalis*), as well as neotropical migrants such as yellow-billed cuckoo (*Coccyzus americanus*) and red-eyed vireo (*Vireo olivaceus*).

The Migratory Bird Treaty Act of 1918 (MBTA) provides for the conservation of migratory birds, which are defined as any species or family of birds that live, reproduce, or migrate within or across international borders at some point during their annual life cycle. Unless permitted, the MBTA prohibits the taking of migratory birds. Migratory birds are further protected through a Memorandum of Understanding between DOE and the U.S. Fish and Wildlife Service (FWS) [EO 13186, 66 *Federal Register* 3853], which is designed to enhance collaboration between DOE, FWS, and local government and to facilitate actions that provide greater protection and conservation of migratory birds. Twenty migratory bird species have been documented to nest on the ORR with another 8 species that winter on the site.

Acoustic surveys conducted during the summer of 2013 found 12 bat species present across the ORR, including Townsend's big-eared bat (*Corynorhinus townsendii*), big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), gray bat (*Myotis grisescens*), eastern small-footed bat (*Myotis leibii*), little brown bat (*Myotis lucifugus*), northern long-eared bat (*Myotis septentrionalis*), Indiana bat (*Myotis sodalis*), evening bat (*Nycticeius humeralis*), and tri-colored bat (*Perimyotis subflavus*) [McCracken et al. 2013]. Surveys conducted in 2008 in the vicinity of the proposed airport documented the presence of big brown bat, eastern red bat, evening bat, and tri-colored bat.

3.9.1.3 Aquatic resources

Aquatic habitats in the study area include surface waters and wetlands (Sects. 3.8.1 and 3.8.2). Surface waters and wetlands in the ORR contribute to biological diversity, with wetlands supporting about half the Reservation's rare plants. These aquatic features also support many fish, amphibian, and wading bird and waterfowl species, as well as invertebrates and plankton communities. Wildlife surveys have not been conducted specifically in the study area. However, the Mitchell Branch watershed, located near the Haul Road, contains a fish assemblage that is considered typical of streams with moderate impact, probably from industrial or urban discharges or poor habitat (Peterson et al. 2005). A variety of amphibian species were documented during the ED-3 and Haul Road surveys, and a similar species assemblage likely occurs in the wetlands of the study area.

Baranski (2011) assessed 15 Aquatic Natural Areas and Aquatic Reference Areas (ARAs) in the ORR. A composite ranking was provided for each area according to various criteria such as size, the number of protected taxa present, overall biodiversity, and others. A reference area known as ARA1 occurs within the study area, coinciding with the wetland adjacent to Haul Road (Fig. 3.10). ARA1 is a small stream with reportedly high benthic invertebrate diversity but low fish diversity. This area was rated as a Priority 3 area (lowest priority group), having the lowest score among the 15 sites.

3.9.1.4 Threatened and endangered species

The Endangered Species Act of 1973 (ESA) prohibits the unauthorized take of threatened or endangered species, where "take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct. An endangered species is defined as any species in danger of extinction throughout all or a significant portion of its range, while a threatened species is defined as any species likely to become an endangered species in the foreseeable future. Threatened and endangered (T&E) species, and species in need of management, are protected at the state level by the Tennessee Nongame and Endangered or Threatened Wildlife Species Conservation Act of 1974 and/or the Rare Plant Protection and Conservation Act of 1985. The Bald and Golden Eagle Protection Act prohibits, without a permit issued by the FWS, the taking of bald eagles (*Haliaeetus leucocephalus*) or golden eagles (*Aquila chrysaetos*).

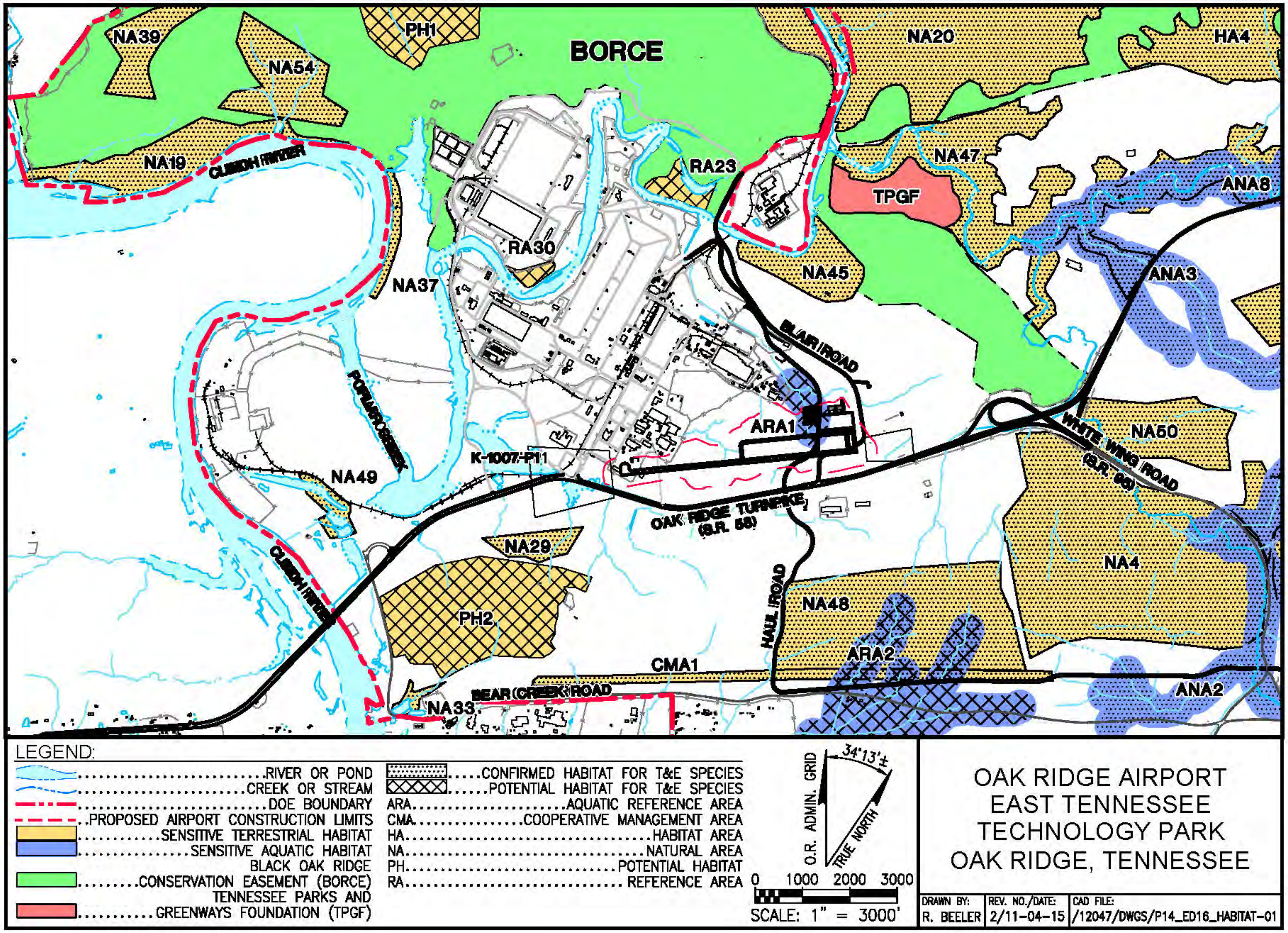

Fig. 3.10. Natural areas and sensitive terrestrial and aquatic habitats in the ETTP area.

The known or potential occurrence of T&E species has been documented as part of the Parcel ED-3 and Haul Road assessments. These areas are either located near, or partly coincide with, the present study area. In addition to species identified in these assessments, nesting bald eagles have been observed in the vicinity of the ETTP area. Species with federal and/or state protection, and with known or potential occurrence on or within about 1 mile of the location for the proposed airport, are shown in Table 3.17.

Table 3.17. Protected species occurring or potentially occurring near the proposed airport area

Common name	Scientific name	Federal status	State status
	Wildlife		
Gray Bat	*Myotis grisescen*	E	E
Indiana Bat	*Myotis sodalis*	E	E
Northern long-eared bat	*Myotis septentrionalis*	T	T
Woodland Jumping Mouse	*Napaeozapus insignis*	-	D
Southeastern Shrew	*Sorex longirostris*	-	D
Meadow Jumping Mouse	*Zapus hudsonius*	-	D
Bald Eagle	*Haliaeetus leucocephalus*	BGEPA	D
Northern Pine Snake	*Pituophis melanoleucas melanoleucas*	-	T
Tennessee Dace	*Phoxinus tennesseensis*	-	D
Four-toed Salamander	*Hemidactylium*	-	D
Valley Flame Crayfish	*Cambarus deweesae*	-	E
	Plants		
Spreading False-Foxglove	*Aureolaria patula*	-	S
Pink Lady's Slipper	*Cypripedium acaule*	-	E
Canada Lily	*Lilium canadense*	-	T
Tubercled Rein-Orchid	*Platanthera flava var. herbiola*	-	T
Nuttall's Waterweed	*Elodea nuttallii*	-	S
Small-headed Rush	*Juncus brachycephalus*	-	S
Fen Orchid	*Liparis loeselii*	-	T
Shining Ladies'-tresses	*Spiranthes lucida*	-	T
American Ginseng	*Panax quinquefolius*	-	S-CE

BGEPA = Bald and Golden Eagle protection Act; D = Deemed in Need of Management; E = Endangered; S = Special Concern; S-CE = Special Concern – Commercially Exploited; T = Threatened.

The northern section of the proposed airport construction limits extends into forested uplands characterized by numerous mature white oak trees and dead standing snags, which can serve as roosting habitat for Indiana and Northern long-eared bats.

3.9.2 Environmental Consequences

The potential impacts to ecological resources from the proposed action include habitat removal and alteration, noise and other disturbance, and aircraft-wildlife strikes. The potential for impacts due to noise, other disturbance, and wildlife-aircraft strikes would be the same for the proposed action and all road options. Therefore, these impact categories are discussed only under the proposed action.

3.9.2.1 Proposed action

Habitat Removal and Alteration

The airport construction area consists of approximately 132 acres of land, including a combination of forest, riparian, shrub, and grassy areas. This combination of features likely results in attractive habitat for numerous wildlife species. The existing vegetative habitats, particularly the forest areas, provide shelter, food, resting, and reproductive opportunities. Much of the construction area would be cleared of existing vegetation in order to place the runway and associated buildings, access roads, and other structures. Remaining vegetation would consist mostly of maintained grasses. Removal of forest and other vertical habitat types would eliminate or degrade ecological functions in the affected area, and the resulting environment would likely support only wildlife species similar to those occurring in the existing developed portions of the study area. Landscaped/developed areas likely have limited value to wildlife species other than those typically associated with urban environments (e.g., rodents, rabbits, and bird species that are tolerant of human presence). Forest removal would also contribute to some degree of habitat fragmentation. However, the specific area to be cleared is located mostly within and adjacent to the developed ETTP area with ongoing human presence and activity. This location likely diminishes the value of the site for many wildlife species. Forest fragmentation would be minimal within the context of the surrounding region. In addition, the 132-acre construction footprint area represents only about 0.4% of the 33,516-acre ORR.

Adverse impacts to sensitive migratory birds would be minimal because much of the area to be disturbed does not consist of suitable habitat especially for those migratory species that require relatively undisturbed interior forest. Impacts would also be minimized because DOE has designated large, non-development areas near the proposed airport location that contain higher quality habitat including relatively unfragmented native forest. These areas include the Blackoak Ridge and McKinney Ridge areas that are within the Black Oak Ridge Conservation Easement, much of Pine Ridge, and large areas of land adjacent to the Clinch River near SR 58.

No federal- or state-listed species are known to occur within the construction footprint, although there is potential for occurrence of some species (Table 3.17). The Indiana bat, gray bat, and Northern long-eared bat have potential for occurrence throughout most of the ORR, including the present study area. The gray bat has been documented in the vicinity in recent years. Since there are no caves in the project area, there should be no impacts to gray bats. Forest and other vegetation removal could displace Indiana and Northern long-eared bats from the impacted area, but because of the availability of adjacent suitable habitat, the species would not be adversely affected on the ORR. The Indiana bat was identified from a mist net sample on Freels Bend in 2013 and there is acoustic evidence of Indiana bat presence at other locations on the ORR (McCracken et al. 2013). However, in order to avoid disturbance of roosting Indiana and Northern long-eared bats, it is recommended that acoustic monitoring be conducted according to FWS guidance, the construction zone should be surveyed for the presence of potential roost trees, and tree removal would not occur between March 31 and November 15 to the extent practical. Preferred habitat for the pine snake is not abundant in the study area, and there have been no recent documented sightings of the species near the study area. There is potential for Canada lily in NA29, but this area is not within the construction footprint. The assessment of Parcel ED-3 conducted by MRW Environmental LLC (2009) listed the tubercled rein-orchid as having been documented within a mile radius of the parcel. Potential habitat may be present in some portions of the study area for these species, but the site is not likely an important area overall.

In addition to vegetation removal, the topography of portions of the construction area would be modified to allow placement of the runway and related facilities and structures. Ground-leveling activities would include the filling or modification of streams and wetlands within the construction footprint. Discussion of consultation with the U.S. Army Corps of Engineers and associated permits, if required, is provided in Sect. 3.8.1, *Water Resources*. A number of reptile, amphibian, and fish species have been documented near the study area and would be expected in the wetland habitat near the Haul Road. Wading birds likely use this area as well, and there is potential for the occurrence of tubercled rein-orchid. Airport placement would result in loss of most of the habitat functions of this wetland area, along with mortality or displacement of associated species. Although wildlife and plant species would be affected, it is not expected that the loss or degradation of wetland habitat in the study area would adversely affect overall populations in the region.

Invasive plants likely are present in the study area. Ground disturbance due to construction activities could provide opportunities for exotic species to become established or to expand existing populations. Under such scenarios, biodiversity could be decreased. Therefore, it is recommended that all disturbed areas should be planted with native vegetation after construction is complete. In addition, native species should be incorporated if vegetation is used for short-term erosion control during construction.

Noise and Other Disturbance

Establishment of the airport would result in the presence of relatively low-flying aircraft in the study area. Wildlife in the vicinity of the airfield could potentially be harassed or disturbed by noise or by visual perception of the aircraft. Wildlife species near the proposed airport would likely exhibit some behavioral reactions to the presence and noise of aircraft, which could include startle response, fleeing, or interruption of activities. Long-term displacement from, or decreased use of, affected forest habitat near the runway is possible. However, the amount of quality habitat affected is small, and large areas of similar habitat occur nearby. The number of individual animals impacted would likely be low compared to overall population numbers. Significant effects, such as hearing damage or decreased reproductive success, are unlikely for any species. It is likely that some individuals would habituate to aircraft noise and visual perception over time. Long-term, population-level reactions or major behavior modifications are not expected.

There currently are no generally accepted scientific or regulatory impact thresholds or quantitative significance criteria with which to evaluate terrestrial wildlife disturbance. Literature reviews providing a synthesis of various studies related to aircraft noise and visual disturbance are provided in Manci et al. (1988), Efroymson et al. (2000), and NoiseQuest (2015).

The bald eagle nesting site on Duct Island is located about 0.8 mile from the south end of the proposed runway. It is assumed that aircraft approaching from the west would be aligned with the runway when passing the nest site. For departures, the distance from the runway at which aircraft would begin to turn is unknown. It is assumed that departing aircraft would, on average, continue in a straight-line path until passing the site. In these cases, the horizontal distance from aircraft to nest would be about 0.2 mile. Based on the studies summarized above, bald eagles could show mild behavioral reactions when seeing aircraft but would probably habituate to the stimulus over time. It is unlikely that overall reproductive success would be decreased.

Wildlife-Aircraft Strikes

Airport operation would result in the potential for collisions between aircraft and birds, bats, and other wildlife. Bird-aircraft strikes would be of primary concern due to the presence of migratory and other protected species, and the greater likelihood of bird strikes compared to other wildlife. According to information from the National Wildlife Strike Database, about 97% of aircraft-wildlife strikes involve birds (FAA and USDA 2014).

Based on the number of birds and other wildlife species documented on the ORR, there is potential for some individuals to be killed or injured by aircraft collisions. It is possible that migratory and other protected bird species, bats, and mammals could be impacted. However, based on the number of annual operations, it is not expected that the risk would be substantial. Although quantification of strike potential and the number of animals affected in a specific area may be difficult, average strike data presented in

Sect. 3.4.2.1 suggest a wildlife strike would occur once every 2.9 years, with a damaging strike occurring once every 10.1 years. Although development and implementation of a wildlife hazard management plan would not guarantee the absence of wildlife-aircraft strikes, it is expected that such a plan would reduce the number of strikes and, combined with other wildlife protection measures, would decrease the magnitude of adverse effects.

Management Practices

Implementation of the following management practices would decrease the potential for adverse impacts to ecological resources:

- To avoid potential disturbance of roosting Indiana and Northern long-eared bats, it is recommended that acoustic monitoring be conducted according to FWS guidance, the construction zone should be surveyed for the presence of potential roost trees, and tree removal should not occur between March 31 and November 15 to the extent practical.

- Incorporate stormwater flow and treatment planning in site design so that wetlands and other surface waters are not impacted.

- All disturbed areas should be planted with native vegetation after construction is complete.

- Native species should be used if vegetation is incorporated in short-term erosion control during construction.

Implement all requirements identified by the FWS during ESA consultation.

3.9.2.2 No action

Under the no action alternative, the airport would not be constructed and there would be no associated land clearing, topography alteration, increased noise or other disturbances, or increased aircraft-wildlife strikes. Habitats would be unaffected and there would be no behavioral or physiological effects to wildlife, including managed species.

3.10 CULTURAL RESOURCES

Cultural resources consist of prehistoric and historic districts, sites, structures, artifacts, objects, and any other physical evidence of human activity considered important to a culture or community for scientific, traditional, religious, or other reasons. They include archaeological resources (both prehistoric and historic), historic architectural resources, and American Indian sacred sites and Traditional Cultural Properties. Historic properties (as defined in 36 *CFR* 60.4) are considered for potential adverse impacts from an action. Historic properties are significant archaeological, architectural, or traditional resources that are either eligible for listing or listed in the National Historic Preservation Act of 1966 (NHPA), as amended. The DOE is required to consider the effects of its undertakings on historic properties listed or eligible for listing in the National Register.

NHPA obligations for a federal agency are independent from the NEPA process and must be complied with even when environmental documentation is not required. When both are required, the agency coordinates NEPA compliance with their NHPA responsibilities to ensure that historic properties, as defined under 36 *CFR* 800.16(l)(1), are given adequate consideration. As allowed by 36 *CFR* 800.8(a), the DOE has chosen to incorporate NHPA Section 106 review into the NEPA process, rather than substituting the NEPA process for a separate NHPA Section 106 review of alternatives (36 *CFR* 800.8[c]).

The DOE Oak Ridge Office (ORO) Cultural Resources Management Plan [CRMP] (DOE 2001) addresses DOE-ORO compliance with cultural resource statutes, ensures that cultural resources are addressed early in the planning process of undertakings, and ensures needed protection is provided or the appropriate documentation is prepared before an undertaking is initiated.

3.10.1 Existing Conditions

The Area of Potential Effects (APE) for this project consists of 170 acres of property (Fig. 2.1) including Parcel ED-13, Parcel ED-16, a portion of Parcel ED-3, and Victorius Boulevard. Additional property would be obtained to accommodate the airport construction footprint including Bldg. K-1330, Bldg. K-1580, portions of Parcel ED-4, and Parcel ED-8. Options for rerouting Haul Road and Blair Road to accommodate the proposed airport layout could also impact additional DOE property (see Sect. 2.1.4).

There are multiple agreement documents currently in place for the ORO. A site-wide programmatic agreement among the DOE ORO, National Nuclear Security Administration, Tennessee State Historic Preservation Officer (TN SHPO), and Advisory Council on Historic Preservation (ACHP) concerning management of historic properties at the Y-12 Complex was signed on August 25, 2003. A site-wide programmatic agreement among the DOE ORO, TN SHPO, and ACHP concerning management of historic properties at the Oak Ridge National Laboratory (ORNL) was signed on February, 23, 2005. A Memorandum of Agreement (MOA) for Bldgs. K-25 and K-27 was signed in 2003. In 2005, the DOE, TN SHPO, and ACHP entered into an MOA regarding the K-25 Building. After it was determined that prohibitive costs and safety considerations would not allow for fulfillment of three stipulations, additional options for mitigation measures were reviewed. A bridge MOA was issued in June 2010 to address outstanding Section 106 actions. A final MOA for the interpretation of historical properties at ETTP was signed in 2012 by the ORO, TN SHPO, ACHP, city of Oak Ridge, and the East Tennessee Preservation Alliance (DOE 2011; DOE 2014). Stipulations in this MOA for the “K-25 Preservation Footprint” include the design and siting of an “Equipment Building” for the display of authentic process gas equipment; design and siting of a “Viewing Tower” for site observation of the K-25 building footprint; and a “K-25 History Center” to be located on the second level of the Fire Station at ETTP (K-1652). The approximate location of these facilities along with other areas of cultural interest in the vicinity of the proposed Oak Ridge airport are shown on Fig. 3.11.

An architectural and archaeological survey of the K-25 Site and surrounding areas was conducted in 1994 (Morris 1998). No known prehistoric sites were recorded within the ETTP fence line, which also includes Parcel ED-4, Parcel ED-8, and Victorius Boulevard. This investigation postulated that due to the extensive grading and fill activities that occurred during the construction of the facility, the presence of intact subsurface features is unlikely. The survey area also covered the Parcel ED-13 and Parcel ED-16 areas.

On November 10, 2015, the U.S. Department of Interior and DOE signed an MOA to establish the Manhattan Project National Historical Park at Los Alamos, New Mexico; Hanford, Washington; and Oak Ridge, Tennessee. One of the three featured properties for Oak Ridge includes the K-25 Building site. The Oak Ridge historic districts and historic sites that could be part of the National Historical Park include the Oak Ridge Historic District, ORNL Historic District (including the X-10 Graphite Reactor

National Historic Landmark), Y-12 Historic District (including the Y-12 Beta-3 Racetracks), and the former K-25 Gaseous Diffusion Process Building.

The main portion of Parcel ED-3 was the former location of “Happy Valley,” a temporary worker housing area established in 1943. This camp housed workers who supported the construction of the K-25 ORGDP. The *Phase I Archaeological Survey of Parcel ED-3 and Historic Assessment of the Happy Valley Worker Camp, Roane County, Tennessee* (New South Associates 2008) was conducted to determine what remained from the original Happy Valley settlement, to note if other sites were present and to evaluate the NRHP eligibility of these resources. This survey and two subsequent studies recorded evidence of the settlement throughout the survey area. In total, 21 artifact concentrations, 13 isolated finds, and 98 surface features were identified during these studies. Because the Happy Valley settlement is strongly associated with the Manhattan Project, and due to the presence of intact archaeological deposits (40RE233 and 40RE577), the site was recommended eligible for the NRHP (New South Associates 2011).

The Wheat Community overlaps the eastern portion of the proposed construction limits for the airport (Fig. 3.11). Wheat was a 19th to 20th century community, with schools, residential and commercial structures, several churches, and a post office. In 1942, all these properties were purchased by the federal government as part of the Manhattan Project (DOE 2011). Of all the structures that once comprised the Wheat Community, only the George Jones Memorial Baptist Church and nearby cemetery still remain and are listed in the NRHP. The Jacobs EM Team (Morris 1998) included several previously surveyed Wheat structures in Site 40RE224, which they considered to be an archaeological district. Although 40RE2224 is an official State of Tennessee Archeological Site, it has never been officially nominated for listing as an official historic district in the NRHP.

The *Phase I Archaeological Survey of Portions of Site 40RE224, The Wheat Community, Roane County, Tennessee* (CRA 2014) attempted to locate six structural locations investigated prior to 2001. The report also contains information on previous investigations of the Wheat Community. Of the six locations, only the George Arnold Property (site 711B) was determined to have intact cultural deposits, and as a result of the findings, a Phase II investigation was recommended to determine National Register eligibility. In addition, the Roane College Site appears to have intact subsurface deposits and, based on pedestrian surveys, is considered potentially eligible for the NRHP. Additional survey is recommended at this site. In addition to 711B and the Roane College site, four other Wheat properties are considered to be contributing properties to the potentially NRHP-eligible Wheat Community Historic District. These include 723A (McKinney Property), 723B (McKinney Store), 730A (Wheat School), and 730B (Wheat School dormitory).

Three cemeteries are located nearby but outside of the proposed airport construction limits. The Wheat Community African Burial Ground (40RE219) is located near SR 58, the George Jones Memorial Cemetery is located to the east of the proposed construction within the Wheat Community Historic District, and a cemetery associated with the Crawford Cumberland Presbyterian Church is located further to the east near the interchange of SR 58 and SR 95 (DOE 2014; New South Associates 2011). All cemeteries on the ORR remain under the control of DOE.

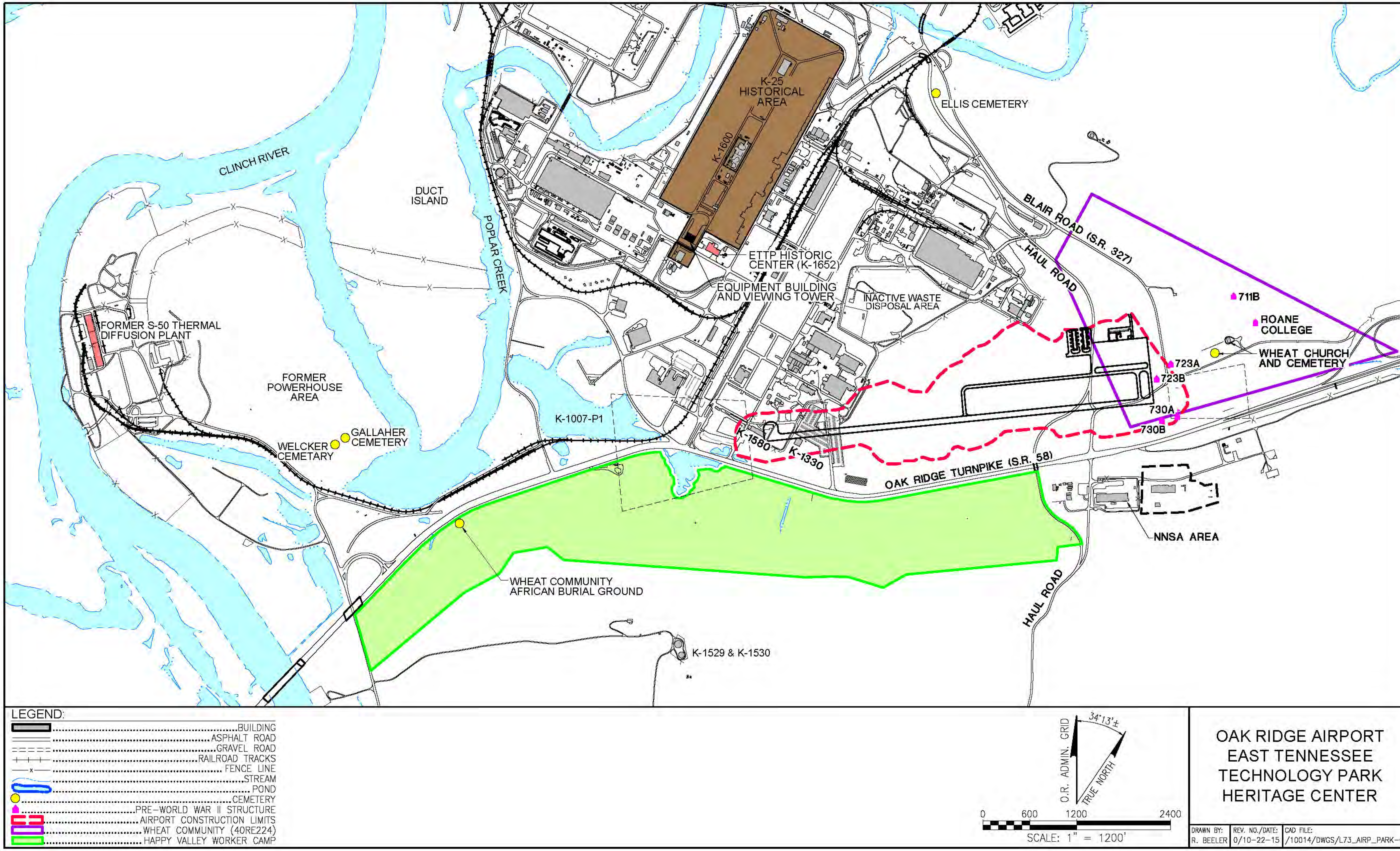

Fig. 3.11. Cultural resources in the vicinity of the proposed Oak Ridge airport.

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3.10.2 Environmental Consequences

This section discusses potential impacts to cultural resources, including any historic and prehistoric resources located within and adjacent to the proposed project area. Impacts to cultural resources can occur by physically altering, damaging, or destroying a resource or by altering characteristics of the surrounding environment that contribute to the resource's significance. Resources can also be impacted by neglecting the resource to the extent that it deteriorates or is destroyed. Adverse effects occur when these activities intersect with identified NRHP-eligible resources within the APE.

3.10.2.1 Proposed action

As this action is considered an undertaking, airport construction and potential road reroute options have the potential to adversely affect cultural resources located in the project vicinity. Other than the Wheat Community (40RE224), no other prehistoric or historic archaeological resources would be affected by the proposed action. Construction of the proposed airport would also not have any direct impacts on the proposed K-25 building footprint facilities stipulated as part of the final MOA or have an adverse impact on the creation of the Manhattan Project National Historic Park. This would also include no adverse impacts from noise and air emissions associated with the airport.

Site 723B is located within the proposed airport construction limits but three of the Wheat Community resources (723A, 730A, and 730B) are on the periphery of the area that could be disturbed for construction of the airport (Fig. 3.11). Because the final airport runway alignment and construction footprint is not finalized, it is uncertain as to whether these three resources would be impacted by the construction of the airport or realignment of Blair Road and the Haul Road. The George Jones Memorial Baptist Church and Cemetery, Site 711B, and the Roane College site are not within the construction footprint and the proposed airport would not have any adverse effects on those sites.

Once the Master Plan being developed by the MKAA is finalized, they and the FAA would determine which resources would be impacted. Additional Section 106 consultation with the TN SHPO would be initiated by the MKAA to determine if there would be adverse effects and if any mitigation would be required.

Copies of correspondence between the DOE, TN SHPO, and other consulting and interested parties are included in Appendix A.

As with previous ORR projects (DOE 2011), deed restrictions may be required if an unanticipated discovery of cultural resources is made during any development activities; all ground-disturbing activities in the vicinity of the discovery would be halted immediately. The MKAA would be responsible for contacting the DOE ORO Cultural Resources Management Coordinator and the TN SHPO, prior to any further disturbance of the area.

3.10.2.2 No action

Under the no action alternative, there would be no adverse effects to cultural resources.

3.11 INFRASTRUCTURE

3.11.1 Existing Conditions

3.11.1.1 Utilities

The majority of the developed area of the Heritage Center (ETTP) has available utilities or existing utility infrastructure is located in the nearby vicinity. The transfer of utilities, roadways, and parking areas at the Heritage Center has allowed CROET and the city of Oak Ridge to invest in the modernization of deteriorating infrastructure that was being run to failure. In 1998, DOE leased the site utility system to CROET for the eventual transfer to the city.

Electricity and Natural Gas

The TVA generates electric power for the region. TVA presently transmits power directly to the ETTP, but most residences and businesses receive their power through distribution companies that purchase wholesale power from TVA. The city of Oak Ridge operates its own electric utility, providing electricity to about 15,000 metered customers. The electrical lines that run through Parcel ED-3 are owned by the city of Oak Ridge. Peak system demand in the city is approximately 120 megavolt-amperes (MVA), while the system’s base capacity is just over 200 MVA.

Natural gas is distributed to houses and other buildings in the region by a number of different companies, including Empiregas, Inc., of Clinton; Harriman Utility Board; Oak Ridge Utility District; and the Powell–Clinch Utility District. East Tennessee Natural Gas Company is the major pipeline transmission system for the area. The Oak Ridge Utility District has a right-of-easement with DOE for a 6-in. natural gas pipeline from the K-720-A Gas Metering Station on the East Tennessee Natural Gas Company’s transmission line (east of Flannagan’s Loop Road) that parallels the south side of SR 58, within Parcel ED-3, and then runs underneath the Clinch River.

Potable Water

Water supply for the Oak Ridge area is obtained from the Clinch River. DOE transferred ownership of its water treatment plant to the city of Oak Ridge effective May 1, 2000. This plant is located on Pine Ridge near the Y-12 Complex. The plant produces about 12 million gallons per day (MGD) and has the capacity to produce up to 28 MGD. Water for the Heritage Center is stored in two water storage tanks (K-1529 and K-1530) located on top of Pine Ridge.

Wastewater Treatment

Facilities for the treatment of domestic and industrial wastewater are available from the city of Oak Ridge. The wastewater system consists of one main 30.0 MGD wastewater treatment plant and one 0.6 MGD treatment plant that serves the Clinch River Industrial Park, ETTP, Horizon Center, and Rarity Ridge. Additionally, the system includes approximately 236 miles of collection system piping and 28 wastewater pumping stations.

3.11.1.2 Transportation

Major transportation routes to the ORR are via two interstate highways, I-40 and I-75, and U.S. highways 11, 25W, and 70. I-40 is located almost directly west of the ETTP. DOE has transferred some roads at the ETTP to the city of Oak Ridge to provide access to property that has already been transferred.

Motorists utilize four roadway segments within and near the proposed Oak Ridge airport study area:

- SR 95 (Oak Ridge Turnpike) from the SR 95/58 interchange to Wisconsin Avenue,
- SR 95 (White Wing Road) from the SR 95/58 interchange to Bear Creek Road,
- SR 327 (Blair Road) from SR 61 to SR 58, and
- SR 58 from Gallaher Road to the SR 95/58 interchange.

In 2013, the annual average daily traffic for roadways near the study site ranged from 3,115 (SR 327) to 10,373 (SR 58) vehicles a day, which is considered light compared to other roadways in Oak Ridge (TDOT 2015). The majority of the ETTP commuting traffic (88%) comes from the east on SR 95/SR 58, and the remaining 12% comes from the west on SR 58. Of the east side traffic, 62% comes from Oak Ridge, 8% comes from Blair Road, and 18% comes from south SR 95 (DOE 1997). SR 95 from the intersection with SR 62 (Illinois Avenue) to the SR 95/58 interchange has been recently widened to a four-lane divided highway.

The following roadways shown on Figs. 2.4 and 2.5 have the potential to be directly impacted by the proposed action:

Blair Road (SR 327) is a collector roadway with a section of the roadway located on DOE property. Under a bilateral agreement with the state, a permanent easement for this section is maintained by the TDOT. The roadway has a posted speed of 35 miles per hour (mph) and provides a connection from SR 61 to SR 58. The intersection of Blair Road and SR 58 is signalized.

Haul Road was built and owned by DOE for transportation of D&D waste to a special landfill at the Y-12 Complex; Haul Road is not a public access road.

Perimeter Road is a DOE-owned and maintained roadway that is not open to the general public. The roadway has a posted speed of 25 mph and provides a connection from Blair Road to SR 58. The intersections of Perimeter Road with Blair Road and SR 58 are stop controlled. Some of the features along this route include: areas with open pavement frontage, a section with steep terrain including sharp horizontal and vertical curves, multiple railroad crossings, a contaminated detention pond, and roadside obstacles such as gated fences, metal bollards, and utilities.

Heritage Center Boulevard is partially DOE owned and maintained, but a section of the roadway on the SR 58 end has been transferred to the city of Oak Ridge. This section is open to public access, but the section beyond the point of public access is access controlled and there is no through traffic for the general public. Heritage Center Boulevard has a posted speed that varies from 15 to 25 mph and provides a connection from Blair Road to SR 58. The intersections of Heritage Center Boulevard with Blair Road and SR 58 are stop controlled. Some of the features along this route include: multiple pedestrian crossings, railroad tracks, and roadside obstacles such as gates, fences, metal bollards, and a sewage lift station. The route also has posted unloading areas, open pavement without a clearly defined traveled way, and adjacent truck weigh scales for the Haul Road.

Victorius Boulevard is a DOE-owned roadway that provides access from SR 58 into the eastern portion of the ETTP. The road presently provides the primary ingress/egress for Bldgs. K-1330, K-1225, and the K-1220 area. Large parking areas are also located on both sides of Victorius Boulevard.

3.11.2 Environmental Consequences

3.11.2.1 Proposed action

Utilities

Under the proposed action, the Oak Ridge airport would connect to the existing utility systems that serve the Heritage Center and the surrounding area. Utility impacts would be expected to be minimal. Any existing utilities that may be within the airport construction limit or associated with the Haul Road and Blair Road options requiring new construction would need to be relocated. Existing overhead electrical lines located within the RPZs could also need to be buried or relocated if they were considered to be a safety hazard. Electrical and natural gas connections would occur via existing supply lines and water and sewer lines would be extended to buildings as needed. Excess service capacity exists at the city of Oak Ridge facilities and is large enough to accommodate the expected utility demand of the airport. Electricity would be purchased from the city of Oak Ridge, and natural gas would be purchased from the Oak Ridge Utility District. Telecommunication services could be provided from the fiber-optic system that serves the Heritage Center.

Transportation

The transport of materials and equipment associated with any construction activities to accomplish the development of the airport would be over regional and local roadways to the site. Additionally, the development would be phased over time, and no adverse impacts are expected. The additional amount of vehicle and truck traffic from operations associated with the airport would have a negligible effect on existing traffic since the affected roadways presently have sufficient design capacity. It should be noted that although commercial and industrial development for the Heritage Center area could potentially increase traffic over time, the volume of traffic is not expected to exceed historic traffic volumes that occurred between 1993 to 1996 during large employment periods at the site. A minor increase in the amount of traffic should also not substantially increase the chance of accidents occurring. Installing turn lanes, additional traffic signals, and frontage roads could mitigate these types of potential impacts, if necessary.

At this time it is not known which of the options for the Haul Road and Blair Road would be implemented (see Sect. 2.1.4). The timing of the continued need for the Haul Road and start date of the airport construction could require an interim detour (less than 6 months), short-term detour (longer than 6 months, less than 2 years), or long-term (longer than 2 years) detour of traffic from Blair Road. The greatest amount of new road construction would be associated with Haul Road Option 1/Blair Road Option 3 and Haul Road Option 2/Blair Road Option 4. Either of these option combinations would eliminate two sharp curves on existing Blair Road, but each would also require new intersections with SR 58, which may or may not need to be signalized. The use of Perimeter Road (Blair Road Option 1) would require some upgrades to meet minimum TDOT design standards. Blair Road Option 1 would require resurfacing the roadway, installation of guardrail, and compliant highway markings and signage. Use of Heritage Center Boulevard (Blair Road Option 2) would require substantial geometric and roadway upgrades before the route would meet minimum design standards. Upgrades to the pavement surface, drainage, highway markings, and signage would be necessary.

The closure of Victorius Boulevard to accommodate construction of the airport runway would have a negligible effect. Although it is presently the primary way to access Bldgs. K-1330, K-1225, and the K-1220 Complex, it is not the only ingress/egress into those areas. Heritage Center Boulevard would continue to provide a route from the southern portion of the Heritage Center and access from the northern portion of the site would also still be available.

3.11.2.2 No action

There would be no changes to utilities under the no action alternative beyond the utility easements and improvements that are taking place as part of ongoing and planned reindustrialization activities. There would be little change from the baseline level of vehicle trips or the potential for accidents involving vehicles. At the baseline level of activity, traffic volume is considered to be within the existing transportation infrastructure's capacity.

3.12 WASTE MANAGEMENT

This section discusses the affected resources of hazardous materials and solid/hazardous wastes as they relate to proposed action activities. Specifically, the presence or usage of hazardous materials and the generation of hazardous or solid waste are discussed.

Hazardous materials are chemicals defined as hazardous by CERCLA. In general, they comprise substances that, because of their quantity concentration, physical, or chemical characteristics, may present substantial danger to public health or the environment when released into the environment. They may include chemicals such as aircraft fuels, solvents, and paints. Hazardous wastes refer to substances considered hazardous by the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976 (RCRA), and are defined as any solid, liquid, contained gaseous, or semisolid waste, or any combination of wastes that either exhibit one or more of the hazardous characteristics of ignitability, corrosivity, toxicity, or reactivity, or are listed as hazardous under 40 *CFR* Part 261.

At the state level, TDEC has received authorization from EPA to regulate the RCRA hazardous waste program for the state. The regulations governing hazardous wastes are found under Tennessee Code Annotated (TCA) Sect. 0400-12-01, *Hazardous Waste Management Regulations*, and pertain to generation, transportation, storage, treatment, disposal, and management of these wastes.

The regulations for control of nonhazardous solid waste are also promulgated by TDEC and are found in TCA Chap. 0400-11-01, *Solid Waste Processing and Disposal*. They regulate all aspects of storage, collection, transportation, and disposal of solid waste, including the regulation of composting facilities.

Because of the age of the buildings scheduled to be demolished (i.e., Bldgs. K-1330 and K-1580 were constructed in 1990 and 1980, respectively), the affected resources also include the potential presence of asbestos in structures. Asbestos is a naturally occurring mineral that is a very effective heat and sound insulator. Consequently, it was used in many buildings as a fire and noise retardant. Asbestos has been linked to several diseases, including lung cancer, and has not been used in construction materials since the late 1980s or early 1990s. In Tennessee, the Bureau of Environmental Health Services Division of Air Pollution Control (APC) is responsible for asbestos management under Chap. 1200-3-11-2, *Asbestos*. Note: The use of lead-based paint (LBP) was banned in 1978 (before both buildings were constructed); consequently, it would not be expected that LBP would be present in substantial quantities.

The ROI for hazardous materials and solid/hazardous wastes encompasses all proposed airport areas where hazardous materials would be utilized and hazardous and/or solid wastes generated. Additionally, the ROI encompasses off-site areas (e.g., landfills) that may be impacted by wastes generated as part of the proposed action.

3.12.1 Existing Conditions

Hazardous Materials/Wastes

Hazardous materials in quantities above *de minimis* are currently not used or stored within the proposed action area. This area includes Bldgs. K-1330 and K-1580 (used as privately-owned space) and portions of Parcels ED-4 and ED-8, comprising mostly open space. Hazardous wastes are also not generated or stored within the area (DOE 2008b; DOE 2009).

Asbestos

An asbestos survey has not been conducted for Bldgs. K-1330 and K-1580. When present, asbestos is usually managed in-place and removed only when there is a threat to human health or the environment, or when it may be disturbed. A notification is required to be filed with the Tennessee APC at least 10 days prior to the removal of any asbestos-containing materials resulting from renovation or demolition. A notification is required where removed quantities exceed 260 linear feet or more on pipes, 160 ft^2 or more on other facility components, or 35 ft^3 or more off facility components where the length or area could not be measured previously. Notification to APC is also required for any demolition, even if there is no asbestos present.

Solid Wastes

Municipal solid wastes currently generated within the area include paper, miscellaneous refuse, and some food wastes from office-related activities. The nearest commercial landfill is the Chestnut Ridge Landfill and Recycling Center in Anderson County operated by Waste Management, Inc., of Tennessee. The landfill started operating in 1979 and encompasses 166 acres. Annually, approximately 400,000 tons of solid waste are disposed at the Chestnut Ridge Landfill. The landfill has a remaining life expectancy of at least 40 years. The following waste types are accepted at the landfill: asbestos, auto shredder fluff, bio-solids, construction and demolition (C&D) debris, industrial and special waste, municipal solid waste, and yard waste. The landfill does not accept hazardous or biohazardous wastes (Waste Management 2015).

3.12.2 Environmental Consequences

The analysis focused on how and to what degree the proposed action would affect hazardous materials usage/management and hazardous/solid waste generation and management. A significant impact would occur if implementation of the proposed action resulted in *one* of the following:

- Increased likelihood of an uncontrolled release of hazardous materials (e.g., from petroleum storage tanks) that could pose a risk to personnel or contaminate soil, water, or air.
- Generation of hazardous or solid waste types or quantities that could not be accommodated by the current management system or landfill.

3.12.2.1 Proposed action

3.12.2.1.1 *Hazardous Materials*

New buildings and other facilities/infrastructure would be constructed utilizing standard construction methods, which would limit, to the extent possible, the use of hazardous materials. The quantity of contractor hazardous materials is expected to be limited and would comprise products routinely used during construction, such as fuels, paints, adhesives, etc. These materials would be stored in proper containers, employing secondary containment as necessary, to prevent releases.

The proposed action includes construction of an aircraft maintenance hangar. Hazardous materials (e.g., lubricating oils, cleaners, and other chemicals) would be employed to support routine aircraft maintenance activities. These materials would be managed in accordance with permits or licenses issued to individual companies and would be stored in containers/locations designed to prevent or limit accidental spills. All spills and accidental discharges of hazardous materials would be reported and mitigated as required.

The proposed action would also include construction of a fuel farm operating two 10,000-gal aboveground tanks for AvGas and Jet A fuel. These tanks would be of double-walled construction (or would employ some other means of secondary containment) and would be equipped with appropriate overfill and spill protection devices. Additionally, spill response equipment, such as absorbent booms and pads, would be made readily available. These tanks may also be required to contain vapor control devices (per TDEC regulations), depending on the actual monthly throughput of gasoline.

Installation of these fuel tanks would necessitate the implementation of a comprehensive spill response program, including development of a Spill Prevention, Control, and Countermeasure Plan in accordance with 40 *CFR* Part 112. Elements of the response program would include application of standard practices (inspections, training, recordkeeping, etc.) designed to minimize the potential for a release, as well as methods, equipment, and procedures for responding to potential fuel spills or other incidents.

The proposed action may also require the removal of existing oil-containing electric transformers or the installation of new transformers at the project site. All work related to transformers would be coordinated through the city of Oak Ridge Electric Department, which owns and maintains the transformers.

Implementation of the above management requirements would minimize and/or mitigate any potential adverse impacts resulting from the storage or use of hazardous materials.

3.12.2.1.2 *Hazardous Wastes*

Construction activities associated with the proposed action are not expected to generate large quantities of hazardous wastes, although minimal waste generation may occur during construction (e.g., waste paint or off-specification fuel). Contractors would be required to have appropriate procedures in-place for storing and disposing of these wastes.

Hazardous wastes may also be generated as a result of aircraft maintenance activities once the airport becomes operational. Maintenance activities would be expected to generate waste petroleum, waste paint, used adhesives, waste solvents/cleaners, etc. It is not possible at this time to estimate the quantity of hazardous wastes that would be generated. No large-scale painting operations are proposed, so it is anticipated that most wastes would be associated with recyclable materials, such as used oil, used batteries, absorbents with oil, off-specification fuel, used hydraulic fluid, etc.

In the event that individual companies generate sufficient quantities to require reporting status, they would likely qualify as conditionally exempt, small-quantity generators (i.e., generating less than 100 kg of hazardous wastes per month). All hazardous wastes would be handled and stored according to applicable state and federal regulations. Wastes that cannot be recycled would be transported in a manner approved by the EPA and the U.S. Department of Transportation (DOT) to licensed off-site facilities for further treatment and/or disposal. It is also possible that some companies may stabilize, test, and treat these wastes on-site as part of their operations.

Implementation of the above management requirements would minimize and/or mitigate any potential adverse impacts resulting from the generation of hazardous wastes.

3.12.2.1.3 *Asbestos*

Buildings K-1330 and K-1580 were constructed in 1990 and 1980, respectively. Therefore, there is a minor potential for these buildings to contain asbestos. Asbestos (if any is found in surveys) would be abated prior to demolition. Disposal of asbestos wastes would be conducted in accordance with TDEC and National Emission Standards for Hazardous Air Pollutants requirements. TDEC would be notified prior to removal actions, and only Tennessee-licensed contractors would be allowed to perform the work. Contractor personnel would have to be trained and certified. Transport and disposal documentation records, including signed manifests, would also be required.

Implementation of these management requirements would mitigate any adverse impacts resulting from asbestos, and no asbestos would be employed in any new construction. Consequently, there would be beneficial impacts from the removal of existing asbestos if present.

3.12.2.1.4 *Solid Wastes*

Construction activities associated with the proposed action would result in the generation of solid wastes, including concrete and asphalt rubble and land-clearing debris. Table 3.18 presents estimated quantities of C&D debris associated with building construction/demolition activities of the proposed action.

Table 3.18. C&D debris from implementation of proposed action

Construction activity	Footprint (ft^2)	Total bldg. area (ft^2)	Conversion factor[a]	C&D debris (tons)
K-1330 (two-story) Demolition	7,000	14,000	158	1,106.0
K-1580 (three-story) Demolition	12,000	36,000	158	2,844.0
Airport Terminal Building Construction	3,000	3,000	4.34	6.5
Maintenance Hangar Construction	8,000	8,000	4.34	17.4
Maintenance Hangar Office Construction	2,000	2,000	4.34	4.3
T-Hangars (two buildings) Construction	-	0[b]	-	0
		Total C&D Debris (tons)		**3,978.2**

[a] Solid waste generation factors for non-residential building construction and demolition (i.e., pounds of solid waste generated per square footage of building) [Source: EPA 2003].

[b] The two T-Hangar buildings would be of pre-constructed steel and assembled on-site.

As the table shows, building construction/demolition activities would generate approximately 3,978 tons of debris. It is not anticipated that land clearing and grading activities would generate a need for disposal of soil or woody waste. This assumes that excavated soils would be used as fill during construction and woody wastes would be sent off for recycling by the wood or wood pulp industry or would be chipped and reused as mulch on-site. Therefore, these materials would not be expected to impact solid waste resources. Additional C&D debris generated from construction of the ramps, taxiways, parking areas, and runway, in the form of wood forms or concreted/asphalt rubble. These materials would also be sent off for recycling if possible.

Municipal solid waste would also be generated from aircraft operations. Waste from aircraft operations generally consist of paper waste. A general relationship between airport activity and solid waste generation is based on 0.6 lb of waste per aircraft operation (Cleveland Municipal Airport Authority 2007). Under the proposed action, projected annual operations (for all aircraft types) range between 4,632 operations in Year 1 to 7,674 operations in Year 5. Using Year 5 for estimating purposes (highest operational tempo), it is estimated that 4,604 lbs (2.3 tons) of annual waste would be generated.

As discussed previously, the Chestnut Ridge Landfill and Recycling Center in Anderson County receives approximately 400,000 tons of solid waste for disposal each year. Based on the estimated quantity of solid waste associated with the proposed action, no adverse impacts are expected as sufficient landfill capacity exists to accommodate the additional solid waste generated from construction, demolition, and operational and activities.

3.12.2.2 No action

Under the no action alternative, there would be no waste management impacts beyond those associated with ongoing DOE and contractor activities.

3.13 INTENTIONAL DESTRUCTIVE ACTS

DOE is required to consider intentional destructive acts, such as sabotage and terrorism, in each EIS or EA that it prepares. As at any location, the possibility exists for random acts of violence and vandalism. The risk of terrorist acts at the proposed airport is minimized by the presence of security force personnel located immediately adjacent at the ETTP. Operations at the Oak Ridge Airport would not change the current airspace restrictions over the Y-12 Complex. Additionally, the airport’s presence would not materially affect the current ability to use an airplane to conduct an intentionally destructive act at DOE facilities in Oak Ridge. DOE has engaged in discussion of this issue with the National Nuclear Security Administration, which has raised no objection to the proposed Oak Ridge Airport. It is also anticipated that security measures (e.g., gates and fences) typical of small industrial parks and other commercial developments would be implemented and serve as an impediment to assault by trucks or other vehicles. No act of sabotage or terrorism has occurred on DOE property at the ETTP during some two decades of cleanup activity.

3.14 ADDITONAL RESOURCE AREAS

FAA Orders 1050.1E and 5050.4B include the FAA NEPA requirements for the preparation of an EA including resource categories to be addressed. Some of the resource categories required by the FAA are not specifically required by the DOE Implementing Procedures (10 *CFR* 1021) unless they are applicable. These include: coastal barriers, coastal zone, DOT Act Section 4(f), light emissions, energy supply, and wild and scenic rivers. DOE has addressed these resource categories as they relate to the proposed action to transfer DOE property to the MKAA for the purpose of constructing and operating a general aviation airport.

Coastal Barriers and Coastal Zone

These resources are not present in the area potentially affected by the proposed action and no action alternative.

Section 4(f)

Section 4(f) resources include publicly owned parks, recreational areas, wildlife and waterfowl refuges, or public and private historical sites. The proposed Oak Ridge airport directly avoids any Section 4(f) properties and would not eliminate or severely degrade the intended use of any Section 4(f) resource including the K-25 Building site, which is part of the Manhattan Project National Historical Park to be established. The MKAA has worked closely with the DOE to ensure that the proposed airport would complement development plans for the National Park and, when complete, the airport could help provide access for visitors to the included Oak Ridge properties.

Light Emissions

The proposed Oak Ridge airport would reside in the ETTP Heritage Center, which is zoned by the city of Oak Ridge for industrial use. Light emissions from the proposed airport would provide only a marginal increase to the existing light emissions from the other industrial and commercial tenants at the park and would not create annoyance to interfere with normal activities in the surrounding area.

Energy Supply

During the Manhattan Project, the K-25 Gaseous Diffusion Plant was the largest single user of electric power in the TVA's five-state region. The existing utility infrastructure at the ETTP Heritage Center is adequate to meet the energy needs of the proposed airport along with other users. Adequate supplies of aviation fuel are also available to meet the any demand from the airport.

Wild and Scenic Rivers

No wild and scenic rivers are located in the immediate vicinity of the proposed airport and none would be adversely impacted from airport operations. The closest wild and scenic river is the Obed, which is located over 20 miles to the northwest from the proposed airport.

3.15 SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Table 3.19 provides a comparative summary of the potential environmental consequences (impacts) that could result from implementing the proposed action or alternatives.

Table 3.19. Summary of impacts by resource

Environmental impact	Proposed action	No action alternative
Airspace	The proposed airport and its anticipated level of operations would enhance aviation capabilities in this region while having little effect on the overall manner in which this airspace environment is structured and managed by the FAA for its various uses.	There would be no effect on the current airspace surrounding the Oak Ridge area.
Air Quality	Based on air emissions modeling and analysis, there would not be a substantial increase in air emissions and no adverse impacts would occur. Temporary particulate emissions during airport and road construction activities would be the greatest contributor. Greenhouse gas emissions are estimated to be approximately 22,400 tons/year, and thus potential impacts on climate change associated with the proposed action would be minimal. If required, the appropriate air permits would be obtained.	There would be no additional impacts to air quality beyond the scope of normal conditions and influences within the region of influence.
Noise	Construction noise would generate localized temporary increases in noise levels at and near the construction. The noise would be generated in an industrial area and should not exceed any thresholds that could result in adverse impacts. Aircraft noise levels would remain below 65 dB DNL at all noise-sensitive locations. At the Wheat Church, noise levels would increase by a noticeable amount (7 dB). However, the church is only used on one day of each year. Furthermore, the noise level at the church would only increase to 55 dB DNL, the EPA threshold below which no impacts to human health and welfare are likely to occur.	Noise levels would remain the same as they are under existing conditions. No noise impacts would occur beyond those associated with ongoing development and remedial action taking place at the ETTP/Heritage Center.
Safety	Based on statistical analysis and the estimated number of aircraft operations, there could be a non-fatal aircraft accident occurring once every 5 months, with a fatal accident occurring once every 2 years. It is calculated that a wildlife strike could occur approximately once every 2.9 years, with a damaging strike occurring once every 10.1 years. These statistical calculations are based on projected airport usage rates and national accident averages and are not intended to represent a predicted outcome. Although implementation of proposed procedures related to safety, accident response, and wildlife-aircraft strikes would not guarantee the absence of safety hazards, it is expected that they would reduce the number and severity of impacts.	There would be no occupational health and safety hazards beyond those associated with ongoing DOE and contractor activities at the ETTP/Heritage Center.

Table 3.19. Summary of impacts by resource (cont.)

Environmental impact	Proposed action	No action alternative
Land Use	The existing land use and visual character of the area would change from a mix of industrial use and open space with the development of the airport and associated roads. Access to the Wheat church and Wheat Trail Greenway would be maintained.	There would be no changes to the existing land use or visual resources beyond those associated with the ongoing and planned reindustrialization activities and remedial actions at the ETTP/Heritage Center.
Socioeconomics	Minor positive employment and income impacts are possible. There would be no impact on population. Positive fiscal impacts include revenue from property and sales taxes. Payment-in-lieu-of-tax on land transferred to the MKAA would not be continued. No disproportionate adverse health or environmental impacts would occur to any low-income or minority population.	No change in employment, income, population, or local government revenues is anticipated beyond that which is generated through current and planned reindustrialization activities and remedial actions.
Geology and Soils	Adverse impacts on site geology are not expected. Geotechnical studies would be conducted if required. Affected soils are generally stable and acceptable for standard construction requirements. Karst areas should be avoided if practicable. Erosion prevention and sedimentation control measures would be implemented to minimize the potential for soil erosion.	No impacts on geology and soils would occur, and existing site conditions would continue unless other development opportunities occurred.
Water Resources	Construction activities for the airport would directly and indirectly impact five streams and approximately 6 acres of wetlands. Three streams and approximately 1.41 acres of wetlands could be impacted depending on which road option is selected and the final road alignment. Groundwater use would be prohibited. Erosion and sedimentation controls would limit potential impacts on surface waters adjacent to the airport. Applicable federal, state, and local laws and regulations would apply to any activities that would directly or indirectly impact water resources.	Ongoing and planned reindustrialization and cleanup activities would continue at the ETTP/Heritage Center. Potential impacts to groundwater and surface waters including wetlands are addressed under approved NEPA decisions and other applicable regulatory documents.
Ecological Resources	Vegetation and habitats in affected areas would be permanently changed to an urban/industrial cover type. Some wildlife would be destroyed and displaced from the airport development. No state or federally listed threatened and endangered species have been identified as occurring in the project area. The potential for wildlife-aircraft strikes could be minimized with the implementation of a wildlife hazard management plan.	Vegetation and wildlife would not be impacted unless other development activities were to occur and no wildlife-aircraft strikes would occur.

Table 3.19. Summary of impacts by resource (cont.)

Environmental impact	Proposed action	No action alternative
Cultural Resources	No cemeteries or known prehistoric sites would be affected. No historic properties eligible or potentially eligible for listing in the National Register of Historic Places (NRHP) would be affected. Four sites considered to be contributing properties to the potentially NRHP-eligible Wheat Community Historic District could be adversely affected from airport construction. No direct impacts on the proposed K-25 building footprint facilities stipulated as part of the final MOA or adverse impact on the creation of the Manhattan Project National Historic Park.	There would be no adverse effects to cultural resources.
Infrastructure	Existing utilities have adequate capacity to support the proposed airport, but minor upgrades and modifications would be needed and some existing utilities may need to be relocated. The existing Haul Road and Blair Road would be impacted, but re-route options could improve existing conditions on the affected roadways.	There would be no impacts on existing utilities beyond those associated with ongoing and planned activities at the ETTP/Heritage Center. Traffic would likely continue to remain close to current levels, and no impacts are anticipated.
Waste Management	Solid non-hazardous waste would be recycled or transported to an appropriate off-site licensed landfill for disposal. Minor quantities of hazardous waste may be generated from airport operations. These wastes would be transported to existing licensed and/or permitted treatment, storage, and disposal facilities.	Ongoing waste management activities would continue unchanged.
Intentional Destructive Acts	The likelihood of sabotage and terrorism is extremely low. However, it is possible but highly unlikely that random acts of vandalism could occur. A variety of measures to control access and maintain security would be used.	Ongoing security measures and property access controls in the area would continue.
Cumulative Impacts	The cumulative contribution of impacts that the proposed action would make on the various environmental resources is expected to be minor.	No additional cumulative impacts would occur.

dB = decibel.
DNL = day-night average sound level.
DOE = U.S. Department of Energy
EPA = U.S. Environmental Protection Agency.
ETTP = East Tennessee Technology Park.
FAA = Federal Aviation Administration.
MKAA = Metropolitan Knoxville Airport Authority.
NEPA = National Environmental Policy Act of 1969.

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4. CUMULATIVE IMPACTS

Cumulative impacts are those that may result from the incremental impacts of an action considered additively with the impacts of other past, present, and reasonably foreseeable future actions. Cumulative impacts are considered regardless of the agency or person undertaking the other actions (40 *CFR* 1508.7) and can result from the combined or synergistic effects of individually minor actions over a period of time.

4.1 CUMULATIVE IMPACTS BY RESOURCE AREA

Airspace

There are no other planned or known aviation projects for this region where the proposed action may contribute to any cumulative impacts on airspace uses. In any event, the FAA reviews all such actions to determine the potential for any such impacts and what mitigation measures may be needed to ensure the overall safety and operational efficiency of all airspace uses within an affected region.

Air Quality

Air quality impacts and emissions associated with the increase in aircraft operations would be minor. Depending on the timing of other infrastructure improvement and construction projects occurring in Roane County and in the surrounding areas, incremental increases in air emissions would result from construction activities. However, emissions from several, simultaneous projects are not likely to result in temporary or long-term combined emissions that would exceed county significance criteria or negatively affect attainment status. Further, the increase in aircraft and ground support equipment emissions associated with the new airport would be minimal when compared to a larger commercial airport and not likely to adversely affect regional air quality.

Additional C&D activities involved in the projects already in progress or expected in the foreseeable future would cause temporary increases in air pollutant emissions. The primary pollutant from construction activities would be particulate matter in the form of fugitive dust. This source of emissions is short-term and the impacts are localized to the immediate area. To minimize these emissions, application of wetting agents during dry periods may be used as mitigation. The increase in heavy industry, traffic, and population growth in the county could adversely impact air quality. Emissions from industrial development would be controlled by the required permitting process.

Noise

Noise generated by projects in industrial areas surrounding the proposed airport (e.g., Heritage Center and Horizon Center) would result in impacts that would be cumulative with the construction noise and/or aircraft operations noise associated with the proposed action. These impacts would be considered minor given the relative insensitivity of industrial areas to noise. In the Rarity Ridge neighborhood, noise level increases with future residential activities would generate cumulative impacts when combined with the noise of aircraft operations at the proposed airport. Aircraft operation noise levels would be low (approximately 45 dBA DNL) and residential noise would not typically exceed 65 dB DNL except in the immediate vicinity of the construction sites. Cumulative noise levels at noise-sensitive locations would be expected to remain well below 65 dB DNL.

Safety

Substantial adverse, cumulative occupational, safety, and health impacts and exposures to workers and the general public are not expected. New or expanded facilities associated with continued reindustrialization and development would be of modern design with engineered controls for improved environmental safety and health operations, thus resulting in improvements to the overall environmental safety and health environment.

The proposed Oak Ridge airport would introduce the potential for aircraft accidents and wildlife-aircraft strike hazards that presently do not exist in the vicinity of the ETTP area. With implementation of proposed procedures related to safety, accident response, and wildlife-aircraft strike minimization, adverse impacts would be minimized.

Land Use

Of the original 58,582 acres of land acquired in 1942 by the federal government, approximately 25,000 acres have been conveyed for residential, commercial, and community development; transportation easements; preservation and recreation; industrial development; and mission-related purposes. Transfer of the 170 acres of DOE property under the proposed action would remove additional land except for about 51 acres of Parcel ED-16; the property was previously analyzed for transfer and development in the *Transfer of Land and Facilities within the ETTP and Surrounding Area EA* (DOE 2011). Further development would not result in substantial changes from the historic industrial land use at the ETTP. Additionally, DOE has designated a large portion of the area surrounding the ETTP as non-development areas, and land use in these areas would remain as it presently is.

Socioeconomics

Regional and local development and reindustrialization activities are likely to result in increased population, employment, and income. The proposed Oak Ridge airport is expected to represent a small part of the total acreage proposed for development, and its effect on the cumulative impacts is expected to be correspondingly small. Actual employment and income impacts from cumulative development activities would depend on the success of each development and the overall rate at which development proceeds, both of which are uncertain. Property tax revenue would depend on the value of the properties, future tax rates, and any tax abatements that may be negotiated.

Geology and Soils

The most frequent effect of surface disturbance with regard to geology and soils in this region is accelerated erosion. Implementation of past, current, and reasonably foreseeable future projects would add to the total acreage of soil disturbed and would permanently alter the soil within the footprint of the projects, adding to the overall loss of soil productivity. However, the majority of actions are within areas where similar construction of roads and buildings has occurred or has been planned. As long as all construction projects comply with state and federal laws and regulations, mitigations would be implemented to minimize erosion from construction activities and sediment delivery to nearby surface water. Additionally, landscaping after construction completion would serve to stabilize soil once the projects have been completed. These actions would minimize the cumulative impacts of construction projects in the region that may otherwise result in accelerated erosion.

Water Resources

The primary cumulative impacts on water resources would result from an increase in the acreage of earthmoving activities and increased impervious areas that have the potential to increase sediment delivery and surface water runoff downstream. As long as all construction projects comply with state and federal laws and regulations, mitigations would be implemented to minimize erosion from construction activities and sediment delivery to nearby surface water. This would minimize the cumulative impacts of construction projects in the region that may otherwise result in increased sediment delivery. The use of temporary or permanent storm water controls such as detention or retention basins and other structures, and stabilization of disturbed areas through landscaping and vegetation, would attenuate increases in surface water runoff and increase groundwater recharge through direct percolation, thus offsetting the loss of pervious surface due to construction in the region and minimizing downstream cumulative effects.

The loss of stream and wetland habitat associated with construction of the airport would represent a permanent loss of those habitats at ETTP. Compensatory mitigation would replace those habitats within the same general region, but those habitats and the functions they perform would never be replaced at ETTP or the ORR.

Ecological Resources

Potential cumulative impacts to ecological resources would be associated with other actions undertaken that could affect the same habitats and wildlife species discussed in this EA. Multiple small, incremental effects can become pronounced if they reach some threshold of significance. Habitats on the ORR, particularly mature forest areas, are proactively managed, and any activities that could affect these resources are evaluated in detail. Natural resource managers are aware of the ORR's ecological importance to the region and are committed to conserving habitats and species. It is unlikely that additional substantial development of forested areas will occur on the ORR in the near future. If such development were to occur, management actions and planning would be expected to minimize ecological impacts.

The proposed airport would introduce the potential for wildlife-aircraft strikes. However, considering the number of annual operations, type of aircraft involved, and WHMP that would be required, it is not expected that additional wildlife strike risk would be substantial to any species or population.

Cultural Resources

Damage to the nature, integrity, and spatial context of cultural resources can have a cumulative impact if the initial act is compounded by other similar losses or impacts. The alteration or demolition of historic structures, or the disturbance or removal of cultural artifacts, may incrementally impact the cultural and historic setting of the ORR and surrounding area. Since there are no identified impacts to cultural resources, no cumulative impacts are expected for this resource area under this action in conjunction with other past, present, or future proposed actions.

Utilities

Continued commercial and industrial development at the Heritage Center, Horizon Center, and the Oak Ridge area, in general, would result in incremental increases in utility usage. However, there is currently sufficient excess capacity to meet the demand, and continued upgrades and improvements in the local and regional utility systems would serve to offset/accommodate any potential utility use increases. Additionally, development would likely be implemented in phases over the course of several years, thus enabling the utilization of new, more energy-efficient technologies to minimize energy consumption and to provide utility systems sufficient opportunity to meet demand through upgrades and improvements. As a result, the cumulative impact on local and regional infrastructure is expected to be minimal.

Transportation

Cumulative transportation impacts in Roane and Anderson Counties could occur from increased development and growth. These potential impacts could be combined with ongoing environmental restoration and D&D activities on the ORR and with the planned expansion of the state highways by TDOT. The main transportation impact of commercial and industrial development would be an increase in average daily traffic volumes. Associated with increases in traffic is the potential for an increased number of accidents, additional noise and air pollution, and road deterioration and damage. However, with recent highway improvements (i.e., SR 58/95), no major transportation impacts would be expected to occur from continued development in the vicinity of the proposed action.

Waste Management

It is impossible to determine what business or secondary development may occur as a result of the new airport; however, proposed industrial activities are not anticipated to generate large quantities of hazardous wastes. These would be managed according to applicable regulatory requirements. Construction activities would generate solid waste; however, these activities would be staggered over time and most solid waste generated (e.g., woody debris and fill) would be reused on-site. Consequently, no cumulative impacts would be expected.

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6. LIST OF AGENCIES AND PERSONS CONTACTED

The following agencies and persons were contacted for information and data used in the preparation of this EA.

Name	Affiliation	Location	Topic
Steve Borden	Tennessee Department of Transportation (TDOT)	Region 1	State Route 327 (Blair Road) Alternatives and Detour Options
Mark Fidler	Cleveland Regional Jetport	Cleveland, TN	Background Information
Joseph Garrison	Tennessee Historical Commission	Nashville, TN	National Historic Preservation Act, Section 106 Compliance
Neil Giffen	Oak Ridge National Laboratory	Oak Ridge, TN	Natural Areas
Daniel Oliver	TDOT	Region 1	State Route 327 (Blair Road) Alternatives and Detour Options
J. Gill Sallade	UCOR (URS | CH2M Oak Ridge LLC)	Oak Ridge, TN	Field Support
Billy Stair	MKAA	Knoxville, TN	MKAA Representative
Nathan Vatter	TDOT	Region 1	State Route 327 (Blair Road) Alternatives and Detour Options
Bryan White	MKAA	Knoxville, TN	Background Information

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APPENDIX A.
CORRESPONDENCE

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Department of Energy

Oak Ridge Office of Environmental Management
P.O. Box 2001
Oak Ridge, Tennessee 37831

July 29, 2014

Dr. Joseph Y. Garrison
Tennessee Historical Commission
Department of Environment and Conservation
2941 Lebanon Road
Nashville, Tennessee 37243-0442

Dear Dr. Garrison:

PROPOSED UNDERTAKING FOR CONVEYANCE OF PROPERTY AND TRANSMITTAL OF PHASE I ARCHAEOLOGICAL SURVEY OF PORTIONS OF SITE 40RE224, THE WHEAT COMMUNITY, ROANE COUNTY, TENNESSEE

The U. S. Department of Energy (DOE) is proposing a potential undertaking to convey approximately 171 acres located in Roane County, Tennessee, adjacent to the East Tennessee Technology Park, to the Metropolitan Knoxville Airport Authority (MKAA). The MKAA has requested the property for the purpose of developing a general aviation airport that would serve private and corporate aircraft. The property requested by MKAA includes a portion of Archeological Site 40RE224 (former Wheat Community). Enclosure 1 is a map depicting the location of the proposed initiative.

Enclosure 2 is *The History of the Wheat Community (40RE224) Roane County, Tennessee* for your review. Enclosure 3 is the *Phase I Archaeological Survey of Portions of Site 40RE224, the Wheat Community, Roane County, Tennessee*, (Survey) for your review. This archaeological survey was prepared for DOE for six previously recorded structural locations within the bounds of Site 40RE224 in the Wheat community within the Oak Ridge Reservation in Roane County, Tennessee. The research focused on providing background historical information on the Wheat Community as a whole, and specifically the six structural locations that were investigated during the archaeological survey pursuant to the June 25, 2001, Memorandum of Agreement (*Memorandum of Agreement Between the U.S. Department of Energy Oak Ridge Operations Office and the Tennessee State Historic Preservation Office Submitted to the Advisory Council on Historic Preservation Pursuant to 36 CFR 800.6(b)(1) Regarding Lease of Land Parcel ED-3 of the Oak Ridge Reservation to the Community Reuse Organization of East Tennessee Oak Ridge Reservation*)

The Survey concluded that Site 711B (George Arnold Property) and the Roane College Site are potentially eligible for the National Register of Historic Places (Register), and these sites warrant further investigation. Please note that neither of these sites is located within the land area being proposed for transfer. The remaining sites evaluated were determined not eligible for listing on the Register.

We have determined, in accordance with §800.3 of the Advisory Council on Historic Preservation's (Council) regulations for the protection of historic properties, that DOE's proposed undertaking (1) is an undertaking, as defined in 36 Code of Federal Regulations 800.16(y), and (2) is the type of activity that has the potential to cause effects on historic properties. In accordance with §800.8(c) of the Council's regulations, we are notifying you and the Council, by copy of this letter, that we intend to use the process and documentation required to comply with the National Environmental Policy Act (NEPA) to comply with Section 106 of the National Historic Preservation Act for this undertaking. In using the NEPA process in lieu of the procedures set forth in §800.3 through §800.6 of the Council's regulations (i.e., the Section 106 process), we will ensure the standards set forth in §800.8(c)(1) through §800.8(c)(5) are met.

PROPOSED UNDERTAKING FOR CONVEYANCE OF PROPERTY AND TRANSMITTAL OF PHASE I ARCHAEOLOGICAL SURVEY OF PORTIONS OF SITE 40RE224, THE WHEAT COMMUNITY, ROANE COUNTY, TENNESSEE

DOE requests your review of the enclosed documentation to ensure requirements of the National Historic Preservation Act for this proposed undertaking are met. After you have had the opportunity to review the Survey and the map showing the proposed land conveyance we would like to meet with you to discuss the path forward for addressing the requirements of the referenced Memorandum of Agreement.

If you have questions or if we can be of any further assistance, please contact me at (865) 576-4094.

Sincerely,

David G. Adler
Regulatory and Stakeholder Affairs

Enclosures:
(1) Airport Land Transfer Map
(2) *The History of the Wheat Community (40RE224) Roane County, Tennessee*
(3) *Phase I Archaeological Survey of Portions of Site 40RE224, the Wheat Community, Roane County, Tennessee*

cc w/enclosures:
Jennifer Barnett, TDEC Division of Archaeology
Cathy Hickey, UCOR, K-1007, MS-7169
Kevin Ironside, RSI
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www.tnhistoricalcommission.org

August 19, 2014

Mr. David Adler
Department of Energy
Oak Ridge Office of Environmental Management
Post Office Box 2001
Oak Ridge, Tennessee 37831

RE: DOE, CULTURAL RESOURCES ASSESSMENT, CONVEY 171 AC./40RE224/
WHEAT COMM., UNINCORPORATED, ROANE COUNTY, TN

Dear Mr. Adler:

At your request, our office has reviewed the above-referenced cultural resources survey report in accordance with regulations codified at 36 CFR 800 (Federal Register, December 12, 2000, 77698-77739). Based on the information provided, we concur that the 171 acre project area contains no historic properties eligible for listing in the National Register of Historic Places.

If project plans are changed or archaeological remains are discovered during construction, please contact this office to determine what further action, if any, will be necessary to comply with Section 106 of the National Historic Preservation Act.

Your cooperation is appreciated.

Sincerely,

E. Patrick McIntyre, Jr.

E. Patrick McIntyre, Jr.
Executive Director and
State Historic Preservation Officer

EPM/jmb

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APPENDIX B.
COMMENTS AND RESPONSES TO THE ENVIRONMENTAL ASSESSMENT

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COMMENT RESPONSE MATRIX

Environmental Assessment

Property Transfer to Develop a General Aviation Airport at the East Tennessee Technology Park Heritage Center, Oak Ridge, Tennessee (DOE/EA-2000)

Reviewer Name: Ellen Smith (AFORR); Sandra K. Goss (TCWP)
Reviewer Agency/Organization: Vice President, Advocates for the Oak Ridge Reservation; Executive Director, Tennessee Citizens for Wilderness Planning
Reviewer Telephone Number:
Reviewer Mailing Address: 130 Tabor Road, Oak Ridge, TN 37830
Reviewer E-mail Address:

Comment #	Page Number	Line Number	Comment	Comment Response
General			Advocates for the Oak Ridge Reservation (AFORR) and Tennessee Citizens for Wilderness Planning (TCWP) are pleased to provide comments on the subject environmental assessment (EA). We think of the Oak Ridge Reservation as a valuable public resource for which the Department of Energy (DOE) has stewardship responsibility on behalf of the public. Therefore, we place great value on environmental reviews like this one. In general, we encourage DOE to make land management decisions that:	Thank you for your comments.

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			1. Minimize adverse effects on the natural and cultural resources of the Reservation, and 2. Provide value to the public by contributing to science, technology, national security, public safety, education, recreation, the economy, or conservation of our common heritage. Additionally, it is important that DOE considers and discloses the cumulative impacts of proposed actions affecting the Reservation. Our specific concerns regarding this EA and the proposed action it addresses are:	
1.			**Purpose and need.** The need for the proposed airport and the economic benefits expected to result from the proposed land transfer have not been substantiated. While the economic justification for this project might not appear to be a topic for DOE's environmental assessment, we contend that it needs to be addressed in this EA because it creates the purported need for federal action and because the land committed for this purpose will be lost to other uses that have known benefits. Before committing to the proposed land transfer and its associated impacts, DOE should obtain solid evidence to support the expectation that the proposed airport is needed and will bring economic benefits; that evidence should be presented in the EA.	The need for an airport is determined by the Federal Aviation Administration (FAA) through their National Plan of Integrated Airport Systems (NPIAS) evaluation process. The proposed Oak Ridge Airport received FAA approval for inclusion in the NPIAS in January 2015. If a proposed airport is placed on the NPIAS, the Secretary of Transportation considers the airport "necessary to provide a safe, efficient, and integrated system of public-use airports adequate to anticipate and meet the needs of civil aeronautics." The current airports (Rockwood, McGee Tyson, and Downtown Island) were also considered when the Oak Ridge Airport was included in the NPIAS.
2.			**Wheat Greenway.** Nowhere in the EA did we find acknowledgment that the Wheat Road that extends east from Blair Road, passing the George Jones Baptist Church, is open to pedestrians and bicyclists as a public greenway (the "Wheat Greenway"). This greenway allows the public to visit the Wheat historic	The Wheat Trail Greenway has been added to Sect. 3.5.1. The Metropolitan Knoxville Airport Authority (MKAA) has made a commitment to the Wheat Community that access to the church and cemetery will be maintained. This will be accomplished by either constructing a new access

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			area and it connects to other greenway trails in forested areas of the Oak Ridge Reservation. It has the potential to be a good recreational destination for visitors to the Manhattan Project National Historic Park. People access the greenway from Blair Road. It appears that Blair Road Options 1 and 2 (as outlined in EA Section 2.1.4.2) could eliminate public access to the Wheat Greenway. Impacts to users of this greenway should be discussed in the EA, and the selected option for Blair Road should preserve public access to the greenway entrance.	road off of Highway 58, or by maintaining the current access point off of Blair Road.
3.			**Section 3.5, Land Use: Existing Tenants.** This section should acknowledge and discuss the fact that the proposed airport would displace existing commercial tenants and related commercial uses on land where the airport would be built. The land transfer will have impacts on these operations, even if the airport isn't built. It can be expected that the proposed land transfer will deter all new investment by current commercial users within the airport development footprint for as long as the airport planning is ongoing, and may cause some occupants to abandon their facilities even before a final decision is made on the proposed airport. In contrast, if DOE were to decline the request for land transfer, commercial users would not be discouraged from staying in their current facilities or making needed expansions or improvements.	Tenants of existing facilities would be displaced if the airport is constructed in its current configuration. The MKAA has been in preliminary discussions with these tenants and will continue communication with them as the project progresses and the Final Master Plan is completed. Relocation options are available and there is adequate time before airport construction would begin to plan appropriately for this provision. The environmental assessment (EA) has been revised (Sect. 3.5) to reflect displacement of existing tenants and to also reflect that construction would preclude any other type of commercial development within the transfer area. Though the land in the airport footprint would not be available for future development, hundreds of acres of existing parcels are available in the Horizon Center and Heritage Center. Additionally, the U.S. Department of Energy (DOE) is currently working on transfer documents that would release an additional 800+ acres for redevelopment. This property was covered by the 2011 EA and Finding of No Significant Impact (FONSI). The Community Reuse Organization of East Tennessee (CROET)

Comment #	Page Number	Line Number	Comment	Comment Response
				and the Industrial Development Board (IDB) are supportive of the transfer of land to support an airport as they believe it is compatible and complementary with the overall use of the area for industrial development.
4.			**Section 3.5, Land Use: Land Use Focus Group.** This section should acknowledge the "Land Use Focus Group" planning process that DOE undertook a little more than a decade ago, with involvement of a diverse range of stakeholders, for the area around the East Tennessee Technology Park (including most of the land proposed for use as an airport). The land use designations that emerged from that planning process should be described and discussed in this EA.	The EA has been revised to acknowledge the outputs of the Land Use Focus Group, including the land use designations that were further evaluated in the 2011 DOE Land Transfer EA (DOE/EA-1640), which reflects the land use plans for development of the East Tennessee Technology Park (ETTP) as an industrial park. The Airport EA is consistent with the evaluation and plans conducted in the 2011 Land Transfer EA.
5.			**Section 3.5, Land Use.** If the land is transferred but an airport is not developed, continued land ownership by the Metropolitan Knoxville Airport Authority (MKAA) could interfere with DOE's ability to properly manage the Oak Ridge Reservation and stymie local government efforts to guide community growth. Therefore, if the transferred land is not developed for an airport, it should revert to DOE ownership, rather than remaining in the ownership of the MKAA.	The deed that DOE would give to the MKAA, if the property transfer occurs, would have a reversion clause that stipulates the return of land from the MKAA to DOE in the event that the airport was not constructed. The time frame of the reversion clause has not yet been determined but would be at the time of deed execution.
6.			**Mitigation measures.** To help decision-makers and the public to understand the scope and magnitude of the impacts of this project, provide quantitative information on the mitigation projects that are expected to be required to compensate for projected impacts to the surface streams, wetlands, and cultural resources that could be damaged or destroyed as a result of the proposed action.	To the extent practicable, potential mitigation measures and other measures to minimize potential adverse impacts were provided in the EA. Quantitative information on any potential mitigations would be premature since the final airport design, road options, and construction plans have not been completed. Additional details on the proposed airport will be part of the MKAA Master Plan and subsequent FAA review.

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				Prior to construction, the MKAA would be required to obtain all necessary permits for actions that could impact air quality, disturb wetlands and streams, and adversely affect cultural resources. The permitting process would establish conditions and mitigations to prevent and minimize adverse impacts to affected resources.
7.			**Cumulative impacts.** An additional action to be identified as a source of potential cumulative impacts is DOE's recent release "for disposal" of roughly 170 acres of land on the opposite side of Hwy. 58 from the proposed airport. Since that "disposal" action was announced in June 2015 (the month before this draft EA is published), it is surprising that it isn't mentioned in the EA. Potential cumulative impacts from the proposed land transfer for the airport and the release of this other property include loss of wildlife habitat, particularly the reduction of contiguous tracts of wildlife land; loss of cultural resources; and aesthetic impacts due to major changes in land use on both sides of the highway.	DOE assessed the cumulative impacts of all future land transfers in a previous EA completed in 2011 (DOE/EA-1640). This 2011 EA evaluated the conveyance and future industrial development of ~1,800 acres of land at the ETTP, which included all but 51 acres of the proposed 170-acre transfer to MKAA. The 2011 EA stated that a future airport was possible and that it would require additional National Environmental Policy Act of 1969 (NEPA) evaluation, which is being conducted with the current EA. As such, cumulative effects were previously assessed in 2011 and considered as this current EA was prepared, and addressed accordingly.

COMMENT RESPONSE MATRIX

Environmental Assessment

Property Transfer to Develop a General Aviation Airport at the East Tennessee Technology Park Heritage Center, Oak Ridge, Tennessee (DOE/EA-2000)

Reviewer Name: Douglas Colclasure
Reviewer Agency/Organization:
Reviewer Telephone Number:
Reviewer Mailing Address:
Reviewer E-mail Address:

Comment #	Page Number	Line Number	Comment	Comment Response
1.			There have been three significant transportation developments in the intervening years since the MKAA began a study in 2009 for a proposed airport on the Oak Ridge Reservation. About 3 years ago, following two years of construction, the TDOT completed the four-laning of State Rt. 95 providing Oak Ridge improved road access to the south and west out to I-40 and Rockwood Airport. And the two other more direct airport related developments have been the total rehabilitation and modernization of Rockwood Airport in 2014 and the reduction in the TDOT aviation funding budget with the capping of FedEx	Thank you for your comment.

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			fuel taxes at $ 10.2 million in 4 years. Currently that revenue is over $30 million per year.	
2.			Following rehabilitation and new facilities, Rockwood airport is now one of the most modern general aviation airports in East Tennessee with 16 new T-hangars, credit card fuel services, upgraded terminal building, pilot lounge for flight planning, and rehabilitation to the adjoining main hangar building. Maintenance services on the runway were completed last fall. It is 23 miles from the proposed airport site in Oak Ridge and very convenient by 4-lane uncongested highway to the three major industrial development sites in Oak Ridge – Heritage Center, Horizon Center, and TVA-Breeder Reactor site. Companies and individuals doing business in Oak Ridge regularly use RKW when arriving by charter, corporate, and private aircraft.	Thank you for your comment.
3.			In 2013, the Federal Emergency Management Agency (FEMA) certified RKW for support use in the event of a regional disaster emergency, capable of accommodating planes as large as Boeing 737s and military C-17s.	Thank you for your comment.
4.			In 1980, there was an initiative to build an airport (see attached history) in Oak Ridge at a site in the UT Arboretum. In the end TDOT constructed the Pellissippi Parkway partly in response to provide convenient air transportation services to the city. Now Oak Ridge has convenient access to TYS and DKX as well as RKW.	Thank you for your comment.
5.			Reviewing the impacts of transferring this ORR land has broader implications beyond the environmental impact to include the very real prospect that both RKW and the nearby proposed Oak Ridge Airport will	The need for an airport is determined by the FAA through their NPIAS evaluation process. The proposed Oak Ridge Airport received FAA approval for inclusion in the NPIAS in January 2015. If a proposed

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			be competing for the same users and TDOT maintenance and operating budgets to the detriment of both.	airport is placed on the NPIAS, the Secretary of Transportation considers the airport "necessary to provide a safe, efficient, and integrated system of public-use airports adequate to anticipate and meet the needs of civil aeronautics." The current airports (Rockwood, McGee Tyson, and Downtown Island) were also considered when the Oak Ridge Airport was included in the NPIAS.
6.			When looking at the growth demands projected by MKAA, consideration should be given to more fully exploiting the availability of RKW and further the possibility that forecast National Defense cuts and base closures could result in closing of the Army Aviation Support Facility #2 on McGhee Tyson, thus freeing space to meet any growth.	See response to previous comment.
7.			Taking into consideration all of these factors over the past 6 years, it is recommended the DOE request a reassessment and detailed economic analysis to more fully support making a land transfer of this nature and magnitude regardless if this EA concludes a finding of no significant environmental impact (FONSI). Keep in mind once the transfer, this and the other required land already transferred is on hold for economic opportunities, while the TDOT continues to address affordability, demand, and meeting regional aviation growth projections.	The economic basis of the decision to build an airport is outside the scope of this EA. The determination of whether a relief airport is needed in the area and the decision to place it at ETTP is being made by the MKAA and the FAA. DOE's proposed action is to transfer the land to the MKAA for the intended purpose of constructing an airport. Though the land in the airport footprint would not be available for future development, hundreds of acres of existing parcels are available in the Horizon Center and Heritage Center. Additionally, DOE is currently working on transfer documents that would release an additional 800+ acres for redevelopment. This property was covered by the 2011 EA and FONSI. CROET and the IDB are supportive of the transfer of land to support an airport as they believe it is compatible and complementary with the overall use of the area for industrial development.

COMMENT RESPONSE MATRIX

Environmental Assessment

Property Transfer to Develop a General Aviation Airport at the East Tennessee Technology Park Heritage Center, Oak Ridge, Tennessee

Reviewer Name: Robert M. Cushman
Reviewer Agency/Organization:
Reviewer Telephone Number: (865) 483–3227
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Comment #	Page Number	Line Number	Comment	Comment Response
1.			Thank you for the opportunity to comment on the draft Environmental Assessment "Property Transfer to Develop a General Aviation Airport at the East Tennessee Technology Park Heritage Center, Oak Ridge, Tennessee." While the document lists many of the impacts that could be associated with a transfer of the land, and subsequent development of an airport, it does not provide a compelling justification of need for the action, nor evidence of the meaningful consideration of alternatives that is supposed to be at the heart of the NEPA process.	The need for an airport is determined by the FAA through their NPIAS evaluation process. The proposed Oak Ridge Airport received FAA approval for inclusion in the NPIAS in January 2015. If a proposed airport is placed on the NPIAS, the Secretary of Transportation considers the airport "necessary to provide a safe, efficient, and integrated system of public-use airports adequate to anticipate and meet the needs of civil aeronautics." The current airports (Rockwood, McGee Tyson, and Downtown Island) were also considered when the Oak Ridge Airport was

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			I would start with the purpose of the land transfer and need for an airport. The single most concise statement for the need of the airport that I could find in the draft EA is the following: "Because the runway length at Knoxville Downtown Island Airport limits operations to small general aviation aircraft and has a waiting list of 125 persons requesting hangar space, the MKAA has determined that the proposed Oak Ridge airport is needed for the improvement of air service in the region." How about an alternative of building some more hangars at McGhee Tyson? That would probably cost much less, and have fewer impacts, than building an entirely new airport. From what I could tell from the draft EA, the Oak Ridge airport would not go very far towards helping those 125 persons – in fact, Table 2.3 mentions "Two T-Hangar Rows (16 units)" – I wonder if more hangar space than that couldn't be provided at McGhee Tyson. While providing more hangar space at McGhee Tyson is outside the realm of DOE, the needs of MKAA were obviously instrumental in inspiring the proposed DOE action, so alternatives available to MKAA that would obviate the need for the proposed DOE action should likewise be discussed, perhaps as an expansion of the "no action" alternative. The draft EA commingles, in terms of justifications and hopes, the direct DOE action (land transfer) and the linked MKAA action (building the airport), so the consideration of alternatives should correspondingly address activities of both agencies as well as alternatives available to them.	included in the NPIAS. The MKAA has stated that funding is available to build more hangars at Downtown Island. However, expansion is limited at that airport and the runway length further constrains the airport as well. At McGhee Tyson general aviation hangar expansion is also severely limited. McGhee Tyson is a Part 139 airport and has a mix of carriers (commercial, military, etc.). This can make it difficult for the general aviation aircraft to mix with the larger aircraft. Also, due to the airport being busier, simply taxiing around the airfield can and is more complicated. Many general aviation plane owners want to be on a general aviation airfield that does not have the added dimensions of being on a very busy commercial airport. This is reflected in the fact that Downtown Island has more general aviation operations per day than McGhee Tyson.

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2.			A more speculative benefit of the proposed airport is given as: "The MKAA also feels that a general aviation airport in Oak Ridge can be a tool in the revitalization efforts underway in the Heritage Center by encouraging new business development and providing highly sought after access for corporate aircraft fleet. The proposed airport would also act as a gateway to the Oak Ridge community by opening new opportunities in tourism and job creation that could also help offset economic losses resulting from continued DOE downsizing, facility closures, and workforce restructuring." This seems like nothing more than a "build it and they will come" philosophy that has not necessarily served us well in the past. If wishful thinking such as this is to be presented in an EA, it should be supported by some solid economic analysis. Has the nearby Rockwood airport had such a positive effect on the Roane County Industrial Park or Roane County in general? Is there reason to believe that McGhee Tyson airport is not adequate to handle the industrial and economic development of Oak Ridge and the Anderson-Roane county area, and that addition of one more municipal airport would make a difference?	The economic basis of the decision to build an airport is outside the scope of this EA. The determination of whether a relief airport is needed in the area and the decision to place it at ETTP is being made by the MKAA and the FAA. DOE's proposed action is to transfer the land to the MKAA for the intended purpose of constructing an airport.
3.			Finally, the draft EA mentions, as justification for the proposed DOE land transfer, congestion at McGhee Tyson: "As a Reliever Airport, the proposed Oak Ridge facility would offer an alternative for general aviation aircraft over the use of McGhee Tyson in order to help relieve congestion and provide improved general aviation access to the overall community."	See response to Comment No. 1.

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			Where exactly is this "congestion" and how bad is it? I've never noticed any congestion at McGhee Tyson, other than in its parking facilities. Generally, most of the gates seem to be vacant at any given time, and I don't remember ever having to wait in line very long to take off or being in a holding pattern waiting to land because of other aircraft.	
4.			In summary, the draft EA does not provide a solid justification as to why the proposed land transfer, and subsequent development of an airport, would solve any existing problems. Nor does it consider one obvious alternative that could address the one current limitation that is stated quantitatively (limited hangar space): provide more hangar space at McGhee Tyson.	Thank you for your comments.

COMMENT RESPONSE MATRIX

Environmental Assessment

Property Transfer to Develop a General Aviation Airport at the East Tennessee Technology Park Heritage Center, Oak Ridge, Tennessee

Reviewer Name: W. G. Dean, Ph.D.
Reviewer Agency/Organization: Part-time Lecturer, Geology, University of Tennessee
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Reviewer Mailing Address: Department of Earth and Planetary Sciences, 1412 Circle Drive, Knoxville, TN 37996–1410
Reviewer E-mail Address: wdean1@utk.edu

Comment #	Page Number	Line Number	Comment	Comment Response
1.			This jeopardizes environmentally sensitive land that has already been set aside. McKinney Ridge, adjoining the parcel directly to the north, will be negatively impacted by having an airport so close by. One has to wonder what the purpose of creating greenspace is if it is subsequently so heavily impacted by an airport. Noise is certainly an issue with this as well as the likelihood of fuel spills. Your EA does not take into account the potential for accidents from the increased traffic nor the impact on supposedly preserved areas.	Over 3,000 acres of land have been placed in permanent conservation in the Black Oak Ridge Conservation Easement (BORCE). An additional 500+ acres of land have been set aside as Natural Areas (NAs) in the Horizon Center as mitigation for that development. About 119 acres of the 170-acre transfer footprint have been planned for development for several years and were evaluated in the 2011 EA. The balance of 51 acres is evaluated in this EA. Of the 51 acres evaluated, approximately 5 acres would be classified as sensitive habitat due to the presence of

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			Further, this area is inundated with wetlands and I see no mitigation plans.	wetlands. The immediately surrounding 3,500+ acres that are in conservation status would not be directly impacted by the airport. Indirect impacts, such as noise and air pollution, have been evaluated and determined to not be significant.
2.			Your EA does not include comprehensive assessments of the cumulative effects of the numerous land-use changes being proffered by the DOE. I think this fails the "spirit and intent" of NEPA, when project environmental effects are considered in a piecemeal fashion. Instead, the DOE needs to consider the total result of the airport land conversion in context with other land-transfers and land-use changes. I believe this is required by law, so therefore, I urge you to re-conduct the Environmental Assessment to include ALL proposed land transfers and re-allocations of use.	DOE assessed the cumulative impacts of all future land transfers in a previous EA completed in 2011 (DOE/EA-1640) and an updated assessment was included in the current EA. The 2011 EA evaluated the conveyance and future industrial development of ~1,800 acres of land at the ETTP, which included all but 51 acres of the proposed 170-acre transfer to the MKAA. The 2011 EA stated that a future airport was possible and that it would require additional NEPA evaluation, which is being conducted with the current EA. As such, cumulative effects were previously assessed in 2011 and considered as this current EA was prepared, and addressed accordingly.
3.			The EA does not address the need for new road construction along Highway 95, which with many curves and only 2 lanes will likely not be able to handle increased traffic. The totality of the airport impact must be considered, so therefore, this needs to be examined, too.	The increased vehicle traffic on local roads and highways is expected to be a very small percentage increase over current traffic levels. State Route (SR) 327 (Blair Road) has 2,491 vehicles per day (VPD). Highway 58 has 10,793 VPD, and Highway 95 has 5,326 VPD. With the current estimated flight level of 150 flights per day (for small aircraft with few passengers), the anticipated vehicular traffic increase on any of these roads will be minimal (likely less than 1% increase) compared to existing traffic levels.

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4.			It is not needed. There is another viable airport in Rockwood that would serve the same purpose and still be accessible to Interstate traffic. There is NO reason to disrupt this land when an excellent and already existing alternative exists.	The need for an airport is determined by the FAA through their NPIAS evaluation process. The proposed Oak Ridge Airport received FAA approval for inclusion in the NPIAS in January 2015. If a proposed airport is placed on the NPIAS, the Secretary of Transportation considers the airport "necessary to provide a safe, efficient, and integrated system of public-use airports adequate to anticipate and meet the needs of civil aeronautics." The current airports (Rockwood, McGee Tyson, and Downtown Island) were also considered when the Oak Ridge Airport was included in the NPIAS.
5.			I question the economic return of this endeavor. I have not seen any convincing evidence of the regional need for this airport and a corporate jet facility serves relatively few customers. To me, this seems like another "giveaway" of public property to a relatively small group of influential members. I don't think the cost of this airport is a value to the public.	The economic basis of the decision to build an airport is outside the scope of this EA. The determination of whether a relief airport is needed in the area and the decision to place it at ETTP is being made by the MKAA and the FAA. DOE's proposed action is to transfer the land to the MKAA for the intended purpose of constructing an airport.

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6.			I think there are very real safety/security concerns: a) The property is located in sensitive wetlands bordering the Clinch River/Melton Lake. There may be increased chances of bird strikes (Canada Geese; Osprey; etc.) in this area. I think it is a poor location in that regard. b) The airport will be too close to Y-12/ORNL facilities and serve only to increase the risk of terrorist-style attacks. Allowing low-flying, fast-moving PRIVATE aircraft to operate so close to a national security facility is perhaps one of the most inane suggestions I have heard. As we have unfortunately seen, jets at low altitude can produce a horrendous risk and one that is mostly unstoppable, particularly with the short distance between the proposed airport and Y-12/ORNL. Even the slightest incident in Oak Ridge could prove disastrous with the thousands of top U.S. Scientists and nearby communities at risk. I sincerely and emphatically request this matter of an airport be fully considered by Homeland Security and publicly discussed, especially when a viable, Safer alternative in Rockwood already exists.	Wildlife-aircraft strike hazards are addressed in the EA (Sects. 3.4 and 3.9.2). Potential safety hazards will also be addressed in the MKAA Master Plan and subsequent FAA review. Operations at the Oak Ridge Airport would not change the current airspace restrictions over the Y-12 Complex. Additionally, the airport's presence would not materially affect the current ability to use an airplane to conduct an intentionally destructive act at DOE facilities in Oak Ridge. DOE has engaged in discussion of this issue with the National Nuclear Security Administration (NNSA), which has raised no objection to the proposed Oak Ridge Airport.
7.			Please consider, the concept to build an airport dates back to the 1960s, when it was viewed as an economic boost to the DOE cities such as Oak Ridge. This concept may not be appropriate now. However, I question why the DOE would contribute lands seized by imminent domain to projects that serve only a handful of customers, yet permanently and negatively alter the local landscape, and only increase the risk of the residents. Please note, neither the Heritage Center	See response to Comment No. 5.

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			nor the Horizon center have created a need for an airport and re-allocating existing corporate aircraft to this new proposed airstrip will result in those clients quickly exiting the Oak Ridge area via the Interstate. Thus, this proposal, as it stands now, doesn't provide the economic boost to Oak Ridge that is claimed.	

COMMENT RESPONSE MATRIX

Environmental Assessment

Property Transfer to Develop a General Aviation Airport at the East Tennessee Technology Park Heritage Center, Oak Ridge, Tennessee

Reviewer Name: Parker Hardy
Reviewer Agency/Organization: President and CEO, Oak Ridge Chamber of Commerce
Reviewer Telephone Number: (865) 483–1321
Reviewer Mailing Address: 123 Amanda Drive, Oak Ridge, TN 37830
Reviewer E-mail Address: hardy@orcc.org

Comment #	Page Number	Line Number	Comment	Comment Response
General			This is a very important & beneficial project. It is of vital economic importance that it be built—and environmentally has no significant impacts.	Thank you for your comment.

COMMENT RESPONSE MATRIX

Environmental Assessment

Property Transfer to Develop a General Aviation Airport at the East Tennessee Technology Park Heritage Center, Oak Ridge, Tennessee (DOE/EA-2000)

Reviewer Name: J. M. Holland
Reviewer Agency/Organization:
Reviewer Telephone Number:
Reviewer Mailing Address:
Reviewer E-mail Address:

Comment #	Page Number	Line Number	Comment	Comment Response
1.			I learned recently of an effort to construct a municipal airport on former K-25 property. I was a resident of Oak Ridge from 1972–1983 and thoroughly enjoyed the experience, having raised 3 children there. Over the years since, I acquired a private pilot's license and eventually built and fly my own airplane. It has enabled me to gain personal experience with the realities and difficulties involved in establishing and maintaining small airports. It is my feeling that Oak Ridge is well served by nearby general aviation facilities in Rockwood and Knoxville: KRKW and KDKX. Having landed at both to visit friends in the	Thank you for your comment.

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			area, I can verify that both are excellent and well established airports.	
2.			My basis for opposing the construction of a third airport on DOE land is both practical and economic. Airports, to be truly functional, exist only on the basis of public subsidy. Airplane owners, as rule, cannot cover the cost of airport maintenance and operation. Nearly every month somewhere in the US, a small airport ceases operation and is removed from the FAA database. The reliability of local, state and federal subsidies cannot be assumed but rather should be discounted as a justification for a new airport and its sustainability. What usually works best is that nearby Cities establish a regional airport. That is what I would recommend to my fellow Oak Ridge pilots. Of the two nearby existing airports, the best option would be Rockwood as Downtown Knoxville is often fog bound due to its proximity to water.	The need for an airport is determined by the FAA through their NPIAS evaluation process. The proposed Oak Ridge Airport received FAA approval for inclusion in the NPIAS in January 2015. If a proposed airport is placed on the NPIAS, the Secretary of Transportation considers the airport “necessary to provide a safe, efficient, and integrated system of public-use airports adequate to anticipate and meet the needs of civil aeronautics.” The current airports (Rockwood, McGee Tyson, and Downtown Island) were also considered when the Oak Ridge Airport was included in the NPIAS.

COMMENT RESPONSE MATRIX

Environmental Assessment

Property Transfer to Develop a General Aviation Airport at the East Tennessee Technology Park Heritage Center, Oak Ridge, Tennessee (DOE/EA-2000)

Reviewer Name: Mary H. Kollie and Thomas G. Kollie, Ph.D.
Reviewer Agency/Organization:
Reviewer Telephone Number: (865) 483–9374
Reviewer Mailing Address: 117 Oklahoma Avenue, Oak Ridge, TN 37830
Reviewer E-mail Address:

Comment #	Page Number	Line Number	Comment	Comment Response
General			This letter is to express our huge disappointment and objections to the DOE plans underway to make land available for a commercial airport to be built on the Oak Ridge Reservation near our home of 52 years. We attended the informational meeting that was held on August 19th.	Thank you for attending the meeting and for your comments.
1.			Regardless of the noise level statistics that have been compiled by the agencies working with DOE on this project, our experience is that we are already impacted by the noise of the recreational air traffic that flies overhead from the nearby Oliver Springs airport. Even	A noise evaluation was performed and has been expanded in the revised version of the EA. The additional noise evaluation includes an analysis of maximum anticipated noise levels, which is beyond the normal requirements of an EA for an airport. The

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			if our home is not located in the specific flight pattern, no doubt there will be additional air traffic in the area by virtue of the fact that the airport will provide more opportunities for plane owners to have convenient access to an airport. Furthermore, helicopters are the most offensive; and we hear them more often than we would like. In regard to leisure plane owners' use of the airport, we feel strongly that this will serve only an elite few. We question if this is the best use of this land?	noise was determined to be at levels that will not create adverse impacts.
2.			Historically, Oak Ridge City Council/Management has a poor track record in bringing businesses and corporations into our city. We doubt an airport will make a significant difference in this regard. Note, however, the new businesses and expansion of businesses in the Clinton, Loudon, and Roane County areas…without an airport! A commercial airport will most likely only serve as overflow from the Island Home Airport in Knoxville, which we understand is in need of additional hangars. We feel this would be an affront to the citizens living in the west end of Oak Ridge.	The primary purpose for this airport is to serve as a reliever airport for the MKAA and not for economic development.
3.			Also, we have safety concerns with the small planes flying close by and the decrease in value of our home thereby resulting. We suggest the Metropolitan Knoxville Airport Authority (MKAA) look elsewhere to expand airport facilities rather than negatively impact a very peaceful neighborhood/city. We implore that DOE decide against making the land available to MKAA for reasons given above.	The MKAA has stated that funding is available to build more hangars at Downtown Island. However, expansion is limited at that airport and the runway length further constrains the airport as well. At McGhee Tyson general aviation hangar expansion is also severely limited. McGhee Tyson is a Part 139 airport and has a mix of carriers (commercial, military, etc.). This can make it difficult for the general aviation aircraft to mix with the larger aircraft. Also, due to the airport being busier, simply taxiing around the airfield can and is more complicated. Many general aviation

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				plane owners want to be on a general aviation airfield that does not have the added dimensions of being on a very busy commercial airport. This is reflected in the fact that Downtown Island has more general aviation operations per day than McGhee Tyson.

COMMENT RESPONSE MATRIX

Environmental Assessment

Property Transfer to Develop a General Aviation Airport at the East Tennessee Technology Park Heritage Center, Oak Ridge, Tennessee (DOE/EA-2000)

Reviewer Name: Melanie Mayes
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Reviewer E-mail Address: mamayes5@yahoo.com

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General			I would like to comment on the proposed Oak Ridge airport. While I appreciate the potential for increasing investments and development in Oak Ridge (I am an OR resident), I do not support the airport.	Thank you for your comment.
1.			I do not see a need for it and the need has not been adequately justified. There is an airport in Rockwood that is close and similar in scale. Such an airport could only serve a few corporate interests or people with a lot of money. I do not see any value to all the rest of us. Big impactful projects should serve a large proportion of the area residents who will have to live	The need for an airport is determined by the FAA through their NPIAS evaluation process. The proposed Oak Ridge Airport received FAA approval for inclusion in the NPIAS in January 2015. If a proposed airport is placed on the NPIAS, the Secretary of Transportation considers the airport “necessary to provide a safe, efficient, and integrated system of

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			with the results; this project does not meet that metric. Further I worry that taxpayers will ultimately be liable directly (construction or management costs) or indirectly (services, roads, etc.), and that we will not receive commensurate value in return. What is the plan if this airport is a big money loser? The city and county, and the state, and the federal government – none of these entities have money to spare.	public-use airports adequate to anticipate and meet the needs of civil aeronautics." The current airports (Rockwood, McGee Tyson, and Downtown Island) were also considered when the Oak Ridge Airport was included in the NPIAS. The economic basis of the decision to build an airport is outside the scope of this EA. The determination of whether a relief airport is needed in the area and the decision to place it at ETTP is being made by the MKAA and the FAA. DOE's proposed action is to transfer the land to the MKAA for the intended purpose of constructing an airport.
2.			The area is environmentally sensitive. The Black Oak Ridge Conservation Area (BORCA) is a set-aside from DOE to mitigate damage to the environment. Having an airport so close to it would certainly diminish its value and its intended purpose and the EA apparently does not adequately analyze this problem. I frequent the greenway and the trail on McKinney Ridge and I don't wish for them to be negatively impacted. I don't want to lose my valuable recreational areas. Further, the EA does not consider the combined effects of multiple planned land transfers, and power-line construction planned for through the BORCA. All of these activities will ruin the spirit and intent of the BORCA and they should not be allowed to proceed.	Over 3,000 acres of land have been placed in permanent conservation in the BORCE. An additional 500+ acres of land have been set aside as NAs in the Horizon Center as mitigation for that development. About 119 acres of the 170-acre transfer footprint have been planned for development for several years and were evaluated in the 2011 EA. The balance of 51 acres is evaluated in this EA. Of the 51 acres evaluated, approximately 5 acres would be classified as sensitive habitat due to the presence of wetlands. The immediately surrounding 3,500+ acres that are in conservation status would not be directly impacted by the airport. Indirect impacts, such as noise and air pollution, have been evaluated and determined to not be significant.

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3.			The area right now is forested with some significant wetlands. The construction would be incredibly destructive to water quality.	Prior to construction, the MKAA would be required to obtain all necessary permits for actions that could impact wetlands and streams. The permitting process would establish conditions and mitigations to prevent and minimize adverse impacts to affected resources.
4.			It is also very likely that the curvy two-lane State Route 95 would then be deemed inadequate for access. So then we will have to make an even bigger mess of the area to fix that problem, at considerable cost to taxpayers.	No impacts to SR 95 were identified during the environmental analysis conducted for the EA.
5.			It has not been mentioned the grave risk to Y-12 and ORNL (the nation's storehouse of uranium and a major weapons production facility) and ORNL (a major research facility) that together employ close to 10,000 people, could be put at risk by the increased use of air space by small and less regulated planes. We have already seen what a terrorist with a plane can do. Please don't put our nation's research resources and weapons stores at risk in this way.	Operations at the Oak Ridge Airport would not change the current airspace restrictions over the Y-12 National Security Complex (Y-12 Complex). Additionally, the airport's presence would not materially affect the current ability to use an airplane to conduct an intentionally destructive act at DOE facilities in Oak Ridge. DOE has engaged in discussion of this issue with the NNSA, which has raised no objection to the proposed Oak Ridge Airport.

COMMENT RESPONSE MATRIX

Environmental Assessment

Property Transfer to Develop a General Aviation Airport at the East Tennessee Technology Park Heritage Center, Oak Ridge, Tennessee (DOE/EA-2000)

Reviewer Name: Martin McBride, Ph.D.
Reviewer Agency/Organization: DOE Nuclear Safety Director (retired)
Reviewer Telephone Number:
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Reviewer E-mail Address:

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1.			Oak Ridge's rich variety of nuclear facilities are important national assets. Plane crashes into many of them can cause substantial environment damage (not to mention loss of life) in the Oak Ridge-Greater Knoxville area. Failing to deal with this impact would be a significant omission in the environmental assessment of the proposed land transfer for the airport. A large private jet—fully loaded with fuel— crashing into an Oak Ridge nuclear facility has the potential to generate a major nuclear accident. From a nuclear	Operations at the Oak Ridge Airport would not change the current airspace restrictions over the Y-12 Complex. Additionally, the airport's presence would not materially affect the current ability to use an airplane to conduct an intentionally destructive act at DOE facilities in Oak Ridge. DOE has engaged in discussion of this issue with the NNSA, which has raised no objection to the proposed Oak Ridge Airport. Any additional safety basis analysis would be completed, if required, after the completion of the MKAA Master Plan.

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			facility standpoint, this represents a tangible hazard similar to the hazard posed by a flying bomb. Because an airport brings more planes to the local area, the introduction of an airport at ETTP will—by definition—bring some measure of added nuclear risk. The ultimate question is: Is this added risk appropriately understood and enveloped within current nuclear safety and NEPA analyses? If not, what needs to be done to understand the risk and control it to acceptable levels?	
2.			Does the risk posed by increased local air traffic from an ETTP airport fall within the envelope of the probabilistic risk assessment for the High-Flux Isotope Reactor? Similarly, is the risk enveloped within the existing nuclear safety and NEPA analyses for the Radiochemical Engineering Development Center, fissile material storage areas of Building 3019, and other nuclear facilities at the Oak Ridge National Laboratory? Will an ETTP airport introduce new accident frequencies, source terms, transport mechanisms, or consequences that have not been previously considered?	See response to Comment No. 1.
3.			Are there special emergency notifications that need to be made, if an emergency flight path will take a plane near the HFIR or other Reservation nuclear facility? Should nuclear facility operations be suspended in time of airport emergency? If so, which nuclear facilities should be addressed and under what emergencies?	See response to Comment No. 1.
4.			The HFIR lacks a reactor containment building. In light of this, does the frequency or consequence of a large private jet crash push risk beyond currently	See response to Comment No. 1.

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			analyzed safety and NEPA bases—considering the number and type of planes permitted at the proposed airport? Are added controls needed on the numbers-of-planes to limit the associated nuclear risk?	
5.			Can a shock-of-impact to the HFIR reactor vessel from a large private jet plane crash create conditions of positive reactivity within the reactor core that would make a nuclear chain reaction speed up? Could such a crash deform and consolidate spent reactor fuel enough—within the HFIR spent fuel pool—to cause a follow-on criticality accident or additional release of spent fuel fission products? Can such a plane crash disrupt fuel pool integrity, disrupt reactor vessel integrity, uncover the core or spent reactor fuel, and release fission products without mitigation to the environment in a manner that is outside the current reactor safety and NEPA bases?	See response to Comment No. 1.
6.			Will the nuclear risk from airport operations—including normal, off-normal, and emergency airport operations—for waste facilities and storage areas on the DOE Oak Ridge Reservation go beyond their existing nuclear safety analyses and existing NEPA analyses?	See response to Comment No. 1.
7.			Will the nuclear risk from airport operations—including normal, off-normal, and emergency airport operations—for Y-12's nuclear facilities go beyond their existing nuclear safety and security analyses and existing NEPA analyses? What about ETTP nuclear facilities, if such still exist?	See response to Comment No. 1.

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8.			The Three Mile Island nuclear accident hurt no one and released only small amounts of radioactive material to the environment, yet the subsequent economic losses were huge. Does DOE understand the magnitude of economic loss to itself and to Oak Ridge (and surrounding counties) of a plane crashing into an Oak Ridge nuclear facility? Is this economic loss acceptable?	DOE has engaged in discussion of this issue with the NNSA, which has raised no objection to the proposed Oak Ridge Airport. It is expected that the likelihood of an accident at one of the Oak Ridge nuclear facilities would not increase if the airport is built. Additional safety basis analysis would be completed, if required, after the completion of the MKAA Master Plan. Based on these reasons, economic impact of an unlikely accident was not evaluated in this EA.
9.			The expected impacts of noise, pollution, and traffic congestion on visitors to the new Manhattan Project National Park are not discussed in the current EA. These impacts should be addressed. Failure to do so would be a second major omission in the EA.	Additional discussion of potential impacts associated with the proposed Oak Ridge airport and the possible establishment of the Manhattan Project National Historical Park (MPNHP) has been added to Sect. 3.10 in the EA.
10.			The current EA is silent on whether the National Park Service and the other parties to the ETTP Heritage Memorandum of Agreement agree that the impacts of an airport on the proposed are acceptable (or not). At a minimum, the EA should document Park Service agreement with the Assessment—since the airport has not been part of public DOE:Park Service negotiations previously. The other parties to the ETTP MOA should be sent the proposed EA and provided an opportunity to comment, if they wish to.	DOE has analyzed the potential impacts of the airport to the MPNHP and other resources at ETTP. In response to comments and feedback, DOE has expanded the evaluation in the EA to more thoroughly describe the resources that are detailed in your letter including the K-25 footprint, S-50 building, Former Powerhouse, Happy Valley, Wheat Community, Wheat Church, African Burial Ground, and the facilities that are not yet constructed (History Center, Equipment Building, and Viewing Tower). It is important to note that, at this time, only the K-25 Building Site is included within the boundaries of the MPNHP unit; these other areas and facilities may be evaluated at a future date for potential inclusion. DOE has revised the EA to include a figure that identifies all of these cultural resources. With the exception of a portion of the Wheat Community, all of the resources are outside of the airport construction footprint, including the Wheat Church and cemetery.

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				Those historic resources within the Wheat Community that may be impacted by the potential development of a general aviation airport will be addressed through National Historic Preservation Act of 1966 (NHPA) consultation with the Tennessee State Historic Preservation Office (SHPO) and mitigated per the outcome of the consultation if it is determined to be necessary. The impacts of noise and air pollution from the airport are assessed in the EA and determined to be at levels that are non- impacting and compatible with the MPNHP.
11.			Does the airport intend to restrict visitation to and gatherings at the historic Wheat church to once a year in the future—when the church and grounds become attached to the National Park? (The EA currently limits its analysis to one gathering at the Wheat church per year— which was the norm in the past, but not in the future with the National Park.) Does the National Park Service agree with your environmental assessment on this subject?	There are no documented plans to attach the Wheat Church to the proposed MPNHP. The conservative noise analysis estimated that the noise levels at the church would increase to 55 dB DNL (day–night average sound level), the U.S. Environmental Protection Agency (EPA) threshold below which no impacts to human health and welfare are likely to occur. Supplemental noise analysis conducted at that site estimated that the maximum noise level on an "average day" of an aircraft flying directly overhead would be 84 dBA (A-weighted decibels). This noise level is loud enough to temporarily interrupt normal conversation, but at levels well below where physical damage to hearing occurs. Interior noise levels could reach a maximum level of 69 dBA, the level of a loud conversation.
12.			The ETTP building was one of the most historic structures on earth. In return for permission to demolish this landmark, DOE promised to build an ETTP museum (including an outdoor area) that would allow visitors a place to consider the world-changing impact of ETTP and the rest of Oak Ridge's	Average noise levels in the vicinity of the K-25 Building site were estimated to be between 40 to 45 dB DNL, well below the EPA threshold for impacts to human health and welfare. Potential air quality and traffic impacts were determined to be minimal.

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			Manhattan Project work. What is the impact of airport noise, pollution, and traffic congestion to this museum experience? Does the National Park Service agree with your environmental assessment on this subject?	
13.			Will the airport impact other heritage attractions on the west end of Oak Ridge, such as the African American slave cemetery, former site of Happy Valley, and the other Wheat sites? Does the National Park Service agree with your environmental assessment on this subject?	The figure in Sect. 3.10 has been revised to show the relationship of the proposed airport to other cultural resources such as the former K-25 Building site, Happy Valley, former Powerhouse Area, African Burial Ground, and the Wheat Community.
14.			According to DOE figures, Roane and Anderson Counties lost about 20% of their DOE residents in the last four years. This cost the local economy many tens of millions of dollars in lost DOE payroll. One of the department's chief explanations for the steady drop in local DOE residency over the last three decades has been a limited housing inventory in Oak Ridge. Will the congestion, noise, and pollution from the airport further limit Oak Ridge's housing inventory? The EA should address this topic.	Based on the analysis conducted for the EA, noise and air quality impacts would be minimal and the increase in traffic is anticipated to be less than 1%, which is less than the normal annual variation. The construction of the proposed airport would not preclude future housing development and no decreases in property values are anticipated. An increase in industrial development of the area, which may be enhanced by the airport, could increase demand and value for property in the vicinity of the ETTP.
15.			Considering that Oak Ridge has very few areas to expand its housing, what are the economic implications of locating the airport adjacent to Rarity Ridge—an area that the City Council once suggested could host 600 new up-scale homes? Will the airport's presence impact the presence of higher-end housing in this area? If so, by how much? The EA should address this topic.	See response to Comment No. 14. The EA has been revised in Sect. 3.3.2 to include additional noise analysis for the Preserve at Clinch River (Rarity Ridge) and existing and potential housing areas near Wisconsin Avenue as shown on Fig. 3.2.

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16.			This year, both Roane and Anderson County property values declined. Due to this decline, Oak Ridge city property taxes are now the highest in East Tennessee. Will the introduction of an airport further depress nearby property values because of congestion, noise, and pollution? If so, is this an acceptable impact? The EA should address this topic.	See response to Comment No. 14.

COMMENT RESPONSE MATRIX

Environmental Assessment

Property Transfer to Develop a General Aviation Airport at the East Tennessee Technology Park Heritage Center, Oak Ridge, Tennessee (DOE/EA-2000)

Reviewer Name: Gerry Middleton
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1.			Significant volume of the Mitchell Branch headwaters originates within the proposed airport site.	A tributary to the upper portion of Mitchell Branch and a delineated wetland in the Mitchell Branch watershed are within the proposed construction footprint. Prior to airport construction, the MKAA and FAA would be required to go through the appropriate permitting process for this area and mitigations would be established through that process.

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2.			Filling of the wetlands on the site could seriously damage the CERCLA actions taken thus far cleaning up Mitchell Branch downstream of these wetlands.	Filling of any wetlands associated with construction of the proposed airport is not expected to have any adverse impact on any Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) actions for Mitchell Branch and vicinity. Prior to construction, the MKAA would be required to obtain all necessary permits for actions that could impact wetlands and streams. The permitting process would establish conditions and mitigations to prevent and minimize adverse impacts to resources and water quality.
3.			ORNL and TDEC biologists use the upper section of Mitchell Branch as a reference site for macroinvertebrate semiquantitative sampling.	The Biological Monitoring and Abatement Program (BMAP) site at Mitchell Branch kilometer (MIK) 1.43 is outside the proposed airport construction limits and would not be directly impacted. Erosion and sediment controls would minimize indirect impacts to the stream until the disturbed areas are stabilized.
4.			Trees with exfoliating bark present and dead snags are present on-site supporting potential Indiana bat maternity roosts.	Additional text has been added to Sect. 3.9.
5.			Endangered Indiana and Gray bat calls were detected on-site (Anabat survey) at the proposed Heritage Center airport site	Indiana and gray bats are both included in the list of potentially occurring federal-listed species in Table 3.17. Seasonal tree cutting restrictions have been included in the EA as recommended by the U.S. Fish and Wildlife Service (USFWS). Once the MKAA Master Plan has been completed and the FAA conducts additional NEPA analysis, the need for Section 7 consultation will be determined.
6.			Prior to construction, DOE or the new site owner should enter into Section 7 consultations with the USFWS regarding the endangered bat species.	Once the MKAA Master Plan is completed, the FAA will determine if/what tree removal is necessary, which will determine whether Section 7 consultation is necessary and, if so, proceed accordingly.

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7.			Wetland creeks support Trichoptera and other aquatic macroinvertebrates such as the Endangered Valley Flame Crayfish.	The Valley Flame Crayfish has been added to the table containing the protected species occurring or potentially occurring near the proposed airport area.
8.			An abandoned open well at the site should be grouted.	This well, if present within the construction area, will be addressed by the MKAA construction contractor subsequent to the property transfer.

COMMENT RESPONSE MATRIX

Environmental Assessment

Property Transfer to Develop a General Aviation Airport at the East Tennessee Technology Park Heritage Center, Oak Ridge, Tennessee (DOE/EA-2000)

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Comment #	Page Number	Line Number	Comment	Comment Response
1.			With the Knoxville Airport 15–20 minutes away, it would be a waste of federal dollars to spend millions on another airport at Oak Ridge.	The economic basis of the decision to build an airport is outside the scope of this EA. The determination of whether a relief airport is needed in the area and the decision to place it at ETTP is being made by the MKAA and the FAA. DOE's proposed action is to transfer the land to the MKAA for the intended purpose of constructing an airport.
2.			The 170-acre site, taken by eminent domain and still under the Dept. of Energy, should stay under the DOE for public use and not be given away for a dubious project.	Thank you for your comment.

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3.			Fog: The valley through which the Oak Ridge turnpike runs and where the airport is proposed is one of the foggiest locations in East Tennessee and would be a hazard for aviation many days of the year. Use the Knoxville airport!	Weather conditions, including fog, will be addressed by the MKAA Master Plan and subsequent FAA review. Visual Flight Rules (VFR) and Instrument Flight Rules (IFR) in place at the proposed airport would also address weather conditions affecting aircraft operations.

COMMENT RESPONSE MATRIX

Environmental Assessment

Property Transfer to Develop a General Aviation Airport at the East Tennessee Technology Park Heritage Center, Oak Ridge, Tennessee (DOE/EA-2000)

Reviewer Name: Mark S. Watson
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General			The City of Oak Ridge has been involved for several years in discussions regarding the development of a general aviation airport in Oak Ridge, and supports the proposed property transfer as set forth in the draft environmental assessment (EA). The proposed location at the East Tennessee Technology Park (ETTP) would require the transfer of approximately 170 acres of federal land to the Metropolitan Knoxville Airport Authority (MKAA), using the General Services Administration (GSA) "Public Benefit Conveyance" process, which allows property to be transferred at no cost.	Thank you for your comments.

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			The proposed land transfer is the next step in the development of the airport project, which benefits the Oak Ridge community in several key ways. First, the enhanced aviation opportunity will serve as an enticement for prospective new residents and industries, contributing to job creation, and economic and community development. Second, the location of an airport at ETTP not only supports the reindustrialization of Heritage Center, but also Horizon Center industries including CVMR. The buildout of these sites helps the City realize a return on infrastructure investments in the west end of Oak Ridge. The proposed location is within the Oak Ridge City limits and also near existing emergency response services located at Oak Ridge Fire Station 4. Third, the proposed action supports City Council Resolution 6-49-2012, which endorses efforts to construct a general aviation airport at ETTP, located in the Oak Ridge city limits, with the MKAA serving as the lead agency. In addition, City Council adopted its 2015 Legislative Agenda by Resolution1-7-2015, which advocates federal land transfer for the airport to MKAA. Further, construction of the proposed airport will benefit local pilots which will help reduce congestion at general aviation airports in the region. Section3.1.2.1 of the EA affirms that the location "is sufficiently distant from the McGhee Tyson and Rockwood airports so as not to affect those airport operations." Finally, the "bounding analysis" conducted within the EA appears to be appropriate in that it describes a reasonable upper end of operational activity associated	

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			with constructing and operating an airport at the proposed location. A separate NEPA review will be conducted by the FAA when the MKAA Master Plan is finalized, and the General Services Administration may also conduct further analysis. I would like to extend my full support and offer to assist as the proposed project moves forward to both maximize benefits and minimize potential impacts.	

COMMENT RESPONSE MATRIX

Environmental Assessment

Property Transfer to Develop a General Aviation Airport at the East Tennessee Technology Park Heritage Center, Oak Ridge, Tennessee (DOE/EA-2000)

Reviewer Name: David K. Olsen
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Reviewer E-mail Address:

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1.			I am a resident of Westwood subdivision and represented the district of the proposed airport on the Roane County Commission for sixteen years. I am very concerned about the proposed airport on the west end of Oak Ridge and the transfer of DOE land to the MKAA to facilitate such. This land transfer would be poor use of public land, and would essentially require the expenditure of $32M of public funds to duplicate the nearby Rockwood Airport.	The economic basis of the decision to build an airport is outside the scope of this EA. The determination of whether a relief airport is needed in the area and the decision to place it at ETTP is being made by the MKAA and the FAA. DOE's proposed action is to transfer the land to the MKAA for the intended purpose of constructing an airport.
2.			The largely unused Rockwood municipal airport already has a paved 5,000-ft runway that is only fifteen nautical miles and thirty minutes by road from	The need for an airport is determined by the FAA through their NPIAS evaluation process. The proposed Oak Ridge Airport received FAA approval for

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			the proposed site. In fact, I believe you can see the site of the proposed airport from the end of the Rockwood runway. MKAA, CROET, Oak Ridge City, and other proponents claim that the airport is needed and would facilitate growth in the two CROET Industrial parks. The Rockwood airport experience seems to demonstrate otherwise. Cumberland, Roane, and Morgan Counties in a consortium have spent about \$7.0M to develop an industrial park around this airport. Roane County's share was around \$2.3M. Today there is no development around the airport, there is no infrastructure, and there are only a few flights per day. It is difficult to believe that public funding from the FAA, State, MKAA, etc., would be available to build and subsidize the operation of a nearby duplicate airport to serve part of the same market. If a general use airport is required west of Knoxville, then the Rockwood airport management probably should be reorganized if needed and the airport developed. It might be a much better option.	inclusion in the NPIAS in January 2015. If a proposed airport is placed on the NPIAS, the Secretary of Transportation considers the airport "necessary to provide a safe, efficient, and integrated system of public-use airports adequate to anticipate and meet the needs of civil aeronautics." The current airports (Rockwood, McGee Tyson, and Downtown Island) were also considered when the Oak Ridge Airport was included in the NPIAS.
3.			Furthermore the case to build such an airport is lacking. The projected growth in the area is modest. The projected air traffic growth is modest. I believe the number of non-commercial pilots is declining. The proposed airport justification document in reality makes the case that the airport is not justified on growth or economic grounds. A rigorous cost-benefit analysis should be required before any land is transferred or public funds are committed to the project.	See response to Comment No. 1.
4.			Moreover whatever the airport justification, the noise analysis in the Environmental Assessment for the Property Transfer (EA) seems flawed. It projects	A supplement to the noise analysis was prepared, which provides details about the projected L_{max} [maximum A-weighted sound level] (Appendix D in

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			50,000 annual operations, or one operation every ten minutes, and then implies that the noise from these operations would not be a significant intrusion on the nearby quiet and peaceful residential neighborhoods. None of this seems reasonable. In addition, the average is not the point. It is the noise of the loudest possible operations that is the most intrusive. What are the ambient noise levels and what would these noise levels be from the loudest operations from the airport for each aircraft type, deep into the nearby residential areas: Westwood, Rarity Ridge, Country Club Estates, and along the turnpike? Also, not discussed in the EA is the effect of the Y-12 airspace exclusion in the next valley, the flight paths in and out of the airport, and Table 2.4 does not list information on the nearby Rockwood airport.	the EA). Additional receiver sites were added for Westwood, Country Club Estates, Former Rarity Oaks, and points at each end of the 40, 45, and 50 DNL contours. Operations at the Oak Ridge Airport would not change the current airspace restrictions over the Y-12 Complex. Additionally, the airport's presence would not materially affect the current ability to use an airplane to conduct an intentionally destructive act at DOE facilities in Oak Ridge. DOE has engaged in discussion of this issue with the NNSA, which has raised no objection to the proposed Oak Ridge Airport. Expected flight paths and other airspace issues will be addressed in the MKAA Master Plan and subsequent FAA review. However, it is expected that the flight paths and airspace will not differ significantly than what was analyzed and modeled for this EA.
5.			In summary, the proposed airport project does not seem financially justified and duplicates a nearby facility. Therefore, at a minimum, DOE should not transfer land to the MKAA unless the MKAA has firmly in place a cost benefit analysis and then the required funding to build and also to operate the proposed airport. The effect of single flights on the nearby residential neighborhoods surely requires further clarification.	Thank you for your comments.

COMMENT RESPONSE MATRIX

Environmental Assessment

Property Transfer to Develop a General Aviation Airport at the East Tennessee Technology Park Heritage Center, Oak Ridge, Tennessee (DOE/EA-2000)

Reviewer Name: Sandra K. Goss, Executive Director
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1.			**Purpose and need.** The purpose of the action is to provide land specifically for an airport. In view of this specific use, the section should make clear that there will be safeguards ensuring that the land, having been transferred, will be used for that specific purpose. Otherwise, the land should revert to DOE, and/or another EA should be undertaken. The need for the proposed airport has not been substantiated. Before committing to the proposed land transfer and its associated impacts, DOE should obtain solid evidence to support the expectation that the proposed airport is needed and present that evidence in	The deed that DOE would give to the MKAA if the property transfer occurs would have a reversion clause that stipulates the return of land from the MKAA to DOE in the event that the airport was not constructed. The time frame of the reversion clause has not yet been determined but would be at the time of deed execution. The need for an airport is determined by the FAA through their NPIAS evaluation process. The proposed Oak Ridge Airport received FAA approval for inclusion in the NPIAS in January 2015. If a proposed airport is placed on the NPIAS, the Secretary of

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			the EA. Of particular importance is establishing a clear business use of the airport, since it is asserted that such use will bring commercial and industrial development. The Purpose and Need section should go beyond mere assertion and present the rationale for the expectation, referring to other EA sections as appropriate. The land committed for this purpose will be lost to other uses that have known benefits; thus, the EA should compare these other potential uses and their benefits to that expected to be realized from the proposed airport.	Transportation considers the airport "necessary to provide a safe, efficient, and integrated system of public-use airports adequate to anticipate and meet the needs of civil aeronautics." The current airports (Rockwood, McGee Tyson, and Downtown Island) were also considered when the Oak Ridge Airport was included in the NPIAS.
2.			**Alternatives Considered but Eliminated.** It should be noted that a potential alternative open to the Metropolitan Knoxville Airport Authority (MKAA) is to enhance and expand the Rockwood Municipal Airport, acknowledging that this alternative is outside DOE's purview.	The Rockwood airport is not within the jurisdiction of the MKAA.
3.			**Wheat Community.** Although the EA acknowledges impacts to the former site of the Wheat Community, it omits discussion of the so-called Wheat Greenway. This greenway extends east from Blair Road along Wheat Road, passing the George Jones Baptist Church. It is open to pedestrians and allows the public to visit the Wheat historic area. It connects to other greenway trails in forested areas of the Oak Ridge Reservation and has the potential to be a good recreational destination for visitors to the Manhattan Project National Historic Park. People access the greenway from Blair Road. It appears that Blair Road Options 1 and 2 (as outlined in EA Section 2.1.4.2) could eliminate public access to the Wheat Greenway. Impacts to users of this greenway should be discussed in the EA, and the	The Wheat Trail Greenway has been added to Sect. 3.5.1. The MKAA has made a commitment to the Wheat Community that access to the church and cemetery will be maintained. This will be accomplished by either constructing a new access road off of Highway 58 or by maintaining the current access point off of Blair Road.

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			selected option for Blair Road should preserve public access to the greenway entrance.	
4.			**Section 3.5, Land Use** This section should acknowledge and discuss the fact that the proposed airport would displace existing commercial tenants and related commercial uses on land where the airport would be built. As noted above, if the transferred land is not developed for an airport, it should revert to DOE ownership, rather than remaining in the ownership of the Metropolitan Knoxville Airport Authority.	Text has been added to Sect. 3.5 stating that the proposed airport would displace existing commercial tenants within Bldgs. K-1330 and K-1580 and would preclude any other type of commercial development within the transfer area. The deed that DOE would give to the MKAA if the property transfer occurs would have a reversion clause that stipulates the return of land from the MKAA to DOE in the event that the airport was not constructed. The time frame of the reversion clause has not yet been determined but would be at the time of deed execution.
5.			**Mitigation measures.** The EA should provide quantitative information on the mitigation projects that are expected to be required to compensate for projected impacts to the surface streams, wetlands, and cultural resources that could be damaged or destroyed as a result of the proposed action. TCWP believes that DOE should be an active participant in mitigation, particularly with regard to mitigation of effects on streams and wetlands, rather than simply referring to future regulatory actions of TDEC and USACE. ??? It would be helpful if the EA included a table summarizing mitigation measures that would be undertaken.	To the extent practicable, potential mitigation measures and other measures to minimize potential adverse impacts were provided in the EA. Quantitative information on any potential mitigations would be premature since the final airport design, road options, and construction plans have not been completed. Additional details on the proposed airport will be part of the MKAA Master Plan and subsequent FAA review. Prior to construction, the MKAA would be required to obtain all necessary permits for actions that could impact air quality and disturb wetlands and streams. The permitting process would establish conditions and mitigations to prevent and minimize adverse impacts to affected resources.

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6.			**Cumulative impacts.** For the most part, the EA presents a good overview of cumulative impacts, considering the limitation that DOE does not have a sitewide planning document (sitewide EIS) as a context for discussion. An additional action to be identified as a source of potential cumulative impacts is DOE's recent release "for disposal" of the Happy Valley site, comprising about 170 acres of land on the opposite side of Hwy. 58 from the proposed airport. Potential cumulative impacts from the proposed land transfer for the airport and the release of this other property should be included in the Cumulative Impacts section.	DOE assessed the cumulative impacts of all future land transfers in a previous environmental assessment completed in 2011 (DOE/EA-1640). This 2011 EA evaluated the conveyance and future industrial development of ~1,800 acres of land at the ETTP, which included all but 51 acres of the proposed 170-acre transfer to the MKAA. The 2011 EA stated that a future airport was possible and that it would require additional NEPA evaluation, which is being conducted with the current EA. As such, cumulative effects were previously assessed in 2011 and considered as this current EA was prepared, and addressed accordingly.

COMMENT RESPONSE MATRIX

Environmental Assessment

Property Transfer to Develop a General Aviation Airport at the East Tennessee Technology Park Heritage Center, Oak Ridge, Tennessee (DOE/EA-2000)

Reviewer Name: Michelle Walker Owenby
Reviewer Agency/Organization: Assistant Commissioner of Policy and Planning, TDEC
Reviewer Telephone Number: (615) 532–9668
Reviewer Mailing Address: State of Tennessee Department of Environment and Conservation, Nashville, TN 37243–0435
Reviewer E-mail Address:

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General			TDEC appreciates the opportunity to comment on the Draft EA. Please note that these comments are not indicative of approval or disapproval of the proposed action or its alternatives, nor should they be interpreted as an indication of all necessary permits that may be required from TDEC should action be taken.	Thank you for your comments.
General			Given that the DOE site was previously used for uranium enrichment and separation processing and has known historic areas of legacy radioactive wastes, residual mercury wastes, and potentially chemical wastes, TDEC generally recommends that any proposed construction project be managed in a manner so that all of the proposed	The parcels of DOE property to be transferred to the MKAA (ED-3, ED-4, ED-13, and ED-16) all received clean parcel determinations under CERCLA §120(h)(4). The previously transferred Parcel ED-8 was approved under a covenant deferral request under §120(h)(3)(C). DOE would

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			areas where any soils are to be disturbed or buildings demolished, are surveyed in advance for radiological, mercury, or chemical wastes and remediated prior to beginning any on-site activity that could disturb legacy wastes.	retain responsibility for any unanticipated discovery of legacy wastes during construction of the proposed airport.
General			TDEC's **Department of Energy Oversight Office (DOE-O)** has reviewed the Draft EA. DOE-O recognizes that the draft EA adequately describes the anticipated impacts of the construction and operation of a general aviation airport and that all impacts will be mitigated through the application of environmental regulations.	Thank you for your comments.
1.			The northern section of the proposed airport footprint extends into forested uplands characterized by numerous mature white oak trees and dead standing snags, which serve as roosting habitat likely supporting the federally endangered Indiana bat.[1] DOE-O concurs with DOE's recommendation that acoustic monitoring be conducted according to U.S. Fish and Wildlife (USFWS) guidance, that the construction zone should be surveyed for the presence of potential roost trees, and that tree removal should not occur between March 31 and October 15 to the extent practical. Specifically, with regard to acoustic monitoring, previous acoustic surveys conducted during the summer of 2013 do not provide site-specific bat acoustic information for the actual footprint of the proposed airport construction area and new surveys may need to be conducted for the specific footprint that will be directly impacted. Additionally, the gray bat has been documented in the vicinity of the construction footprint and habitat destruction would be expected to, at a minimum, displace this bat species. [1] TDEC staff walked over the hilly, forested topography north of the RSI solar panel array in August 2015 and counted >30 mature white oaks and	Text in Sect. 3.9.2 has been revised to address potential displacement of the gray bat.

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			dead snags with loose, exfoliating bark or holes, cracks or crevices that bats may use as maternity roosts.	
2.			During an August 2015 TDEC walkover of the proposed airport construction site, the wetlands were observed to be fed by small springs or seeps capable of supporting aquatic life such as the Tennessee-listed Valley Flame Crayfish (*Cambarus deweesae*, Endangered species) that is a primary burrower known to occur in Roane County. These spring or seep-fed wetlands identified as S06, W09, W10, and W13 constitute part of the source water (i.e., headwaters) for Mitchell Branch. The loss of these wetlands may severely impact the benthic macroinvertebrate community in this upper reach of Mitchell Branch[2] which is used by both TDEC and Oak Ridge National Laboratory (ORNL) biologists as a reference monitoring site (i.e., Aquatic Reference Area 1, ARA1[3]). ______________ [2] Mitchell Branch (lower) is an impacted Tennessee stream and as such is entitled to an even greater level of protection. Over the years, the quality of lower Mitchell Branch has improved through remediation of legacy problems and the healthy fauna from upstream have been able to slowly repopulate the lower portions of the stream. Disturbing and filling in tributaries and associated wetlands of upper Mitchell Branch will likely degrade the quality of the upstream benthic populations and therefore remove a source of nursery organisms for repopulation of downstream portions of Mitchell Branch. As such, continued improvement of lower Mitchell Branch will likely be halted. [3] ARA1 is a small stream with reportedly high benthic invertebrate diversity but low fish diversity and it will likely be severely degraded during construction with a loss of diversity expected. A loss of biodiversity may negate the site from future use as a benthic reference.	The Valley Flame Crayfish has been added to Table 3.17 that lists the protected species occurring or potentially occurring near the proposed airport. Prior to construction, the MKAA would be required to obtain all necessary permits for actions that could impact wetlands and streams. The permitting process would establish conditions and mitigations to prevent and minimize adverse impacts to resources and water quality. The BMAP site at MIK 1.43 is outside the proposed airport construction limits and would not be directly impacted. Erosion and sediment controls would minimize indirect impacts to the stream until the disturbed areas are stabilized.

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3.			DOE-O recommends that the statement “No federal- or state-listed species are known to occur within the construction footprint, although there is potential for occurrence of some species (Table 3.17)” on page 3-46 be verified with a thorough field biology survey.	The final airport footprint will not be known until the MKAA Master Plan is completed and the FAA conducts additional NEPA analysis. Once completed, a determination can be made as to the potential impacts to environmental receptors including federal- and state-listed species. FAA will enter into Section 7 consultation with the USFWS if necessary, and the need for additional field studies will be made at that time. This EA is a bounding analysis that evaluated the current airport footprint and the known species in the area. The MKAA Master Plan will determine the final airport footprint and will provide a better idea of the timing of the project. Species currently present, or absent, from the footprint could change from now until the time of airport construction and thus, additional fieldwork is not appropriate at this time.
4.			DOE-O recommends that DOE enhance Fig. 1.2, 2011 EA Area including Parcel ED-16, by identifying, in this figure, the other ED parcels that the proposed airport will affect (include parcels ED-13 and ED-8) and by identifying in the legend or removing the solid blue line and the dashed blue line surrounding the ETTP industrial area. As depicted, it is unclear what the solid blue line and the dashed blue line represent.	The purpose of Fig. 1.2 is to show the extent of the area that was evaluated in the 2011 EA for transfer of land and facilities within the ETTP. Figure 2.1 shows the property status for all of the parcels that are part of the proposed airport. Figure 1.2 has been revised to add the solid and dashed blue lines to the legend.

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General			TDEC's **Division of Natural Areas (DNA)** has reviewed the Draft EA and provides the following comments regarding the proposed action:	Thank you for your comments.
1.			The specific area to be cleared is located mostly within and adjacent to the developed ETTP area with ongoing human presence and activity that diminishes the value of the site for many listed species. However, DNA advises that a number of the taxa below may remain on or near the property depending upon site conditions. DNA has reviewed the state's natural heritage database with regard to the project site and found that the following rare species have been observed previously within one mile of the project. Several of these species were also specifically noted by DOE-O:	The EA has been revised to include additional species per the state's natural heritage database.

Type	Scientific Name	Common Name	Global Rank	St. Rank	Fed. Prot.	St. Prot.	Habitat
Vertebrate Animal	*Aneides aeneus*	Green Salamander	G3G4	S3S4	--	Rare, Not State Listed	Damp crevices in shaded rock outcrops and ledges; beneath loose bark and cracks of trees and sometimes in/or under logs.
Vascular Plant	*Aureolaria patula*	Spreading False-foxglove	G3	S3	--	S	Oak Woods and Edges
Vertebrate Animal	*Chrosomus tennesseensis*	Tennessee Dace	G3	S3	--	D	First order spring-fed streams of woodlands in Ridge and Valley limestone region; Tennessee River watershed.
Vertebrate Animal	*Cryptobranchus alleganiensis*	Hellbender	G3G4	S3	No Status	D	Rocky, clear creeks and rivers with large shelter rocks.
Vascular Plant	*Elodea nuttallii*	Nuttall's Waterweed	G5	S2	--	S	Aquatic; Streams and Ponds
Vertebrate Animal	*Hemidactylium scutatum*	Four-toed Salamander	G5	S3	--	D	Woodland swamps, Shallow depres-

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										sions, & sphagnum mats on acidic soils; middle & east Tennessee.	
			Vertebrate Animal	*Hemitremia flammea*	Flame Chub	G3	S3	--	D	Springs and spring-fed streams with lush aquatic vegetation; Tennessee & middle Cumberland river watersheds.	
			Other (Ecological)	*Heron rookery*	Heron Rookery	GNR	SNR	--	Rare, Not State	<Null>	
			Vascular Plant	*Juncus brachycephalus*	Small-headed Rush	G5	S2	--	S	Seeps and Wet Bluffs	
			Vertebrate Animal	*Limnothlypis swainsonii*	Swainson's Warbler	G4	S3	--	D	Mature, rich, damp, deciduous floodplain and swamp forests.	
			Vascular Plant	*Liparis loeselii*	Fen Orchis	G5	S1	--	T	Calcareous Seeps	
			Vertebrate Animal	*Myotis grisescens*	Gray Myotis	G3	S2	LE	E	Cave obligate year-round; frequents forested areas; migratory.	
			Vertebrate Animal	*Napaeozapus insignis*	Woodland Jumping Mouse	G5	S4	--	D	Deciduous and coniferous forests with herbaceous groundcover; middle and east Tennessee.	
			Vascular Plant	*Panax quinquefolius*	American Ginseng	G3G4	S3S4	--	S-CE	Rich Woods	
			Vascular Plant	*Platanthera flava var. herbiola*	Tubercled Rein-orchid	G4?T4Q	S2	--	T	Swamps and Floodplains	
			Invertebrate Animal	*Pleurobema rubrum*	Pyramid Pigtoe	G2G3	S1S2	--	Rare, Not State Listed	Rivers with strong current and firm sand/gravel substrates; TN & Cumberland river systems including KY Reservoir; W Uplands & W Highland Rim.	
			Vertebrate Animal	*Sorex longirostris*	Southeastern Shrew	G5	S4	--	D	Various habitats including wet	

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<tr><th>Comment #</th><th>Page Number</th><th>Line Number</th><th></th><th>Comment Response</th></tr>
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<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>meadows, damp woods, and uplands; statewide.</td></tr>
<tr><td>Vascular Plant</td><td>Spiranthes lucida</td><td>Shining Ladies’-tresses</td><td>G5</td><td>S1S2</td><td>--</td><td>T</td><td>Alluvial Woods and Moist Slopes</td></tr>
<tr><td>Vertebrate Animal</td><td>Synaptomys cooperi</td><td>Southern Bog Lemming</td><td>G5</td><td>S4</td><td>--</td><td>D</td><td>Marshy meadows, wet balds, & rich upland forests.</td></tr>
<tr><td>Vertebrate Animal</td><td>Zapus hudsonius</td><td>Meadow Jumping Mouse</td><td>G5</td><td>S4</td><td>No Status</td><td>D</td><td>Open grassy fields; often abundant in thick vegetation near water bodies; statewide.</td></tr>
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</td><td></td></tr>
<tr><td>2.</td><td></td><td></td><td>Not shown on the list above, yet highly probable from area watersheds, is the Valley Flame Crayfish (Cambarus deweesae, State Endangered).[1] Springs, wetlands, and wet meadows should be thoroughly inventoried to determine its presence in area floodplains. Should suitable habitat exist on or immediately downstream of the site, DNA recommends that project plans provide for the protection of these species.

[1] This burrowing species is widespread in the Poplar Creek watershed, and is anticipated from abutting systems. It is reported as near as 1.8 air miles from the site.</td><td>The Valley Flame Crayfish has been added to Table 3.17 that lists the protected species occurring or potentially occurring near the proposed airport.

DOE does not plan to conduct additional inventories or field surveys for the presence of the Valley Flame Crayfish as the proposed action (i.e., land transfer) will have no impact on any biological receptors. As the FAA conducts additional NEPA analysis when the MKAA Master Plan is completed, a determination can be made as to the need for additional biological surveys.</td></tr>
<tr><td>3.</td><td></td><td></td><td>DNA also recommends that DOE coordinate this project with the Tennessee Wildlife Resources Agency (Rob Todd, rob.todd@tn.gov, 615–781–6577) to ensure that legal requirements for protection of state listed rare animals are addressed.</td><td>The final airport footprint will not be known until the MKAA Master Plan is completed and the FAA conducts additional NEPA analysis. Once completed, a determination can be made as to the potential impacts to environmental receptors including federal- and state-listed species. FAA will enter into Section 7 consultation with the USFWS if necessary, and coordinate with the Tennessee Wildlife Resources Agency to ensure legal requirements for protection of listed species</td></tr>
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				are addressed. This EA is a bounding analysis that evaluated the current airport footprint and the known species in the area. The MKAA Master Plan will determine the final airport footprint and will provide a better idea of the timing of the project. Species currently present, or absent, from the footprint could change from now until the time of airport construction and thus, additional agency coordination and fieldwork are not appropriate at this time.
4.			DNA recommends that DOE contact the USFWS Field Office, Cookeville, Tennessee (931–525–4970) for comments regarding federally listed species.	The Draft EA was provided to the USFWS and no comments were received from them.
5.			For stabilization of disturbed areas, the Tennessee Natural Heritage Program advocates the use of native trees, shrubs, and warm season grasses, where practicable. Care should be taken to prevent re-vegetation of disturbed areas with plants listed by the Tennessee Exotic Pest Plant Council as harmful exotic plants.	This will be addressed when the MKAA applies for the applicable permits to begin construction activities.
6.			DNA advises that DOE keep in mind that not all of Tennessee has been surveyed and that a lack of records for any particular area should not be construed to mean that rare species necessarily are absent.	Comment noted.

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General			TDEC's **Division of Water Resources (DWR)** has reviewed the Draft EA and provides the following comments:	Thank you for your comments.
1.			The portion of ETTP being transferred for the proposed project is addressed under NPDES Permit TN0002950, an Individual Stormwater permit for the DOE facility.[1] Because this project will fundamentally change the nature of the watershed's stormwater runoff, DWR advises that the proposed transfer of land and future construction account for the potential stormwater impacts[2] and that the airport construction be covered under an Individual Construction Stormwater Permit.[3] [1] The individual NPDES permit will require development of a Stormwater Management Plan addressing installation, implementation, and maintenance of control measures and must comply with the Tennessee Antidegradation Statement available at http://share.tn.gov/sos/rules/0400/0400-40/0400-40.htm. For the watershed in which this project is located, the NPDES permit identifies stormwater constituents of concern including mercury, metals (arsenic, thallium, selenium, lead, copper, and cadmium), Technetium-99, PCBs, and gross alpha/beta radiation. [2] *See* http://environment-online.tn.gov:8080/pls/enf_reports/f?p=9034:34001. [3] The project cannot be authorized for coverage under the General Permit (GP) because the receiving stream, Poplar Creek Embayment of Watts Bar Lake (Waterbody Unit ID TN06010207001 – 0100), is already impaired for mercury and PCBs, and the project has the potential to increase pollutant loadings into the receiving stream, at http://www.tn.gov/assets/entities/environment/attachments/2014-proposed-final-303d-list.pdf, pg. 85. Also, the project area exceeds the scope of projects authorized for coverage under a GP. The GP only authorizes a 50-acre disturbance at any time. *General NPDES Permit for Discharges of Stormwater Associated with Construction Activities, Permit No. TNR100000, effective May 24, 2011, expires May 23, 2016, para 3.5.3.1, pg 19* – available at http://www.tn.gov/assets/entities/environment/attachments/permit_water_tnr100000.pdf.	Potential stormwater impacts and management will be addressed by the MKAA Master Plan and subsequent FAA review. Additionally, stormwater issues will be addressed during the permitting process that MKAA will be required to complete prior to the start of any construction activities.

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2.			Discharges that would add loadings of a pollutant that is identified as causing or contributing to an impairment of a water body on the list of impaired waters are not authorized by this permit.[4] [4] *See* subpart 1.3 of permit TNR100000 cited above.	Comment noted.
3.			Permanent stormwater control measures for the controlled release of stormwater will be required for the proposed action in accordance with a performance standard that is to be determined.[5] DWR encourages the use of both structural and non-structural measures for stormwater controls. Due to the extensive subsurface contamination on the western half of the proposed airport site, control measures involving infiltration are not allowed. [5] Performance standards for permanent stormwater control measures will be established following the EPA Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act, TN NPDES Permit No. TNS000000, NPDES General Permit for Discharges from Small Municipal Separate Storm Sewer Systems, and City of Oak Ridge Municipal Separate Storm Sewer System TNS088366.	Comment noted.
General			TDEC's **Division of Underground Storage Tanks (UST)** has reviewed the Draft EA. UST advises that if new underground storage tanks are added for this project and/or the current underground storage tanks or lines are disturbed during construction, DOE will need to notify UST and file appropriate paperwork.	Comment noted but the notification would be made by the MKAA and not DOE.
General			TDEC's **Tennessee Geological Survey (TGS)** has reviewed the Draft EA and has no specific comments regarding the proposed action or its alternative.	Thank you for your review.

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General			TDEC's **Division of Solid Waste Management (SWM)** has reviewed the Draft EA. Based on the review of records for old, closed solid waste landfills, no sites were identified in SWM's records showing disposal on the proposed airport footprint. Given that the facility (DOE's Oak Ridge Reservation) has been in operation for over 75 years, SWM recommends that DOE also check any existing archival records for on-site dumping/disposal locations.[1] SWM advises that any wastes which may be generated during the project, including any wastes unearthed during the project, would be subject to a radiological/hazardous waste determination, and must be managed appropriately. [1] Tennessee's SWM program dates back to 1972, so there could conceivably be disposal in the proposed location that predates the program and of which SWM is unaware.	The parcels of DOE property to be transferred to the MKAA (ED-3, ED-4, ED-13, and ED-16) all received clean parcel determinations under CERCLA §120(h)(4). The previously transferred Parcel ED-8 was approved under a covenant deferral request under §120(h)(3)(C). DOE would retain responsibility for any unanticipated discovery of legacy wastes during construction of the proposed airport.
General			TDEC's **Division of Air Pollution Control (APC)** has reviewed the Draft EA and provides the following comments regarding the proposed action:	Thank you for your comments.
1.			This project is proposed to take place in Roane County, TN, and APC comments that a small portion of Roane County (located around the TVA Kingston fossil plant) was named as part of the Knoxville PM2.5 nonattainment area (both the 24-hour and Annual stds. by EPA).[1] [1] Currently the Knoxville area is classified as meeting both the 24-hour and annual PM2.5 stds. with a Clean Data determination issued by EPA. However, the area is still classified as nonattainment for PM2.5. The Knoxville ozone nonattainment area was recently reclassified to attainment by EPA. This area included the counties of Knox and Blount and a small portion of Anderson.	Comment noted.

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2.			Regarding the increased air emissions projected after completion of the project, APC believes the Total and Percent of County Emissions numbers in Table 3.3 in Section 3.2.2.1 of the Draft EA are low and recommends that the calculations be reviewed and recalculated.[2] Also, APC recommends that these estimates be evaluated against the possible increase in vehicular traffic associated with the new airport users and associated staff and on-site mobile equipment. ______________ [2] The major sources of these emissions are from the aircrafts that will use the facility. Aircrafts are classified as mobile sources and not typically subject to APC permitting.	Estimates of air emissions were calculated based on the best information available at the time of analysis and were deemed to be sufficiently conservative to support the transfer of DOE property to the MKAA. After completion of the MKAA Master Plan and further review by FAA, it may be determined that further air quality analysis is needed, especially if it is determined that any air quality permits are needed.
3.			An Air Conformity Applicability Modeling analysis was included with the Draft EA and, given that the project area is currently attaining the National Ambient Air Quality Standards (NAAQS), APC recognizes that it may not be necessary to consider the analysis at this time.	Comment noted.
4.			APC advises that if any on-site building demolition activity is projected to occur, an asbestos survey needs to be performed before the demolition is to begin.[3] ______________ [3] The plan identifies two potential buildings that could be affected (K-1330 and K-1580). The notification procedures are included in the asbestos section of the draft.	Comment noted. Building demolition and construction of the airport will be the responsibility of the MKAA.
5.			APC notes that there will be fugitive dust impacts associated with the on-site construction activity and that these will need to be mitigated through a dust suppression protocol as needed.	Control measures for lowering fugitive dust emissions were included in the EA and would be the responsibility of the MKAA.

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6.			If any ground clearing is anticipated as part of the runway construction activities, open burning may be used to dispose of the residual trees and stumps removed on-site. APC recommends that alternate disposal methods be considered if practical or economically feasible (grinding, chipping, or composting).	Comment noted.

COMMENT RESPONSE MATRIX

Environmental Assessment

Property Transfer to Develop a General Aviation Airport at the East Tennessee Technology Park Heritage Center, Oak Ridge, Tennessee (DOE/EA-2000)

Reviewer Name: James Rushton
Reviewer Agency/Organization: President, Westwood Home Owners Association
Reviewer Telephone Number:
Reviewer Mailing Address: 103 Winston Lane, Oak Ridge, TN 37830
Reviewer E-mail Address:

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General			These questions and comments were assembled by the Home Owners Association for the Westwood Subdivision encompassing Whippoorwill Drive and its side streets in Oak Ridge, Tennessee. The neighborhood contains 183 homes. Westwood is one of the nearest neighborhoods to east of the proposed Oak Ridge General Aviation Airport. The Environmental Assessment is silent on potential impacts or advantages to the nearest residents east or northeast of the airport. Our questions are intended to improve the information in the Environmental Assessment, which likely will be a reference document	Thank you for your comments.

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			in any future Federal Aviation Administration approval process. Any deficiencies in the Environmental Assessment may complicate the land transfer or the FAA process. The following questions are intended to ensure that a complete environmental assessment is performed by DOE prior to the property transfer.	
1.			What is the estimated number of flights per day that will pass over or be near (within 2,000 feet) the Oak Ridge Westwood Subdivision by a twin engine piston plane, by a twin engine turboprop, and by a twin engine corporate jet during takeoffs and approaches to the proposed Oak Ridge Airport?	Based on the analysis completed for the EA, there should be no aircraft within 2,000 feet of Westwood from normal takeoffs and approaches and the touch and go patterns that were modeled. Final flight paths and other airspace issues will be part of the MKAA Master Plan and subsequent FAA review.
2.			What are the minimum and typical elevations above ground level for flights of the three types of airplanes over or near Westwood?	The FAA regulations (14 *CFR* Part 91 – General Operating and Flight Rules) state that the minimum safe altitude over any congested area of a city, town, or settlement, or over any open air assembly of persons, is 1,000 feet above the highest obstacle within a horizontal distance of 2,000 feet of the aircraft.
3.			What will be the maximum sound levels (L_{max}) at ground level in the Oak Ridge Westwood Subdivision from a twin engine piston plane, from a twin engine turboprop, and from a twin engine corporate jet during takeoffs and approaches to the proposed Oak Ridge Airport?	The L_{max} (dBA) calculated for Westwood is: Cessna Citation II – 47 Cessna 172R – 36 Beech Baron 58P – 48 Bell 206L – <35
4.			The Noise Analysis in the Environmental Assessment should be extended to the nearest neighborhoods east of the airport, including Westwood, Country Club Estates, and the property formerly called Rarity Oaks, which is expected to include approximately 200 homes before the proposed airport	A supplement to the noise analysis was prepared, which provides details about the projected L_{max} (Appendix D in the EA). Additional receiver sites were added for Westwood, Country Club Estates, Former Rarity Oaks, and points at each end of the 40, 45, and 50 DNL contours.

Comment #	Page Number	Line Number	Comment	Comment Response
			is operational. Because most of these neighborhoods are away from major roads, the residences have very low ambient noise levels. How does the FAA Instruction 10501E, referred to on page D-11, affect the need for noise analyses at the neighborhoods east of the airport?	The FAA Instruction 1051E would not be applicable to those neighborhoods since they are outside of the 45 DNL and greater contours.
5.			What will be the impact of an airport on residential development east of the proposed Oak Ridge Airport? The DOE Master Plan shows development of at least two new developments each with 200+ residences. One is on 200 acres + or - immediately west of Wisconsin Avenue and the second is the former Rarity Oaks subdivision. The Environmental Assessment is silent on this topic.	The EA has been revised in Sect. 3.3.2 to include potential noise impacts to former Rarity Oaks and the area west of Wisconsin Avenue as shown on Fig. 3.2. The construction of the proposed airport would not preclude future development of these areas.
6.			Given the limitations on the airspace over the Y-12 National Security Complex, what will be the flight paths for takeoff to the east and landings from the east?	Operations at the Oak Ridge Airport would not change the current airspace restrictions over the Y-12 Complex. DOE has engaged in discussion of this issue with the NNSA, which has raised no objection to the proposed Oak Ridge Airport. Expected flight paths and other airspace issues will be addressed in the MKAA Master Plan and subsequent FAA review. However, it is expected that the flight paths and airspace will not differ significantly than what was analyzed and modeled for this EA.
7.			The EA should include area maps showing open airspace and expected flight paths for different types of aircraft to allow area residents to understand the potential impacts to their residences.	Expected flight paths and other airspace issues will be addressed in the MKAA Master Plan and subsequent FAA review. However, it is expected that the flight paths and airspace will not differ significantly than what was analyzed and modeled for this EA.

Comment #	Page Number	Line Number	Comment	Comment Response
8.			What is the minimum distance for straight flight into and out of the airport to the east before planes will be able to turn over Westwood or other neighborhoods? The Environmental Assessment should include a discussion of landing patterns and takeoff patterns for the different types of aircraft expected.	See response to Comment No. 7.
9.			The Environmental Assessment does not contain any maps or photographs that show the proposed airport runway and the neighborhoods to the east or the entire City of Oak Ridge. Such maps or overhead photographs should be included in the environmental assessment to provide a more complete perspective.	A new figure has been added to the EA showing the location of Westwood, Former Rarity Oaks, Country Club Estates, and the Preserve at Clinch River in relationship to the proposed airport.
10.			What fraction of takeoffs and landings will be to or from the east, respectively? The Environmental Assessment appears to contain conflicting information on the percentages of takeoffs and landings in each direction. For example, in Section 3.2.3, "Flight Tracks," it is stated that, "Therefore, the total runway utilization was assumed to be 40% on Runway 06, and 60% on Runway 24." From Figures 3-1 and 3-1, "Runway 06 operates from west to east and Runway 24 operates from east to west. Then, apparently contradicting the "40% on Runway 06" statement of Section 3.2.3, Section 3.3.2.1, "Proposed action," states that, "Approximately 60% of total operations would be expected to be conducted on a west-to-east flow" – is the operational direction of Runway 06.	Section 3.3.2.1 in the EA has been revised as follows: Since instrument approach procedures would only be available from the west (Runway 06), approximately 60% of the total operations were assumed to be conducted on a west-to-east flow. The Noise Analysis Report (Appendix D) has been revised as follows: The proposed airport will have the ability to allow aircraft to fly using IFRs, but only for aircraft using Runway 06. For this reason the total runway utilization was assumed to be 60% on Runway 06, and 40% on Runway 24. These assumptions for the noise modeling were based on the best available information at the time of analysis. Further refinement of airport operations and runway utilization will be part of the MKAA Master Plan.
11.			If the airport has an instrumented landing system, will it be installed on the western or eastern approach pathway? Section 3.3.2.1, "Proposed action," states that, "instrument approach procedures would be available from the west only." Discussions with	Preliminary information provided at that time of analysis indicated that the instrument landing system would be for the western approach to Runway 06. Additional information on the instrument approach procedures for the airport will be part of the MKAA

Comment #	Page Number	Line Number	Comment	Comment Response
			spokespersons at the public meeting on the Environmental Assessment indicated that the prevailing winds are slightly biased toward coming from the west. Surely the instrument approach system would be oriented toward landing into the prevailing wind (even if only slightly biased in one direction), and that implies that instrument approaches would be available from the east only, not the west. In any case, how will the instrumented landing system affect the number or type of flight operations east of the airport?	Master Plan.
12.			What will be the hours of operation of the proposed airport? Will night landings and takeoffs be permitted?	Actual hours of operation are unknown at this time but will likely be addressed in the MKAA Master Plan. For purposes of analysis the noise modeling assumed that less than 5% of total operations would be conducted in the late-night period between 10:00 p.m. and 7:00 a.m.
13.			Is there a time limit or required progress milestones for airport development that must be satisfied? Does the property revert to DOE for industrial development if these requirements or others are not met? Any such agreements should be included in the Environmental Assessment.	The deed that DOE would give to the MKAA if the property transfer occurs would have a reversion clause that stipulates the return of land from the MKAA to DOE in the event that the airport was not constructed. The time frame of the reversion clause has not yet been determined but would be at the time of deed execution.
14.			From an airport safety perspective, did DOE assess the probability of valley fogs in selecting this site?	The EA did not specifically address valley fogs. Weather conditions, including fog, will be addressed by the MKAA Master Plan and subsequent FAA review. VFRs and IFRs in place at the proposed airport would also address weather conditions affecting aircraft operations.

Comment #	Page Number	Line Number	Comment	Comment Response
15.			What is the possible range of runway alignments that may be selected within the proposed transfer of 170 acres? At the public meeting, an MKAA official stated that the runway alignment might be changed by a few degrees either direction to minimize development costs.	This will be part of the MKAA Master Plan.
16.	3-10	21–23	The Environmental Assessment states that “60% of the operations would be on a west-to-east flow. This expectation is based on prevailing winds in the area and the fact that instrument approach procedures would be available from the west only.” The prevailing winds in that area are from the west. Explain this apparent contradiction. Meteorological tower data on the wind flow patterns should be included.	See response to Comment No. 10.

COMMENT RESPONSE MATRIX

Environmental Assessment

Property Transfer to Develop a General Aviation Airport at the East Tennessee Technology Park Heritage Center, Oak Ridge, Tennessee (DOE/EA-2000)

Reviewer Name: Bonita Irwin, Secretary/Treasurer and Steve Goodpasture
Reviewer Agency/Organization: Wheat Alumni Association
Reviewer Telephone Number: (865) 882–1856
Reviewer Mailing Address:
Reviewer E-mail Address: sgoodpasture@comcast.net

Comment #	Page Number	Line Number	Comment	Comment Response
General			Wheat was a thriving community prior to its acquisition by the Federal government in 1942. The land being considered for the proposed transfer contains five sites that have not been fully addressed with a Phase 1 archeological survey per Section 106 of the National Historic Preservation Act of 1966. In 2014, Cultural Resources Analysts, Inc. conducted a Phase 1 survey on six structural locations within the proposed land transfer that are within the Wheat Historical District 40RE224. An additional five sites located on the extreme northeast end of the proposed land transfer, along Blair Road, were not included in	Site 726B has been determined by DOE to not be individually eligible for National Register of Historic Places (NRHP) listing or contributing to the potentially NRHP-eligible Wheat Community Historic District. The sites considered to be contributing properties to the potentially NRHP-eligible Wheat Community Historic District are 723A, 723B, 730A, and 730B. A Phase II investigation is recommended for 711B to determine individual NRHP eligibility. The Roane College site is considered eligible for the NRHP. The George Jones Memorial Baptist Church and Cemetery are already listed in the NRHP. Site

Comment #	Page Number	Line Number	Comment	Comment Response
			this survey. The numbers associated with each of these sites are 723A (C. N. McKinney Home), 723B (McKinney Store), 726B (Watson's Service Station), 730A (Wheat School), and 730B (Women's Dormitory). The numbers assigned to each site coincide with the tract number assigned by the Department of Army during acquisition and a letter for each structure on the tract. The NHPA status of each of these sites has been identified in previous cultural resource surveys of the Oak Ridge Reservation as contributing to the Wheat Historical District. These sites need further evaluation as to their eligibility for inclusion on the National Register of Historical Places. These sites are important to the previous residents of Wheat. Currently the sites of these buildings are easily identified and can be viewed from Blair Road. With the construction of the proposed airport, these sites will cease to exist. Further archeological surveys need to be conducted on these sites.	723B is located within the proposed airport construction limits, but three of the four contributing properties (723A, 730A, and 730B) are on the periphery of the area that could be disturbed for construction of the airport. Because the final airport runway alignment and construction footprint is not finalized, it is uncertain as to whether these three resources would be impacted by the construction of the airport or realignment of Blair Road and the Haul Road. Once the Master Plan, being developed by the MKAA is finalized, they and the FAA would determine which resources would be impacted. If there was the potential for impacts, additional Section 106 consultation with the SHPO would be initiated by the MKAA to determine if there would be adverse effects and if any mitigation would be required.

COMMENT RESPONSE MATRIX

Environmental Assessment

Property Transfer to Develop a General Aviation Airport at the East Tennessee Technology Park Heritage Center, Oak Ridge, Tennessee (DOE/EA-2000)

Reviewer Name: John A. Wojtowicz
Reviewer Agency/Organization:
Reviewer Telephone Number:
Reviewer Mailing Address:
Reviewer E-mail Address:

Comment #	Page Number	Line Number	Comment	Comment Response
General			Mitchell Branch (lower) is an impacted Tennessee stream. As such, it is entitled to an even greater level of protection than an unimpacted stream. Biological monitoring (both fish and benthic macroinvertebrates) of Mitchell Branch has been conducted for many years in order to study the effects of mitigating a number of the legacy problems caused by conduct of the Manhattan Project at the site. Over the years the quality of lower Mitchell Branch has improved considerably. One of the reasons for the improvement of lower Mitchell Branch is that the upper portion of the stream has been relatively undisturbed. Being	A tributary to the upper portion of Mitchell Branch and a delineated wetland in the Mitchell Branch watershed are within the proposed construction footprint. Prior to airport construction, the MKAA and FAA would be required to go through the appropriate permitting process for this area and mitigations would be established through that process. The upper Mitchell Branch BMAP site is located downstream of the proposed airport construction area and would not be directly impacted. Continued monitoring at this site would provide an indicator of any potential adverse impacts from construction and

Comment #	Page Number	Line Number	Comment	Comment Response
			relatively undisturbed, upper Mitchell Branch serves as a refuge for a healthy benthic macroinvertebrate fauna. As conditions downstream improve, due to remediation of legacy problems, this healthy fauna from upstream has been able to slowly repopulate the lower portions of the stream. Disturbing and filling in tributaries and associated wetlands of upper Mitchell Branch will likely greatly degrade the quality of the upstream benthic populations and, therefore, remove a source of nursery organisms for repopulation of downstream portions of Mitchell Branch as they improve. As such, continued improvement of lower Mitchell Branch will likely be halted. Since a large part of the impetus behind the CERCLA work that has been performed at ETTP has been improvement in water quality conditions, it does not seem that this type of impact to the area, which will likely occur from placement of an airport in this area, is warranted.	operation of the proposed airport.
General			From reading of this document, it is apparent that little, if any, floral or faunal work has been performed directly on the area in question. As such, a thorough survey of the area should be required (particularly for threatened and endangered species) before plans for this airport progress much further.	Much of the area directly adjacent to and within the proposed airport site has been previously surveyed. The descriptions of potentially affected habitats and biota are sufficient for this environmental analysis. However, additional ecological surveys of the area could be required during the permitting process that would be required to be completed prior to any construction.

Comment #	Page Number	Line Number	Comment	Comment Response
1.	3-43	13–15	The statement "ARA1 is a small stream with reportedly high benthic invertebrate diversity but low fish diversity. This area was rated as a Priority area (lowest priority group), having the lowest score among the 15 sites…" undercuts the importance of this tributary of Mitchell Branch. As discussed in the first general comment above, upper Mitchell Branch and its tributaries serve as a nursery area for benthic macroinvertebrate species that are slowly repopulating lower stretches of the stream as conditions improve due to remedial activities at ETTP. Although it is a member of the lowest priority group reservation-wide, its continued existence and health are absolutely critical to the eventual recovery of Mitchell Branch as a whole.	See response to first comment.

APPENDIX C.
AIR QUALITY

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CONTENTS

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TABLES

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ACRONYMS

CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	*Code of Federal Regulations*
EPA	U.S. Environmental Protection Agency
GHG	greenhouse gas
NAAQS	National Ambient Air Quality Standards
PSD	Prevention of Significant Deterioration
ROI	Region of Influence
SIP	State Implementation Plan
TDEC	Tennessee Department of Environment and Conservation

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C.1. INTRODUCTION

This appendix presents an overview of the Clean Air Act (CAA) and Tennessee Department of Environment and Conservation (TDEC) Division of Air Pollution Control requirements, as well as calculations, including the assumptions used for the air quality analyses presented in the Environmental Assessment.

C.2. AIR QUALITY PROGRAM OVERVIEW

In order to protect public health and welfare, the U.S. Environmental Protection Agency (EPA) has developed numerical concentration based standards, or National Ambient Air Quality Standards (NAAQS), for six "criteria" pollutants (based on health-related criteria) under the provisions of the CAA Amendments of 1970. There are two kinds of NAAQS: primary and secondary standards. Primary standards prescribe the maximum permissible concentration in the ambient air to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards prescribe the maximum concentration or level of air quality required to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings (40 *Code of Federal Regulations* [*CFR*] 50).

The CAA gives states the authority to establish air quality rules and regulations. These rules and regulations must be equivalent to, or more stringent than, the federal program. The TDEC Division of Air Pollution Control is the state agency that regulates air quality emissions sources in Tennessee under the authority of the federal CAA and amendments, federal regulations, and state laws.

Tennessee has adopted the federal NAAQS as shown in Table C.1 (TDEC 2006).

Based on measured ambient air pollutant concentrations, the EPA designates areas of the United States as having air quality better than the NAAQS (attainment), worse than the NAAQS (nonattainment), and unclassifiable. The areas that cannot be classified (on the basis of available information) as meeting or not meeting the NAAQS for a particular pollutant are "unclassifiable" and are treated as attainment areas until proven otherwise. Attainment areas can be further classified as "maintenance" areas, which are areas previously classified as nonattainment areas but where air pollutant concentrations have been successfully reduced to below the standard. Maintenance areas are subject to special maintenance plans and must operate under some of the nonattainment area plans to ensure compliance with the NAAQS. Roane County is in moderate nonattainment for particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$) and in attainment for all other criteria pollutants.

A general conformity analysis is required to be conducted for areas designated as nonattainment or maintenance of the NAAQS if the action's direct and indirect emissions have a potential to emit one or more of the six criteria pollutants at or above concentrations standards shown in Table C.1 or the *de minimis* emission rate thresholds in Table C.2 or Table C.3.

Table C.1. Summary of National and State Ambient Air Quality Standards

Criteria Pollutant	Averaging Time	Federal Primary NAAQS	Federal Secondary NAAQS	Tennessee Standards
Carbon monoxide (CO)	8 h	9 ppm (10 mg/m³)	No standard	9 ppm (10 mg/m³)
	1 h	35 ppm (40 mg/m³)	No standard	35 ppm (40 mg/m³)
Lead (Pb)	Rolling 3-month average	0.15 μg/m³[a]	0.15 μg/m³	1.5 μg/m³
Nitrogen dioxide (NO_2)	Annual	0.053 ppm[b] (100 μg/m³)	0.053 ppm (100 μg/m³)	0.053 ppm (100 μg/m³)
	1 h	100 ppb	No standard[c]	No standard
Particulate matter ≤ 10 micrometers (PM_{10})	24 h	150 μg/m³	150 μg/m³	150 μg/m³
Particulate matter < 2.5 micrometers ($PM_{2.5}$)	Annual	15 μg/m³	15 μg/m³	No standard
	24 h	35 μg/m³	35 μg/m³	No standard
Ozone (O_3)	8 h	0.075 ppm³ (157 μg/m³)	0.075 ppm (157 μg/m³)	0.12 ppm (235 μg/m³)
Sulfur dioxide (SO_2)	Annual	No standard	No standard	80 μg/m³
	24 h[a]	No standard	No standard	365 μg/m³
	3 h	No standard	0.50 ppm[c] (1,300 μg/m³)	No standard
	1 h	75 ppb[d]	No standard	No standard

Source: EPA 2014a (federal standards); TDEC 2006 (Tennessee standards).
mg/m³ = milligrams per cubic meter; μg/m³ = micrograms per cubic meter; NAAQS = National Ambient Air Quality Standards; ppb = parts per billion; ppm = parts per million

[a] Final rule signed October 15, 2008. The 1978 lead standard (1.5 μg/m³ as a quarterly average) remains in effect until 1 year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

[b] The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-h standard.

[c] Final rule signed March 12, 2008. The 1997 ozone standard (0.08 ppm, annual fourth-highest daily maximum 8-h concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, EPA revoked the 1-h ozone standard (0.12 ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard (‘anti-backsliding”). The 1-h ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than or equal to 1.

[d] Final rule signed June 2, 2010. The 1971 annual and 24-h SO_2 standards were revoked in that same rulemaking. However, these standards remain in effect until 1 year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

Table C.2. Emission Rates for Criteria Pollutants in Nonattainment Areas[a]

Pollutant	Emission Rate (tons/year)
Ozone (VOCs or NO_x)	
Serious nonattainment areas	50
Severe nonattainment areas	25
Extreme nonattainment areas	10
Other ozone nonattainment areas outside an ozone transport region	100
Marginal and moderate nonattainment areas inside an ozone transport region	
VOCs	50
NO_x	100
CO: All nonattainment areas	100
SO_2 or NO_2: All nonattainment areas	100
PM_{10}	
Moderate nonattainment areas	100
Serious nonattainment areas	70
$PM_{2.5}$	
Direct emissions	100
SO_2	100
NO_x (unless determined not to be a significant precursor)	100
VOCs or ammonia (if determined to be significant precursors)	100
Pb: All nonattainment areas	25

Source: EPA 2014b.
[a] *De minimis* threshold levels for conformity applicability analysis.
CO = carbon monoxide; NO_2 = nitrogen dioxide; NO_x = nitrogen oxides; VOC = volatile organic compound; Pb = lead; $PM_{2.5}$ = particulate matter with a diameter less than or equal to 2.5 microns; PM_{10} = particulate matter with a diameter less than or equal to 10 microns; SO_2 = sulfur dioxide.

Table C.3. Emission Rates for Criteria Pollutants in Attainment (Maintenance) Areas[a]

Pollutant	Emission Rate (tons/year)
Ozone (NO_x, SO_2, or NO_2): All maintenance areas	100
Ozone (VOCs)	
Maintenance areas inside an ozone transport region	50
Maintenance areas outside an ozone transport region	100
CO: All maintenance areas	100
PM_{10}: All maintenance areas	100
$PM_{2.5}$	
Direct emissions	100
SO_2	100
NO_x (unless determined not to be a significant precursor)	100
VOCs or ammonia (if determined to be significant precursors)	100
Pb: All maintenance areas	25

Source: EPA 2014b.
[a] *De minimis* threshold levels for conformity applicability analysis.
CO = carbon monoxide; NO_x = nitrogen oxides; VOC = volatile organic compound; Pb = lead; $PM_{2.5}$ = particulate matter with a diameter less than or equal to 2.5 microns; PM_{10} = particulate matter with a diameter less than or equal to 10 microns; SO_2 = sulfur dioxide.

Each state is required to develop a State Implementation Plan (SIP) that sets forth how CAA provisions will be imposed within the state. The SIP is the primary means for the implementation, maintenance, and enforcement of the measures needed to attain and maintain the NAAQS within each state and includes control measures, emissions limitations, and other provisions required to attain and maintain the ambient air quality standards. The purpose of the SIP is two-fold. First, it must provide a control strategy that will result in the attainment and maintenance of the NAAQS. Second, it must demonstrate that progress is being made in attaining the standards in each nonattainment area.

In attainment areas, major new or modified stationary sources of air emissions on and in the area are subject to Prevention of Significant Deterioration (PSD) review to ensure that these sources are constructed without causing significant adverse deterioration of the clean air in the area. A major new source is defined as one that has the potential to emit any pollutant regulated under the CAA in amounts equal to or exceeding specific major source thresholds, that is, 100 or 250 tons/year based on the source's industrial category. A major modification is a physical change or change in the method of operation at an existing major source that causes a significant "net emissions increase" at that source of any regulated pollutant. Table C.4 lists the PSD significant emissions rate thresholds for selected criteria pollutants (EPA 1990).

Table C.4. Criteria Pollutant Significant Emissions Rate Increases Under PSD Regulations

Pollutant	**Significant Emissions Rate (tons/year)**
PM_{10}	15
$PM_{2.5}$	10
Total suspended particulates	25
SO_2	40
NO_x	40
Ozone (VOCs)	40
CO	100

Source: Title 40 *Code of Federal Regulations* Part 51.
CO = carbon monoxide; NO_x = nitrogen oxides; VOC = volatile organic compound; Pb = lead; $PM_{2.5}$ = particulate matter with a diameter less than or equal to 2.5 microns; PM_{10} = particulate matter with a diameter less than or equal to 10 microns; PSD = Prevention of Significant Deterioration; SO_2 = sulfur dioxide; VOC = volatile organic compound.

The goals of the PSD program are to: (1) ensure economic growth while preserving existing air quality; (2) protect public health and welfare from adverse effects that might occur even at pollutant levels better than the NAAQS; and (3) preserve, protect, and enhance the air quality in areas of special natural recreational, scenic, or historic value, such as national parks and wilderness areas. Sources subject to PSD review are required by the CAA to obtain a permit before commencing construction. The permit process requires an extensive review of all other major sources within a 50-mile radius and all Class I areas within a 62-mile radius of the facility. Emissions from any new or modified source must be controlled using best available control technology. The air quality, in combination with other PSD sources in the area, must not exceed the maximum allowable incremental increase identified in Table C.5. National parks and wilderness areas are designated as Class I areas, where any appreciable deterioration in air quality is considered significant. Class II areas are those where moderate, well-controlled industrial growth could be permitted. Class III areas allow for greater industrial development.

Table C.5. Federal Allowable Pollutant Concentration Increases Under PSD Regulations

Pollutant	Averaging Time	Maximum Allowable Concentration ($\mu g/m^3$)		
		Class I	Class II	Class III
PM_{10}	Annual	4	17	34
	24 h	8	30	60
SO_2	Annual	2	20	40
	24 h	5	91	182
	3 h	25	512	700
NO_2	Annual	2.5	25	50

Source: Title 40 *Code of Federal Regulations* Part 51.
NO_2 = nitrogen dioxide; PM_{10} = particulate matter with a diameter less than or equal to 10 microns; PSD = Prevention of Significant Deterioration; SO_2 = sulfur dioxide; $\mu g/m^3$ = micrograms per cubic meter.

The Ambient Monitoring Program measures levels of air pollutants throughout the state. The data are used to determine compliance with air standards established for five compounds and to evaluate the need for special controls for various other pollutants.

The air quality monitoring network is used to identify areas where the ambient air quality standards are being violated and plans are needed to reduce pollutant concentration levels to be in attainment with the standards. Also included are areas where the ambient standards are being met, but plans are necessary to ensure maintenance of acceptable levels of air quality in the face of anticipated population or industrial growth.

The result of this attainment/maintenance analysis is the development of local and statewide strategies for controlling emissions of criteria air pollutants from stationary and mobile sources. The first step in this process is the annual compilation of the ambient air monitoring results, and the second step is the analysis of the monitoring data for general air quality, exceedances of air quality standards, and pollutant trends.

C.3. REGULATORY COMPARISONS

The CAA Sect. 176(c), "General Conformity," requires federal agencies to demonstrate that their proposed activities would conform to the applicable SIP for attainment of the NAAQS. General conformity applies only to nonattainment and maintenance areas. If the emissions from a federal action proposed in a nonattainment area exceed annual *de minimis* thresholds identified in the rule, a formal conformity determination is required of that action. The thresholds are more restrictive as the severity of the nonattainment status of the region increases. The criteria pollutants are compared with Roane County emissions.

For the analysis, in order to evaluate air emissions and their impact on the overall region of influence (ROI), the emissions associated with the project activities were compared with the total emissions on a pollutant-by-pollutant basis for the ROI's 2008 National Emissions Inventory data. Potential impacts to air quality are evaluated with respect to the extent, context, and intensity of the impact in relation to relevant regulations, guidelines, and scientific documentation. The Council on Environmental Quality (CEQ) defines significance in terms of context and intensity in 40 *CFR* 1508.27. This requires that the significance of the action must be analyzed in respect to the setting of the proposed action and based relative to the severity of the impact. The CEQ National Environmental Policy Act regulations (40 *CFR* 1508.27(b)) provide 10 key factors to consider in determining an impact's intensity. To provide a more conservative analysis, the county was selected as the ROI instead of the EPA-designated Air Quality Control Region, which is a much larger area.

C.4. PROJECT CALCULATIONS

Included as Attachment C.1 to this Appendix are the following general project descriptions and cost calculations reports:

- ORAEA CONST ACAM Detail Report.pdf
- OREA_AircraftOps_ACAM Detail Report.pdf
- ORAEA_TANKS_ACAM Detail Report.pdf
- HaulRd_Subalt1 ACAM Detail Report.pdf
- HaulRd_Subalt2 ACAM Detail Report.pdf
- BlairRd_Subalt1 ACAM Detail Report.pdf
- BlairRd_Subalt2 ACAM Detail Report.pdf
- BlairRd_Subalt3 ACAM Detail Report.pdf

C.5. TANKS REPORTS

Included as Attachment C.2 to this Appendix are the following output files from the TANKS 4.0.9d program:

- ORAEA_AvGasTANKS_Emiss.pdf
- ORAEA_JetA_TANKS_Emiss.pdf

These evaporative emissions were used to calculate greenhouse gas (GHG) emissions associated with the fuel storage tanks. Emission factors for GHGs are provided in Table C.6.

Table C.6. GHG Emission Factors

	Emission factors		
	CO_2 (kg/lb)	**CH_4 (g/lb)**	**N_2O (g/lb)**
AvGas	8.31	0.47	0.09
Jet-A	9.75	0	0.31

GHG = greenhouse gas.

C.6. REFERENCES

EPA (U.S. Environmental Protection Agency) 1990. *Draft New Source Review Workshop Manual: Prevention of Significant Deterioration and Nonattainment Permitting*, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Washington, D.C., October.

EPA 2014a. *National Ambient Air Quality Standards (NAAQS)*. Retrieved from http://www.epa.gov/air/criteria.html. Last update October 21, 2014. Accessed April 2015.

EPA 2014b. *De Minimis Emission Levels for General Conformity Applicability*, 40 *Code of Federal Regulations* Part 93 § 153. Retrieved from http://www.epa.gov/oar/genconform/deminimis.html, in April 2015. Last updated January 31, 2014.

TDEC (Tennessee Department of Environment and Conservation) 2006. *Bureau of Environment Division of Air Pollution Control Chapter 1200-3-3 Ambient Air Quality Standards*. Retrieved from http://www.state.tn.us/sos/rules/1200/1200-03/1200-03-03.pdf in April 2015.

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Attachment C.1.
Air Conformity Applicability Model (ACAM) Reports

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DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

1. General Information

- Action Location

Base: MCGHEE TYSON ANBG
County(s): Roane
Regulatory Area(s): Knoxville, Tennessee

- Action Title: Oak Ridge Airport Environmental Assessment (ORAEA)

- Project Number/s (if applicable):

- Projected Action Start Date: 1 / 2017

- Action Purpose and Need:

The proposed action evaluated in this Environmental Assessment (EA) is the title transfer of U.S. Department of Energy (DOE) property located at the East Tennessee Technology Park (ETTP) Heritage Center to the Metropolitan Knoxville Airport Authority (MKAA) for the purpose of constructing and operating a general aviation airport. The proposed Oak Ridge airport is intended to be an airport that supports the needs of the general aviation community in the Oak Ridge and Knoxville region and enhances the development potential of the area by attracting new businesses/industries to the Heritage Center for future economic growth.

In addition to responding to the request for the property transfer from the MKAA, DOE's action is needed to continue the reduction and elimination of landlord costs associated with underutilized and excess DOE property at the ETTP. This helps to free money for reinvestment in cleanup projects to further reduce risks at the site. The conveyance of unneeded property can also help offset economic losses resulting from continued DOE downsizing, facility closures, and workforce restructuring. The MKAA feels that a general aviation airport is needed in Oak Ridge and can be a tool in the revitalization efforts underway in the Heritage Center by encouraging new business development and providing highly sought after access for corporate aircraft fleet. The proposed airport would also act as a gateway to the Oak Ridge community by opening new opportunities in tourism and job creation.

- Action Description:

Under the proposed action, DOE would transfer approximately 170 acres of property located within the EA study area. The property to be transferred includes Parcel ED-13, Parcel ED-16, a portion of Parcel ED-3, and Victorious Boulevard. DOE would transfer the property to the MKAA using the General Services Administration (GSA) "Public Benefit Conveyance" process, which allows for property transfer at no cost, but does not provide indemnification to the transferee. Additional property would need to be obtained by the MKAA to accommodate the approximately 132-acre airport construction footprint. This additional property was previously transferred by DOE to the Community Reuse Organization of East Tennessee and includes Bldg. K-1330, Bldg. K-1580, portions of Parcel ED-4, and Parcel ED-8.

Development and construction activities would include land clearing, grading, placement and compaction of earth backfill to establish required building elevations, building demolition (Bldgs. K-1330 and K-1580), excavation for the installation of concrete foundations/footings, and infrastructure development including but not limited to, utility connections. Construction activities would also include the runway, taxiway, and apron space, vehicle access roads, parking, terminal and hangar buildings, walkways, fuel farm, and fire protection facilities and equipment.

- Point of Contact

Name: Brad Boykin
Title: CTR
Organization: Leidos
Email: boykinb@leidos.com
Phone Number: 850.609.3450

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

- Activity List:

Activity Type		Activity Title
2.	Construction / Demolition	Airport Facilities

2. Construction / Demolition

2.1 General Information and Timeline Assumptions

- Activity Location
County: Roane
Regulatory Area(s): Knoxville, Tennessee

- Activity Title: Airport Facilities

- Activity Description:
RW
Taxiway
Parking
Building Demo
Building Construction

- Activity Start Date
Start Month: 1
Start Month: 2017

- Activity End Date
Indefinite: False
End Month: 12
End Month: 2018

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	2.788610
SO_x	0.022364
NO_x	14.507672
CO	10.817141
PM 10	126.641471

Pollutant	Total Emissions (TONs)
PM 2.5	0.772534
Pb	0.000000
NH_3	0.015289

2.2 Demolition Phase

2.2.1 Demolition Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2017

- Phase Duration
Number of Month: 6
Number of Days: 0

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

2.2.2 Demolition Phase Assumptions

- General Demolition Information
Area of Building to be demolished (ft^2): 50,000
Height of Building to be demolished (ft): 20

- Default Settings Used: Yes
- Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number of Equipment	Hours Per Day
Concrete/Industrial Saws Composite	1	8
Rubber Tired Dozers Composite	1	1
Tractors/Loaders/Backhoes Composite	2	6

- Vehicle Exhaust
Average Hauling Truck Capacity (yd^3): 20 (default)
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

2.2.3 Demolition Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) [default]

Concrete/Industrial Saws Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.0678	0.0006	0.4267	0.3892	0.0297	0.0297	0.0061	58.463
Rubber Tired Dozers Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.2464	0.0024	1.9508	0.9300	0.0796	0.0796	0.0222	239.08
Tractors/Loaders/Backhoes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.0558	0.0007	0.3680	0.3666	0.0221	0.0221	0.0050	66.797

- Vehicle Exhaust and Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2
LDGV	00.4460	00.0068	00.3140	08.0000	00.0248	00.0113		00.1017	00368.0
LDGT	00.6560	00.0095	00.5120	09.2200	00.0248	00.0113		00.1017	00516.6
HDGV	00.6310	00.0165	00.8180	08.1200	00.0398	00.0246		00.0451	00904.0
LDDV	00.0870	00.0029	00.0880	00.6920	00.0380	00.0234		00.0068	00314.1
LDDT	00.3020	00.0056	00.3170	00.5650	00.0472	00.0319		00.0068	00598.6
HDDV	00.2900	00.0116	01.8830	00.5800	00.0777	00.0529		00.0270	01242.9
MC	02.3000	00.0033	01.1900	14.3200	00.0372	00.0207		00.0113	00177.4

2.2.4 Demolition Phase Formula(s)

- Fugitive Dust Emissions per Phase

$PM10_{FD} = (0.00042 * BA * BH) / 2,000$

$PM10_{FD}$: Fugitive Dust PM 10 Emissions (TONs)
0.00042: Emission Factor (lb/ft^3)
BA: Area of Building to be demolished (ft^2)
BH: Height of Building to be demolished (ft)
2,000: Conversion Factor pounds to tons

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2,000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2,000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = BA * BH * (1 / 27) * 0.25 * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
BA: Area of Building being demolish (ft^2)
BH: Height of Building being demolish (ft)
(1 / 27): Conversion Factor cubic feet to cubic yards ($1\ yd^3 / 27\ ft^3$)
0.25: Volume reduction factor (material reduced by 75% to account for air space)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2,000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2,000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)

0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

2.3 Site Grading Phase

2.3.1 Site Grading Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2017

- Phase Duration
Number of Month: 6
Number of Days: 0

2.3.2 Site Grading Phase Assumptions

- General Site Grading Information
Area of Site to be Graded (ft^2): 2,128,626
Amount of Material to be Hauled On-Site (yd^3): 150
Amount of Material to be Hauled Off-Site (yd^3): 150

- Site Grading Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number of Equipment	Hours Per Day
Excavators Composite	1	8
Graders Composite	2	8
Other Construction Equipment Composite	2	8
Rollers Composite	1	8
Rubber Tired Dozers Composite	2	8
Scrapers Composite	4	8
Tractors/Loaders/Backhoes Composite	2	8

- Vehicle Exhaust
Average Hauling Truck Capacity (yd^3): 20 (default)
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

2.3.3 Site Grading Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) [default]

Excavators Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2**
Emission Factors	0.0915	0.0013	0.5857	0.5183	0.0288	0.0288	0.0082	119.57
Graders Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2**
Emission Factors	0.1120	0.0014	0.8007	0.5843	0.0396	0.0396	0.0101	132.74
Other Construction Equipment Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2**
Emission Factors	0.0674	0.0012	0.5044	0.3568	0.0206	0.0206	0.0060	122.54
Rollers Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2**
Emission Factors	0.0736	0.0007	0.4866	0.3912	0.0321	0.0321	0.0066	67.046
Rubber Tired Dozers Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2**
Emission Factors	0.2464	0.0024	1.9508	0.9300	0.0796	0.0796	0.0222	239.08
Scrapers Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2**
Emission Factors	0.2256	0.0026	1.7483	0.8713	0.0716	0.0716	0.0203	262.48
Tractors/Loaders/Backhoes Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2**
Emission Factors	0.0558	0.0007	0.3680	0.3666	0.0221	0.0221	0.0050	66.797

- Vehicle Exhaust and Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2
LDGV	00.4460	00.0068	00.3140	08.0000	00.0248	00.0113		00.1017	00368.0
LDGT	00.6560	00.0095	00.5120	09.2200	00.0248	00.0113		00.1017	00516.6
HDGV	00.6310	00.0165	00.8180	08.1200	00.0398	00.0246		00.0451	00904.0
LDDV	00.0870	00.0029	00.0880	00.6920	00.0380	00.0234		00.0068	00314.1
LDDT	00.3020	00.0056	00.3170	00.5650	00.0472	00.0319		00.0068	00598.6
HDDV	00.2900	00.0116	01.8830	00.5800	00.0777	00.0529		00.0270	01242.9
MC	02.3000	00.0033	01.1900	14.3200	00.0372	00.0207		00.0113	00177.4

2.3.4 Site Grading Phase Formula(s)

- Fugitive Dust Emissions per Phase

$PM10_{FD}$ = (20 * ACRE * WD) / 2,000

$PM10_{FD}$: Fugitive Dust PM 10 Emissions (TONs)
20: Conversion Factor Acre Day to pounds (20 lbs / 1 Acre Day)
ACRE: Total acres (acres)
WD: Number of Total Work Days (days)
2,000: Conversion Factor pounds to tons

- Construction Exhaust Emissions per Phase

CEE_{POL} = (NE * WD * H * EF_{POL}) / 2,000

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)

EF_{POL}: Emission Factor for Pollutant (lb/hour)
2,000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
$VMT_{VE} = (HA_{OnSite} + HA_{OffSite}) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
HA_{OnSite}: Amount of Material to be Hauled On-Site (yd^3)
$HA_{OffSite}$: Amount of Material to be Hauled Off-Site (yd^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2,000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2,000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

2.4 Building Construction Phase

2.4.1 Building Construction Phase Timeline Assumptions

- Phase Start Date
Start Month: 6
Start Quarter: 1
Start Year: 2017

- Phase Duration
Number of Month: 6
Number of Days: 0

2.4.2 Building Construction Phase Assumptions

- General Building Construction Information

Building Category: Office or Industrial
Area of Building (ft^2): 10,000
Height of Building (ft): 30
Number of Units: N/A

- Building Construction Default Settings

Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number of Equipment	Hours Per Day
Cranes Composite	1	4
Forklifts Composite	2	6
Tractors/Loaders/Backhoes Composite	1	8

- Vehicle Exhaust

Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips

Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

- Vendor Trips

Average Vendor Round Trip Commute (mile): 40 (default)

- Vendor Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

2.4.3 Building Construction Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) [default]

Cranes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.1073	0.0013	0.8624	0.4152	0.0352	0.0352	0.0096	128.62
Forklifts Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.0399	0.0006	0.2492	0.2181	0.0118	0.0118	0.0036	54.395
Tractors/Loaders/Backhoes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.0558	0.0007	0.3680	0.3666	0.0221	0.0221	0.0050	66.797

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- Vehicle Exhaust and Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2
LDGV	00.4460	00.0068	00.3140	08.0000	00.0248	00.0113		00.1017	00368.0
LDGT	00.6560	00.0095	00.5120	09.2200	00.0248	00.0113		00.1017	00516.6
HDGV	00.6310	00.0165	00.8180	08.1200	00.0398	00.0246		00.0451	00904.0
LDDV	00.0870	00.0029	00.0880	00.6920	00.0380	00.0234		00.0068	00314.1
LDDT	00.3020	00.0056	00.3170	00.5650	00.0472	00.0319		00.0068	00598.6
HDDV	00.2900	00.0116	01.8830	00.5800	00.0777	00.0529		00.0270	01242.9
MC	02.3000	00.0033	01.1900	14.3200	00.0372	00.0207		00.0113	00177.4

2.4.4 Building Construction Phase Formula(s)

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2,000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2,000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = BA * BH * (0.42 / 1,000) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.42 / 1,000): Conversion Factor ft^3 to trips (0.42 trip / 1,000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2,000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2,000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)

VM: Worker Trips On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

- Vender Trips Emissions per Phase
$VMT_{VT} = BA * BH * (0.38 / 1,000) * HT$

VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.38 / 1,000): Conversion Factor ft^3 to trips (0.38 trip / 1,000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VT} * 0.002205 * EF_{POL} * VM) / 2,000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

2.5 Architectural Coatings Phase

2.5.1 Architectural Coatings Phase Timeline Assumptions

- Phase Start Date
Start Month: 10
Start Quarter: 1
Start Year: 2017

- Phase Duration
Number of Month: 3
Number of Days: 0

2.5.2 Architectural Coatings Phase Assumptions

- General Architectural Coatings Information
Building Category:
Total Square Footage (ft^2): 10,000
Number of Units: N/A

- Architectural Coatings Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

2.5.3 Architectural Coatings Phase Emission Factor(s)

- Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2
LDGV	00.4460	00.0068	00.3140	08.0000	00.0248	00.0113		00.1017	00368.0
LDGT	00.6560	00.0095	00.5120	09.2200	00.0248	00.0113		00.1017	00516.6
HDGV	00.6310	00.0165	00.8180	08.1200	00.0398	00.0246		00.0451	00904.0
LDDV	00.0870	00.0029	00.0880	00.6920	00.0380	00.0234		00.0068	00314.1
LDDT	00.3020	00.0056	00.3170	00.5650	00.0472	00.0319		00.0068	00598.6
HDDV	00.2900	00.0116	01.8830	00.5800	00.0777	00.0529		00.0270	01242.9
MC	02.3000	00.0033	01.1900	14.3200	00.0372	00.0207		00.0113	00177.4

2.5.4 Architectural Coatings Phase Formula(s)

- Worker Trips Emissions per Phase
VMT_{WT} = (1 * WT * PA) / 800

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
1: Conversion Factor man days to trips (1 trip / 1 man * day)
WT: Average Worker Round Trip Commute (mile)
PA: Paint Area (ft^2)
800: Conversion Factor square feet to man days (1 ft^2 / 1 man * day)

V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2,000

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

- Off-Gassing Emissions per Phase
VOC_{AC} = (AB * 2.0 * 0.0116) / 2,000.0

VOC_{AC}: Architectural Coating VOC Emissions (TONs)
BA: Area of Building (ft^2)
2.0: Conversion Factor total area to coated area (2.0 ft^2 coated area / total area)
0.0116: Emission Factor (lb/ft^2)
2,000: Conversion Factor pounds to tons

2.6 Paving Phase

2.6.1 Paving Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2017

- Phase Duration
Number of Month: 12
Number of Days: 0

2.6.2 Paving Phase Assumptions

- General Paving Information
Paving Area (ft^2): 885,711

- Paving Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number of Equipment	Hours Per Day
Pavers Composite	1	8
Paving Equipment Composite	2	8
Rollers Composite	2	6

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

2.6.3 Paving Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) [default]

Excavators Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.0915	0.0013	0.5857	0.5183	0.0288	0.0288	0.0082	119.57
Graders Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.1120	0.0014	0.8007	0.5843	0.0396	0.0396	0.0101	132.74
Other Construction Equipment Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.0674	0.0012	0.5044	0.3568	0.0206	0.0206	0.0060	122.54
Rollers Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.0736	0.0007	0.4866	0.3912	0.0321	0.0321	0.0066	67.046
Rubber Tired Dozers Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.2464	0.0024	1.9508	0.9300	0.0796	0.0796	0.0222	239.08
Scrapers Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.2256	0.0026	1.7483	0.8713	0.0716	0.0716	0.0203	262.48
Tractors/Loaders/Backhoes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.0558	0.0007	0.3680	0.3666	0.0221	0.0221	0.0050	66.797

- Vehicle Exhaust and Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2
LDGV	00.4460	00.0068	00.3140	08.0000	00.0248	00.0113		00.1017	00368.0
LDGT	00.6560	00.0095	00.5120	09.2200	00.0248	00.0113		00.1017	00516.6
HDGV	00.6310	00.0165	00.8180	08.1200	00.0398	00.0246		00.0451	00904.0
LDDV	00.0870	00.0029	00.0880	00.6920	00.0380	00.0234		00.0068	00314.1
LDDT	00.3020	00.0056	00.3170	00.5650	00.0472	00.0319		00.0068	00598.6
HDDV	00.2900	00.0116	01.8830	00.5800	00.0777	00.0529		00.0270	01242.9
MC	02.3000	00.0033	01.1900	14.3200	00.0372	00.0207		00.0113	00177.4

2.6.4 Paving Phase Formula(s)

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2{,}000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2,000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = PA * 0.25 * (1 / 27) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
PA: Paving Area (ft^2)
0.25: Thickness of Paving Area (ft)
(1 / 27): Conversion Factor cubic feet to cubic yards (1 yd^3 / 27 ft^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2{,}000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2{,}000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)

0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

- Off-Gassing Emissions per Phase
$VOC_P = (2.62 * PA) / 43560$

VOC_P: Paving VOC Emissions (TONs)
2.62: Emission Factor (lb/acre)
PA: Paving Area (ft^2)
43,560: Conversion Factor square feet to acre (43,560 ft^2 / acre)^2 / acre)

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

1. General Information

- Action Location
Base: MCGHEE TYSON ANBG
County(s): Roane
Regulatory Area(s): Knoxville, Tennessee

- Action Title: Oak Ridge Airport

- Project Number/s (if applicable):

- Projected Action Start Date: 1 / 2016

- Action Purpose and Need:
See previous

- Action Description:
See previous

- Point of Contact
Name: Brad Boykin
Title: CTR
Organization: Leidos
Email: boykinb@leidos.com
Phone Number: 850-609-3450

- Activity List:

Activity Type		Activity Title
2.	Aircraft	Fixed-Wing Turbine
3.	Aircraft	Fixed-Wing Piston Beechcraft
4.	Aircraft	Fixed-Wing Piston Cessna
5.	Aircraft	Helicopter

2. Aircraft

2.1 General Information and Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Roane
Regulatory Area(s): Knoxville, Tennessee

- Activity Title: Fixed-Wing Turbine

- Activity Description:
2,486 annual flight operations

- Activity Start Date
Start Month: 1
Start Year: 2016

- Activity End Date
Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	18.179313
SO_x	0.081302
NO_x	3.234155
CO	16.982082
PM 10	0.470636

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.446255
Pb	0.000000
NH_3	0.000000

2.2 Aircraft and Engines

2.2.1 Aircraft and Engines Assumptions

- Aircraft and Engine
Aircraft Designation: T-47A
Engine Model: JT15D-5
Primary Function: General - Business Jet
Number of Engines: 2

- Aircraft and Engine Surrogate
Is Aircraft and Engine a Surrogate? Yes
Original Aircraft Name: Cessna Citation II
Original Engine Name: JT-15D-4B

2.2.2 Aircraft and Engines Emission Factor(s)

- Aircraft and Engine Emissions Factors (lb/1,000 lbs fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	235.50	136.97	1.06	1.66	119.20	0.82	0.74	3252.46
Approach	524.00	13.46	1.06	4.93	38.60	0.73	0.66	3252.46
Intermediate	1371.00	1.50	1.06	10.08	1.15	0.23	0.21	3252.46
Military	1630.00	0.00	1.06	11.13	0.00	0.13	0.12	3252.46
After Burn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3252.46

2.3 Flight Operations

2.3.1 Flight Operations Assumptions

- Flight Operations
Number of Aircraft: 20
Number of Annual LTOs (Landing and Take-off) cycles: 124.3
Number of Annual TGOs (Touch-and-Go) cycles: 0

- Default Settings Used: Yes

- Flight Operations TIMs (Time In Mode)
Taxi/Idle Out (mins): 6.5 (default)
Takeoff (mins): 0.4 (default)
Climb Out (mins): 0.5 (default)

Approach (mins): 1.6 (default)
Taxi/Idle In (mins): 6.5 (default)

- Trim Test
Idle (mins): 12 (default)
Approach (mins): 27 (default)
Intermediate (mins): 9 (default)
Military (mins): 12 (default)
AfterBurn (mins): 0 (default)

2.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for LTOs per Year
AEM_{POL} = (TIM / 60) * (FC / 1,000) * EF * NE * NA * LTO / 2,000

AEM_{POL}: Aircraft Emissions per Pollutant and Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1,000: Conversion Factor pounds to 1,000 pounds
EF: Emission Factor (lb/1,000 lbs fuel)
NE: Number of Engines
NA: Number of Aircraft
LTO: Number of Landing and Take-off Cycles
2,000: Conversion Factor pounds to TONs

- Aircraft Emissions for LTOs per Year
$AE_{LTO} = AEM_{IDLE\_IN} + AEM_{IDLE\_OUT} + AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{LTO}: Aircraft Emissions (TONs)
AEM_{IDLE_IN}: Aircraft Emissions for Idle-In Mode (TONs)
AEM_{IDLE_OUT}: Aircraft Emissions for Idle-Out Mode (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for TGOs per Year
AEM_{POL} = (TIM / 60) * (FC / 1,000) * EF * NE * NA * TGO / 2,000

AEM_{POL}: Aircraft Emissions per Pollutant and Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1,000: Conversion Factor pounds to 1,000 pounds
EF: Emission Factor (lb/1,000 lbs fuel)
NE: Number of Engines
NA: Number of Aircraft
TGO: Number of Touch-and-Go Cycles
2,000: Conversion Factor pounds to TONs

- Aircraft Emissions for TGOs per Year
$AE_{TGO} = AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{TGO}: Aircraft Emissions (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)

$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for Trim per Year
$AEPS_{POL}$ = (TD / 60) * (FC / 1,000) * EF * NE * NA * NTT / 2,000

$AEPS_{POL}$: Aircraft Emissions per Pollutant and Power Setting (TONs)
TD: Test Duration (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1,000: Conversion Factor pounds to 1,000 pounds
EF: Emission Factor (lb/1,000 lbs fuel)
NE: Number of Engines
NA: Number of Aircraft
NTT: Number of Trim Test
2,000: Conversion Factor pounds to TONs

- Aircraft Emissions for Trim per Year
$AE_{TRIM} = AEPS_{IDLE} + AEPS_{APPROACH} + AEPS_{INTERMEDIATE} + AEPS_{MILITARY} + AEPS_{AFTERBURN}$

AE_{TRIM}: Aircraft Emissions (TONs)
$AEPS_{IDLE}$: Aircraft Emissions for Idle Power Setting (TONs)
$AEPS_{APPROACH}$: Aircraft Emissions for Approach Power Setting (TONs)
$AEPS_{INTERMEDIATE}$: Aircraft Emissions for Intermediate Power Setting (TONs)
$AEPS_{MILITARY}$: Aircraft Emissions for Military Power Setting (TONs)
$AEPS_{AFTERBURN}$: Aircraft Emissions for After Burner Power Setting (TONs)

2.4 Auxiliary Power Unit (APU)

2.4.1 Auxiliary Power Unit (APU) Assumptions

- Default Settings Used: Yes

- Auxiliary Power Unit (APU) [default]

Number of APU per Aircraft	Operation Hours for Each LTO	Exempt Source?	Designation	Manufacturer

2.4.2 Auxiliary Power Unit (APU) Emission Factor(s)

- Auxiliary Power Unit (APU) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e

2.4.3 Auxiliary Power Unit (APU) Formula(s)

- Auxiliary Power Unit (APU) Emissions per Year
APU_{POL} = APU * OH * LTO * NA * EF_{POL} / 2,000

APU_{POL}: Auxiliary Power Unit (APU) Emissions per Pollutant (TONs)
APU: Number of Auxiliary Power Units
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
NA: Number of Aircraft
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2,000: Conversion Factor pounds to tons

2.5 Aerospace Ground Equipment (AGE)

2.5.1 Aerospace Ground Equipment (AGE) Assumptions

- Default Settings Used: Yes

- AGE Usage
Number of Annual LTO (Landing and Take-off) cycles for AGE: 124.3

- Aerospace Ground Equipment (AGE) [default]

Total Number of AGE	Operation Hours for Each LTO	Exempt Source?	AGE Type	Designation
20	0.5	No	Air Compressor	MC-1A - 18.4 hp
20	0.17	No	Generator Set	A/M32A-86D
20	0.17	No	Heater	H1
20	0.5	No	Hydraulic Test Stand	MJ-1-1
20	1	No	Light Cart	TF-1

2.5.2 Aerospace Ground Equipment (AGE) Emission Factor(s)

- Aerospace Ground Equipment (AGE) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
MC-1A - 18.4 hp	1.1	0.267	0.008	0.419	0.267	0.071	0.068	24.8
A/M32A-86D	6.5	0.294	0.046	6.102	0.457	0.091	0.089	147.0
H1	0.4	0.100	0.011	0.160	0.180	0.006	0.006	8.9
MJ-1-1	2.5	0.026	0.018	0.757	0.043	0.109	0.105	57.2
TF-1	0.0	0.025	0.043	0.170	0.130	0.160	0.155	30.7

2.5.3 Aerospace Ground Equipment (AGE) Formula(s)

- Aerospace Ground Equipment (AGE) Emissions per Year
$AGE_{POL} = AGE * OH * LTO * EF_{POL} / 2,000$

AGE_{POL}: Aerospace Ground Equipment (AGE) Emissions per Pollutant (TONs)
AGE: Total Number of Aerospace Ground Equipment
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2,000: Conversion Factor pounds to tons

3. Aircraft

3.1 General Information and Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Roane
Regulatory Area(s): Knoxville, Tennessee

- Activity Title: Fixed-Wing Piston Beechcraft

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

- Activity Description:
20% of 45,736 annual flight operations

- Activity Start Date
Start Month: 1
Start Year: 2016

- Activity End Date
Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	20.822644
SO_x	0.299151
NO_x	10.782462
CO	26.329614
PM 10	1.418851

Pollutant	Emissions Per Year (TONs)
PM 2.5	1.360775
Pb	0.000000
NH_3	0.000000

3.2 Aircraft and Engines

3.2.1 Aircraft and Engines Assumptions

- Aircraft and Engine
Aircraft Designation: T-44
Engine Model: PT6A-27
Primary Function: Trainer
Number of Engines: 2

- Aircraft and Engine Surrogate
Is Aircraft and Engine a Surrogate? Yes
Original Aircraft Name: Beechcraft Baron 58
Original Engine Name: Continental TIO-520

3.2.2 Aircraft and Engines Emission Factor(s)

- Aircraft and Engine Emissions Factors (lb/1,000 lbs fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	115.00	57.70	1.06	2.43	64.00	0.50	0.45	3252.46
Approach	215.00	2.51	1.06	8.37	23.26	0.10	0.09	3252.46
Intermediate	400.00	0.00	1.06	7.00	1.20	0.25	0.23	3252.46
Military	425.00	0.00	1.06	7.81	1.01	0.24	0.22	3252.46
After Burn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3252.46

3.3 Flight Operations

3.3.1 Flight Operations Assumptions

- Flight Operations
Number of Aircraft: 10
Number of Annual LTOs (Landing and Take-off) cycles: 914.72
Number of Annual TGOs (Touch-and-Go) cycles: 0

- Default Settings Used: Yes

- Flight Operations TIMs (Time In Mode)
Taxi/Idle Out (mins): 12.8 (default)
Takeoff (mins): 0.4 (default)
Climb Out (mins): 0.9 (default)
Approach (mins): 3.8 (default)
Taxi/Idle In (mins): 6.4 (default)

- Trim Test
Idle (mins): 12 (default)
Approach (mins): 27 (default)
Intermediate (mins): 9 (default)
Military (mins): 12 (default)
AfterBurn (mins): 0 (default)

3.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for LTOs per Year
AEM_{POL} = (TIM / 60) * (FC / 1,000) * EF * NE * NA * LTO / 2,000

AEM_{POL}: Aircraft Emissions per Pollutant and Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1,000: Conversion Factor pounds to 1,000 pounds
EF: Emission Factor (lb/1,000 lbs fuel)
NE: Number of Engines
NA: Number of Aircraft
LTO: Number of Landing and Take-off Cycles
2,000: Conversion Factor pounds to TONs

- Aircraft Emissions for LTOs per Year
$AE_{LTO} = AEM_{IDLE\_IN} + AEM_{IDLE\_OUT} + AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{LTO}: Aircraft Emissions (TONs)
AEM_{IDLE_IN}: Aircraft Emissions for Idle-In Mode (TONs)
AEM_{IDLE_OUT}: Aircraft Emissions for Idle-Out Mode (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for TGOs per Year
AEM_{POL} = (TIM / 60) * (FC / 1,000) * EF * NE * NA * TGO / 2,000

AEM_{POL}: Aircraft Emissions per Pollutant and Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1,000: Conversion Factor pounds to 1,000 pounds
EF: Emission Factor (lb/1,000 lbs fuel)
NE: Number of Engines
NA: Number of Aircraft
TGO: Number of Touch-and-Go Cycles
2,000: Conversion Factor pounds to TONs

- Aircraft Emissions for TGOs per Year
$AE_{TGO} = AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{TGO}: Aircraft Emissions (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for Trim per Year
$AEPS_{POL}$ = (TD / 60) * (FC / 1,000) * EF * NE * NA * NTT / 2,000

$AEPS_{POL}$: Aircraft Emissions per Pollutant and Power Setting (TONs)
TD: Test Duration (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1,000: Conversion Factor pounds to 1,000 pounds
EF: Emission Factor (lb/1,000 lbs fuel)
NE: Number of Engines
NA: Number of Aircraft
NTT: Number of Trim Test
2,000: Conversion Factor pounds to TONs

- Aircraft Emissions for Trim per Year
$AE_{TRIM} = AEPS_{IDLE} + AEPS_{APPROACH} + AEPS_{INTERMEDIATE} + AEPS_{MILITARY} + AEPS_{AFTERBURN}$

AE_{TRIM}: Aircraft Emissions (TONs)
$AEPS_{IDLE}$: Aircraft Emissions for Idle Power Setting (TONs)
$AEPS_{APPROACH}$: Aircraft Emissions for Approach Power Setting (TONs)
$AEPS_{INTERMEDIATE}$: Aircraft Emissions for Intermediate Power Setting (TONs)
$AEPS_{MILITARY}$: Aircraft Emissions for Military Power Setting (TONs)
$AEPS_{AFTERBURN}$: Aircraft Emissions for After Burner Power Setting (TONs)

3.4 Auxiliary Power Unit (APU)

3.4.1 Auxiliary Power Unit (APU) Assumptions

- Default Settings Used: Yes

- Auxiliary Power Unit (APU) [default]

Number of APU per Aircraft	Operation Hours for Each LTO	Exempt Source?	Designation	Manufacturer

3.4.2 Auxiliary Power Unit (APU) Emission Factor(s)

- Auxiliary Power Unit (APU) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e

3.4.3 Auxiliary Power Unit (APU) Formula(s)

- Auxiliary Power Unit (APU) Emissions per Year
$APU_{POL} = APU * OH * LTO * NA * EF_{POL} / 2,000$

APU_{POL}: Auxiliary Power Unit (APU) Emissions per Pollutant (TONs)
APU: Number of Auxiliary Power Units
OH: Operation Hours for Each LTO (hour)

LTO: Number of LTOs
NA: Number of Aircraft
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2,000: Conversion Factor pounds to tons

3.5 Aerospace Ground Equipment (AGE)

3.5.1 Aerospace Ground Equipment (AGE) Assumptions

- Default Settings Used: Yes

- AGE Usage
Number of Annual LTO (Landing and Take-off) cycles for AGE: 914.72

- Aerospace Ground Equipment (AGE) [default]

Total Number of AGE	Operation Hours for Each LTO	Exempt Source?	AGE Type	Designation
10	0.5	No	Air Compressor	MC-1A - 18.4 hp
10	0.17	No	Generator Set	A/M32A-86D
10	0.17	No	Heater	H1
10	0.5	No	Hydraulic Test Stand	MJ-1-1
10	1	No	Light Cart	TF-1

3.5.2 Aerospace Ground Equipment (AGE) Emission Factor(s)

- Aerospace Ground Equipment (AGE) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
MC-1A - 18.4 hp	1.1	0.267	0.008	0.419	0.267	0.071	0.068	24.8
A/M32A-86D	6.5	0.294	0.046	6.102	0.457	0.091	0.089	147.0
H1	0.4	0.100	0.011	0.160	0.180	0.006	0.006	8.9
MJ-1-1	2.5	0.026	0.018	0.757	0.043	0.109	0.105	57.2
TF-1	0.0	0.025	0.043	0.170	0.130	0.160	0.155	30.7

3.5.3 Aerospace Ground Equipment (AGE) Formula(s)

- Aerospace Ground Equipment (AGE) Emissions per Year
$AGE_{POL} = AGE * OH * LTO * EF_{POL} / 2,000$

AGE_{POL}: Aerospace Ground Equipment (AGE) Emissions per Pollutant (TONs)
AGE: Total Number of Aerospace Ground Equipment
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2,000: Conversion Factor pounds to tons

4. Aircraft

4.1 General Information and Timeline Assumptions

- Add or Remove Activity from Baseline? Add

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

- Activity Location
County: Roane
Regulatory Area(s): Knoxville, Tennessee

- Activity Title: Fixed-Wing Piston Cessna

- Activity Description:
80% of 45,736 annual flight operations

- Activity Start Date
Start Month: 1
Start Year: 2016

- Activity End Date
Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	8.451416
SO_x	1.196598
NO_x	34.594838
CO	207.795357
PM 10	15.021413

Pollutant	Emissions Per Year (TONs)
PM 2.5	13.853330
Pb	0.000000
NH_3	0.000000

4.2 Aircraft and Engines

4.2.1 Aircraft and Engines Assumptions

- Aircraft and Engine
Aircraft Designation: T-41
Engine Model: IO-360-C
Primary Function: General - Piston
Number of Engines: 1

- Aircraft and Engine Surrogate
Is Aircraft and Engine a Surrogate? Yes
Original Aircraft Name: Cessna 172 R
Original Engine Name: Lycoming IO-360-L2A

4.2.2 Aircraft and Engines Emission Factor(s)

- Aircraft and Engine Emissions Factors (lb/1,000 lbs fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	8.00	56.58	1.06	1.16	897.40	60.00	54.00	3252.46
Approach	37.00	11.15	1.06	10.16	691.26	47.95	43.16	3252.46
Intermediate	72.00	9.38	1.06	4.59	983.26	40.00	36.00	3252.46
Military	103.00	11.50	1.06	1.99	1199.03	20.00	18.00	3252.46
After Burn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3252.46

4.3 Flight Operations

4.3.1 Flight Operations Assumptions

- Flight Operations
Number of Aircraft: 30
Number of Annual LTOs (Landing and Take-off) cycles: 1219.62
Number of Annual TGOs (Touch-and-Go) cycles: 0

- Default Settings Used: Yes

- Flight Operations TIMs (Time In Mode)
Taxi/Idle Out (mins): 12 (default)
Takeoff (mins): 0.3 (default)
Climb Out (mins): 4.98 (default)
Approach (mins): 6 (default)
Taxi/Idle In (mins): 4 (default)

- Trim Test
Idle (mins): 12 (default)
Approach (mins): 27 (default)
Intermediate (mins): 9 (default)
Military (mins): 12 (default)
AfterBurn (mins): 0 (default)

4.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for LTOs per Year
AEM_{POL} = (TIM / 60) * (FC / 1,000) * EF * NE * NA * LTO / 2,000

AEM_{POL}: Aircraft Emissions per Pollutant and Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1,000: Conversion Factor pounds to 1,000 pounds
EF: Emission Factor (lb/1,000 lbs fuel)
NE: Number of Engines
NA: Number of Aircraft
LTO: Number of Landing and Take-off Cycles
2,000: Conversion Factor pounds to TONs

- Aircraft Emissions for LTOs per Year
$AE_{LTO} = AEM_{IDLE\_IN} + AEM_{IDLE\_OUT} + AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{LTO}: Aircraft Emissions (TONs)
AEM_{IDLE_IN}: Aircraft Emissions for Idle-In Mode (TONs)
AEM_{IDLE_OUT}: Aircraft Emissions for Idle-Out Mode (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for TGOs per Year
AEM_{POL} = (TIM / 60) * (FC / 1,000) * EF * NE * NA * TGO / 2,000

AEM_{POL}: Aircraft Emissions per Pollutant and Mode (TONs)
TIM: Time in Mode (min)

60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1,000: Conversion Factor pounds to 1,000 pounds
EF: Emission Factor (lb/1,000 lbs fuel)
NE: Number of Engines
NA: Number of Aircraft
TGO: Number of Touch-and-Go Cycles
2,000: Conversion Factor pounds to TONs

- Aircraft Emissions for TGOs per Year
$AE_{TGO} = AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{TGO}: Aircraft Emissions (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for Trim per Year
$AEPS_{POL} = (TD / 60) * (FC / 1,000) * EF * NE * NA * NTT / 2,000$

$AEPS_{POL}$: Aircraft Emissions per Pollutant and Power Setting (TONs)
TD: Test Duration (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1,000: Conversion Factor pounds to 1,000 pounds
EF: Emission Factor (lb/1,000 lbs fuel)
NE: Number of Engines
NA: Number of Aircraft
NTT: Number of Trim Test
2,000: Conversion Factor pounds to TONs

- Aircraft Emissions for Trim per Year
$AE_{TRIM} = AEPS_{IDLE} + AEPS_{APPROACH} + AEPS_{INTERMEDIATE} + AEPS_{MILITARY} + AEPS_{AFTERBURN}$

AE_{TRIM}: Aircraft Emissions (TONs)
$AEPS_{IDLE}$: Aircraft Emissions for Idle Power Setting (TONs)
$AEPS_{APPROACH}$: Aircraft Emissions for Approach Power Setting (TONs)
$AEPS_{INTERMEDIATE}$: Aircraft Emissions for Intermediate Power Setting (TONs)
$AEPS_{MILITARY}$: Aircraft Emissions for Military Power Setting (TONs)
$AEPS_{AFTERBURN}$: Aircraft Emissions for After Burner Power Setting (TONs)

4.4 Auxiliary Power Unit (APU)

4.4.1 Auxiliary Power Unit (APU) Assumptions

- Default Settings Used: Yes

- Auxiliary Power Unit (APU) [default]

Number of APU per Aircraft	Operation Hours for Each LTO	Exempt Source?	Designation	Manufacturer

4.4.2 Auxiliary Power Unit (APU) Emission Factor(s)

- Auxiliary Power Unit (APU) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e

4.4.3 Auxiliary Power Unit (APU) Formula(s)

- Auxiliary Power Unit (APU) Emissions per Year
APU_{POL} = APU * OH * LTO * NA * EF_{POL} / 2,000

APU_{POL}: Auxiliary Power Unit (APU) Emissions per Pollutant (TONs)
APU: Number of Auxiliary Power Units
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
NA: Number of Aircraft
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2,000: Conversion Factor pounds to tons

4.5 Aerospace Ground Equipment (AGE)

4.5.1 Aerospace Ground Equipment (AGE) Assumptions

- Default Settings Used: Yes

- AGE Usage
Number of Annual LTO (Landing and Take-off) cycles for AGE: 1219.62

- Aerospace Ground Equipment (AGE) [default]

Total Number of AGE	Operation Hours for Each LTO	Exempt Source?	AGE Type	Designation
30	0.5	No	Air Compressor	MC-1A - 18.4 hp
30	0.17	No	Generator Set	A/M32A-86D
30	0.17	No	Heater	H1
30	0.5	No	Hydraulic Test Stand	MJ-1-1
30	1	No	Light Cart	TF-1

4.5.2 Aerospace Ground Equipment (AGE) Emission Factor(s)

- Aerospace Ground Equipment (AGE) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
MC-1A - 18.4 hp	1.1	0.267	0.008	0.419	0.267	0.071	0.068	24.8
A/M32A-86D	6.5	0.294	0.046	6.102	0.457	0.091	0.089	147.0
H1	0.4	0.100	0.011	0.160	0.180	0.006	0.006	8.9
MJ-1-1	2.5	0.026	0.018	0.757	0.043	0.109	0.105	57.2
TF-1	0.0	0.025	0.043	0.170	0.130	0.160	0.155	30.7

4.5.3 Aerospace Ground Equipment (AGE) Formula(s)

- Aerospace Ground Equipment (AGE) Emissions per Year
AGE_{POL} = AGE * OH * LTO * EF_{POL} / 2,000

AGE_{POL}: Aerospace Ground Equipment (AGE) Emissions per Pollutant (TONs)
AGE: Total Number of Aerospace Ground Equipment
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2,000: Conversion Factor pounds to tons

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

5. Aircraft

5.1 General Information and Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Roane
Regulatory Area(s): Knoxville, Tennessee

- Activity Title: Helicopter

- Activity Description:
1,491 annual flight operations

- Activity Start Date
Start Month: 1
Start Year: 2016

- Activity End Date
Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	3.108921
SO_x	0.025577
NO_x	3.865785
CO	9.944756
PM 10	0.153403

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.141924
Pb	0.000000
NH_3	0.000000

5.2 Aircraft and Engines

5.2.1 Aircraft and Engines Assumptions

- Aircraft and Engine
Aircraft Designation: C-12J
Engine Model: PT6A-65B
Primary Function: General - Turboprop
Number of Engines: 2

- Aircraft and Engine Surrogate
Is Aircraft and Engine a Surrogate? Yes
Original Aircraft Name: Bell 206L Long Ranger
Original Engine Name: Allison 250-C30P

5.2.2 Aircraft and Engines Emission Factor(s)

- Aircraft and Engine Emissions Factors (lb/1,000 lbs fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	131.43	53.66	1.06	1.89	166.43	1.23	1.11	3252.46
Approach	339.89	3.31	1.06	4.59	20.86	0.74	0.67	3252.46
Intermediate	570.64	0.72	1.06	6.69	6.72	0.29	0.26	3252.46
Military	633.06	0.53	1.06	7.08	5.36	0.26	0.23	3252.46
After Burn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3252.46

5.3 Flight Operations

5.3.1 Flight Operations Assumptions

- Flight Operations
Number of Aircraft: 10
Number of Annual LTOs (Landing and Take-off) cycles: 149.1
Number of Annual TGOs (Touch-and-Go) cycles: 0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)
Taxi/Idle Out (mins): 9.2
Takeoff (mins): 0.4
Climb Out (mins): 1.2
Approach (mins): 5.1
Taxi/Idle In (mins): 6.7

- Trim Test
Idle (mins): 12
Approach (mins): 27
Intermediate (mins): 9
Military (mins): 12
AfterBurn (mins): 0

5.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for LTOs per Year
AEM_{POL} = (TIM / 60) * (FC / 1,000) * EF * NE * NA * LTO / 2,000

AEM_{POL}: Aircraft Emissions per Pollutant and Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1,000: Conversion Factor pounds to 1,000 pounds
EF: Emission Factor (lb/1,000 lbs fuel)
NE: Number of Engines
NA: Number of Aircraft
LTO: Number of Landing and Take-off Cycles
2,000: Conversion Factor pounds to TONs

- Aircraft Emissions for LTOs per Year
$AE_{LTO} = AEM_{IDLE\_IN} + AEM_{IDLE\_OUT} + AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{LTO}: Aircraft Emissions (TONs)
AEM_{IDLE_IN}: Aircraft Emissions for Idle-In Mode (TONs)
AEM_{IDLE_OUT}: Aircraft Emissions for Idle-Out Mode (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for TGOs per Year
$AEM_{POL} = (TIM / 60) * (FC / 1,000) * EF * NE * NA * TGO / 2,000$

AEM_{POL}: Aircraft Emissions per Pollutant and Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1,000: Conversion Factor pounds to 1,000 pounds
EF: Emission Factor (lb/1,000 lbs fuel)
NE: Number of Engines
NA: Number of Aircraft
TGO: Number of Touch-and-Go Cycles
2,000: Conversion Factor pounds to TONs

- Aircraft Emissions for TGOs per Year
$AE_{TGO} = AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{TGO}: Aircraft Emissions (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for Trim per Year
$AEPS_{POL} = (TD / 60) * (FC / 1,000) * EF * NE * NA * NTT / 2,000$

$AEPS_{POL}$: Aircraft Emissions per Pollutant and Power Setting (TONs)
TD: Test Duration (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1,000: Conversion Factor pounds to 1,000 pounds
EF: Emission Factor (lb/1,000 lbs fuel)
NE: Number of Engines
NA: Number of Aircraft
NTT: Number of Trim Test
2,000: Conversion Factor pounds to TONs

- Aircraft Emissions for Trim per Year
$AE_{TRIM} = AEPS_{IDLE} + AEPS_{APPROACH} + AEPS_{INTERMEDIATE} + AEPS_{MILITARY} + AEPS_{AFTERBURN}$

AE_{TRIM}: Aircraft Emissions (TONs)
$AEPS_{IDLE}$: Aircraft Emissions for Idle Power Setting (TONs)
$AEPS_{APPROACH}$: Aircraft Emissions for Approach Power Setting (TONs)
$AEPS_{INTERMEDIATE}$: Aircraft Emissions for Intermediate Power Setting (TONs)
$AEPS_{MILITARY}$: Aircraft Emissions for Military Power Setting (TONs)
$AEPS_{AFTERBURN}$: Aircraft Emissions for After Burner Power Setting (TONs)

5.4 Auxiliary Power Unit (APU)

5.4.1 Auxiliary Power Unit (APU) Assumptions

- Default Settings Used: Yes

- Auxiliary Power Unit (APU) [default]

Number of APU per Aircraft	Operation Hours for Each LTO	Exempt Source?	Designation	Manufacturer

5.4.2 Auxiliary Power Unit (APU) Emission Factor(s)

- Auxiliary Power Unit (APU) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e

5.4.3 Auxiliary Power Unit (APU) Formula(s)

- Auxiliary Power Unit (APU) Emissions per Year

$APU_{POL} = APU * OH * LTO * NA * EF_{POL} / 2,000$

APU_{POL}: Auxiliary Power Unit (APU) Emissions per Pollutant (TONs)
APU: Number of Auxiliary Power Units
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
NA: Number of Aircraft
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2,000: Conversion Factor pounds to tons

5.5 Aerospace Ground Equipment (AGE)

5.5.1 Aerospace Ground Equipment (AGE) Assumptions

- Default Settings Used: Yes

- AGE Usage

Number of Annual LTO (Landing and Take-off) cycles for AGE: 149.1

- Aerospace Ground Equipment (AGE) [default]

Total Number of AGE	Operation Hours for Each LTO	Exempt Source?	AGE Type	Designation
10	0.75	No	Generator Set	A/M32A-86D

5.5.2 Aerospace Ground Equipment (AGE) Emission Factor(s)

- Aerospace Ground Equipment (AGE) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
A/M32A-86D	6.5	0.294	0.046	6.102	0.457	0.091	0.089	147.0

5.5.3 Aerospace Ground Equipment (AGE) Formula(s)

- Aerospace Ground Equipment (AGE) Emissions per Year

$AGE_{POL} = AGE * OH * LTO * EF_{POL} / 2,000$

AGE_{POL}: Aerospace Ground Equipment (AGE) Emissions per Pollutant (TONs)
AGE: Total Number of Aerospace Ground Equipment
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2,000: Conversion Factor pounds to tons

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

1. General Information

- Action Location
Base: MCGHEE TYSON ANBG
County(s): Roane
Regulatory Area(s): Knoxville, Tennessee

- Action Title: ORAEA

- Project Number/s (if applicable):

- Projected Action Start Date: 1 / 2017

- Action Purpose and Need:
See previous

- Action Description:
See previous

- Point of Contact
Name: Brad Boykin
Title: CTR
Organization: Leidos
Email: boykinb@leidos.com
Phone Number: 860.609.3450

- Activity List:

Activity Type		Activity Title
2.	Tanks	AvGas Tank
3.	Tanks	Jet-A Tank

2. Tanks

2.1 General Information and Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Roane
Regulatory Area(s): Knoxville, Tennessee

- Activity Title: AvGas Tank

- Activity Description:
10,000 gal AvGas horizontal tank

- Activity Start Date
Start Month: 1
Start Year: 2017

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

- Activity End Date

Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	5.154854
SO_x	0.000000
NO_x	0.000000
CO	0.000000
PM 10	0.000000

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.000000
Pb	0.000000
NH_3	0.000000

2.2 Tanks Assumptions

- Chemical

Chemical Name: Gasoline (RVP 15.0)
Chemical Category: Petroleum Distillates
Chemical Density: 5.6
Vapor Molecular Weight (lb/lb-mole): 60
Stock Vapor Density (lb/ft^3): 0.0811898517061197
Vapor Pressure: 7.46805
Vapor Space Expansion Factor (dimensionless): 0.068

- Tank

Type of Tank: Horizontal Tank
Tank Length (ft): 17
Tank Diameter (ft): 12
Annual Net Throughput (gallon/year): 120000

2.3 Tank Formula(s)

- Vapor Space Volume

VSV = (PI / 4) * D^2 * L / 2

VSV: Vapor Space Volume (ft^3)
PI: PI Math Constant
D^2: Tank Diameter (ft)
L: Tank Length (ft)
2: Convertion Factor (Vapor Space Volume is assumed to be one-half of the tank volume)

- Vented Vapor Saturation Factor

VVSF = 1 / (1 + (0.053 * VP * L / 2))

VVSF: Vented Vapor Saturation Factor (dimensionless)
0.053: Constant
VP: Vapor Pressure (psia)
L: Tank Length (ft)

- Standing Storage Loss per Year

SSL_{VOC} = 365 * VSV * SVD * VSEF * VVSF / 2000

SSL_{VOC}: Standing Storage Loss Emissions (TONs)
365: Number of Daily Events in a Year (Constant)
VSV: Vapor Space Volume (ft^3)

SVD: Stock Vapor Density (lb/ft^3)
VSEF: Vapor Space Expansion Factor (dimensionless)
VVSF: Vented Vapor Saturation Factor (dimensionless)
2000: Conversion Factor pounds to tons

- Number of Turnovers per Year
NT = (7.48 * ANT) / ((PI / 4.0) * D * L)

NT: Number of Turnovers per Year
7.48: Constant
ANT: Annual Net Throughput
PI: PI Math Constant
D^2: Tank Diameter (ft)
L: Tank Length (ft)

- Working Loss Turnover (Saturation) Factor per Year
WLSF = (18 + NT) / (6 * NT)

WLSF: Working Loss Turnover (Saturation) Factor per Year
18: Constant
NT: Number of Turnovers per Year
6: Constant

- Working Loss per Year
WL_{VOC} = 0.0010 * VMW * VP * ANT * WLSF / 2,000

0.0010: Constant
VMW: Vapor Molecular Weight (lb/lb-mole)
VP: Vapor Pressure (psia)
ANT: Annual Net Throughput
WLSF: Working Loss Turnover (Saturation) Factor
2,000: Conversion Factor pounds to tons

3. Tanks

3.1 General Information and Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Roane
Regulatory Area(s): Knoxville, Tennessee

- Activity Title: Jet-A Tank

- Activity Description:
10,000 gal horiz Jet-A tank

- Activity Start Date
Start Month: 1
Start Year: 2017

- Activity End Date
Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	0.013628
SO_x	0.000000
NO_x	0.000000
CO	0.000000
PM 10	0.000000

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.000000
Pb	0.000000
NH_3	0.000000

3.2 Tanks Assumptions

- Chemical
Chemical Name: Jet kerosene (JP-5, JP-8 or Jet-A)
Chemical Category: Petroleum Distillates
Chemical Density: 7
Vapor Molecular Weight (lb/lb-mole): 130
Stock Vapor Density (lb/ft^3): 0.000170775135930213
Vapor Pressure: 0.00725
Vapor Space Expansion Factor (dimensionless): 0.068

- Tank
Type of Tank: Horizontal Tank
Tank Length (ft): 17
Tank Diameter (ft): 12
Annual Net Throughput (gallon/year): 120,000

3.3 Tank Formula(s)

- Vapor Space Volume
$VSV = (PI / 4) * D^2 * L / 2$

VSV: Vapor Space Volume (ft^3)
PI: PI Math Constant
D^2: Tank Diameter (ft)
L: Tank Length (ft)
2: Convertion Factor (Vapor Space Volume is assumed to be one-half of the tank volume)

- Vented Vapor Saturation Factor
$VVSF = 1 / (1 + (0.053 * VP * L / 2))$

VVSF: Vented Vapor Saturation Factor (dimensionless)
0.053: Constant
VP: Vapor Pressure (psia)
L: Tank Length (ft)

- Standing Storage Loss per Year
$SSL_{VOC} = 365 * VSV * SVD * VSEF * VVSF / 2,000$

SSL_{VOC}: Standing Storage Loss Emissions (TONs)
365: Number of Daily Events in a Year (Constant)
VSV: Vapor Space Volume (ft^3)

SVD: Stock Vapor Density (lb/ft^3)
VSEF: Vapor Space Expansion Factor (dimensionless)
VVSF: Vented Vapor Saturation Factor (dimensionless)
2,000: Conversion Factor pounds to tons

- Number of Turnovers per Year
NT = (7.48 * ANT) / ((PI / 4.0) * D * L)

NT: Number of Turnovers per Year
7.48: Constant
ANT: Annual Net Throughput
PI: PI Math Constant
D^2: Tank Diameter (ft)
L: Tank Length (ft)

- Working Loss Turnover (Saturation) Factor per Year
WLSF = (18 + NT) / (6 * NT)

WLSF: Working Loss Turnover (Saturation) Factor per Year
18: Constant
NT: Number of Turnovers per Year
6: Constant

- Working Loss per Year
WL_{VOC} = 0.0010 * VMW * VP * ANT * WLSF / 2,000

0.0010: Constant
VMW: Vapor Molecular Weight (lb/lb-mole)
VP: Vapor Pressure (psia)
ANT: Annual Net Throughput
WLSF: Working Loss Turnover (Saturation) Factor
2,000: Conversion Factor pounds to tons

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DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

1. General Information

- Action Location
Base: MCGHEE TYSON ANBG
County(s): Roane
Regulatory Area(s): Knoxville, Tennessee

- Action Title: ORAEA (Haul Rd Options)

- Project Number/s (if applicable):

- Projected Action Start Date: 1 / 2016

- Action Purpose and Need:
See Previous.

- Action Description:
See Previous.

Haul Rd Option 1: 4,640 linear ft of road improvements
Haul Rd Option 2: 7,673 linear ft of road improvements
Blair Rd Option 1: 12,144 linear ft of road improvements
Blair Rd Option 2: 6,464 linear ft of road improvements
Blair Rd Option 3: 1,530 linear ft of road improvements

- Point of Contact
Name: Brad Boykin
Title: CTR
Organization: Leidos
Email: boykinb@leidos.com
Phone Number: 850-609-3450

- Activity List:

Activity Type		Activity Title
2.	Construction / Demolition	Haul Rd Option 1

2. Construction / Demolition

2.1 General Information and Timeline Assumptions

- Activity Location
County: Roane
Regulatory Area(s): Knoxville, Tennessee

- Activity Title: Haul Rd Option 1

- Activity Description:
4,640 linear ft by 30 ft; 139,200 ft^2

- Activity Start Date
Start Month: 1
Start Month: 2016

- Activity End Date
Indefinite: False
End Month: 12
End Month: 2017

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.847593
SO_x	0.007274
NO_x	5.113502
CO	4.403132
PM 10	5.246085

Pollutant	Total Emissions (TONs)
PM 2.5	0.314283
Pb	0.000000
NH_3	0.010992

2.1 Site Grading Phase

2.1.1 Site Grading Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2016

- Phase Duration
Number of Month: 3
Number of Days: 0

2.1.2 Site Grading Phase Assumptions

- General Site Grading Information
Area of Site to be Graded (ft^2): 167,040
Amount of Material to be Hauled On-Site (yd^3): 0
Amount of Material to be Hauled Off-Site (yd^3): 0

- Site Grading Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number of Equipment	Hours Per Day
Graders Composite	1	8
Other Construction Equipment Composite	1	8
Rubber Tired Dozers Composite	1	8
Tractors/Loaders/Backhoes Composite	2	7

- Vehicle Exhaust
Average Hauling Truck Capacity (yd^3): 20 (default)
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

2.1.3 Site Grading Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) [default]

Graders Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2**
Emission Factors	0.1196	0.0014	0.8866	0.5883	0.0441	0.0441	0.0107	132.74
Other Construction Equipment Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2**
Emission Factors	0.0719	0.0012	0.5679	0.3602	0.0233	0.0233	0.0064	122.56
Rubber Tired Dozers Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2**
Emission Factors	0.2591	0.0024	2.0891	0.9833	0.0858	0.0858	0.0233	239.09
Tractors/Loaders/Backhoes Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2**
Emission Factors	0.0610	0.0007	0.4069	0.3689	0.0258	0.0258	0.0055	66.797

- Vehicle Exhaust and Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2
LDGV	00.4730	00.0068	00.3380	08.1500	00.0248	00.0113		00.1017	00368.0
LDGT	00.6890	00.0095	00.5440	09.4700	00.0248	00.0113		00.1017	00516.7
HDGV	00.6810	00.0165	00.9340	08.2000	00.0414	00.0259		00.0451	00904.2
LDDV	00.0970	00.0029	00.1080	00.7150	00.0408	00.0260		00.0068	00314.1
LDDT	00.3160	00.0056	00.3420	00.5790	00.0492	00.0337		00.0068	00598.6
HDDV	00.2990	00.0116	02.1550	00.6470	00.0889	00.0632		00.0270	01243.4
MC	02.3000	00.0033	01.1900	14.3200	00.0372	00.0207		00.0113	00177.4

2.1.4 Site Grading Phase Formula(s)

- Fugitive Dust Emissions per Phase

$PM10_{FD} = (20 * ACRE * WD) / 2,000$

$PM10_{FD}$: Fugitive Dust PM 10 Emissions (TONs)
20: Conversion Factor Acre Day to pounds (20 lbs / 1 Acre Day)
ACRE: Total acres (acres)
WD: Number of Total Work Days (days)
2,000: Conversion Factor pounds to tons

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2,000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2,000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
$VMT_{VE} = (HA_{OnSite} + HA_{OffSite}) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
HA_{OnSite}: Amount of Material to be Hauled On-Site (yd^3)
$HA_{OffSite}$: Amount of Material to be Hauled Off-Site (yd^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2,000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2,000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

2.2 Paving Phase

2.2.1 Paving Phase Timeline Assumptions

- Phase Start Date
Start Month: 4
Start Quarter: 1
Start Year: 2016

- Phase Duration
Number of Month: 9
Number of Days: 0

2.2.2 Paving Phase Assumptions

- General Paving Information
Paving Area (ft^2): 139,200

- Paving Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number of Equipment	Hours Per Day
Cement and Mortar Mixers Composite	4	6
Pavers Composite	1	7
Paving Equipment Composite	2	6
Rollers Composite	1	7

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

2.2.3 Paving Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) [default]

Graders Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.1196	0.0014	0.8866	0.5883	0.0441	0.0441	0.0107	132.74
Other Construction Equipment Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.0719	0.0012	0.5679	0.3602	0.0233	0.0233	0.0064	122.56
Rubber Tired Dozers Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.2591	0.0024	2.0891	0.9833	0.0858	0.0858	0.0233	239.09
Tractors/Loaders/Backhoes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.0610	0.0007	0.4069	0.3689	0.0258	0.0258	0.0055	66.797

- Vehicle Exhaust and Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2
LDGV	00.4730	00.0068	00.3380	08.1500	00.0248	00.0113		00.1017	00368.0
LDGT	00.6890	00.0095	00.5440	09.4700	00.0248	00.0113		00.1017	00516.7
HDGV	00.6810	00.0165	00.9340	08.2000	00.0414	00.0259		00.0451	00904.2
LDDV	00.0970	00.0029	00.1080	00.7150	00.0408	00.0260		00.0068	00314.1
LDDT	00.3160	00.0056	00.3420	00.5790	00.0492	00.0337		00.0068	00598.6
HDDV	00.2990	00.0116	02.1550	00.6470	00.0889	00.0632		00.0270	01243.4
MC	02.3000	00.0033	01.1900	14.3200	00.0372	00.0207		00.0113	00177.4

2.2.4 Paving Phase Formula(s)

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2,000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2,000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = PA * 0.25 * (1 / 27) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
PA: Paving Area (ft^2)
0.25: Thickness of Paving Area (ft)
(1 / 27): Conversion Factor cubic feet to cubic yards (1 yd^3 / 27 ft^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2,000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2,000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

- Off-Gassing Emissions per Phase

$VOC_P = (2.62 * PA) / 43,560$

VOC_P: Paving VOC Emissions (TONs)
2.62: Emission Factor (lb/acre)
PA: Paving Area (ft^2)
43560: Conversion Factor square feet to acre (43560 ft2 / acre)^2 / acre)

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DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

1. General Information

- Action Location
Base: MCGHEE TYSON ANBG
County(s): Roane
Regulatory Area(s): Knoxville, Tennessee

- Action Title: ORAEA (Haul Rd Options)

- Project Number/s (if applicable):

- Projected Action Start Date: 1 / 2016

- Action Purpose and Need:
See Previous.

- Action Description:
See Previous.

Haul Rd Option 1: 4,640 linear ft of road improvements
Haul Rd Option 2: 7,673 linear ft of road improvements
Blair Rd Option 1: 12,144 linear ft of road improvements
Blair Rd Option 2: 6,464 linear ft of road improvements
Blair Rd Option 3: 1,530 linear ft of road improvements

- Point of Contact
Name: Brad Boykin
Title: CTR
Organization: Leidos
Email: boykinb@leidos.com
Phone Number: 850-609-3450

- Activity List:

Activity Type		Activity Title
2.	Construction / Demolition	Haul Rd Option 2

2. Construction / Demolition

2.1 General Information and Timeline Assumptions

- Activity Location
County: Roane
Regulatory Area(s): Knoxville, Tennessee

- Activity Title: Haul Rd Option 2

- Activity Description:
7,673 linear ft by 30 ft; 230,190 ft^2

- Activity Start Date
Start Month: 1
Start Month: 2016

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

- Activity End Date
Indefinite: False
End Month: 12
End Month: 2017

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.903010
SO_x	0.007398
NO_x	5.557982
CO	4.409352
PM 10	8.506761

Pollutant	Total Emissions (TONs)
PM 2.5	0.352675
Pb	0.000000
NH_3	0.007208

2.1 Site Grading Phase

2.1.1 Site Grading Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2016

- Phase Duration
Number of Month: 3
Number of Days: 0

2.1.2 Site Grading Phase Assumptions

- General Site Grading Information
Area of Site to be Graded (ft^2): 27,6228
Amount of Material to be Hauled On-Site (yd^3): 0
Amount of Material to be Hauled Off-Site (yd^3): 0

- Site Grading Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number of Equipment	Hours Per Day
Graders Composite	1	8
Other Construction Equipment Composite	1	8
Rubber Tired Dozers Composite	1	8
Tractors/Loaders/Backhoes Composite	2	7

- Vehicle Exhaust
Average Hauling Truck Capacity (yd^3): 20 (default)
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

2.1.3 Site Grading Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) [default]

Graders Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2**
Emission Factors	0.1196	0.0014	0.8866	0.5883	0.0441	0.0441	0.0107	132.74
Other Construction Equipment Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2**
Emission Factors	0.0719	0.0012	0.5679	0.3602	0.0233	0.0233	0.0064	122.56
Rubber Tired Dozers Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2**
Emission Factors	0.2591	0.0024	2.0891	0.9833	0.0858	0.0858	0.0233	239.09
Tractors/Loaders/Backhoes Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2**
Emission Factors	0.0610	0.0007	0.4069	0.3689	0.0258	0.0258	0.0055	66.797

- Vehicle Exhaust and Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2
LDGV	00.4730	00.0068	00.3380	08.1500	00.0248	00.0113		00.1017	00368.0
LDGT	00.6890	00.0095	00.5440	09.4700	00.0248	00.0113		00.1017	00516.7
HDGV	00.6810	00.0165	00.9340	08.2000	00.0414	00.0259		00.0451	00904.2
LDDV	00.0970	00.0029	00.1080	00.7150	00.0408	00.0260		00.0068	00314.1
LDDT	00.3160	00.0056	00.3420	00.5790	00.0492	00.0337		00.0068	00598.6
HDDV	00.2990	00.0116	02.1550	00.6470	00.0889	00.0632		00.0270	01243.4
MC	02.3000	00.0033	01.1900	14.3200	00.0372	00.0207		00.0113	00177.4

2.1.4 Site Grading Phase Formula(s)

- Fugitive Dust Emissions per Phase

$PM10_{FD}$ = (20 * ACRE * WD) / 2,000

$PM10_{FD}$: Fugitive Dust PM 10 Emissions (TONs)
20: Conversion Factor Acre Day to pounds (20 lbs / 1 Acre Day)
ACRE: Total acres (acres)
WD: Number of Total Work Days (days)
2,000: Conversion Factor pounds to tons

- Construction Exhaust Emissions per Phase

CEE_{POL} = (NE * WD * H * EF_{POL}) / 2,000

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2,000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

VMT_{VE} = (HA_{OnSite} + $HA_{OffSite}$) * (1 / HC) * HT

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
HA_{OnSite}: Amount of Material to be Hauled On-Site (yd^3)
$HA_{OffSite}$: Amount of Material to be Hauled Off-Site (yd^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2,000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2,000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

2.2 Paving Phase

2.2.1 Paving Phase Timeline Assumptions

- Phase Start Date
Start Month: 4
Start Quarter: 1
Start Year: 2016

- Phase Duration
Number of Month: 9
Number of Days: 0

2.2.2 Paving Phase Assumptions

- General Paving Information
Paving Area (ft^2): 230190

- Paving Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

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- Construction Exhaust (default)

Equipment Name	Number of Equipment	Hours Per Day
Pavers Composite	1	8
Paving Equipment Composite	2	6
Rollers Composite	2	6

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

2.2.3 Paving Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) [default]

Graders Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.1196	0.0014	0.8866	0.5883	0.0441	0.0441	0.0107	132.74
Other Construction Equipment Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.0719	0.0012	0.5679	0.3602	0.0233	0.0233	0.0064	122.56
Rubber Tired Dozers Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.2591	0.0024	2.0891	0.9833	0.0858	0.0858	0.0233	239.09
Tractors/Loaders/Backhoes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.0610	0.0007	0.4069	0.3689	0.0258	0.0258	0.0055	66.797

- Vehicle Exhaust and Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2
LDGV	00.4730	00.0068	00.3380	08.1500	00.0248	00.0113		00.1017	00368.0
LDGT	00.6890	00.0095	00.5440	09.4700	00.0248	00.0113		00.1017	00516.7
HDGV	00.6810	00.0165	00.9340	08.2000	00.0414	00.0259		00.0451	00904.2
LDDV	00.0970	00.0029	00.1080	00.7150	00.0408	00.0260		00.0068	00314.1
LDDT	00.3160	00.0056	00.3420	00.5790	00.0492	00.0337		00.0068	00598.6
HDDV	00.2990	00.0116	02.1550	00.6470	00.0889	00.0632		00.0270	01243.4
MC	02.3000	00.0033	01.1900	14.3200	00.0372	00.0207		00.0113	00177.4

2.2.4 Paving Phase Formula(s)

- Construction Exhaust Emissions per Phase
$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2{,}000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment

WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2,000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
$VMT_{VE} = PA * 0.25 * (1 / 27) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
PA: Paving Area (ft^2)
0.25: Thickness of Paving Area (ft)
(1 / 27): Conversion Factor cubic feet to cubic yards (1 yd^3 / 27 ft^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2,000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2,000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

- Off-Gassing Emissions per Phase
$VOC_P = (2.62 * PA) / 43,560$

VOC_P: Paving VOC Emissions (TONs)
2.62: Emission Factor (lb/acre)
PA: Paving Area (ft^2)
43,560: Conversion Factor square feet to acre (43,560 ft^2 / acre)^2 / acre)

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

1. General Information

- Action Location
Base: MCGHEE TYSON ANBG
County(s): Roane
Regulatory Area(s): Knoxville, Tennessee

- Action Title: ORAEA (Blair Rd Options)

- Project Number/s (if applicable):

- Projected Action Start Date: 1 / 2016

- Action Purpose and Need:
See Previous

- Action Description:
See Previous.

Option 1: 12,144 linear ft of road improvements
Option 2: 6,464 linear ft of road improvements
Option 3: 1,530 linear ft of road improvements

- Point of Contact
Name: Brad Boykin
Title: CTR
Organization: Leidos
Email: boykinb@leidos.com
Phone Number: 8506093450

- Activity List:

	Activity Type	Activity Title
2.	Construction / Demolition	Blair Rd Option 1

2. Construction / Demolition

2.1 General Information and Timeline Assumptions

- Activity Location
County: Roane
Regulatory Area(s): Knoxville, Tennessee

- Activity Title: Blair Rd Option 1

- Activity Description:
12,144 linear ft by 30 ft; 437,184 ft^2

- Activity Start Date
Start Month: 1
Start Month: 2016

- Activity End Date

Indefinite: False
End Month: 12
End Month: 2017

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	1.084030
SO_x	0.009353
NO_x	6.839680
CO	5.189974
PM 10	13.314802

Pollutant	Total Emissions (TONs)
PM 2.5	0.409854
Pb	0.000000
NH_3	0.007929

2.1 Site Grading Phase

2.1.1 Site Grading Phase Timeline Assumptions

- Phase Start Date

Start Month: 1
Start Quarter: 1
Start Year: 2016

- Phase Duration

Number of Month: 3
Number of Days: 0

2.1.2 Site Grading Phase Assumptions

- General Site Grading Information

Area of Site to be Graded (ft^2): 437,184
Amount of Material to be Hauled On-Site (yd^3): 0
Amount of Material to be Hauled Off-Site (yd^3): 0

- Site Grading Default Settings

Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number of Equipment	Hours Per Day
Excavators Composite	1	8
Graders Composite	1	8
Other Construction Equipment Composite	1	8
Rubber Tired Dozers Composite	1	8
Scrapers Composite	2	8
Tractors/Loaders/Backhoes Composite	3	8

- Vehicle Exhaust

Average Hauling Truck Capacity (yd^3): 20 (default)
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

2.1.3 Site Grading Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) [default]

Excavators Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.0987	0.0013	0.6602	0.5212	0.0332	0.0332	0.0089	119.58
Graders Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.1196	0.0014	0.8866	0.5883	0.0441	0.0441	0.0107	132.74
Other Construction Equipment Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.0719	0.0012	0.5679	0.3602	0.0233	0.0233	0.0064	122.56
Rubber Tired Dozers Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.2591	0.0024	2.0891	0.9833	0.0858	0.0858	0.0233	239.09
Scrapers Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.2382	0.0026	1.9017	0.9053	0.0783	0.0783	0.0214	262.48
Tractors/Loaders/Backhoes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.0610	0.0007	0.4069	0.3689	0.0258	0.0258	0.0055	66.797

- Vehicle Exhaust and Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2
LDGV	00.4730	00.0068	00.3380	08.1500	00.0248	00.0113		00.1017	00368.0
LDGT	00.6890	00.0095	00.5440	09.4700	00.0248	00.0113		00.1017	00516.7
HDGV	00.6810	00.0165	00.9340	08.2000	00.0414	00.0259		00.0451	00904.2
LDDV	00.0970	00.0029	00.1080	00.7150	00.0408	00.0260		00.0068	00314.1
LDDT	00.3160	00.0056	00.3420	00.5790	00.0492	00.0337		00.0068	00598.6
HDDV	00.2990	00.0116	02.1550	00.6470	00.0889	00.0632		00.0270	01243.4
MC	02.3000	00.0033	01.1900	14.3200	00.0372	00.0207		00.0113	00177.4

2.1.4 Site Grading Phase Formula(s)

- Fugitive Dust Emissions per Phase
$PM10_{FD}$ = (20 * ACRE * WD) / 2,000

$PM10_{FD}$: Fugitive Dust PM 10 Emissions (TONs)
20: Conversion Factor Acre Day to pounds (20 lbs / 1 Acre Day)
ACRE: Total acres (acres)
WD: Number of Total Work Days (days)
2,000: Conversion Factor pounds to tons

- Construction Exhaust Emissions per Phase
CEE_{POL} = (NE * WD * H * EF_{POL}) / 2,000

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2,000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
$VMT_{VE} = (HA_{OnSite} + HA_{OffSite}) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
HA_{OnSite}: Amount of Material to be Hauled On-Site (yd^3)
$HA_{OffSite}$: Amount of Material to be Hauled Off-Site (yd^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2{,}000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2{,}000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

2.2 Paving Phase

2.2.1 Paving Phase Timeline Assumptions

- Phase Start Date
Start Month: 4
Start Quarter: 1
Start Year: 2016
- Phase Duration
Number of Month: 9
Number of Days: 0

2.2.2 Paving Phase Assumptions

- General Paving Information
Paving Area (ft^2): 364,320

- Paving Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number of Equipment	Hours Per Day
Pavers Composite	1	8
Paving Equipment Composite	2	6
Rollers Composite	2	6

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

2.2.3 Paving Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) [default]

Excavators Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.0987	0.0013	0.6602	0.5212	0.0332	0.0332	0.0089	119.58
Graders Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.1196	0.0014	0.8866	0.5883	0.0441	0.0441	0.0107	132.74
Other Construction Equipment Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.0719	0.0012	0.5679	0.3602	0.0233	0.0233	0.0064	122.56
Rubber Tired Dozers Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.2591	0.0024	2.0891	0.9833	0.0858	0.0858	0.0233	239.09
Scrapers Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.2382	0.0026	1.9017	0.9053	0.0783	0.0783	0.0214	262.48
Tractors/Loaders/Backhoes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.0610	0.0007	0.4069	0.3689	0.0258	0.0258	0.0055	66.797

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- Vehicle Exhaust and Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2
LDGV	00.4730	00.0068	00.3380	08.1500	00.0248	00.0113		00.1017	00368.0
LDGT	00.6890	00.0095	00.5440	09.4700	00.0248	00.0113		00.1017	00516.7
HDGV	00.6810	00.0165	00.9340	08.2000	00.0414	00.0259		00.0451	00904.2
LDDV	00.0970	00.0029	00.1080	00.7150	00.0408	00.0260		00.0068	00314.1
LDDT	00.3160	00.0056	00.3420	00.5790	00.0492	00.0337		00.0068	00598.6
HDDV	00.2990	00.0116	02.1550	00.6470	00.0889	00.0632		00.0270	01243.4
MC	02.3000	00.0033	01.1900	14.3200	00.0372	00.0207		00.0113	00177.4

2.2.4 Paving Phase Formula(s)

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2,000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2,000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = PA * 0.25 * (1 / 27) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
PA: Paving Area (ft^2)
0.25: Thickness of Paving Area (ft)
(1 / 27): Conversion Factor cubic feet to cubic yards (1 yd^3 / 27 ft^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2,000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2,000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)

0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

- Off-Gassing Emissions per Phase

$VOC_P = (2.62 * PA) / 43,560$

VOC_P: Paving VOC Emissions (TONs)
2.62: Emission Factor (lb/acre)
PA: Paving Area (ft^2)
43,560: Conversion Factor square feet to acre (43,560 ft^2 / acre)^2 / acre)

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DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

1. General Information

- Action Location
Base: MCGHEE TYSON ANBG
County(s): Roane
Regulatory Area(s): Knoxville, Tennessee

- Action Title: ORAEA (Blair Rd Options)

- Project Number/s (if applicable):

- Projected Action Start Date: 1 / 2016

- Action Purpose and Need:
See Previous

- Action Description:
See Previous.

Option 1: 12,144 linear ft of road improvements
Option 2: 6,464 linear ft of road improvements
Option 3: 1,530 linear ft of road improvements

- Point of Contact
Name: Brad Boykin
Title: CTR
Organization: Leidos
Email: boykinb@leidos.com
Phone Number: 8506093450

- Activity List:

	Activity Type	Activity Title
2.	Construction / Demolition	Blair Rd Option 2

2. Construction / Demolition

2.1 General Information and Timeline Assumptions

- Activity Location
County: Roane
Regulatory Area(s): Knoxville, Tennessee

- Activity Title: Blair Rd Option 2

- Activity Description:
6,464 linear ft by 30 ft; 193,920 ft^2

- Activity Start Date
Start Month: 1
Start Month: 2016

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- Activity End Date
Indefinite: False
End Month: 12
End Month: 2017

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.851433
SO_x	0.007274
NO_x	5.113502
CO	4.403132
PM 10	7.184219

Pollutant	Total Emissions (TONs)
PM 2.5	0.314283
Pb	0.000000
NH_3	0.010992

2.1 Site Grading Phase

2.1.1 Site Grading Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2016

- Phase Duration
Number of Month: 3
Number of Days: 0

2.1.2 Site Grading Phase Assumptions

- General Site Grading Information
Area of Site to be Graded (ft^2): 23,2704
Amount of Material to be Hauled On-Site (yd^3): 0
Amount of Material to be Hauled Off-Site (yd^3): 0

- Site Grading Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number of Equipment	Hours Per Day
Graders Composite	1	8
Other Construction Equipment Composite	1	8
Rubber Tired Dozers Composite	1	8
Tractors/Loaders/Backhoes Composite	2	7

- Vehicle Exhaust
Average Hauling Truck Capacity (yd^3): 20 (default)
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

2.1.3 Site Grading Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) [default]

Graders Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.1196	0.0014	0.8866	0.5883	0.0441	0.0441	0.0107	132.74
Other Construction Equipment Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.0719	0.0012	0.5679	0.3602	0.0233	0.0233	0.0064	122.56
Rubber Tired Dozers Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.2591	0.0024	2.0891	0.9833	0.0858	0.0858	0.0233	239.09
Tractors/Loaders/Backhoes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.0610	0.0007	0.4069	0.3689	0.0258	0.0258	0.0055	66.797

- Vehicle Exhaust and Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2
LDGV	00.4730	00.0068	00.3380	08.1500	00.0248	00.0113		00.1017	00368.0
LDGT	00.6890	00.0095	00.5440	09.4700	00.0248	00.0113		00.1017	00516.7
HDGV	00.6810	00.0165	00.9340	08.2000	00.0414	00.0259		00.0451	00904.2
LDDV	00.0970	00.0029	00.1080	00.7150	00.0408	00.0260		00.0068	00314.1
LDDT	00.3160	00.0056	00.3420	00.5790	00.0492	00.0337		00.0068	00598.6
HDDV	00.2990	00.0116	02.1550	00.6470	00.0889	00.0632		00.0270	01243.4
MC	02.3000	00.0033	01.1900	14.3200	00.0372	00.0207		00.0113	00177.4

2.1.4 Site Grading Phase Formula(s)

- Fugitive Dust Emissions per Phase
$PM10_{FD}$ = (20 * ACRE * WD) / 2,000

$PM10_{FD}$: Fugitive Dust PM 10 Emissions (TONs)
20: Conversion Factor Acre Day to pounds (20 lbs / 1 Acre Day)
ACRE: Total acres (acres)
WD: Number of Total Work Days (days)
2,000: Conversion Factor pounds to tons

- Construction Exhaust Emissions per Phase
CEE_{POL} = (NE * WD * H * EF_{POL}) / 2,000

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2,000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
VMT_{VE} = (HA_{OnSite} + $HA_{OffSite}$) * (1 / HC) * HT

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
HA_{OnSite}: Amount of Material to be Hauled On-Site (yd^3)
$HA_{OffSite}$: Amount of Material to be Hauled Off-Site (yd^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2,000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2,000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

2.2 Paving Phase

2.2.1 Paving Phase Timeline Assumptions

- Phase Start Date
Start Month: 4
Start Quarter: 1
Start Year: 2016

- Phase Duration
Number of Month: 9
Number of Days: 0

2.2.2 Paving Phase Assumptions

- General Paving Information
Paving Area (ft^2): 193,920

- Paving Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number of Equipment	Hours Per Day
Cement and Mortar Mixers Composite	4	6
Pavers Composite	1	7
Paving Equipment Composite	2	6
Rollers Composite	1	7

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

2.2.3 Paving Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) [default]

Graders Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.1196	0.0014	0.8866	0.5883	0.0441	0.0441	0.0107	132.74
Other Construction Equipment Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.0719	0.0012	0.5679	0.3602	0.0233	0.0233	0.0064	122.56
Rubber Tired Dozers Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.2591	0.0024	2.0891	0.9833	0.0858	0.0858	0.0233	239.09
Tractors/Loaders/Backhoes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.0610	0.0007	0.4069	0.3689	0.0258	0.0258	0.0055	66.797

- Vehicle Exhaust and Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2
LDGV	00.4730	00.0068	00.3380	08.1500	00.0248	00.0113		00.1017	00368.0
LDGT	00.6890	00.0095	00.5440	09.4700	00.0248	00.0113		00.1017	00516.7
HDGV	00.6810	00.0165	00.9340	08.2000	00.0414	00.0259		00.0451	00904.2
LDDV	00.0970	00.0029	00.1080	00.7150	00.0408	00.0260		00.0068	00314.1
LDDT	00.3160	00.0056	00.3420	00.5790	00.0492	00.0337		00.0068	00598.6
HDDV	00.2990	00.0116	02.1550	00.6470	00.0889	00.0632		00.0270	01243.4
MC	02.3000	00.0033	01.1900	14.3200	00.0372	00.0207		00.0113	00177.4

2.2.4 Paving Phase Formula(s)

- Construction Exhaust Emissions per Phase
$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2,000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2,000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = PA * 0.25 * (1 / 27) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
PA: Paving Area (ft^2)
0.25: Thickness of Paving Area (ft)
(1 / 27): Conversion Factor cubic feet to cubic yards (1 yd^3 / 27 ft^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2,000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2,000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

- Off-Gassing Emissions per Phase

$VOC_P = (2.62 * PA) / 43560$

VOC_P: Paving VOC Emissions (TONs)
2.62: Emission Factor (lb/acre)
PA: Paving Area (ft^2)
43,560: Conversion Factor square feet to acre (43,560 ft^2 / acre)^2 / acre)

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

1. General Information

- Action Location
Base: MCGHEE TYSON ANBG
County(s): Roane
Regulatory Area(s): Knoxville, Tennessee

- Action Title: ORAEA (Blair Rd Options)

- Project Number/s (if applicable):

- Projected Action Start Date: 1 / 2016

- Action Purpose and Need:
See Previous

- Action Description:
See Previous.

Option 1: 12,144 linear ft of road improvements
Option 2: 6464 linear ft of road improvements
Option 3: 1530 linear ft of road improvements

- Point of Contact
Name: Brad Boykin
Title: CTR
Organization: Leidos
Email: boykinb@leidos.com
Phone Number: 8506093450

- Activity List:

Activity Type		Activity Title
2.	Construction / Demolition	Blair Rd Option 3

2. Construction / Demolition

2.1 General Information and Timeline Assumptions

- Activity Location
County: Roane
Regulatory Area(s): Knoxville, Tennessee

- Activity Title: Blair Rd Option 3

- Activity Description:
1,530 linear ft by 30 ft; 45,900 ft^2

- Activity Start Date
Start Month: 1
Start Month: 2016

- Activity End Date
Indefinite: False
End Month: 12
End Month: 2017

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.811262
SO_x	0.007330
NO_x	4.895460
CO	4.406775
PM 10	1.928676

Pollutant	Total Emissions (TONs)
PM 2.5	0.301502
Pb	0.000000
NH_3	0.010812

2.1 Site Grading Phase

2.1.1 Site Grading Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2016

- Phase Duration
Number of Month: 3
Number of Days: 0

2.1.2 Site Grading Phase Assumptions

- General Site Grading Information
Area of Site to be Graded (ft^2): 55,080
Amount of Material to be Hauled On-Site (yd^3): 0
Amount of Material to be Hauled Off-Site (yd^3): 0

- Site Grading Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Graders Composite	1	6
Other Construction Equipment Composite	1	8
Rubber Tired Dozers Composite	1	6
Tractors/Loaders/Backhoes Composite	1	7

- Vehicle Exhaust
Average Hauling Truck Capacity (yd^3): 20 (default)
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

2.1.3 Site Grading Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) [default]

Graders Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.1196	0.0014	0.8866	0.5883	0.0441	0.0441	0.0107	132.74
Other Construction Equipment Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.0719	0.0012	0.5679	0.3602	0.0233	0.0233	0.0064	122.56
Rubber Tired Dozers Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.2591	0.0024	2.0891	0.9833	0.0858	0.0858	0.0233	239.09
Tractors/Loaders/Backhoes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.0610	0.0007	0.4069	0.3689	0.0258	0.0258	0.0055	66.797

- Vehicle Exhaust and Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2
LDGV	00.4730	00.0068	00.3380	08.1500	00.0248	00.0113		00.1017	00368.0
LDGT	00.6890	00.0095	00.5440	09.4700	00.0248	00.0113		00.1017	00516.7
HDGV	00.6810	00.0165	00.9340	08.2000	00.0414	00.0259		00.0451	00904.2
LDDV	00.0970	00.0029	00.1080	00.7150	00.0408	00.0260		00.0068	00314.1
LDDT	00.3160	00.0056	00.3420	00.5790	00.0492	00.0337		00.0068	00598.6
HDDV	00.2990	00.0116	02.1550	00.6470	00.0889	00.0632		00.0270	01243.4
MC	02.3000	00.0033	01.1900	14.3200	00.0372	00.0207		00.0113	00177.4

2.1.4 Site Grading Phase Formula(s)

- Fugitive Dust Emissions per Phase

$PM10_{FD}$ = (20 * ACRE * WD) / 2,000

$PM10_{FD}$: Fugitive Dust PM 10 Emissions (TONs)
20: Conversion Factor Acre Day to pounds (20 lbs / 1 Acre Day)
ACRE: Total acres (acres)
WD: Number of Total Work Days (days)
2,000: Conversion Factor pounds to tons

- Construction Exhaust Emissions per Phase

CEE_{POL} = (NE * WD * H * EF_{POL}) / 2,000

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2,000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

VMT_{VE} = (HA_{OnSite} + $HA_{OffSite}$) * (1 / HC) * HT

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
HA_{OnSite}: Amount of Material to be Hauled On-Site (yd^3)
$HA_{OffSite}$: Amount of Material to be Hauled Off-Site (yd^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2,000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2,000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

2.2 Paving Phase

2.2.1 Paving Phase Timeline Assumptions

- Phase Start Date
Start Month: 4
Start Quarter: 1
Start Year: 2016

- Phase Duration
Number of Month: 9
Number of Days: 0

2.2.2 Paving Phase Assumptions

- General Paving Information
Paving Area (ft^2): 45,900

- Paving Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number of Equipment	Hours Per Day
Cement and Mortar Mixers Composite	4	6
Pavers Composite	1	7
Paving Equipment Composite	1	8
Rollers Composite	1	7
Tractors/Loaders/Backhoes Composite	1	7

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

2.2.3 Paving Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) [default]

Graders Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.1196	0.0014	0.8866	0.5883	0.0441	0.0441	0.0107	132.74
Other Construction Equipment Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.0719	0.0012	0.5679	0.3602	0.0233	0.0233	0.0064	122.56
Rubber Tired Dozers Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.2591	0.0024	2.0891	0.9833	0.0858	0.0858	0.0233	239.09
Tractors/Loaders/Backhoes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2
Emission Factors	0.0610	0.0007	0.4069	0.3689	0.0258	0.0258	0.0055	66.797

- Vehicle Exhaust and Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2
LDGV	00.4730	00.0068	00.3380	08.1500	00.0248	00.0113		00.1017	00368.0
LDGT	00.6890	00.0095	00.5440	09.4700	00.0248	00.0113		00.1017	00516.7
HDGV	00.6810	00.0165	00.9340	08.2000	00.0414	00.0259		00.0451	00904.2
LDDV	00.0970	00.0029	00.1080	00.7150	00.0408	00.0260		00.0068	00314.1
LDDT	00.3160	00.0056	00.3420	00.5790	00.0492	00.0337		00.0068	00598.6
HDDV	00.2990	00.0116	02.1550	00.6470	00.0889	00.0632		00.0270	01243.4
MC	02.3000	00.0033	01.1900	14.3200	00.0372	00.0207		00.0113	00177.4

2.2.4 Paving Phase Formula(s)

- Construction Exhaust Emissions per Phase
$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2,000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2,000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
$VMT_{VE} = PA * 0.25 * (1 / 27) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
PA: Paving Area (ft^2)
0.25: Thickness of Paving Area (ft)
(1 / 27): Conversion Factor cubic feet to cubic yards (1 yd^3 / 27 ft^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2,000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2,000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2,000: Conversion Factor pounds to tons

- Off-Gassing Emissions per Phase
$VOC_P = (2.62 * PA) / 43,560$

VOC_P: Paving VOC Emissions (TONs)
2.62: Emission Factor (lb/acre)
PA: Paving Area (ft^2)
43,560: Conversion Factor square feet to acre (43,560 ft^2 / acre)^2 / acre)

Attachment C.2.
TANKS 4.0.9d Reports

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TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification	
User Identification:	001
City:	Oak Ridge
State:	Tennessee
Company:	Citgo
Type of Tank:	Horizontal Tank
Description:	Horiz 10000 gal AvGas Fuel Tank
Tank Dimensions	
Shell Length (ft):	17.00
Diameter (ft):	10.00
Volume (gallons):	10,000.00
Turnovers:	12.00
Net Throughput(gal/yr):	120,000.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N
Paint Characteristics	
Shell Color/Shade:	White/White
Shell Condition	Good
Breather Vent Settings	
Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Oak Ridge, Tennessee (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

001 - Horizontal Tank
Oak Ridge, Tennessee

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 15.0)	All	58.27	52.65	63.90	56.57	7.8940	7.1095	8.7454	60.0000			92.00	Option 4: RVP=15, ASTM Slope=3

AttC.2-4

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

001 - Horizontal Tank
Oak Ridge, Tennessee

Annual Emission Calcaulations	
Standing Losses (lb):	2,491.6974
Vapor Space Volume (cu ft):	850.4311
Vapor Density (lb/cu ft):	0.0852
Vapor Space Expansion Factor:	0.2912
Vented Vapor Saturation Factor:	0.3234
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	850.4311
Tank Diameter (ft):	10.0000
Effective Diameter (ft):	14.7160
Vapor Space Outage (ft):	5.0000
Tank Shell Length (ft):	17.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0852
Vapor Molecular Weight (lb/lb-mole):	60.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	7.8940
Daily Avg. Liquid Surface Temp. (deg. R):	517.9408
Daily Average Ambient Temp. (deg. F):	56.5500
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	516.2400
Tank Paint Solar Absorptance (Shell):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,273.0000
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.2912
Daily Vapor Temperature Range (deg. R):	22.4995
Daily Vapor Pressure Range (psia):	1.6359
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	7.8940
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	7.1095
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	8.7454
Daily Avg. Liquid Surface Temp. (deg R):	517.9408
Daily Min. Liquid Surface Temp. (deg R):	512.3160
Daily Max. Liquid Surface Temp. (deg R):	523.5657
Daily Ambient Temp. Range (deg. R):	22.8333
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.3234
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	7.8940
Vapor Space Outage (ft):	5.0000
Working Losses (lb):	1,353.2592
Vapor Molecular Weight (lb/lb-mole):	60.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	7.8940
Annual Net Throughput (gal/yr.):	120,000.0000
Annual Turnovers:	12.0000
Turnover Factor:	1.0000
Tank Diameter (ft):	10.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	3,844.9566

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

001 - Horizontal Tank
Oak Ridge, Tennessee

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP 15.0)	1,353.26	2,491.70	3,844.96

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	002
City:	Oak Ridge
State:	Tennessee
Company:	Citgo
Type of Tank:	Horizontal Tank
Description:	Horiz Jet A 10000 gal tank

Tank Dimensions

Shell Length (ft):		17.00
Diameter (ft):		10.00
Volume (gallons):		10,000.00
Turnovers:		12.00
Net Throughput(gal/yr):		120,000.00
Is Tank Heated (y/n):	N	
Is Tank Underground (y/n):	N	

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Oak Ridge, Tennessee (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

002 - Horizontal Tank
Oak Ridge, Tennessee

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Jet kerosene	All	58.27	52.65	63.90	56.57	0.0081	0.0067	0.0095	130.0000			162.00	Option 1: VP50 = .006 VP60 = .0085

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

002 - Horizontal Tank
Oak Ridge, Tennessee

Annual Emission Calcaulations	
Standing Losses (lb):	2.3044
Vapor Space Volume (cu ft):	850.4311
Vapor Density (lb/cu ft):	0.0002
Vapor Space Expansion Factor:	0.0394
Vented Vapor Saturation Factor:	0.9979
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	850.4311
Tank Diameter (ft):	10.0000
Effective Diameter (ft):	14.7160
Vapor Space Outage (ft):	5.0000
Tank Shell Length (ft):	17.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0002
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0081
Daily Avg. Liquid Surface Temp. (deg. R):	517.9408
Daily Average Ambient Temp. (deg. F):	56.5500
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	516.2400
Tank Paint Solar Absorptance (Shell):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,273.0000
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0394
Daily Vapor Temperature Range (deg. R):	22.4995
Daily Vapor Pressure Range (psia):	0.0028
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0081
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0067
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0095
Daily Avg. Liquid Surface Temp. (deg R):	517.9408
Daily Min. Liquid Surface Temp. (deg R):	512.3160
Daily Max. Liquid Surface Temp. (deg R):	523.5657
Daily Ambient Temp. Range (deg. R):	22.8333
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9979
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0081
Vapor Space Outage (ft):	5.0000
Working Losses (lb):	2.9966
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0081
Annual Net Throughput (gal/yr.):	120,000.0000
Annual Turnovers:	12.0000
Turnover Factor:	1.0000
Tank Diameter (ft):	10.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	5.3010

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

002 - Horizontal Tank
Oak Ridge, Tennessee

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Jet kerosene	3.00	2.30	5.30

APPENDIX D.
NOISE ANALYSIS

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Blue Ridge Research and Consulting, LLC

Technical Report

Noise Analysis for the Proposed Oak Ridge General Aviation Airport

May 5, 2015

Prepared for
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BRRC Contract No. p010168401

Report Number
BRRC 15-04

Prepared by
Bruce J. Ikelheimer, Ph.D.

1. Introduction

1.1. Purpose

The Department of Energy (DOE) is considering developing a new Oak Ridge General Aviation Airport, near Oak Ridge TN. The proposed airport is intended to support the needs of the general aviation community in the Oak Ridge and Knoxville, Tennessee region. It is the intent to construct the proposed Oak Ridge airport as a Reliever Airport to the Knoxville area's McGhee Tyson Airport, the regions Commercial Service Airport. The proposed airport would also compliment McGhee Tyson's other general aviation reliever airport, Knoxville Downtown Island Airport.

As part of the development process for this airport, an Environmental Assessment (EA) is being prepared. Under the Proposed Action, a general aviation airport would be constructed and operated with a single runway. The proposed airport would accommodate both fixed-wing and helicopter operations. Under the No Action Alternative, the proposed Oak Ridge General Aviation Airport would not be constructed. Ambient sound conditions in and around the proposed airport would remain as they are today with no significant impacts.

This technical report documents the current ambient sound environment around the proposed airport and describes the noise environment anticipated as a result of this proposed airport. For clarity, this report is divided into two parts: ambient sound environment and airport noise modeling. Report elements include definitions of key terms, a description of the ambient measurement approach, site descriptions, sound monitoring results, and the acoustic modeling of the proposed airport operations.

1.2. Definitions of Key Terms

To assist the reader in understanding the terminology used in characterizing soundscapes, the following definitions are provided:

Acoustical Metrics: Physical measures used to quantify distinct aspects of sound.

Ambient Soundscape: The totality of sounds occurring within a given area. These sounds include natural and human-made sound but exclude the noise source being considered and analyzed.

dB: A Decibel is a logarithmic measurement ratio used to compare sound pressure levels. "A 3-dB change is the threshold of change detectable by the human ear, a 5-dB change is readily noticeable, and a 10-dB change is perceived as a doubling or halving of noise loudness."

dBA: A logarithmic ratio with the "A" denoting an adjustment to the frequency content of a noise event to represent how the average human ear responds to sound.

L_{eq}: The equivalent continuous sound level is defined as the steady sound pressure level which, over a given period of time, has the same total energy as the actual fluctuating noise.

L_{NN}: The sound level that is exceeded NN% of the time for a given period. For example, L_{90} represents the sound level exceeded for 90% of the measurement period.

2. Ambient Sound Environment

2.1. Approach

An ambient sound study was conducted at three monitoring sites to represent the No Action Alternative. Sound measurements were performed over a six-day period from Thursday March 12th to Tuesday March 17th, 2015. This six-day period included four full 24-hour days (two week days and two weekend days) and two partial days. The measurement were performed using a Larson Davis 831 Type 1 sound level meter (SLM), used for precision measurements in the field, with an accuracy of ±1 dBA. The pairing of the SLMs with an environmental case and windscreen ensures reliable noise monitoring during periods of inclement weather. The microphones were mounted on tripods or stakes and protected with bird spikes, with the SLM housed in a securable environmental case. The SLMs were programmed to collect and store ambient acoustic data every one-second. An in-field calibration of the SLM was performed at the start of the noise measurements and verified at the completion of the testing.

The measured acoustic data were then analyzed to determine the L_{90}, an average hourly L_{eq}, and an average 24-hour L_{eq}. The average hourly L_{90} is the sound level that is exceeded 90% of the time and is a measure of the general ambient acoustical environment. The L_{90} is the level that exists when most intruding sounds, such as dogs barking or occasional traffic noise, are excluded. The average hourly L_{eq} is a measure of the average sound energy occurring within each hour. The level includes all of the acoustic energy that occurs within that hour, and so it is impacted by changes in insect sounds and traffic noise. Finally, the 24-hour L_{eq} is the average sound level over the entire day, which includes variations from day to night.

2.2. Individual Measurement Sites

A brief description of each ambient measurement location along with the site's Latitude and Longitude is provided in Table 2-1 with a more detailed description to follow.

Table 2-1. Description and Location of the Three Sound Monitoring Sites

Site Number	Description	Latitude	Longitude
Site 1	Rarity Ridge Community Entrance	35.901970°	-84.402900°
Site 2	Rarity Ridge Water Flow Station	35.905810°	-84.414420°
Site 3	Wheat Church	35.938250°	-84.373170°

Site 1 – Rarity Ridge Entrance

Measurement location 1, shown in Figure 2-1, was selected to capture the local traffic noise from Tennessee State Route 58. The SLM was positioned near to the entrance to the Rarity Ridge Community. The microphone was mounted on a tripod and placed just within a copse of trees near Bradburry Ave, as can be seen in Figure 2-2. Observations during installation of the SLM noted the dominant noise features of this location as traffic noise from Route 58, with the singing of frogs in the background.

Figure 2-1. Location of Measurement Site 1

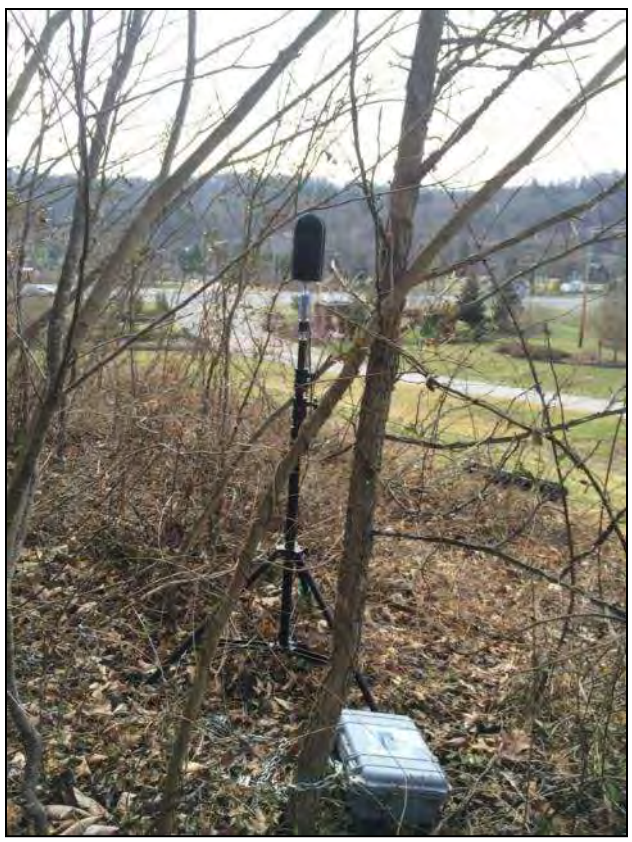

Figure 2-2. Measurement Site 1, with the Rarity Ridge Community Entrance Visible in the Background

Site 2 – Rarity Ridge Water Flow Station

The location of measurement Site 2, shown in Figure 2-3, was aligned along the centerline of the proposed runway. The SLM microphone was mounted on a stake, in close proximity to Rarity Ridge Water Flow Station, as seen in Figure 2-4. This location was farther from route 58 than Site 1, with an intervening hill. It was therefore more protected from the traffic noise than Site 1 and, thus, was generally quieter. Observations during installation noted the primary acoustical feature of this location was the singing of frogs.

Figure 2-3. Location of Measurement Site 2

Figure 2-4. Position of Site 2 Relative to the Water Flow Station, Visible in the Background

Site 3 - Wheat Church

Measurement location 3, shown in Figure 2-5, was positioned in close proximity to the Wheat Church. The SLM microphone was mounted on a stake in the ground within the cemetery next to the church, as seen in Figure 2-6. This site was elevated above Route 58, but still received traffic noise. In addition, frog singing was also clearly evident.

Figure 2-5. Location of Measurement Site 3

Figure 2-6. Position of Site #3, with the Wheat Church in the Background

2.3. Sound Monitoring Results

The average hourly L_{90} for all measurement sites is shown in Figure 2-7. The hour of the day is shown along the x-axis, and the average hourly L_{90} is shown along the y-axis. The hourly L_{90} of Sites 1 and 3 are nearly identical throughout the 24-hour time period, indicating similar background acoustical environments. The hourly L_{90} for Sites 1 and 3 had an increase in sound level starting around 4:00 AM that tapered off after 10:00 PM. The hourly L_{90} for Site 2 tended to remain fairly constant, generally 5 dB lower during much of the day compared to Sites 1 and 3, with an increase in sound levels around 10:00 PM, then decreasing.

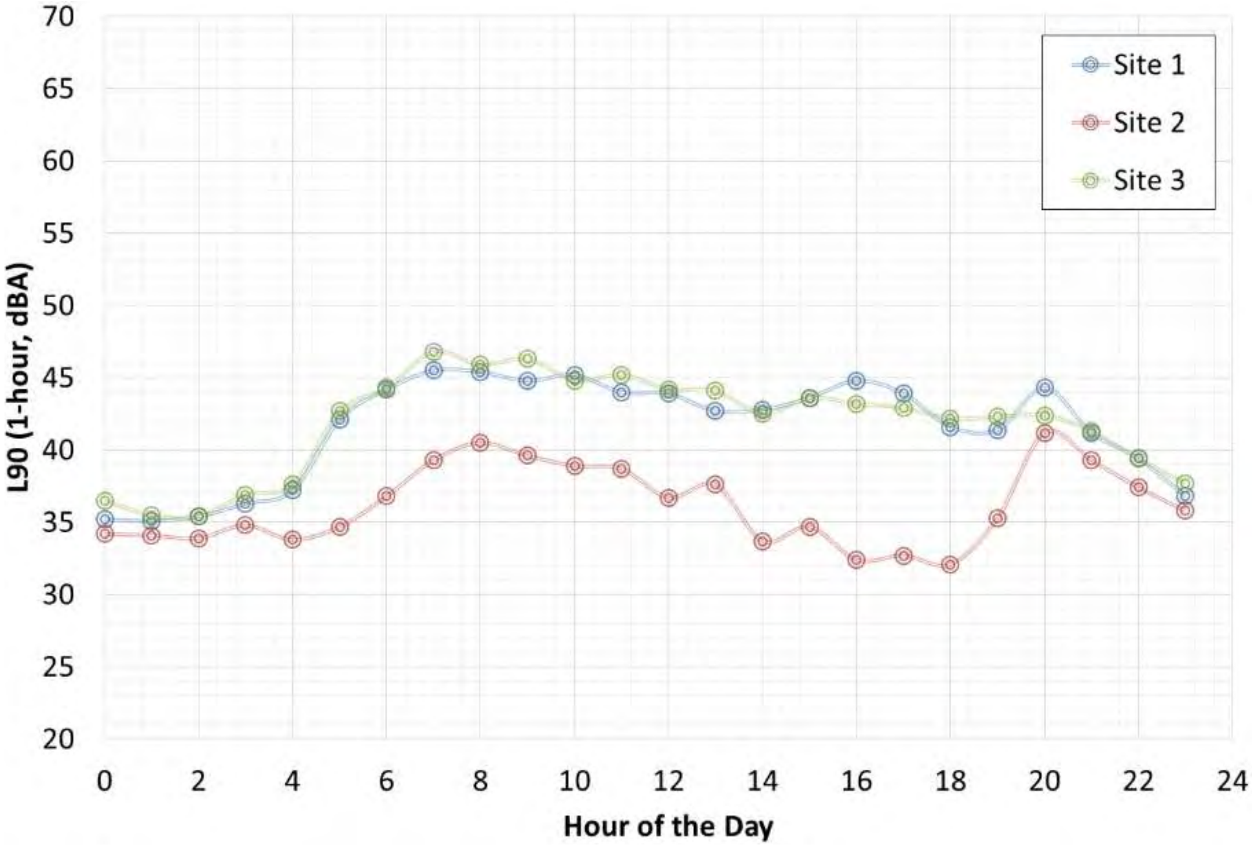

Figure 2-7 Average Hourly L_{90} for the Three Measurement Sites

The Average Hourly and 24-hour L_{eq} for the three measurement sites is shown in Figure 2-8. As with Figure 2-7, the hour of the day is shown on the x-axis, and the L_{eq} is shown on the y-axis. The average hourly levels are shown with straight lines and markers, while the 24-hour average L_{eq} is shown with dashed lines. Site 1 has the highest level of sound because of its proximity to Route 58. Site 3 has the next highest level of sound, and it is the second closest site to the Route 58. Site 2, which was farthest from any roads, has the lowest sound level of all.

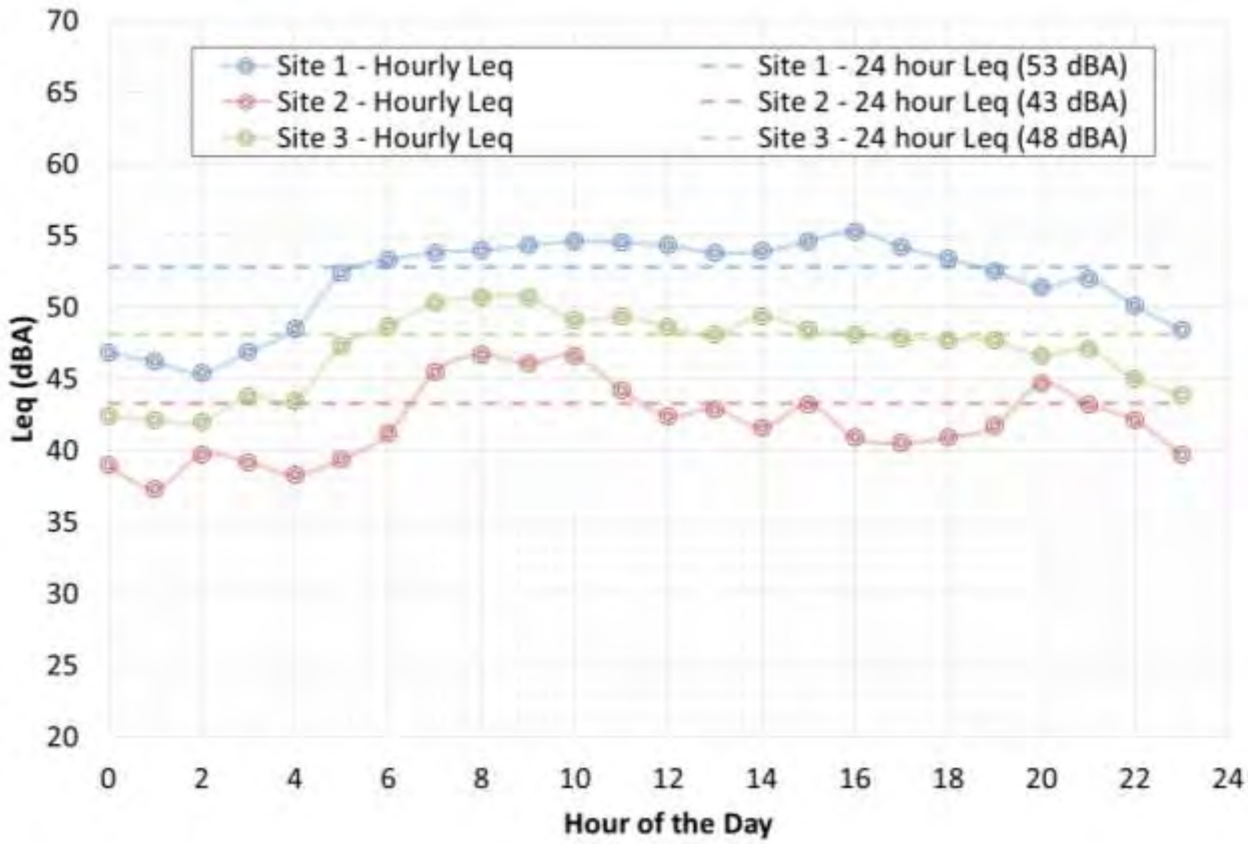

Figure 2-8 Average Hourly and 24-hour Average L_{eq} for the Three Measurement Sites

3. Airport Noise Modeling

3.1. Approach

The current accepted methodology for documenting the noise environment around a civilian airport is to use the Federal Aviation Administration's (FAA) Integrated Noise Model (INM) as defined by FAA Order 5050.4B, *NEPA Implementing Instructions for Airport Projects*. The latest version of this model is INM 7.0d. This model accounts for noise emitted by the aircraft operations in and around the airport, and it includes calculations of the effects of the local terrain on the noise propagation.

The model has several input requirements, which will be highlighted in the following sections. The inputs required include runway coordinates, flight profiles, flight tracks, and total operations at the airport. The flight profiles dictate the aircrafts speed, engine power settings, and flight path angle. The flight tracks describe where the aircraft will fly, and the operations at the airport define how many of which aircraft types will operate at the airport. The operations at the airport are further divided into those that occur from 7:00 am and 10:00 pm (known as the acoustical daytime), and those that occur between 10:00 pm and 7:00 am (known as the acoustical nighttime).

The model computes and accumulates the noise from all of the airport operations, and produces contours of Day-Night Average Sound Level (DNL). The A-weighted DNL, expressed in decibels (dBA), is a 24-hour average noise level used to define the level of noise exposure on a community. A 10 dBA penalty is applied to all operations that occur during the acoustical night period to account for increased annoyance during this time period. Noise levels that exceed 65 dBA DNL are more likely to result in noise impacts widely considered to be significant. However, in a quiet environment such as that found near the proposed airport, noise levels below 65 dBA DNL may also be of concern. FAA has additional guidance for areas that have a low noise level in Instruction 10501.E, although that guidance is more focused on high-altitude aircraft routes than on local airports. That guidance identifies changes to the existing noise environment. For noise levels between 45 dBA and 60 dBA, a net change in the DNL by 5 dB requires disclosure, and potentially additional supplemental analysis.

3.2. Modeling Inputs

3.2.1. Runway Coordinates

Of the various airport configurations considered, the Heritage Center Site Concept 3[1] was selected for acoustical analysis. In this orientation, the runway is placed as far southeast as possible without requiring relocating the Oak Ridge Turnpike. This runway is defined as 5,000 feet long and 75 feet wide with two endpoints: Runway 06, and Runway 24, defined in Table 3-1.

Table 3-1. Runway End-Points

Runway 06 Start		Runway 24 Start	
Latitude	Longitude	Latitude	Longitude
35.927021°	-84.386644°	35.935783°	-84.373669°
35.905810°	-84.414420°	35.905810°	-84.414420°

3.2.2. Flight Profiles

Aircraft flight profiles specify how the aircraft fly, defining their climb/descent rates, power settings, and speeds. The INM provides pre-defined standard flight profiles for all operations which are under consideration at the Oak Ridge proposed airport. Therefore, for this analysis, the default standard profiles were used for all operations.

3.2.3. Flight Tracks

Flight tracks define the ground paths the aircraft fly. For this analysis, the flight tracks can be broken down into two major groups; flight tracks for fixed wing aircraft, and flight tracks for helicopters.

Fixed-wing Flight Tracks

Operations of fixed-wing aircraft are proposed to include arrivals, departures, and Touch-and-Go patterns (TGO). The approach and departure tracks are assumed to be straight-in and straight-out with no turns near the airfield. The flight tracks for the TGO operations were designed with a 1 nautical-mile (NM) abeam distance, 1 NM final leg, and the turn to downwind coming 1 NM past the runway end. TGO operations include both left and right turning flight tracks for each runway. The fixed-wing approach, departure, and TGO flight tracks are shown graphically in Figure 3-1, 3-2, 3-3, and 3-4. A naming convention was established to better identify these TGO tracks, with TGO being the root, followed by the runway the aircraft use, and lastly the direction they turn. Therefore TGO06R is a flight track that departs from Runway 06 and turns to the right.

Helicopter Flight Tracks

The helicopter flight tracks were developed to mimic the tracks defined in the latest EA for McGhee Tyson airport[2]. The helicopters approach and depart the airport perpendicular to the runway, as shown Figure 3-5 through Figure 3-8. A naming convention was established for these tracks as well. The name

[1] "Proposed Oak Ridge General Aviation Airport Preliminary Planning Study Phase II - Programming Report", March 2012. Prepared for Metropolitan Knoxville Airport Authority

[2] Environmental Assessment Runway 5L-23R Reconstruction Program at McGhee Tyson Airport, Final, July 2014.

for arrival tracks begin with ARR, and departure tracks begin with DEP. The runway they use is then added, followed by their general direction of flight, East (E) or West (W). For example, a helicopter arriving to Runway 06 from the east has a flight track named ARR06E, while a flight track departing from Runway 24 and heading west is named DEP24W.

Figure 3-1. Fixed-wing Approach Flight Tracks

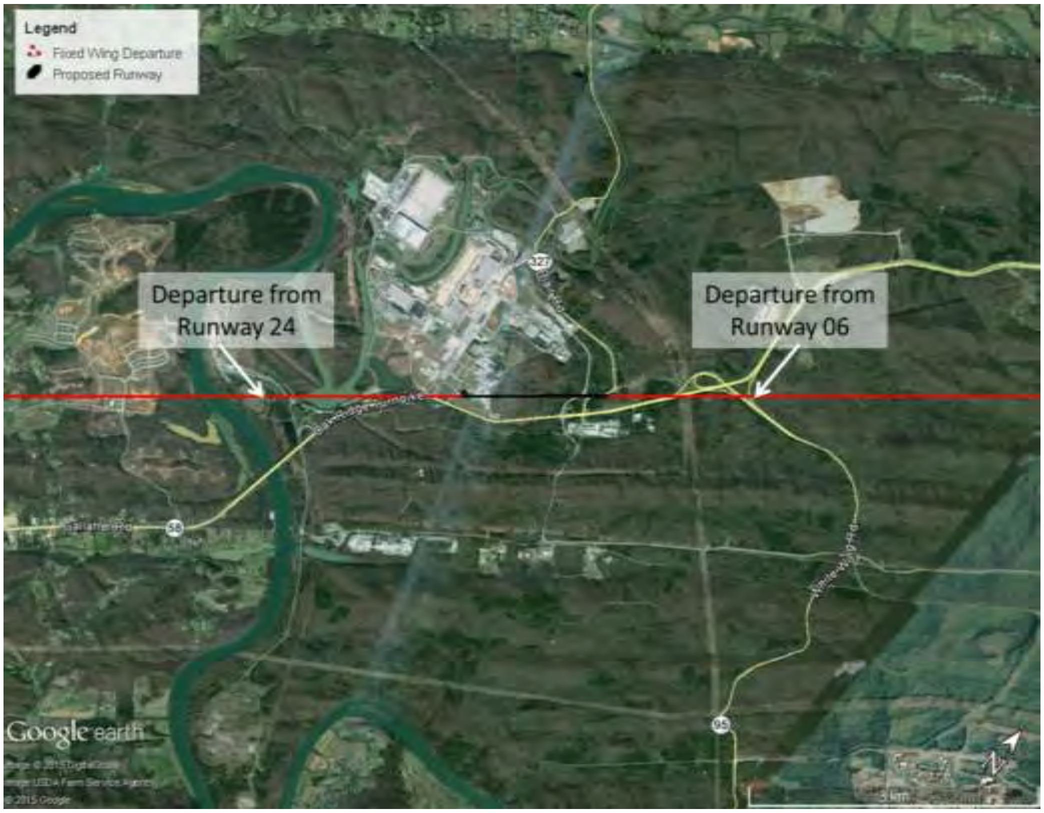

Figure 3-2. Fixed-wing Departure Flight Tracks

Figure 3-3. Fixed-wing Right Turning Touch-and-go Flight Tracks

Figure 3-4. Fixed-Wing Left Turning Touch-and-go Flight Tracks

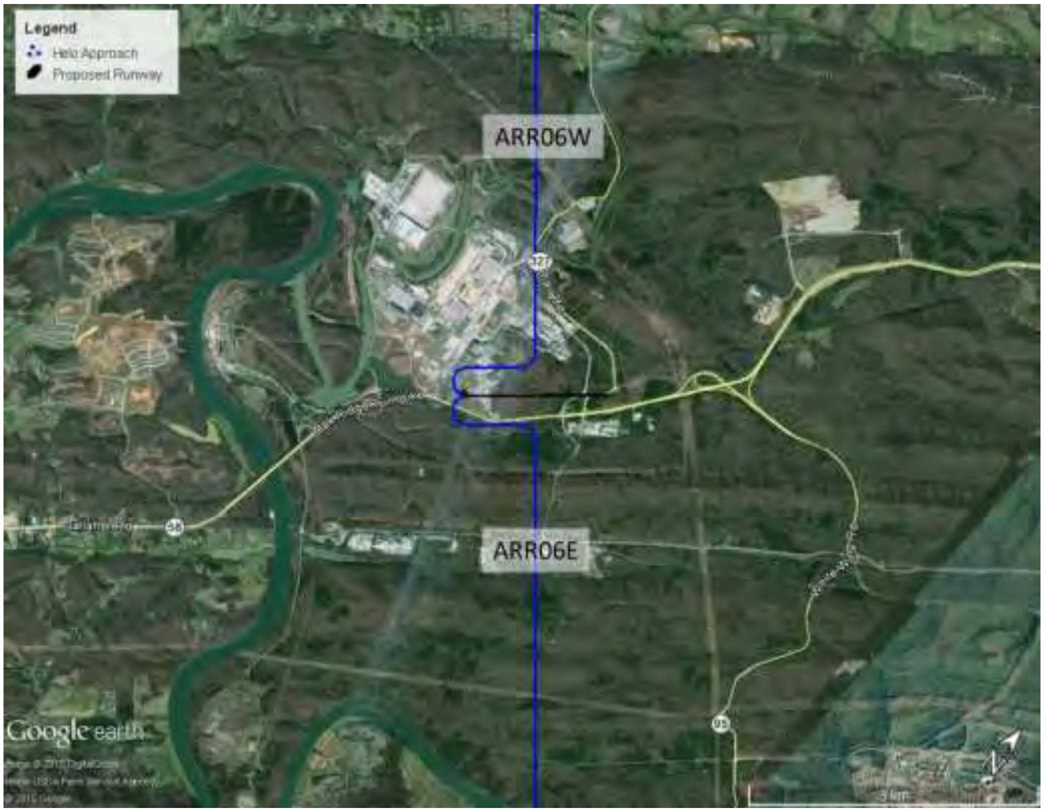

Figure 3-5. Helicopter Approaches to Runway 06

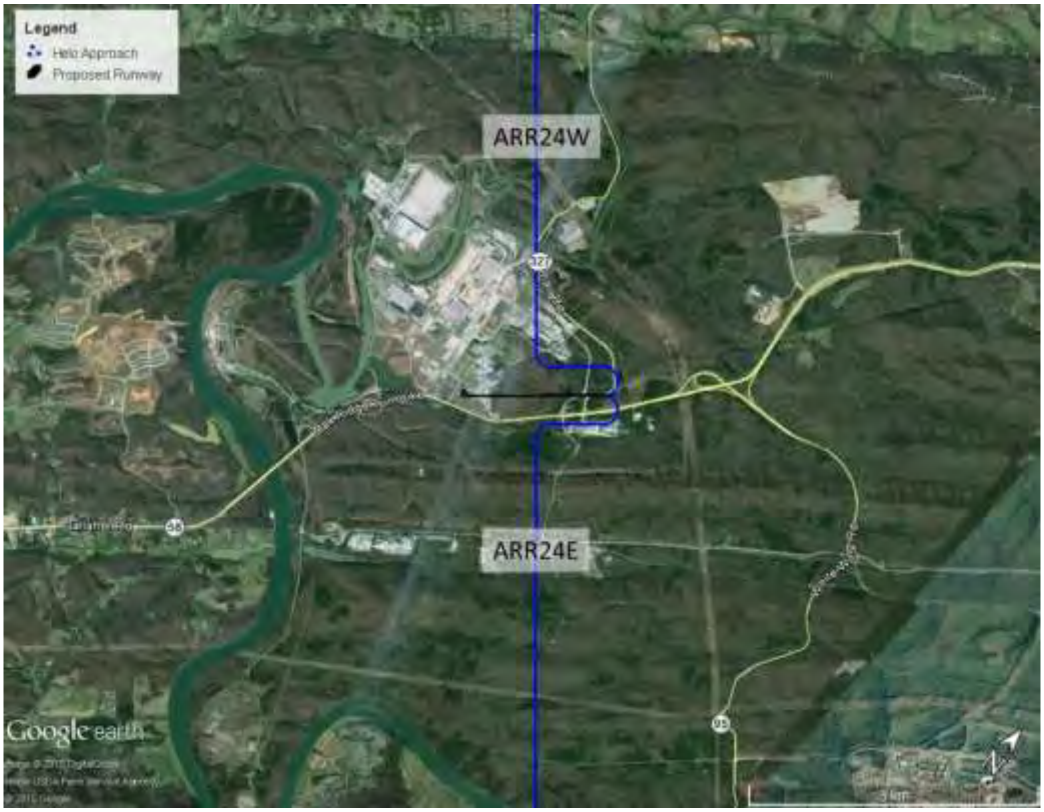

Figure 3-6. Helicopter Approaches to Runway 24

Figure 3-7. Helicopter Departures from Runway 06

Figure 3-8. Helicopter Departures from Runway 24

Airport Operations

Basic assumptions about the total flight operations and fleet mix were utilized to distribute individual flight operations to these flight tracks. This total number of aircraft and operations is provided below. For these operations, 95% are predicted to occur during the acoustic day time (7:00AM to 10:00PM), and 5% are predicted to occur during the acoustic night time (10:00PM to 7:00AM). Representative aircraft used for noise modeling is also provided in Table 3-2, with sample images of these aircraft provided in Figure 3-9.

Table 3-2. Total Annual Aircraft Operations for the Proposed Airport[3,4]

Category	Representative Aircraft	Day Time (95%)	Night Time (5%)	Total
Fixed-Wing Turbine	Cessna Citation II	2,362	124	2,486
Fixed-Wing Piston	Cessna 172R	35,194	1,852	37,046
	Beechcraft Baron 58P	8,255	434	8,690
Helicopter	Bell 206L Long Ranger	1,416	75	1,491
Total Operations		**47,227**	**2,486**	**49,713**

[3] E-Mail communication. Mike Deacon. MICHAEL.D.DEACON@leidos.com. Oak Ridge Airport. 10 March 2015.

[4] Leidos Subcontract Modification, Subcontract Number p010168401, Mod 2, 21 April 2015

These operations are also split into itinerant aircraft and local aircraft. Itinerant aircraft are defined as aircraft that enter or leave the airport's airspace as part of their flight path. Local aircraft are aircraft that do not leave the airspace. For the purposes of this study, all local aircraft operations were assumed to be preforming Touch and Go (TGO) operations.

Table 3-3. Local and Itinerant Operations for the Proposed Airport

Category	Representative Aircraft	Local	Itinerant	Total
Fixed-Wing Turbine	Cessna Citation II	0	2,486	2,486
Fixed-Wing Piston	Cessna 172R	16,414	20,632	37,046
	Beechcraft Baron 58P	3,850	4,840	8,690
Helicopter	Bell 206L Long Ranger	0	1491	1,491
Total Operations		**20,264**	**29,449**	**49,713**

Figure 3-9. Representative Aircraft Used for Modeling the Proposed Action (Public Domain Images)

The proposed airport will have the ability allow aircraft to fly using Instrument Flight Rules, but only for aircraft using Runway 06. For this reason the total runway utilization was assumed to be 60% on Runway 06, and 40% on Runway 24[3]. It is also assumed that approach and departure runway utilization would be the same. Helicopters are assumed to use both runways with equal frequency.

By combining the aircraft usage and the runway utilization rules with the total airfield operations provided in Table 3-2 and Table 3-3, the specific numbers of individual operations on each unique flight track at the proposed airport were determined. These operational data were then entered into the INM for the analysis. For the time basis, the INM uses an average day concept, so the total number of annual operations is divided by 365 to determine an average day number.

It should be noted that for each TGO operations, there is one departure and one landing. Therefore, when counting TGO operations, each TGO operation actually counts for two operations as defined in Table 3-2. Also, for TGO operations, it was assumed that the aircraft would utilize left turning and right turning patterns equally. The following tables provide the final operational numbers supplied to the INM.

Table 3-4. Fixed-wing Arrival and Departure Daily Operations

Representative Aircraft	INM Code	Runway 24				Runway 06			
		Arrivals		Departures		Arrivals		Departures	
		Day	Night	Day	Night	Day	Night	Day	Night
Cessna 550 Citation II	CNA550	1.294	0.068	1.294	0.068	1.941	0.102	1.941	0.102
Cessna 172R	CNA172	8.539	0.449	8.539	0.449	12.808	0.674	12.808	0.674
Beechcraft Baron 58P	BRC58P	2.009	0.106	2.009	0.106	3.014	0.159	3.014	0.159

Table 3-5. Fixed-wing Touch-and-go Daily Operations

Representative Aircraft	INM Code	Runway 24				Runway 06			
		TGO24R		TGO24L		TGO06R		TGO06L	
		Day	Night	Day	Night	Day	Night	Day	Night
Cessna 172R	CNA172	5.367	0.282	5.367	0.282	8.050	0.424	8.050	0.424
Beechcraft Baron 58P	BEC58P	1.263	0.066	1.263	0.066	1.894	0.100	1.894	0.100

TGO06R is a TGO pattern, using Runway 06, turning to the right.

Table 3-6. Helicopter Arrival and Departure Daily Operations

Representative Aircraft	INM Code	Arrival							
		ARR06E		ARR24E		ARR06W		ARR24W	
		Day	Night	Day	Night	Day	Night	Day	Night
Bell 206L Long Ranger	B206L	0.485	0.026	0.485	0.026	0.485	0.026	0.485	0.026

ARR06E is an arrival from the East to Runway 06.

Representative Aircraft	INM Code	Depart							
		DEP06E		DEP24E		DEP06W		DEP24W	
		Day	Night	Day	Night	Day	Night	Day	Night
Bell 206L Long Ranger	B206L	0.485	0.026	0.485	0.026	0.485	0.026	0.485	0.026

DEP06E is a depature to the East from Runway 06

3.3. Model Results

With these inputs defined, INM was utilized to generate a noise contour map for the proposed flight operations. The results are shown in Figure 3-10, together with the locations of the three measurement sites. The analysis shows that no areas beyond 250 feet from the runway centerline would be exposed to noise levels above 65 dBA DNL, primarily because of the limited number of operations of generally quiet aircraft. A more detailed analysis at the three individual measurement sites is provided in Table 3-7. Site 3, which is close to the Wheat Church, has the highest expected sound exposure. However, at 55 dBA DNL, this site is below 65 dBA, the noise level at which noise impacts would be considered significant. For the other two sites, the predicted DNL level is below the measured ambient noise level as defined by the 24 hour L_{eq} (Figure 2-8).

For special situations, FAA may consider noise levels below the 65 dBA DNL level. Following FAA instruction 1050.1E, there is special consideration for areas that do not fall within the normal bounds of an airport noise study. For these cases, typically areas below busy aviation corridors or within national parks, the concern is more about the change in the local noise level. For existing noise conditions between 45 dBA and 60 dBA, any change in the noise level of +/- 5 dB could be subject to supplemental noise analysis.

The measurement Site 3 is predicted to have a 7 dB increase in the local noise level, based on the measured 24 hour L_{eq}. Further analysis of this site shows that, for the proposed action, approximately 65 aircraft (including helicopters) would use the runway that would bring them close to the church during the acoustic day time. This operational tempo translates into approximately 1 aircraft every 15 minutes. The maximum sound level expected from these operations is 84 dBA. This is loud enough to interrupt a normal conversation, but not loud enough to cause hearing damage or even discomfort. Assuming conservative transmission losses from outside the building to inside the building of 15 dB, interior noise levels could reach a maximum level of 69 dBA – the level of loud conversation. This site is still within the confines of the DOE property and is not in regular use. Therefore the only people impacted by these noise levels would be people visiting the site.

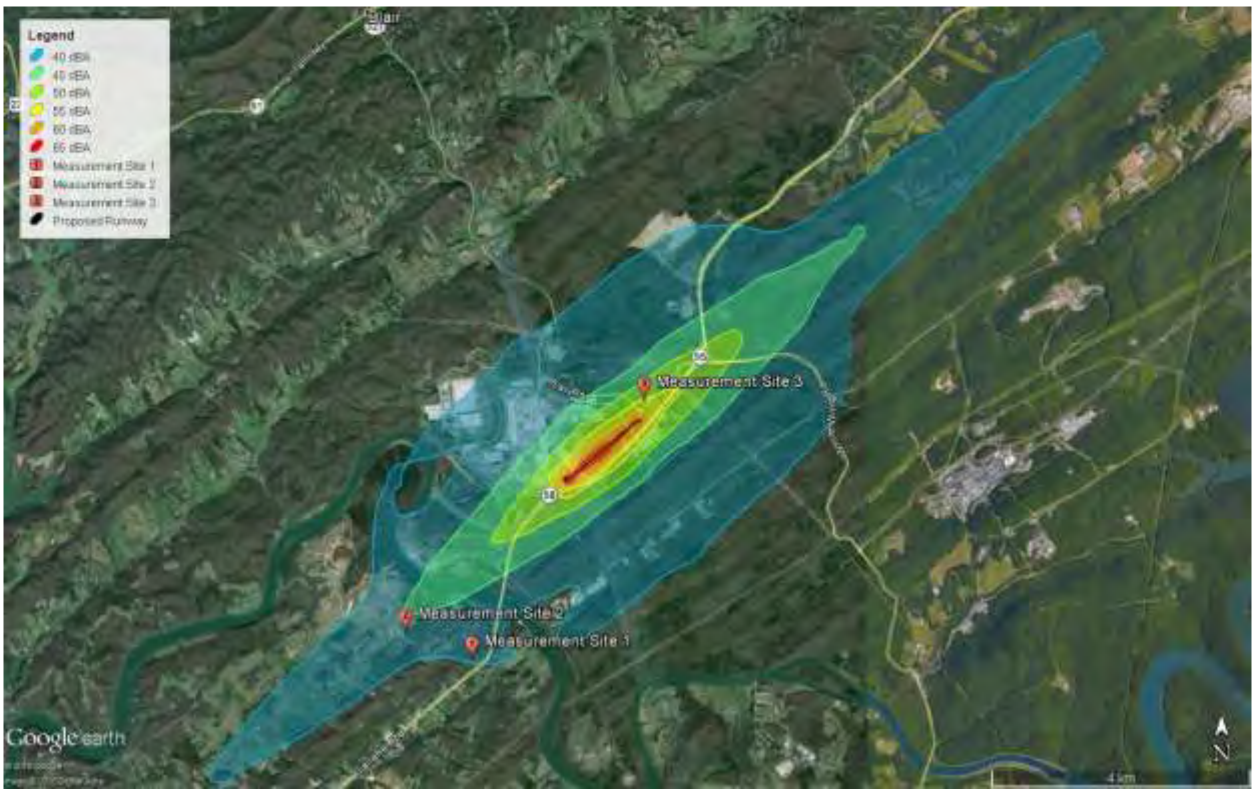

Figure 3-10. Proposed Airport Noise Exposure Contours

Table 3-7. Predicted Sound Exposure for the Specific Measurement Sites

Measurement Site	Description	Day-Night Level
Site 1	Rarity Ridge Community Entrance	40 dBA
Site 2	Rarity Ridge Water Flow Station	44 dBA
Site 3	Wheat Church	56 dBA

Considerations for Future Growth

The effect of increased operations at the proposed airport can initially be assessed by scaling the overall operations. This scaling assumes that the same operational mix is used, along with the same aircraft. Scaled DNL values will increase at the rate of 10*log10(X), where X is the multiple of the total operations. For example, if the airport operations were doubled, the scaled DNL will increase globally by 3 dB (e.g. 10*log10(2) = 3 dB). This scaling provides a quick gauge for the effect of increasing operations.

With this logic, it is possible to estimate the required level of increased operations to generate 65 dB DNL at the three monitor locations. From this analysis, total airport operations would need to increase by a factor of 8 before the Wheat Church (Site 3) experiences noise levels of 65 dBA DNL. Similarly, the next highest received noise level, at Site 2, the airport would need to experience a 126 fold increase in operations before this site reached a level of 65 dBA DNL. The airport would need to see a 316 fold increase in total operations before Site 1 would be expected to reach a level of 65 dBA DNL.

4. Conclusion

The Department of Energy (DOE) is considering developing a new Oak Ridge General Aviation Airport, near Oak Ridge TN. The proposed airport is intended to support the needs of the general aviation community in the Oak Ridge and Knoxville, Tennessee region. As part of the development process for this airport, an Environmental Assessment (EA) is being prepared. In the process of developing the EA, Blue Ridge Research and Consulting was contracted to conduct noise measurements of the current ambient environment, and to conduct noise modeling of the proposed new airport.

Background noise measurements were collected to provide an acoustical No Action Alternative baseline. Three sites were selected within close proximity to the proposed airport. One site was close to a local road (Site 1), one site was aligned along the center line of the runway (Site 2), and one was placed near an historic building, the Wheat Church (Site 3). Data were collected for more than four days, including both weekend and weekday periods.

For the proposed action, the airport operations were modeled using the FAA’s recommended software, INM. The results of the noise analysis indicate the planned Oak Ridge General Aviation Noise levels generated by flight operations at the airport are not expected to reach 65 dBA DNL beyond 250 feet from the runway centerline, and the operational tempo would need to increase by a factor of 8 before the closest point of interest, the Wheat Church, will receive noise at this level. Noise levels at the Wheat Church location are expected to increase above the measured background level by 8 dB, as defined by the 24 hour L_{eq}. Additional analysis shows that aircraft would be expected to fly close to the church about once every 15 minutes between the ours of 7:00AM and 10:00PM. The maximum expected sound level from these events is 84 dBA. This is loud enough to interrupt a normal conversation, but not loud enough to cause hearing damage or even discomfort.

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Blue Ridge Research and Consulting, LLC

L_{max} Supplement

Noise Analysis for the Proposed Oak Ridge General Aviation Airport

September 22, 2015

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BRRC Contract No. p010168401

Report Number
BRRC 15-04 Supplement

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Introduction

The following report is a supplement to the Blue Ridge Research and Consulting's "Noise Analysis for the Proposed Oak Ridge General Aviation Airport" report, dated 21 August, 2015. This supplement provides details about the projected maximum noise level (L_{max}) based on the operational descriptions defined within that report.

Noise Power Distance Data

The Integrated Noise Model (INM) has an extensive database of noise from different aircraft. It uses this database to compute the noise around airports. This data is often referred to as the Noise-Power-Distance data, or NPD data for short, and is organized in tables that provide the noise level for a given power output from the aircraft and the total distance to the receiver. This is the original reference data for the model, often collected through field measurements.

Below are provided the L_{max} NPD data tables for the fixed wing aircraft in the noise study. The distance column is the total distance to the aircraft. The other columns identify different power setting for the aircraft. Note that the Cessna Citation uses power defined in pounds of thrust, while the other aircraft use power as a percentage. INM uses a different procedure to compute the maximum noise level from helicopters which takes into consideration other flight conditions. This makes it impossible to provide the NPD data in an analogous way to the fixed wing data, therefore the Bell 206L data is not provided in these tables.

	L_{max} (dBA)			
	Thrust			
Distance	300 lbs	600 lbs	1200 lbs	1550 lbs
200 ft	83	86	93	95
400 ft	76	79	86	89
630 ft	72	74	81	84
1000 ft	67	69	76	79
2000 ft	59	61	68	71
4000 ft	50	53	58	62
6300 ft	44	46	52	56
10000 ft	37	40	45	48
16000 ft	30	32	37	40
25000 ft	21	24	28	31

Figure 1. NPD Data for the Cessna Citation II

Distance	L_{max} (dBA) Thrust			
	26.6%	58.2%	59.6%	100.0%
200 ft	72	79	83	85
400 ft	64	72	76	78
630 ft	60	68	71	73
1000 ft	55	63	66	68
2000 ft	48	55	59	60
4000 ft	40	47	51	52
6300 ft	34	41	45	46
10000 ft	29	34	39	40
16000 ft	22	27	32	34
25000 ft	17	20	25	26

Figure 2. NPD Data for the Cessna 172R

Distance	L_{max} (dBA) Thrust	
	30%	100%
200 ft	83	95
400 ft	77	89
630 ft	73	85
1000 ft	68	81
2000 ft	62	74
4000 ft	54	66
6300 ft	49	61
10000 ft	43	55
16000 ft	36	49
25000 ft	30	42

Figure 3. NPD Data for the Beech Baron 58P

Oak Ridge General Aviation Airport L_{max} Analysis

In addition to generic NPD data, BRRC analyzed the maximum noise predicted around the proposed airport. Nine receiver locations were identified for this analysis, with their GPS coordinates and basic descriptions provided in Table 1. This table is organized from the North East, generally progressing to the South West. Noise analysis for each of these sites is provided in tables below in the same order. These are shown all together in Figure 4.

Table 1. Locations of Additional L_{max} Analysis Sites

Point Name	Description	Latitude	Longitude
NE 40 DNL Site	NE Edge of the 40 DNL Contour	35.988428°	-84.295389°
Country Club	Country Club Estates	35.970127°	-84.323311°
Rarity Oaks	Rarity Oaks Community	35.966569°	-84.340439°
Westwood	Westwood Community	35.981744°	-84.357094°
NE 45 DNL Site	NE Edge of the 45 DNL Contour	35.962380°	-84.335213°
NE 50 DNL Site	NE Edge of the 50 DNL Contour	35.947710°	-84.356567°
SW 50 DNL Site	SW Edge of the 50 DNL Contour	35.918552°	-84.399411°
SW 45 DNL Site	SW Edge of the 45 DNL Contour	35.908243°	-84.414927°
SW 40 DNL Site	SW Edge of the 40 DNL Contour	35.885333°	-84.448268°

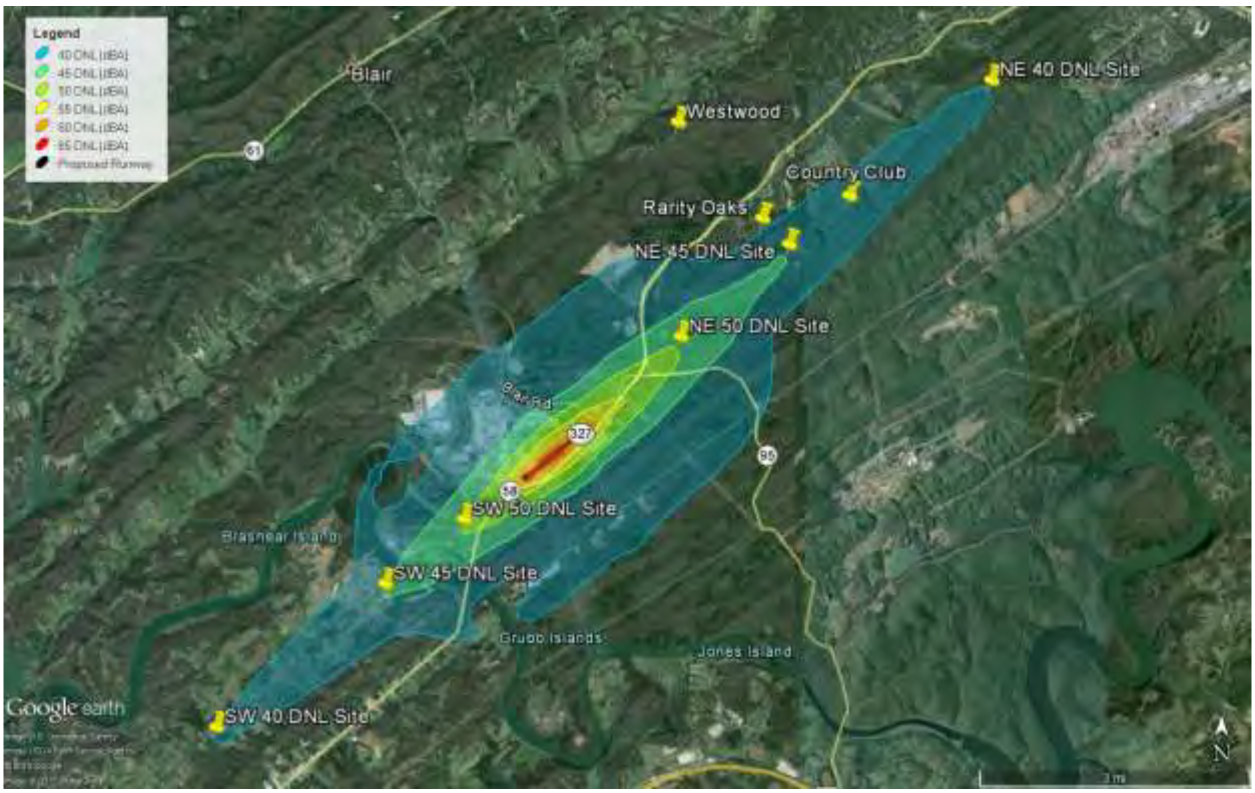

Figure 4. Aerial Photo with all Nine of the L_{max} Analysis Locations.

The tables shown below provide the maximum noise level generated by each operation at the airport, and the state of the aircraft when that maximum noise level was generated. The 'Operation Description' explains what operation the aircraft was flying. These correspond to Tables 3-4 and 3-5 in the full noise report. The 'Distance to Aircraft' column in the tables is the total distance from the aircraft to the receiver. The 'Approximate Altitude MSL (ft)' column shows the altitude of the aircraft relative to Mean Seal Level. The 'Speed' column provides the aircraft speed in knots. Finally, the 'Thrust Setting' column provides different metrics for different aircraft. Again, for the Cessna Citation II the engine power is listed in Pounds of thrust, while for the Cessna 172 R and the Beech Baron 58P the engine power is listed as a percent. Note that levels above 100% are allowed by the Integrated Noise Model. Helicopters do not use engine power directly, so the engine power column for the Bell 206L simply has an '-NA-'.

In general, departures generate higher levels of noise than do approaches, and aircraft that fly over a receiver will produce a higher level of noise than aircraft that fly away from receivers. For example, Table 2 shows the L_{max} values computed for the **NE 40 DNL Site**. This site is located North-East of the runway, at the edge of the 40 DNL noise contour. Aircraft that depart on Runway 06 fly close to this location, therefore these operations generate the highest L_{max} levels. Alternatively, aircraft that depart on Runway 24 fly away from this location and generate lower L_{max} levels at this same location.

NE 40 DNL Site

This receiver is located at the North-East edge of the 40 DNL contour as can be seen in Figure 5.

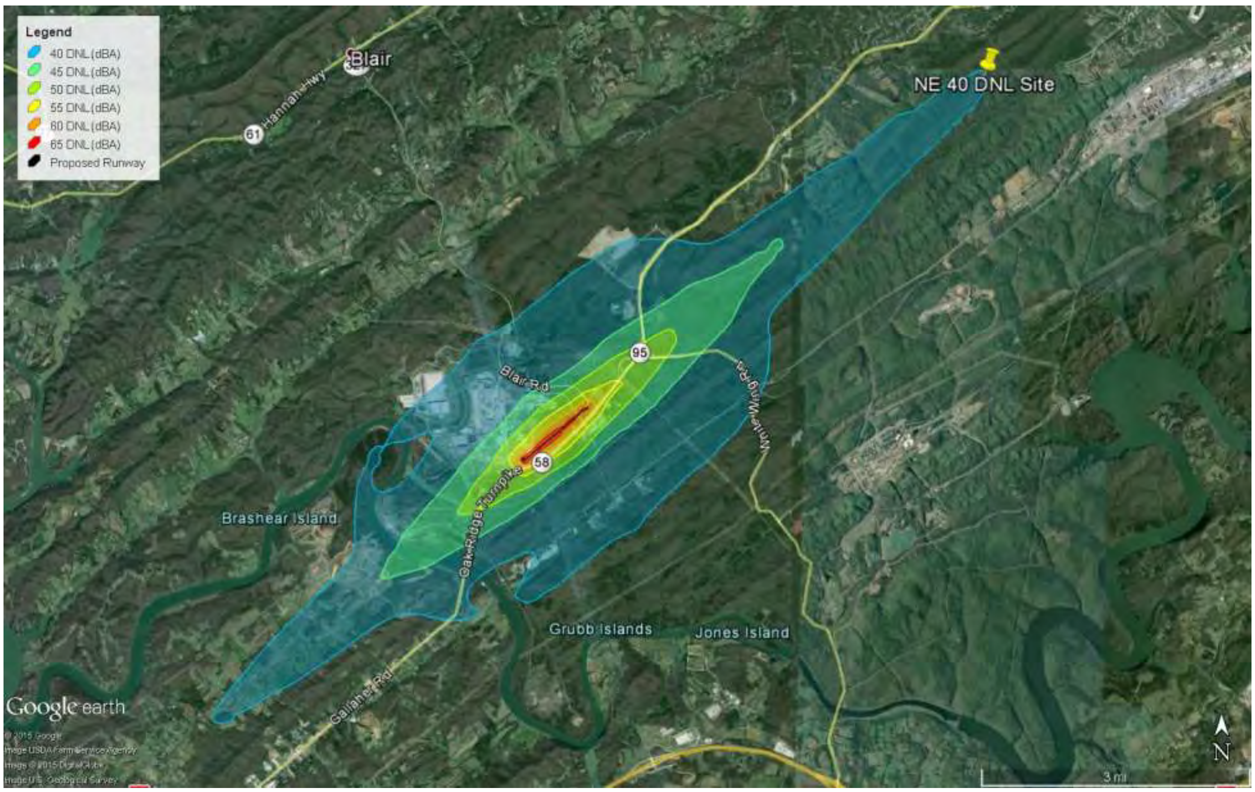

Figure 5. Location of NE 40 DNL Site

Table 2. Detailed L_{max} Analysis for the NE 40 DNL Site

L_{max} Values for the NE 40 DNL Site

Cessna Citation II

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting (lbs)	Lmax (dBA)
Departure from Runway 06	3,280	4,300	214	1,710	67
Approach to Runway 24	1,690	2,700	125	415	61
Departure from Runway 24	30,070	1,100	9	2,192	< 35
Approach to Runway 06	32,310	1,100	31	250	< 35

Cessna 172 R

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting (%)	Lmax (dBA)
Departure from Runway 06	2,650	3,700	76	97	57
Approach to Runway 24	1,690	2,700	76	29	50
Right Turning Touch and Go from Runway 06	20,090	2,000	61	50	< 35
Left Turning Touch and Go from Runway 06	20,100	2,000	61	50	< 35
Departure from Runway 24	30,070	1,100	8	143	< 35
Right Turning Touch and Go from Runway 24	21,160	1,700	66	29	< 35
Left Turning Touch and Go from Runway 24	21,150	1,700	66	29	< 35
Approach to Runway 06	33,540	1,100	10	10	< 35

Beech Baron 58P

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting (%)	Lmax (dBA)
Departure from Runway 06	3,080	3,700	133	82	66
Approach to Runway 24	1,690	2,700	112	38	64
Right Turning Touch and Go from Runway 06	20,090	2,000	103	52	< 35
Left Turning Touch and Go from Runway 06	20,100	2,000	103	52	< 35
Right Turning Touch and Go from Runway 24	21,180	1,100	108	52	< 35
Left Turning Touch and Go from Runway 24	21,160	1,700	105	52	< 35
Departure from Runway 24	30,070	1,700	9	125	< 35
Approach to Runway 06	32,210	1,100	31	10	< 35

Bell 206 L Long Ranger

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting	Lmax (dBA)
Helicopter Approach from the West	29,760	1,600	57	-NA-	< 35
Helicopter Approach from the West	29,760	1,600	57	-NA-	< 35
Helicopter Approach from the East	32,550	1,100	1	-NA-	< 35
Helicopter Approach from the East	32,550	1,100	1	-NA-	< 35
Helicopter Departure to the East	29,760	1,800	57	-NA-	< 35
Helicopter Departure to the East	32,550	1,100	1	-NA-	< 35
Helicopter Departure to the West	29,770	1,800	57	-NA-	< 35
Helicopter Departure to the West	32,550	1,100	1	-NA-	< 35

Country Club Site

This site is located close to the Oak Ridge Country Club as shown in Figure 6.

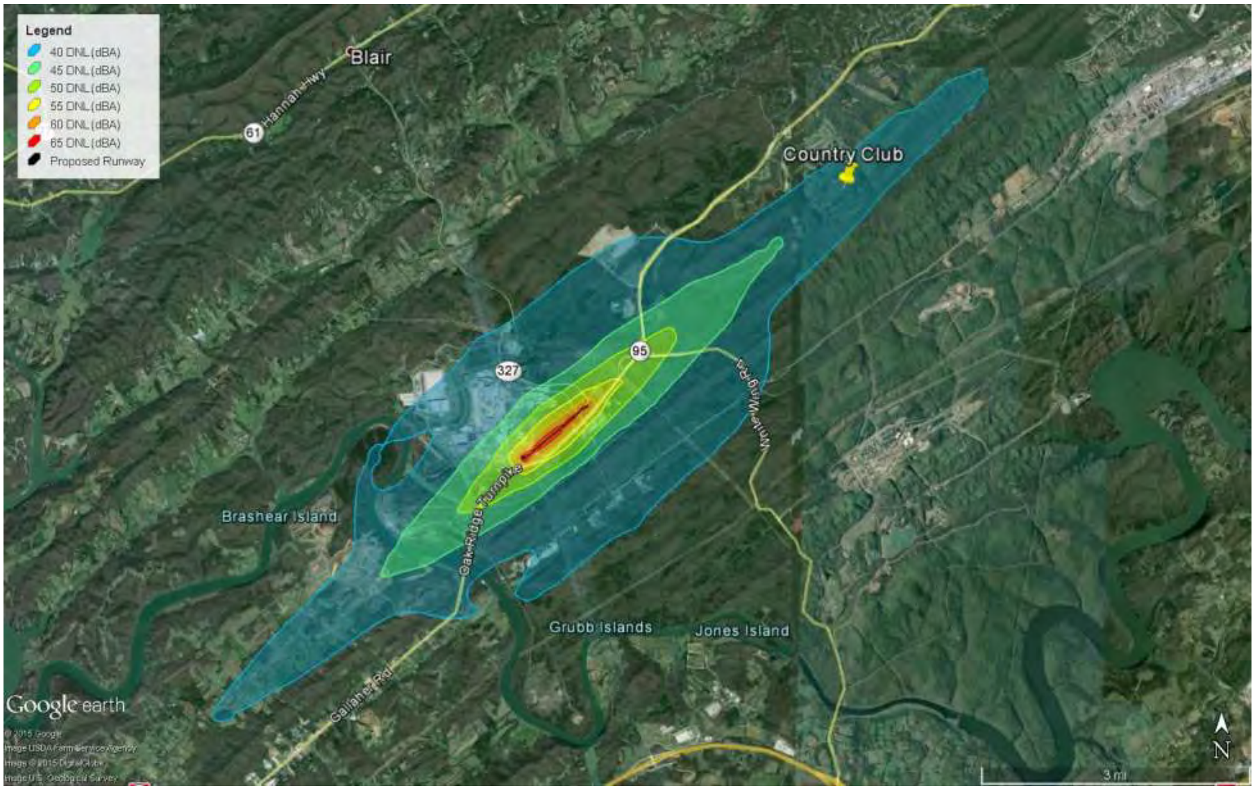

Figure 6. Location of the Country Club Site

Table 3. Detailed L_{max} Analysis for the Country Club Site

L_{max} Values for the Country Club Site

Cessna Citation II

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting (lbs)	Lmax (dBA)
Departure from Runway 06	2,080	3,200	193	1,874	74
Approach to Runway 24	1,070	2,200	113	622	68
Departure from Runway 24	19,460	1,100	9	2,192	< 35
Approach to Runway 06	21,700	1,100	31	250	< 35

Cessna 172 R

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting (%)	Lmax (dBA)
Departure from Runway 06	1,840	2,900	76	95	61
Approach to Runway 24	1,070	2,200	76	29	55
Right Turning Touch and Go from Runway 06	9,700	2,000	61	50	< 35
Left Turning Touch and Go from Runway 06	9,650	2,000	61	50	< 35
Right Turning Touch and Go from Runway 24	10,690	1,700	65	29	< 35
Left Turning Touch and Go from Runway 24	10,730	1,700	65	29	< 35
Departure from Runway 24	19,460	1,100	8	143	< 35
Approach to Runway 06	22,930	1,100	10	10	< 35

Beech Baron 58P

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting (%)	Lmax (dBA)
Approach to Runway 24	1,070	2,200	100	41	70
Departure from Runway 06	2,170	3,300	129	81	69
Right Turning Touch and Go from Runway 06	9,700	2,000	103	52	42
Left Turning Touch and Go from Runway 06	9,650	2,000	103	52	42
Right Turning Touch and Go from Runway 24	10,720	2,000	104	31	40
Left Turning Touch and Go from Runway 24	10,760	2,000	104	31	40
Departure from Runway 24	19,460	1,100	9	125	38
Approach to Runway 06	21,610	1,100	31	10	< 35

Bell 206 L Long Ranger

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting	Lmax (dBA)
Helicopter Approach from the West	19,150	1,600	57	-NA-	< 35
Helicopter Approach from the West	19,150	1,600	57	-NA-	< 35
Helicopter Approach from the East	21,940	1,100	9	-NA-	< 35
Helicopter Departure to the West	19,160	1,800	57	-NA-	< 35
Helicopter Departure to the East	19,160	1,800	57	-NA-	< 35
Helicopter Approach from the East	21,940	1,100	1	-NA-	< 35
Helicopter Departure to the West	21,940	1,100	1	-NA-	< 35
Helicopter Departure to the East	21,940	1,100	9	-NA-	< 35

Rarity Oaks Site

This receiver is located in the Rarity Oaks community, as shown in Figure 7.

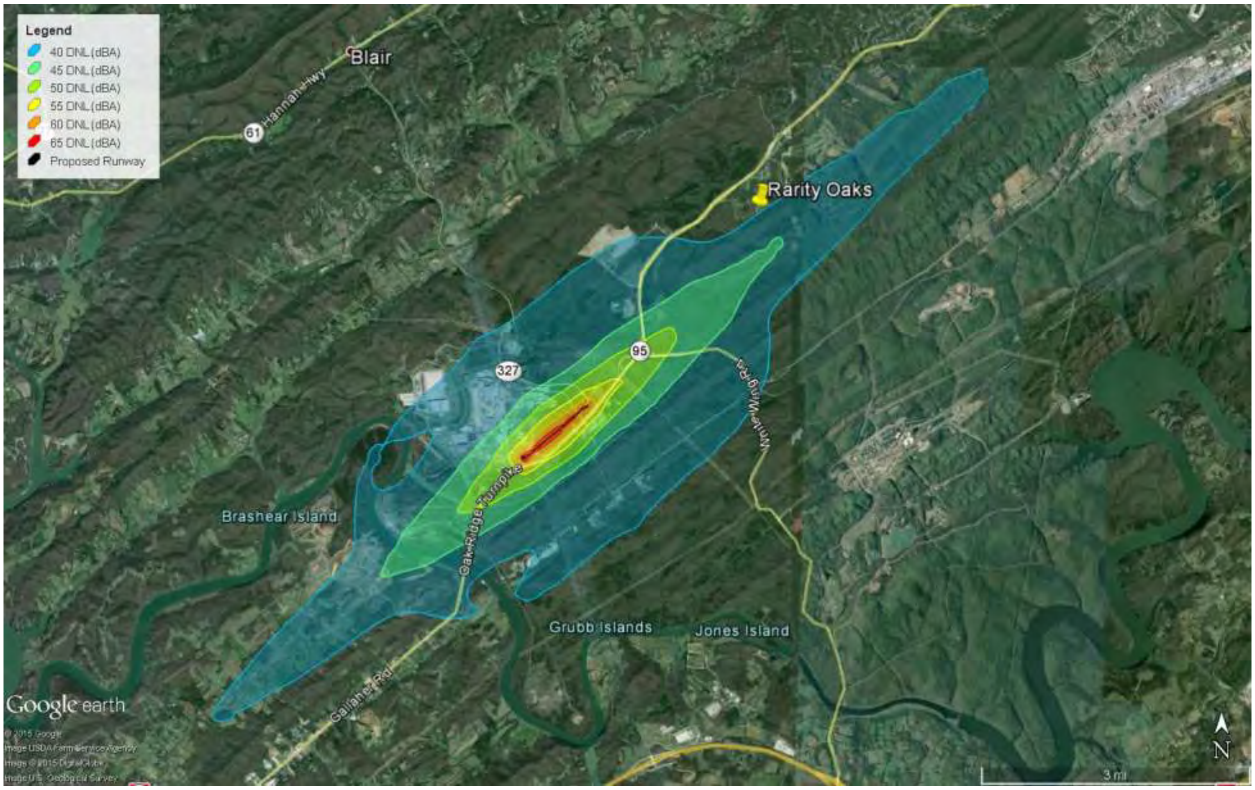

Figure 7. Location of the Rarity Oaks Site

Table 4. Detailed L_{max} Analysis for the Rarity Oaks Site

L_{max} Values for the Rarity Oaks

Cessna Citation II

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting (lbs)	Lmax (dBA)
Departure from Runway 06	3,050	2,900	174	1,921	68
Approach to Runway 24	2,530	1,900	106	647	56
Departure from Runway 24	14,910	1,100	9	2,192	31
Approach to Runway 06	17,130	1,100	31	250	23

Cessna 172 R

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting (%)	Lmax (dBA)
Departure from Runway 06	2,870	2,600	76	95	55
Approach to Runway 24	2,530	1,900	74	29	45
Left Turning Touch and Go from Runway 06	4,670	2,000	61	50	40
Right Turning Touch and Go from Runway 06	6,300	2,000	61	50	37
Right Turning Touch and Go from Runway 24	5,690	1,700	66	29	32
Left Turning Touch and Go from Runway 24	7,170	1,600	65	29	28
Departure from Runway 24	14,910	1,100	8	143	25
Approach to Runway 06	18,350	1,100	10	10	10

Beech Baron 58P

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting (%)	Lmax (dBA)
Departure from Runway 06	3,050	2,900	129	80	65
Approach to Runway 24	2,530	1,900	94	41	60
Left Turning Touch and Go from Runway 06	4,670	2,000	103	52	54
Right Turning Touch and Go from Runway 06	5,730	2,000	105	52	51
Right Turning Touch and Go from Runway 24	6,300	2,000	103	52	49
Left Turning Touch and Go from Runway 24	7,200	1,900	103	24	46
Departure from Runway 24	14,910	1,100	9	125	43
Approach to Runway 06	17,040	1,100	31	10	<35

Bell 206 L Long Ranger

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting	Lmax (dBA)
Helicopter Approach from the West	14,700	1,600	57	-NA-	35
Helicopter Approach from the West	14,540	1,600	57	-NA-	<35
Helicopter Approach from the East	17,370	1,100	1	-NA-	<35
Helicopter Approach from the East	17,250	2,000	57	-NA-	<35
Helicopter Departure to the West	14,560	1,800	57	-NA-	<35
Helicopter Departure to the East	14,700	1,800	57	-NA-	<35
Helicopter Departure to the West	17,330	2,100	114	-NA-	<35
Helicopter Departure to the East	17,370	1,100	1	-NA-	<35

Westwood Site

This receiver is located in the Westwood community, as shown in Figure 8.

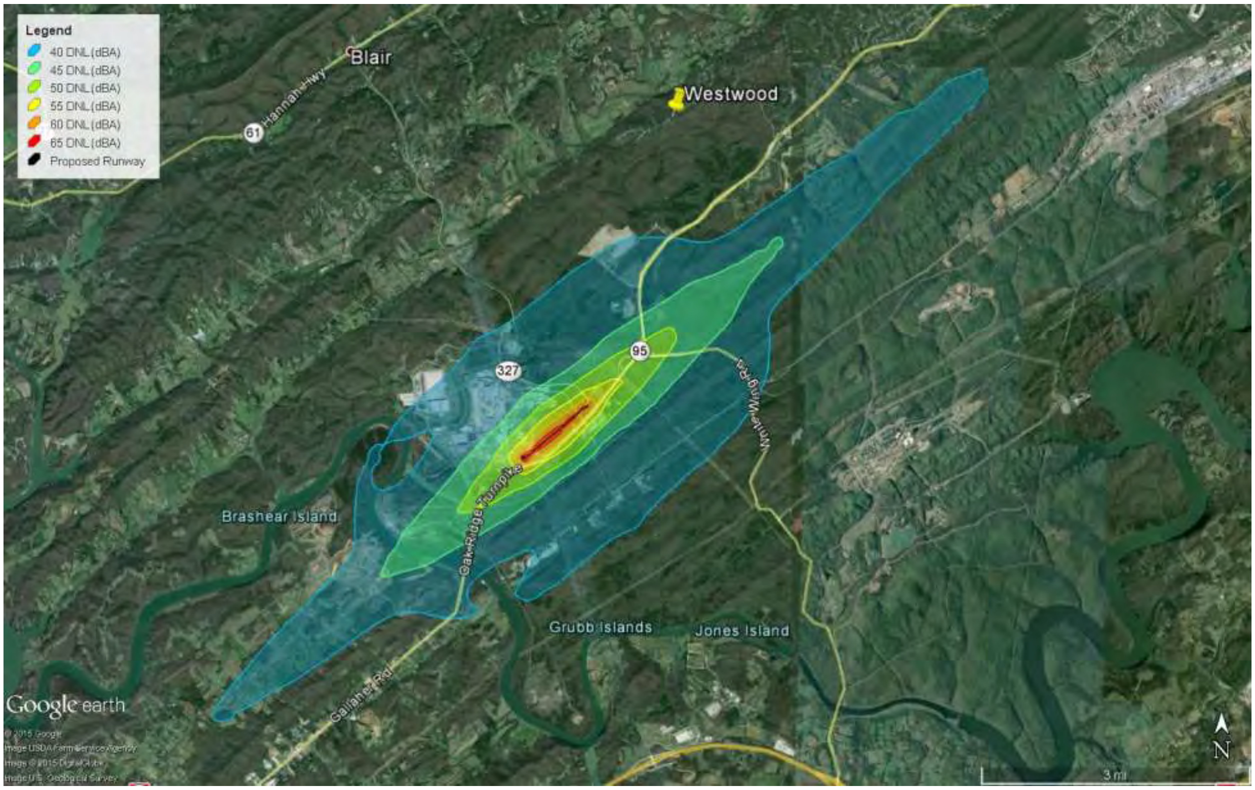

Figure 8. Location of the Westwood Site.

Table 5. Detailed L_{max} Analysis for the Westwood Site.

L_{max} Values for the Westwood Site

Cessna Citation II					
Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting (lbs)	Lmax (dBA)
Departure from Runway 06	9,890	2,900	174	1,924	47
Approach to Runway 24	9,770	1,900	106	647	<35
Departure from Runway 24	17,430	1,100	9	2,192	<35
Approach to Runway 06	19,340	1,100	31	250	<35

Cessna 172 R					
Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting (%)	Lmax (dBA)
Departure from Runway 06	9,840	2,600	76	95	36
Approach to Runway 24	6,920	2,000	61	50	<35
Left Turning Touch and Go from Runway 06	11,730	2,000	61	50	<35
Right Turning Touch and Go from Runway 06	7,700	1,800	67	29	<35
Right Turning Touch and Go from Runway 24	17,430	1,100	8	143	<35
Left Turning Touch and Go from Runway 24	9,770	1,900	74	29	<35
Departure from Runway 24	12,250	1,600	64	29	<35
Approach to Runway 06	20,410	1,100	10	10	<35

Beech Baron 58P					
Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting (%)	Lmax (dBA)
Departure from Runway 06	9,880	2,900	129	80	48
Approach to Runway 24	6,920	2,000	103	52	46
Left Turning Touch and Go from Runway 06	7,720	2,000	103	52	45
Right Turning Touch and Go from Runway 06	11,730	2,000	103	52	43
Right Turning Touch and Go from Runway 24	17,430	1,100	9	125	41
Left Turning Touch and Go from Runway 24	12,270	1,800	101	24	40
Departure from Runway 24	9,770	1,900	94	41	39
Approach to Runway 06	19,260	1,100	31	10	<35

Bell 206 L Long Ranger					
Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting	Lmax (dBA)
Helicopter Approach from the West	17,360	1,600	57	-NA-	<35
Helicopter Approach from the West	16,830	1,600	57	-NA-	<35
Helicopter Approach from the East	17,000	2,100	114	-NA-	<35
Helicopter Departure to the West	19,540	1,100	1	-NA-	<35
Helicopter Departure to the West	16,840	1,900	57	-NA-	<35
Helicopter Departure to the East	17,020	2,100	114	-NA-	<35
Helicopter Departure to the East	17,370	1,700	57	-NA-	<35
Helicopter Approach from the East	19,540	1,100	8	-NA-	<35

NE 45 DNL Site

This receiver is located at the North-East edge of the 45 DNL contour as can be seen in Figure 9.

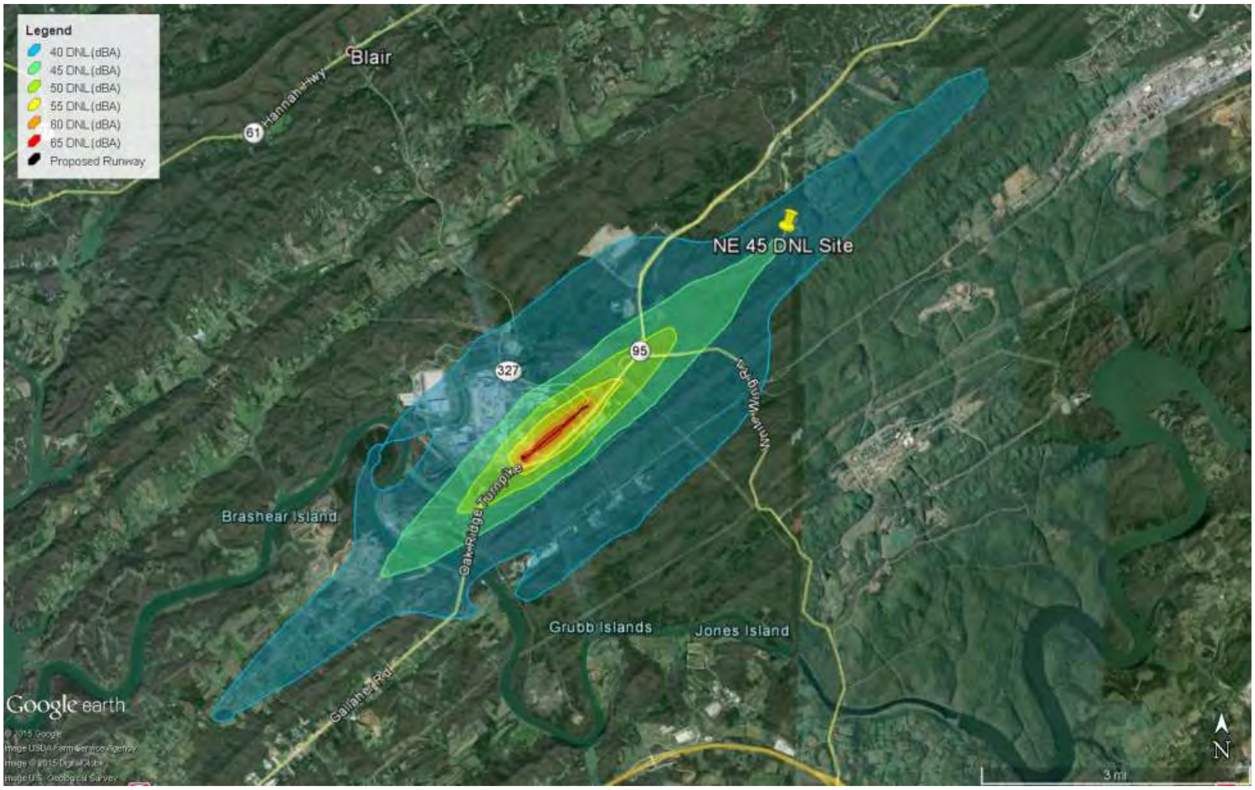

Figure 9. Location of NE 45 DNL Site.

Table 6. Detailed L_{max} Analysis for the NE 45 DNL Site

L_{max} Values for the NE 45 DNL Site

Cessna Citation II

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting (lbs)	Lmax (dBA)
Departure from Runway 06	1,880	2,900	174	1,919	75
Approach to Runway 24	900	1,900	106	648	70
Departure from Runway 24	14,940	1,100	9	2,192	< 35
Approach to Runway 06	17,190	1,100	31	250	< 35

Cessna 172 R

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting (%)	Lmax (dBA)
Departure from Runway 06	1,580	2,600	76	95	63
Approach to Runway 24	900	1,900	74	29	57
Left Turning Touch and Go from Runway 06	5,330	2,000	61	50	38
Right Turning Touch and Go from Runway 06	5,480	2,000	61	50	37
Right Turning Touch and Go from Runway 24	6,310	1,700	66	29	< 35
Left Turning Touch and Go from Runway 24	6,430	1,700	65	29	< 35
Departure from Runway 24	14,940	1,100	8	143	< 35
Approach to Runway 06	18,420	1,100	10	10	< 35

Beech Baron 58P

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting (%)	Lmax (dBA)
Approach to Runway 24	900	1,900	94	41	71
Departure from Runway 06	1,870	2,900	129	80	71
Left Turning Touch and Go from Runway 06	5,330	2,000	103	52	51
Right Turning Touch and Go from Runway 06	5,480	2,000	103	52	51
Right Turning Touch and Go from Runway 24	6,350	2,000	104	31	48
Left Turning Touch and Go from Runway 24	6,470	2,000	104	31	48
Departure from Runway 24	14,940	1,100	9	125	42
Approach to Runway 06	17,090	1,100	31	10	< 35

Bell 206 L Long Ranger

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting	Lmax (dBA)
Helicopter Approach from the West	14,650	1,600	57	-NA-	< 35
Helicopter Approach from the West	14,640	1,600	57	-NA-	< 35
Helicopter Approach from the East	17,430	1,100	1	-NA-	< 35
Helicopter Departure to the West	14,650	1,800	57	-NA-	< 35
Helicopter Departure to the East	14,660	1,800	57	-NA-	< 35
Helicopter Approach from the East	17,430	1,100	1	-NA-	< 35
Helicopter Departure to the West	17,430	1,100	1	-NA-	< 35
Helicopter Departure to the East	17,430	1,100	1	-NA-	< 35

NE 50 DNL Site

This receiver is located at the North-East edge of the 50 DNL contour as can be seen in Figure 10.

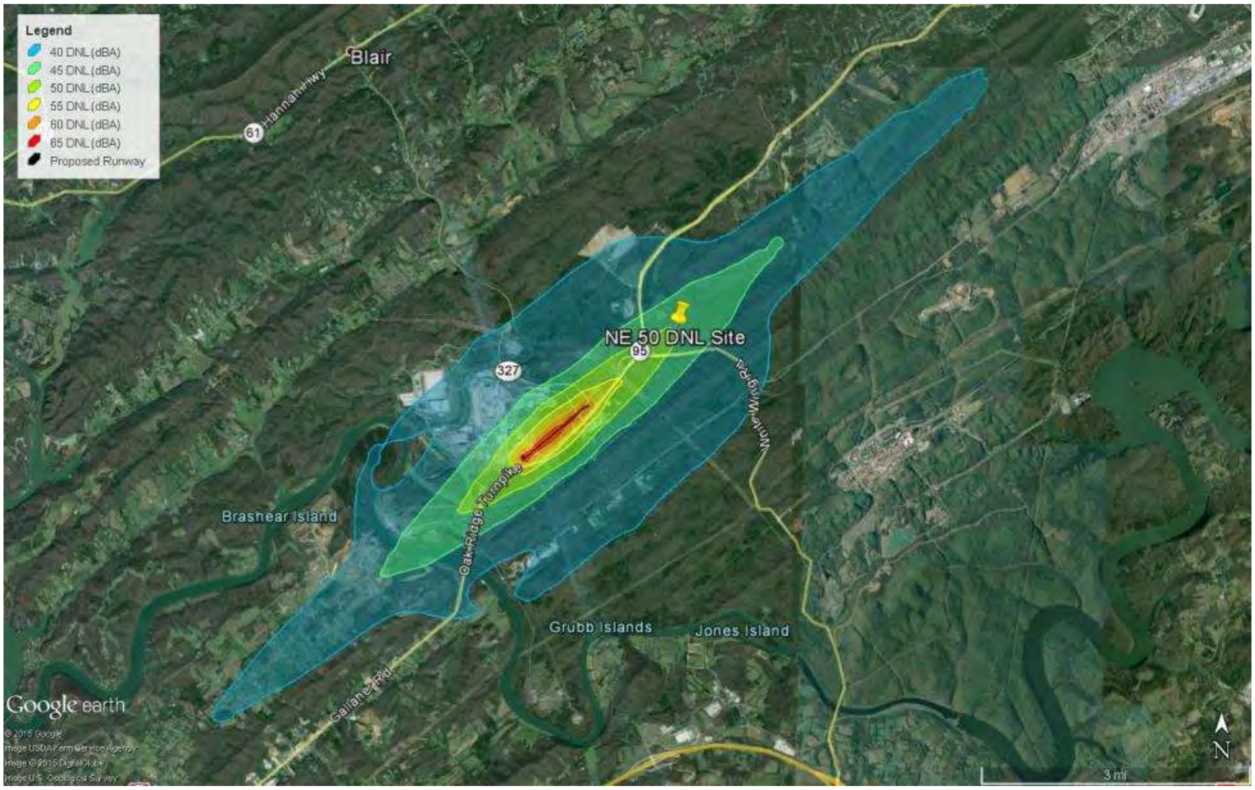

Figure 10. Location of the NE 50 DNL Site.

Table 7. Detailed L_{max} Analysis for the NE 50 DNL Site

L_{max} Values for the NE 50 DNL Site

Cessna Citation II

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting (lbs)	Lmax (dBA)
Departure from Runway 06	1,340	2,200	127	1,967	79
Approach to Runway 24	660	1,500	106	638	74
Departure from Runway 24	6,670	1,100	9	2,192	42
Approach to Runway 06	8,920	1,100	31	250	< 35

Cessna 172 R

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting (%)	Lmax (dBA)
Departure from Runway 06	1,190	2,000	69	107	67
Right Turning Touch and Go from Runway 06	1,120	2,000	61	50	66
Left Turning Touch and Go from Runway 06	1,120	2,000	61	50	66
Right Turning Touch and Go from Runway 24	650	1,500	63	29	60
Approach to Runway 24	660	1,500	61	29	60
Left Turning Touch and Go from Runway 24	670	1,500	63	29	60
Departure from Runway 24	6,670	1,100	8	143	37
Approach to Runway 06	10,150	1,100	10	10	< 35

Beech Baron 58P

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting (%)	Lmax (dBA)
Departure from Runway 06	1,400	2,200	119	99	77
Approach to Runway 24	660	1,500	94	40	74
Right Turning Touch and Go from Runway 06	1,120	2,000	103	52	71
Left Turning Touch and Go from Runway 06	1,120	2,000	103	52	71
Right Turning Touch and Go from Runway 24	880	1,700	95	24	68
Left Turning Touch and Go from Runway 24	900	1,700	95	24	68
Departure from Runway 24	6,670	1,100	9	125	53
Approach to Runway 06	8,820	1,100	31	10	37

Bell 206 L Long Ranger

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting	Lmax (dBA)
Helicopter Approach from the West	6,420	1,600	57	-NA-	49
Helicopter Approach from the West	6,410	1,600	57	-NA-	48
Helicopter Departure to the West	6,430	1,800	57	-NA-	44
Helicopter Approach from the East	9,150	1,100	1	-NA-	44
Helicopter Departure to the East	6,440	1,800	57	-NA-	44
Helicopter Approach from the East	9,150	1,100	1	-NA-	39
Helicopter Departure to the West	9,150	1,100	1	-NA-	39
Helicopter Departure to the East	9,150	1,100	1	-NA-	39

SW 50 DNL Site

This receiver is located at the South-West edge of the 50 DNL contour as can be seen in Figure 11.

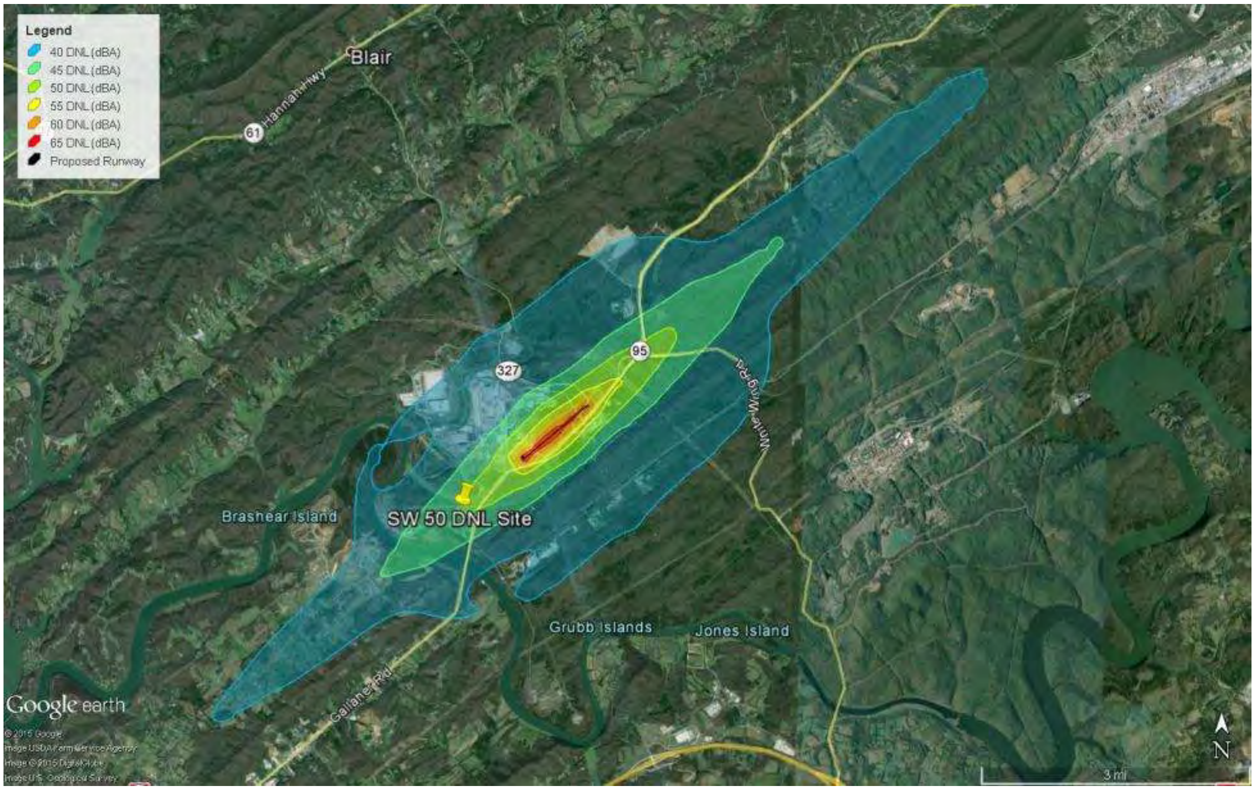

Figure 11. Location of SW 50 DNL Site

Table 8. Detailed L_{max} Analysis for the SW 50 DNL Site.

L_{max} Values for the SW 50 DNL Site

Cessna Citation II

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting (lbs)	Lmax (dBA)
Departure from Runway 24	1,270	2,000	127	1,958	80
Approach to Runway 06	570	1,300	106	635	75
Departure from Runway 06	4,890	1,000	9	2,192	45
Approach to Runway 24	7,140	1,100	31	250	36

Cessna 172 R

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting (%)	Lmax (dBA)
Right Turning Touch and Go from Runway 24	1,100	1,800	69	107	67
Left Turning Touch and Go from Runway 24	1,100	1,800	69	107	67
Departure from Runway 24	1,140	1,900	69	107	67
Right Turning Touch and Go from Runway 06	570	1,300	61	29	61
Left Turning Touch and Go from Runway 06	570	1,300	61	29	61
Approach to Runway 06	570	1,300	61	29	61
Departure from Runway 06	4,890	1,000	8	143	40
Approach to Runway 24	8,370	1,100	10	10	< 35

Beech Baron 58P

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting (%)	Lmax (dBA)
Departure from Runway 24	1,370	2,100	119	104	78
Approach to Runway 06	570	1,300	94	40	75
Right Turning Touch and Go from Runway 24	1,210	2,000	103	52	74
Left Turning Touch and Go from Runway 24	1,210	2,000	103	52	74
Right Turning Touch and Go from Runway 06	740	1,500	93	28	71
Left Turning Touch and Go from Runway 06	740	1,500	93	28	71
Departure from Runway 06	4,890	1,000	9	125	56
Approach to Runway 24	7,040	1,100	31	10	39

Bell 206 L Long Ranger

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting	Lmax (dBA)
Helicopter Approach from the East	4,690	1,600	57	-NA-	55
Helicopter Approach from the East	4,700	1,600	57	-NA-	54
Helicopter Approach from the West	4,720	1,700	57	-NA-	49
Helicopter Departure to the East	4,730	1,700	57	-NA-	49
Helicopter Departure to the West	7,400	1,000	1	-NA-	48
Helicopter Approach from the West	7,400	1,000	1	-NA-	44
Helicopter Departure to the West	7,400	1,000	1	-NA-	43
Helicopter Departure to the East	7,400	1,000	1	-NA-	42

SW 45 DNL Site

This receiver is located at the South-West edge of the 45 DNL contour as can be seen in Figure 12.

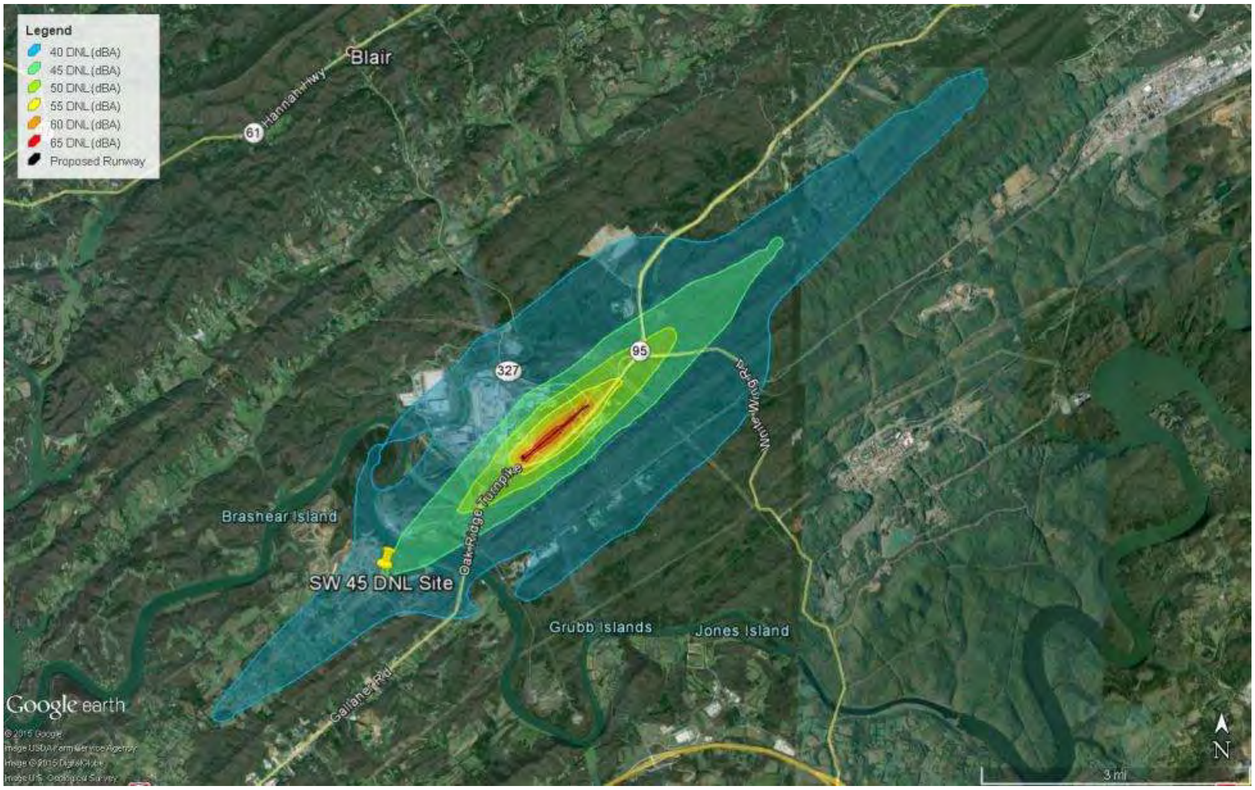

Figure 12. Location of the SW 45 DNL Site

Table 9. Detailed L_{max} Analysis for the SW 45 DNL Site

L_{max} Values for the SW 45 DNL Site

Cessna Citation II

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting (lbs)	Lmax (dBA)
Departure from Runway 24	1,870	2,700	156	1,957	76
Approach to Runway 06	790	1,600	106	643	72
Departure from Runway 06	10,810	1,000	9	2,192	37
Approach to Runway 24	13,060	1,100	31	250	< 35

Cessna 172 R

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting (%)	Lmax (dBA)
Departure from Runway 24	1,500	2,300	76	94	63
Approach to Runway 06	790	1,600	74	29	58
Right Turning Touch and Go from Runway 24	1,980	2,000	61	50	53
Left Turning Touch and Go from Runway 24	2,090	2,000	61	50	52
Left Turning Touch and Go from Runway 06	2,620	1,500	65	29	43
Right Turning Touch and Go from Runway 06	2,710	1,500	65	29	43
Departure from Runway 06	10,810	1,000	8	143	< 35
Approach to Runway 24	14,290	1,100	10	10	< 35

Beech Baron 58P

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting (%)	Lmax (dBA)
Approach to Runway 06	790	1,600	94	41	72
Departure from Runway 24	1,760	2,600	129	79	71
Right Turning Touch and Go from Runway 24	1,980	2,000	103	52	65
Left Turning Touch and Go from Runway 24	2,090	2,000	103	52	64
Left Turning Touch and Go from Runway 06	2,720	1,800	103	24	58
Right Turning Touch and Go from Runway 06	2,800	1,800	103	24	57
Departure from Runway 06	10,810	1,000	9	125	46
Approach to Runway 24	12,960	1,100	31	10	< 35

Bell 206 L Long Ranger

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting	Lmax (dBA)
Helicopter Approach from the East	10,550	1,600	57	-NA-	41
Helicopter Approach from the East	10,560	1,600	57	-NA-	40
Helicopter Approach from the West	13,320	1,000	1	-NA-	38
Helicopter Departure to the East	10,580	1,700	57	-NA-	35
Helicopter Departure to the West	10,560	1,700	57	-NA-	35
Helicopter Approach from the West	13,320	1,000	1	-NA-	< 35
Helicopter Departure to the West	13,320	1,000	1	-NA-	< 35
Helicopter Departure to the East	13,320	1,000	1	-NA-	< 35

SW 40 DNL Site

This receiver is located at the South-West edge of the 40 DNL contour as can be seen in Figure 13.

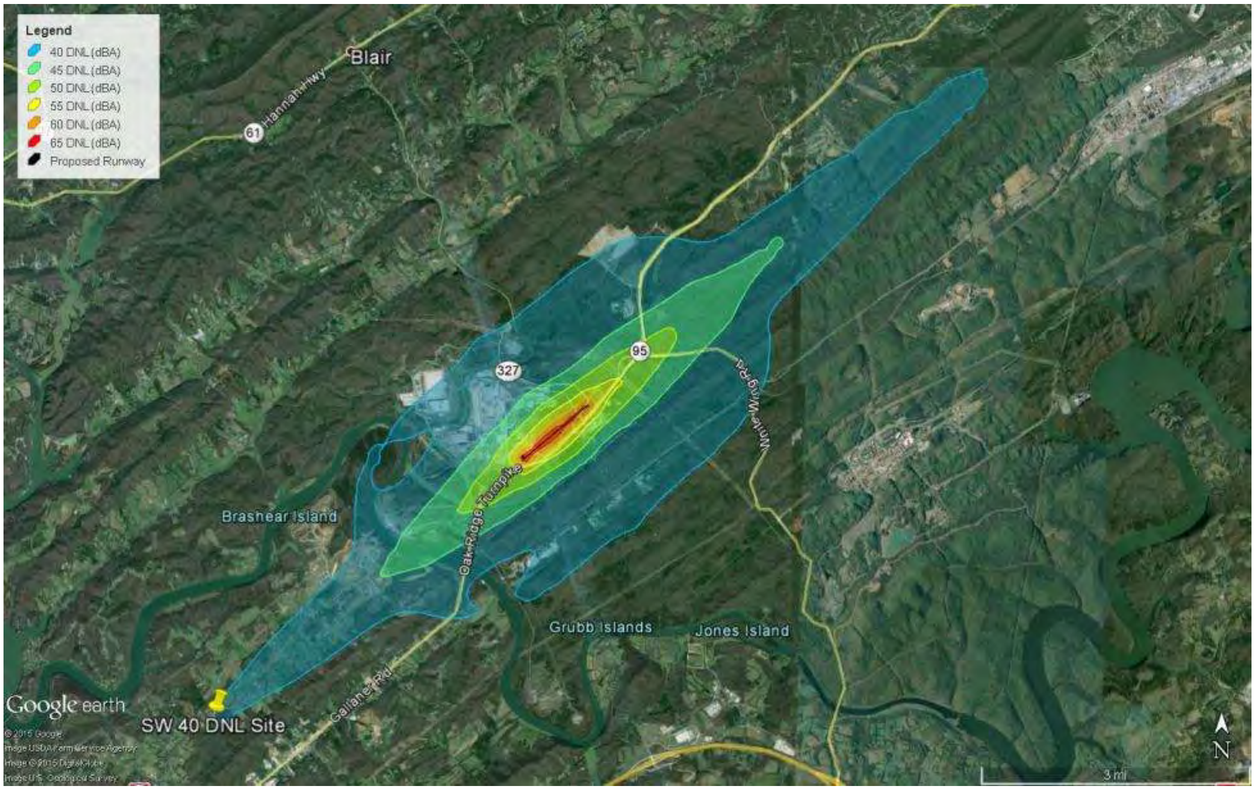

Figure 13. Location of the SW 40 DNL Site.

Table 10. Detailed L_{max} Analysis for the SW 40 DNL Site.

L_{max} Values for the SW 40 DNL Site

Cessna Citation II

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting (lbs)	Lmax (dBA)
Departure from Runway 24	3,020	3,800	204	1,711	68
Approach to Runway 06	1,480	2,300	113	525	64
Departure from Runway 06	23,740	1,000	9	2,192	< 35
Approach to Runway 24	25,990	1,100	31	250	< 35

Cessna 172 R

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting (%)	Lmax (dBA)
Departure from Runway 24	2,440	3,300	76	96	58
Approach to Runway 06	1,480	2,300	76	29	52
Right Turning Touch and Go from Runway 24	13,900	2,000	61	50	< 35
Left Turning Touch and Go from Runway 24	13,890	2,000	61	50	< 35
Departure from Runway 06	23,740	1,000	8	143	< 35
Right Turning Touch and Go from Runway 06	14,930	1,600	66	29	< 35
Left Turning Touch and Go from Runway 06	14,940	1,600	66	29	< 35
Approach to Runway 24	27,220	1,100	10	10	< 35

Beech Baron 58P

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting (%)	Lmax (dBA)
Departure from Runway 24	2,810	3,600	129	81	67
Approach to Runway 06	1,480	2,300	100	39	66
Right Turning Touch and Go from Runway 24	13,900	2,000	103	52	39
Left Turning Touch and Go from Runway 24	13,890	2,000	103	52	39
Right Turning Touch and Go from Runway 06	14,950	1,900	104	47	36
Left Turning Touch and Go from Runway 06	14,960	1,900	104	46	36
Departure from Runway 06	23,740	1,000	9	125	36
Approach to Runway 24	25,890	1,100	31	10	< 35

Bell 206 L Long Ranger

Operation Description	Distance to Aircraft (ft)	Approximate Altitude MSL (ft)	Speed (knots)	Thrust Setting	Lmax (dBA)
Helicopter Approach from the East	23,470	1,600	57	-NA-	< 35
Helicopter Approach from the East	23,470	1,600	57	-NA-	< 35
Helicopter Approach from the West	26,250	1,000	1	-NA-	< 35
Helicopter Approach from the West	26,250	1,000	1	-NA-	< 35
Helicopter Departure to the West	23,480	1,700	57	-NA-	< 35
Helicopter Departure to the West	26,250	1,000	1	-NA-	< 35
Helicopter Departure to the East	23,480	1,700	57	-NA-	< 35
Helicopter Departure to the East	26,250	1,000	1	-NA-	< 35

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