DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
FINDING OF NO SIGNIFICANT IMPACT (FONSI)
Concourse and Gate Expansion
Nashville International Airport
Nashville, TN

I. Introduction/Background

In accordance with the National Environmental Policy Act (NEPA), this Finding of No Significant Impact (FONSI) announces final agency determinations and approvals for those Federal Actions by the Federal Aviation Administration (FAA) that are necessary to support the proposed development at the Nashville International Airport in Nashville, Tennessee.

II. Proposed Federal Action

The federal actions are FAA funding assistance and Airport Layout Plan (ALP) approval for the proposed development which includes the following components:

- Redevelop Concourse A to accommodate up to 16 gates as well as add passenger hold room and circular space. This element includes demolition of existing Concourse A to accommodate future development.
- Construction of Concourse E (satellite concourse) at approximately 90,000 square feet with eight gates.
- Expand north terminal apron by approximately 500,000 square feet.
- Construct haul road to expanded apron.
- Decommission a section of Taxiway Juliet to accommodate construction of Concourse E.
- Modify terminal facilities to expand ticketing, concessions, baggage areas, and other amenities.
- Utility and fencing relocations/expansions to accommodate above development items.
- Encapsulate approximately 1,600 linear feet of a stream.
- Expand storm water detention basin and modify airport perimeter road to accommodate development items.
- Vegetative clearing and storm water improvements to “Low Impact Development” site north of the airport.
- Use of construction support areas to facilitate staging, milling stockpile, and material borrow.

III. Purpose and Need

The FAA has defined the purpose and need for implementing the proposed action as being necessary to accommodate existing and future passenger demand as well as future air carrier aircraft operations and parking. While accommodating demand, the improvements need to be consistent with existing airport infrastructure, promote efficient passenger throughput, and enhance customer experience. The proposed improvements should also adhere to FAA design standards, found in FAA Advisory Circular 150/5300-

13, *Airport Design*, and be consistent with Code of Federal Regulations (CFR) 14, Part 77, *Safe, Efficient Use and Preservation of the Navigable Airspace*.

IV. Alternatives

Federal guidelines concerning the environmental review process require that all reasonable and practicable alternatives that might accomplish the objectives of a proposed project be identified and evaluated. Such an examination ensures that alternatives are not prematurely dismissed and may lead to consideration of alternatives that fulfill the project's purpose and need as well as enhance environmental quality or have a less detrimental effect. The alternatives listed below were evaluated for this Environmental Assessment (EA).

1. Alternatives 1A and 1B – Variations on improvements to Concourse A.
2. Alternative 2 – Sponsor's preferred alternative and described above in Section II.
3. Alternative 3 – Expand Concourse B.
4. Alternative 4 – Expand Concourse C.
5. Alternative 5 – Expand Concourse D.
6. No Action Alternative

Section 4 of the EA describes the alternatives in detail and provides a basis for alternative screening. As part of the screening effort, all alternatives were eliminated from consideration except for Alternative 2 and the No Action Alternative.

V. Environmental Impacts

The EA analyzed all relevant environmental categories based on FAA Order 5050.4B, "*National Environmental Policy Act Implementing Instructions for Airport Projects*" (NEPA). Those resource categories that the Sponsor's preferred alternative has the potential to impact are discussed below. Any mitigation measures proposed are discussed in Section VI.

V A. Air Quality

The proposed action is expected to generate additional emissions due to increased aircraft operations, support vehicles, and construction activities. As explained in pages 35-37 of the EA, the increased emissions, as modeled, are expected to remain below the level of significance, including Green-house Gas (GHG) emissions.

V B. Biological Resources

The proposed action will impact 1,627 linear feet of an intermittent stream by filling and rerouting the stream into a concrete pipe and partial open channel. In addition, the proposed action will impact 6.7 acres of vegetation, which will impact various species and their habitat. Based on the information in the EA, impacts to State or Federal species are not expected. This is due to a lack of known presence of listed bat species as well as low quality habitat for American

Ginseng and Price's Potato-bean. Table 6 in Section 5 of the EA details the extent of potential habitat impacts by listed species.

V C. Section 4(f)

The proposed action has the potential impact the Metro Soccer Complex due to increases in noise exposure. Approximately 0.6 acres of the complex are within the increased 65 Day-Night Average Sound Level (DNL), as modeled in the EA. However, the expanded 65 DNL, compared to the No Action Alternative extends approximately 18 feet further than the No Action Alternative and does not reach the playing fields or attributes that quality the resource as a Section 4(f). As such, the potential for impact does not rise to the level of "Constructive Use" under Section 4(f). As such, significant impacts are not anticipated.

V D. Hazardous Materials, Solid Waste, Pollution Prevention

The proposed action will involve the expansion of fuel lines and storage as well as the relocation of the glycol dump station and oil/water separators. In addition, the action will involve generation of waste from construction activities and from increased operational use. Waste disposal will be handled in accordance with applicable local, state, and federal guidelines. Significant impacts are not expected.

V E. Natural Resources and Energy Supply

As discussed in Section 5.11, the proposed action will result in increased energy usage during construction and operationally. However, the impact from the increased demand is not expected to exceed energy supplies.

V F. Noise and Land Use

Based on the information contained in the EA, the proposed action is not expected to cause direct impacts from noise or to land use. The proposed action will, however, lead to additional aircraft operations and is expected to result in increases to the level of significant noise around the airport. Specifically, the 65-DNL was modeled to have an increased area when compared to the No Action Alternative. However, the increase in noise is not expected to be significant to ground based receptors. The areas within the larger 65-DNL contour include compatible land uses, a cemetery and the Metro Soccer Complex. The cemetery and soccer complex are both within the 65-DNL of the no action alternative. When compared to the No Action Alternative, the proposed action extends the 65-DNL by 18 feet over the soccer complex and 16 feet over the cemetery. As such, the proposed action does not result in a material change from noise exposure. See Section V C. for more information on the Metro Soccer Complex.

V G. Socioeconomics

The proposed action is expected to result in increased space for business opportunities in the airport's terminal facilities and improve passenger experience at the airport. This may lead to increased business activity, which would create positive socioeconomic impacts. No adverse impacts, or significant positive impacts, are expected.

V H. Water Resources

The proposed action will directly impact 1,627 linear feet of an intermittent stream. The action includes converting 423 linear feet of the stream from stream channel to open channel. Impacts are also expected to include 125 linear feet riparian zone of Sims Branch. Regarding storm water, an existing storm water detention basin will expanded to accommodate additional capacity. Further impacts to water resources are not expected due to project design and best management practices. Impacts to the stream will be mitigated. Therefore, significant impacts are not expected. Mitigation for stream impacts is discussed below in Section VI B.

V I. Construction Impacts

As part of construction activities, the proposed action could impact various environmental categories due to emissions, dust, storm water runoff, and noise. Such impacts are discussed by each environmental resource within the EA. Construction impacts are expected to be short-term and mitigated through best management practices. Significant impacts are not expected.

VI. Environmental Mitigation

The Airport Sponsor shall be responsible for obtaining all necessary construction permits or certifications as described in Section VI A. below prior to initiating construction activities near or on the environmental resource requiring the permit. Project related permits, certifications, and other mitigation measures required for the proposed action are discussed below. It should be noted that best management practices (BMPs) are considered standard operating procedure and are not considered mitigation; therefore, they are not discussed in this section.

VI A. Permits and Certifications

The project will require the following permits or certifications:

1. National Pollutant Discharge Elimination System (NPDES) construction storm water discharge permit.
2. Section 404 Individual Permit.
3. Section 401 Water Quality Certification.
4. Individual Aquatic Resources Alteration Permit.

VI B. Mitigation

Without proper mitigation, the proposed action may exceed the threshold of significance. Mitigation shall be completed for the following environmental categories:

1. The airport sponsor will complete mitigation for stream impacts with the U.S. Army Corps of Engineers and Tennessee Department of Environment and Conservation. Anticipated mitigation will be a combination of mitigation bank and in-lieu-fee credits. Mitigation cost are expected to be $1.37 million.

2. Storm water mitigation will be completed pursuant with the Metro Government of Nashville, Water Services, using the Low-Impact Development sites.

VII. Public Involvement

The following agencies were consulted in the preparation of this EA:

- U.S. Federal Aviation Administration
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- U.S. Environmental Protection Agency
- U.S. Forest Service
- U.S. Coast Guard
- Federal Highway Administration
- Federal Emergency Management Agency
- National Park Service
- Natural Resources Conservation Service
- Tennessee Wildlife Resources Agency
- Tennessee Department of Environment and Conservation
- Tennessee Valley Authority
- Tennessee Historical Commission
- Tennessee Division of Archaeology
- Tennessee Department of Transportation
- Tennessee Division of Forestry
- Metropolitan Government of Nashville and Davidson County (METRO)

On May 18, 2021, a public notice was placed in the Nashville Tennessean and the airport website announcing the availability of the draft EA, opportunity to comment, and the date of public hearing. The hearing was held June 18, 2021, at the Nashville International Airport. However, there were no attendees and no comments were received during the 30-day comment period.

VIII. Decision

After careful and thorough consideration of the facts contained herein, the undersigned finds that approval of the proposed development is consistent with existing national environmental policies and objectives as set forth in Section 101(a) of the National Environmental Policy Act of 1969 (NEPA) and that it will not significantly affect the quality of the human environment or otherwise include any condition requiring consultation pursuant to Section 102(2)(C) of NEPA.

Approved: ______________________________ Date: ____________________

Tommy L. Dupree
Manager, MEM-ADO

Environmental Assessment (EA)

Nashville International Airport
Concourse and Gate Expansion
MNAA Project 2019A

Metropolitan Nashville Airport Authority
Nashville, Tennessee

July 12, 2021

This Environmental Assessment becomes a Federal document when evaluated, signed, and dated by the Responsible Federal Aviation Administration (FAA) Official.

Responsible FAA Official	July 20, 2021 Date

Prepared by:

GARVER

Financial Disclosure Statement:	
Environmental Assessment Cost:	$328k
Total Project Cost:	$870m

Table of Contents

List of Figures

List of Tables

List of Appendices

1.0 Introduction and Background

The Nashville International Airport (BNA or Airport) is a public use airport that is owned and operated by the Metropolitan Nashville Airport Authority (MNAA) and serves private and major commercial airlines. The Airport is located on the east side of Nashville, Tennessee and situated between Briley Parkway, Interstate 40 (I-40) and Murfreesboro Pike. A general location map of the Nashville area in relation to the airport is shown in **Figure 1**. The Airport covers approximately 4,500 acres, has four primary use concrete runways, full parallel taxiways, ground support equipment, and four active concourses (A, B, C, and D) with concourse T approved and currently under construction. The total number of gates at BNA (post Vision[1]) is 48 gates. The Airport's concourses provide amenities such as restaurants, ATMs, restrooms, hold rooms, entertainment, and concessions. BNA provides a high-quality customer experience and facilities and desires to maintain these same standards as the airport expands.

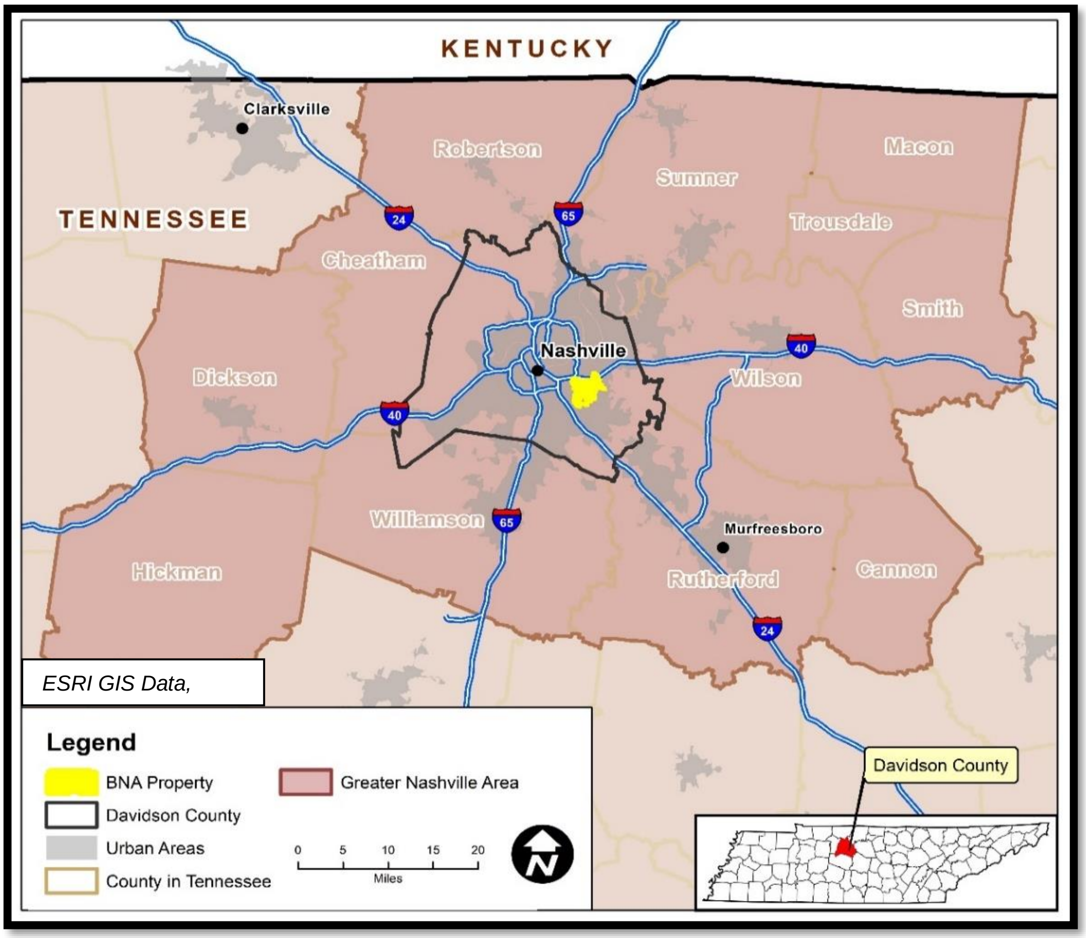

Figure 1: Site Location Map

[1] BNA Vision is defined in the airport's Master Plan Update as a growth and expansion plan to maintain a world-class facility while accommodating the airport's record-breaking passenger increases.

BNA proposes to expand its gate capacity to support the documented increase in regional growth by expanding Concourse A, constructing a new satellite concourse[2], and constructing other related improvements as part of the Proposed Action. Terminal aprons are also proposed for expansion to accommodate safety of maneuvering aircraft around expanded Concourse A. These actions are evaluated in this BNA Concourse and Gate Expansion Environmental Assessment (EA). The Proposed Action is being pursued to expand facilities to increase capacity in response to projected enplanement forecasts commensurate with the economic growth of the greater Nashville area.

The MNAA developed a long-term plan for addressing necessary airport improvements through 2041. This plan was called the BNA Vision (Vision 1.0 EA, 2018). As documented in the Vision 1.0 EA and Finding of No Significant Impact (FONSI) issued March 2018, the greater Nashville area has experienced unprecedented growth over the past decade. The Vision 1.0 EA was identified as a "*comprehensive plan designed to enable BNA to meet the needs of projected increased growth in the region and accommodate rapidly increasing numbers of passengers flying into and out of BNA*", and the Vision 1.0 EA thoroughly documented growth patterns regarding increased enplanements and regional population growth. Research conducted during compilation of the Vision 1.0 EA is considered recent; therefore, many resource evaluations such as demographics, broad scale socioeconomic discussions, and enplanement forecasts are still considered applicable to this EA. As a result, that document will serve as a baseline for, and is referenced in, this EA.

This EA has been prepared per Federal Aviation Administration (FAA) Orders 5050.4B and 1050.1F, and the FAA Environmental Desk Reference for Airport Actions. A list of EA preparers is located in **Section 10**.

2.0 Purpose and Need

2.1 Purpose

The purpose of the Proposed Action is to address current and forecasted passenger, air carrier, and stakeholder[3] needs by providing Nashville International Airport with 17 additional gates within the 20-year planning period. All design and development associated with the Proposed Action would meet current FAA Airport Design Standards per Advisory Circular (AC) 150/5300-13A, 14 Code of Federal Regulations (CFR) Part 77 airspace regulations and other appropriate FAA ACs. The Proposed Action would be designed to be compatible with the existing north and south aprons to accommodate three remain overnight (RON) airside parking areas and provide dual taxilanes for the safe and efficient maneuvering of aircraft. Additional RON spaces would be accounted for by proposed gates to help alleviate the 2037 planning level RON need of 18 positions. Proposed terminal improvements in the existing facilities would address capacity and configuration

[2] A satellite concourse is one that is physically separated from the main terminal building.
[3] Stakeholders include air carriers and other interested parties.

limitations and deficiencies in the ticketing and baggage handling areas while providing enhanced customer experience and safe and efficient passenger movement through the airport.

2.2 Need

The need for the Proposed Action is to accommodate projected increases in both enplanements and aircraft operations as a result of significant population, tourism, and economic growth in the greater Nashville area. The 2013 Airport Master Plan (AMP) forecast data was determined to have underestimated growth trends in the area and this was realized when the 2018 Master Plan Update (MPU) by AECOM (2018) was completed. The 2018 MPU provides detailed documentation of the significant growth trends of the greater Nashville area. Historical data of actual enplanements recorded between 2013 and 2016 (FAA, 2019) indicated an approximate 1.2 million enplanements increase over the four-year period. Actual enplanement growth between 2017 and 2018 was 8.3% followed by a 14.6% increase between 2018 and 2019, and an approximate 13% increase during the period from 2019 to mid-2020. Additionally, forecasts identified in the *Nashville International Airport Enplanements Forecast* (Lynch, 2017) projected a 43% increase in enplanements by 2035, which is an increase from approximately seven million enplaned passengers in 2018 to more than ten million in 2035. The 2019 FAA-approved forecast data, found in **Appendix A**, projects 11.9 million enplanements by 2037. To account for such growth, the MPU identified the need for 65 total gates, which is identified as a need for 17 additional gates to be operational by 2035. The addition of 17 gates will satisfy the Airport's need for 65 total gates (48 existing gates [post Vision 1.0 implementation] plus 17 proposed gates) by the year 2037. The basis for the immediate need for these additional gates is provided in the 2019 FAA-approved Aviation Demand Forecasts (AECOM, 2019)[4].

The forecasted significant increases in enplanements and airside operations will require expansion of the north and south aprons to provide RON parking at gates and dual taxilanes. According to the MPU an additional 12 RON spaces are needed through the 20-year planning period. Expansions of both the north and south aprons and dual taxilanes are necessary to serve the volume of aircraft traffic created by with the proposed gates, mitigate terminal apron congestion, and reduce pilot confusion (FAA, Concourse A Airspace Determination, July 2020). Stormwater management would be needed to address the addition of impervious areas. An unnamed stream tributary would need to be encapsulated to efficiently convey natural flow under the north apron expansion.

An increase in ticking kiosks from 45 to 96 would be needed to meet projected check-in behaviors and accommodate new airlines. Each kiosk would need five square feet of space with an additional 35% circulation factor. Deficiencies in baggage handling areas would further reduce passenger capacity and experience without the proposed improvements. Concourse capacity and reconfiguration improvements will provide enhanced customer experience, and safe and efficient movement through the airport. It has been documented in the MPU[5] that 11 baggage claim

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[4] Refer to Chapter 3-Aviation Demand Forecasts of the MPU.
[5] *Nashville International Airport Facilities Requirements Simulation Study Report* (TransSolutions, 2017)

devices would be needed to meet projected demands by the year 2041. There are an existing 8 baggage claim devices; therefore, an additional 3 baggage claim devices are needed.

3.0 Proposed Action (Project Description)

3.1 Proposed Action Elements

The major elements of the Proposed Action (Alternative 2) are contained within the Study Areas as shown in **Figure 2.** Although the proposed satellite concourse would be paired with all concourse expansion alternatives, it is retained as part of the Proposed Action. Detailed discussion of the satellite concourse is provided in **Section 3.2**. The Proposed Action satisfies the objectives of the purpose and need by achieving the total required 65 gates by the year 2037, accomplished by the addition of 17 gates to the existing 48 gates (post Vision), addressing Concourse A width deficiencies, providing dual parallel taxilanes, and a double loaded concourse[6].

3.1.1 Terminal Buildings: New/Redeveloped Concourse A and Passenger Accessibility

The Proposed Action will extend and redevelop Concourse A into a 16-gate concourse, which may serve multiple air carriers and will require a gate bridge to accommodate each gate. The redeveloped concourse, as shown in **Figures 3 and 4,** will be a 2-level, double-loaded concourse, and net nine additional gates within an approximate 351,200 square feet (ft^2) footprint. A total of 14 Airport Design Group (ADG) III positions and two ADG V positions are included with this expansion. Demolition of the entire existing concourse (110,353 ft^2) is required for redevelopment. Upgrades to Concourse A include constructing over 48,000 ft^2 of circulation area[7], and almost 63,000 ft^2 of holdroom[8] area. These improvements address existing Concourse A width deficiencies and aid in improving the customer experience and reducing wait times. Walking distance from the security check points to the proposed concourse is estimated at 2,200 feet.

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[6] A double-loaded concourse has gates on both sides.
[7] A circulation area includes those areas between the main lobby and gates as well as access between floors per *AC 150/5360-13A*.
[8] Holdrooms are defined as areas utilized for assembling and holding passengers before a flight departure per *AC 150/5360-13A.*

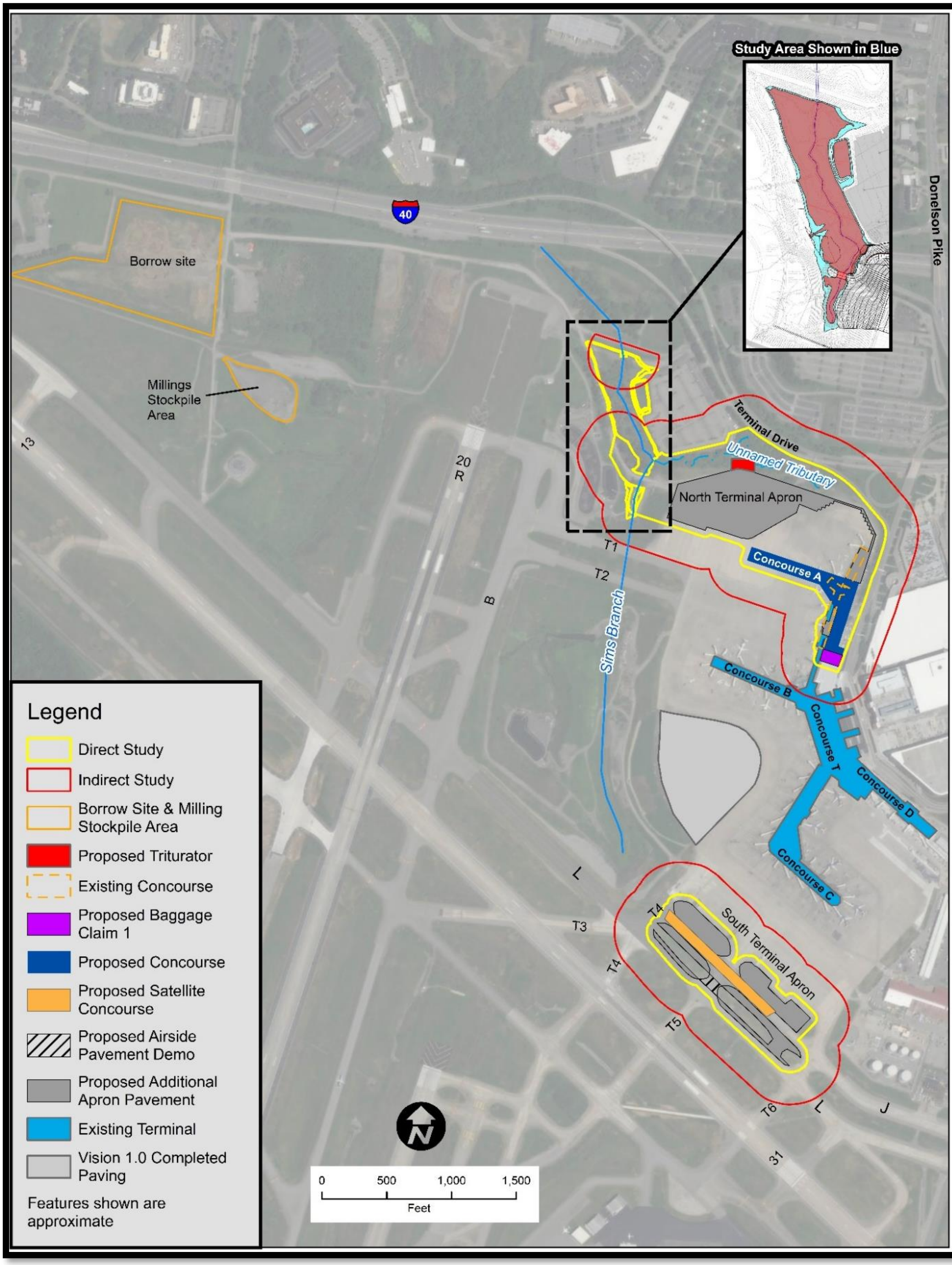

Figure 2: Proposed Action (Alternative 2) Overview

Concourse and Gate Expansion

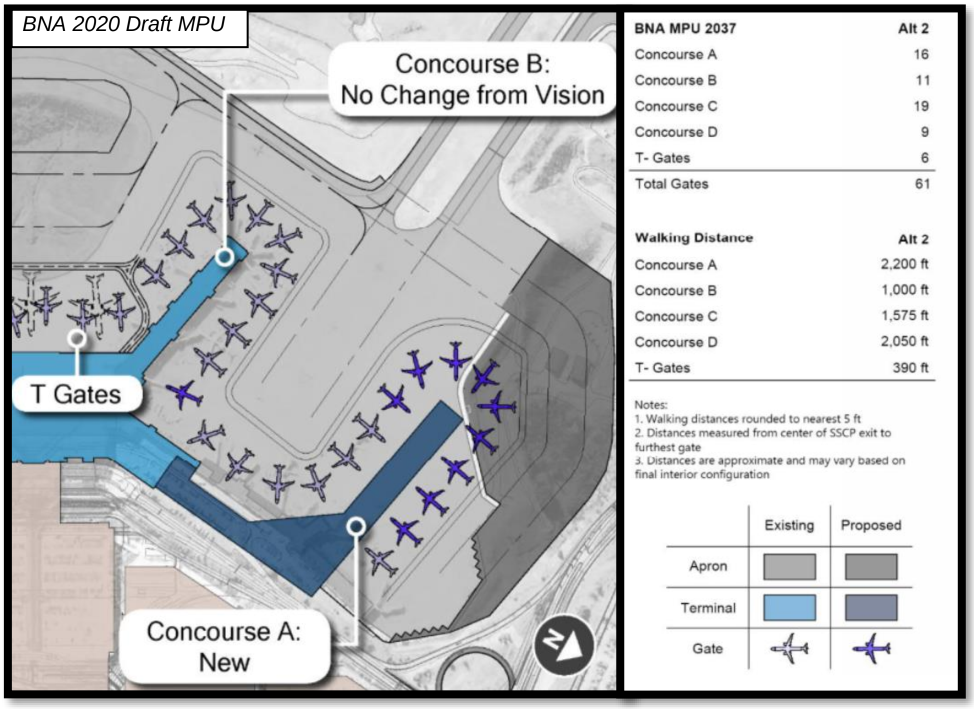

Figure 3: Proposed Action (Alternative 2) – Concourse A Layout

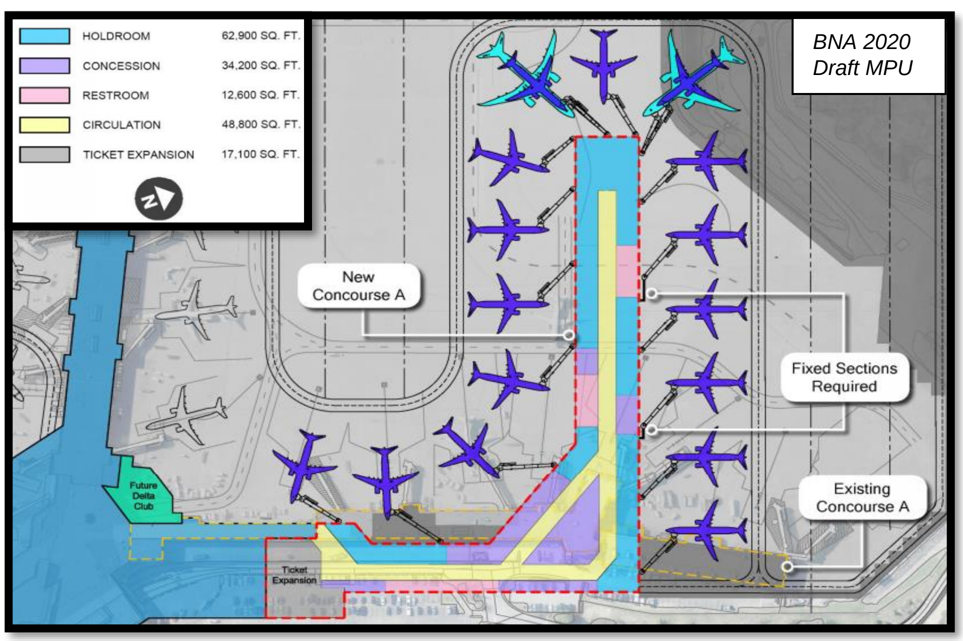

Figure 4: Proposed Action (Alternative 2) – Concourse A Internal Conceptual Layout

3.1.2 Terminal Apron: Aircraft Movement and Dual Taxilanes

The proposed new Concourse A configuration requires expanding the north terminal apron to accommodate FAA separation distance requirements provided in AC 150/5300-13A for the safe and efficient maneuvering of aircraft and ground support equipment. This apron expansion will provide for dual taxilanes that are necessary for the volume of aircraft traffic serving the proposed gates. The expanded apron will be striped to accommodate dual taxilanes along the outer edge of the expanded apron and be designed for ADG III through V aircraft.

Pavement expansion of approximately 500,000 ft^2 that allows for the construction of dual parallel taxilanes and three RON positions is included with the north apron expansion. Refer to **Figure 5** for the north apron expansion layout. This expansion will require clearing and filling of approximately 20 acres of existing airport property. Construction of a 24-foot wide asphalt haul road with guard rail is needed for vehicular access to the apron. Expansion of the north apron also requires the reclassification of 12 acres of airport land from non-aeronautical use to aeronautical use. After completion of the north apron expansion, temporary RON parking would be provided until the full build out of Concourse A.

Concourse and Gate Expansion

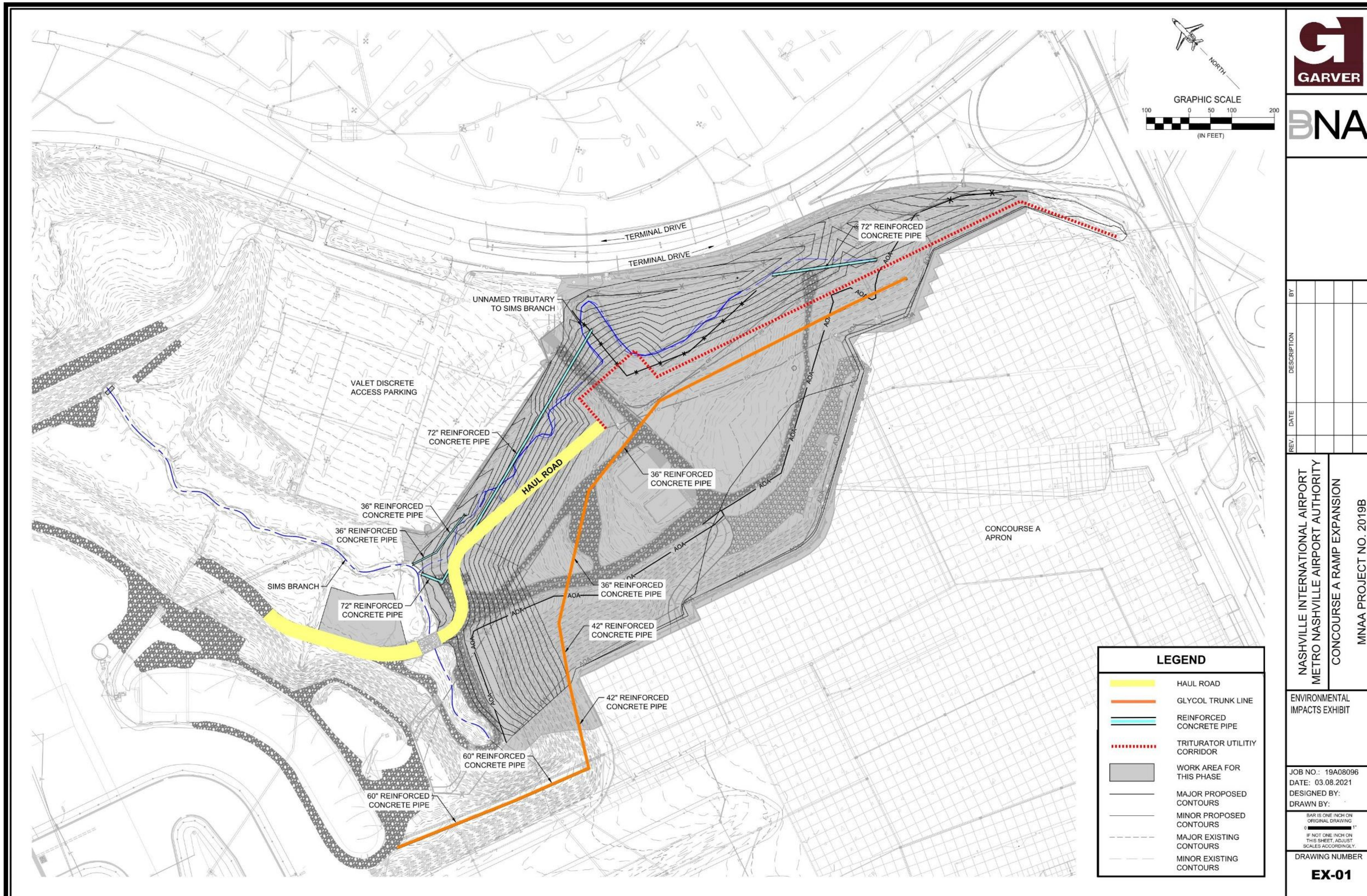

Figure 5: North Apron Expansion Overview

3.1.3 Terminal Expansion and Improvements (Amenities, Concessions, Ticket Lobby, Baggage Handling)

Redeveloped Concourse A will include approximately 34,200 ft^2 of concessions, 12,600 ft^2 of new restrooms (an increase from 3,799 ft^2 in the existing concourse) and ticket lobby expansion by 17,100 ft^2 (refer to **Figure 4**). Facility requirements for concessions is based on enplanements. The projected, facility wide concession areas are estimated to have an approximate 148,000 ft^2 deficit by the end of the 20-year planning period[9]; however, the net increase of 34,200 ft^2 in concession areas associated with redeveloped Concourse A will help offset that deficiency.

Concourse design will increase the overall passenger experience by providing additional amenities and reducing wait times at ticket and baggage handling facilities. **Figure 6** shows two baggage makeup units (BMU[10]) and a checked baggage inspection station (CBIS)/checked baggage reconciliation area (CBRA) with two explosive detection systems (EDS) that will be constructed under the proposed concourse on the ground level.

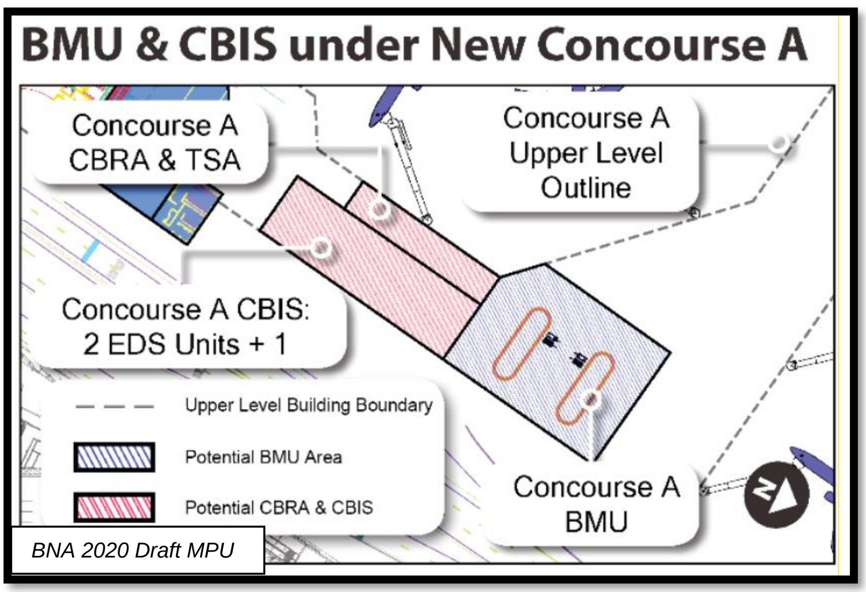

Figure 6: Baggage Makeup and Checked Baggage Inspection System Layout

[9] Concession facility requirements are documented in Chapter 4 of the MPU.
[10] BMU areas include tug and cart circulation, and staging areas.

3.1.4 Utility Relocations

Several utilities including water, sewer, electric, fiber optic, communications, heating and cooling, natural gas, and emergency generator(s) would be relocated within the expanded apron areas associated with Concourse A as shown in **Figure 7**. The fuel hydrant and distribution system would also be updated to accommodate the additional gates. A new 2-bay triturator[11] would be constructed on the north side of the expanded north apron. Deicing areas and collection facilities would be updated and include a new glycol treatment trunk line that would be installed parallel to the existing line north of Taxiway T2. The north apron expansion also includes waste glycol tank and oil/water separator(s) relocations and reconfiguration of the deicing locations.

3.1.5 Security Fence Relocation

Relocation of 2,000 linear feet of Airport Operations Area (AOA) security fence and partial security fence removal is required for the expansion and to accommodate the conversion of additional land to aeronautical use. Refer to **Figure 7** showing the relocated AOA fence. The relocated AOA security fence will meet standard design and signage criteria identified in FAA Advisory Circular 150/5370-10F *Standards for Specifying Construction of Airports.*

[11] A triturator is a waste disposal system designed to treat lavatory waste.

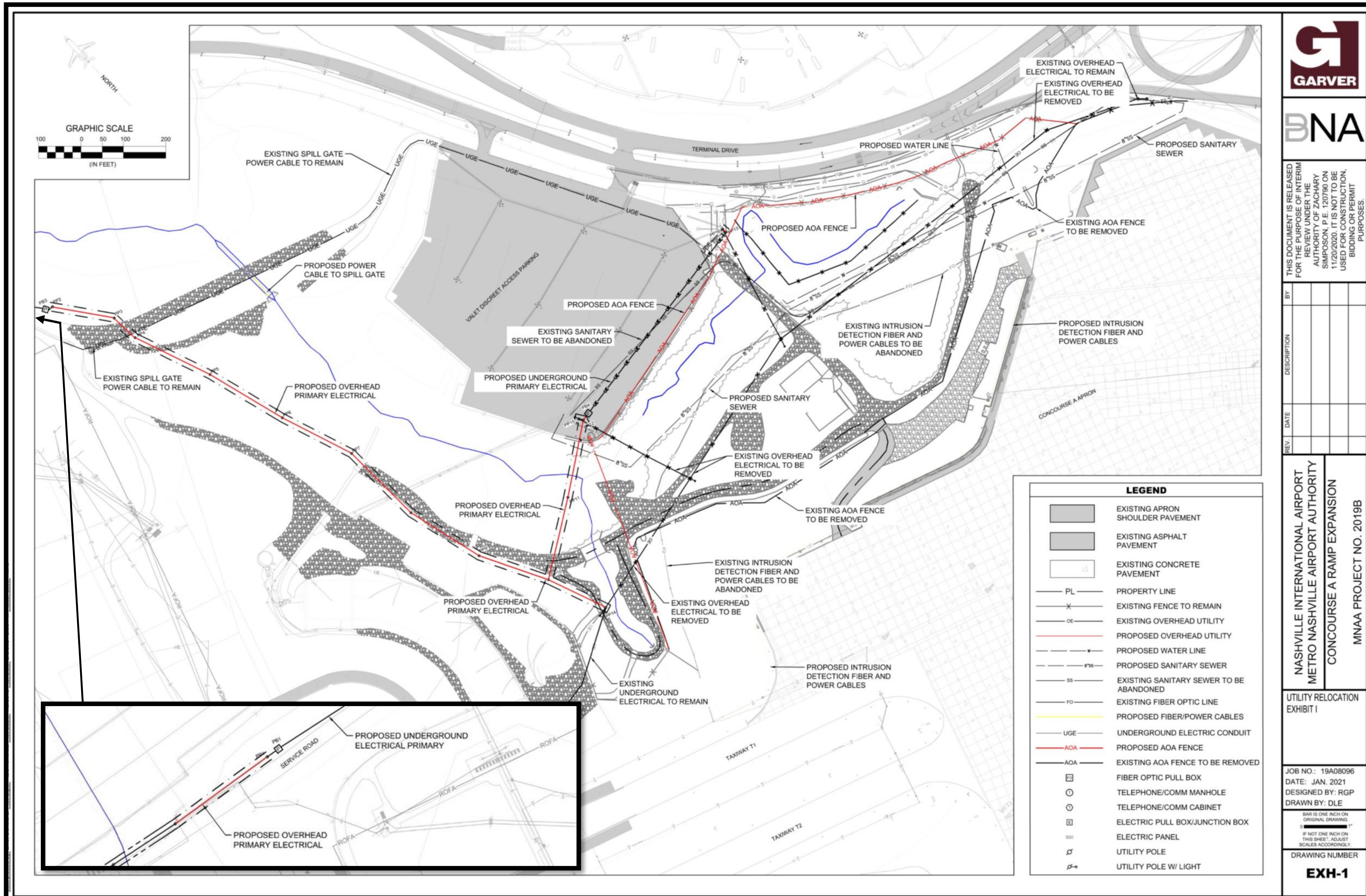

Figure 7: AOA Fence and Utility Relocations Overview

3.1.6 Stream Encapsulation and Stormwater Management

The Proposed Action requires encapsulation of approximately 1,627 linear feet of an intermittent jurisdictional unnamed stream tributary that is required to efficiently convey stream and stormwater flows under the expanded apron. As shown in **Figure 5**, the stream will be encapsulated into a 72-inch reinforced concrete pipe. Encapsulation is required as a result of apron expansion fill slopes needed to account for the significant changes in elevation (70+ feet) between the proposed apron surface and existing ground elevation along the meandering stream channel.

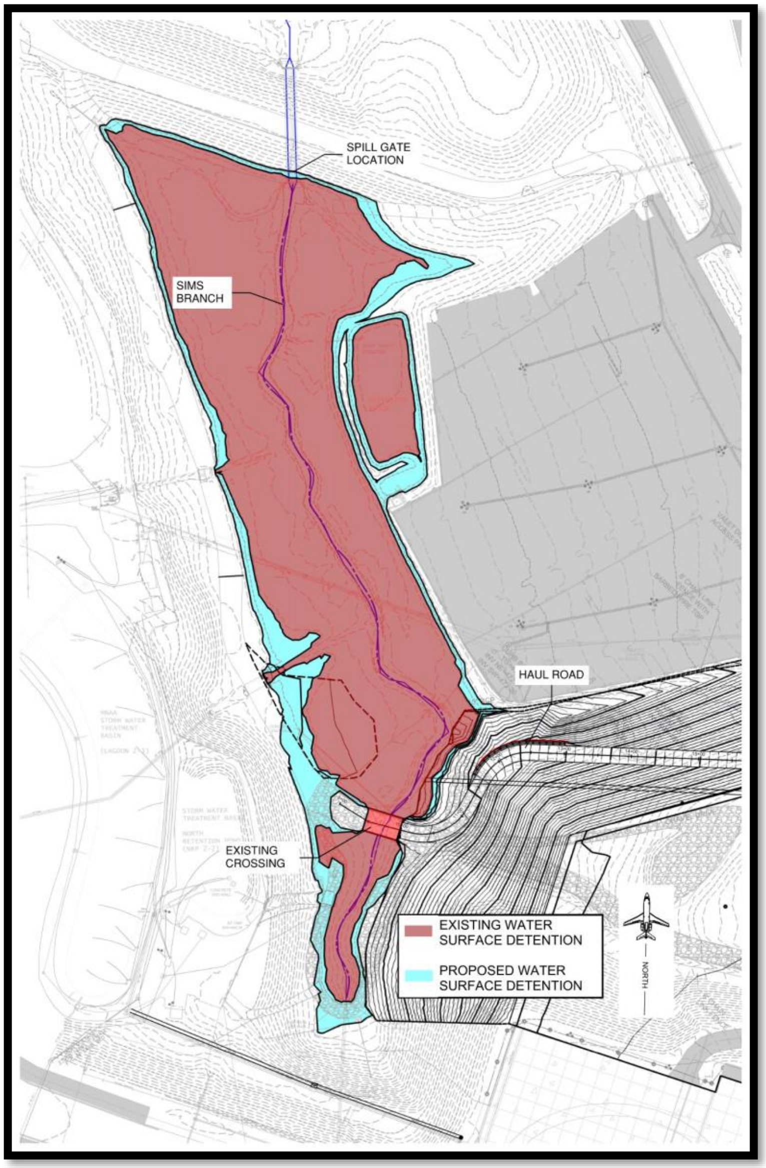

Figure 8: Proposed Stormwater Detention

Due to the increase in impervious area by approximately 500,000 ft^2, additional stormwater detention is required and being proposed downstream of the north apron expansion within an existing stormwater detention basin along Sims Branch (see **Figure 8**). A new outfall structure will be installed at the north end of the detention basin (at spill gate location) to provide additional storage capacity. This outlet structure will be constructed on existing pipes and will control flow into those existing pipes. No new pipes will be constructed. The existing basin's capacity would be increased to detain the appropriate 100-year storm event for the drainage area. Increasing the existing storage capacity would be achieved by modifying the outfall to raise the storage level by 1.8 feet. Due to the capacity increase of the existing stormwater detention basin, the Airport perimeter road will be raised vertically in one approximate 100-foot section located northwest of the existing crossing of Sims Branch.

3.1.7 Low Impact Development

The Proposed Action requires compliance with the Metro's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit[12]. As enacted by Metro Water Services (MWS) in compliance the MS4 permit, new developments are required to comply with Low Impact Development (LID) guidelines[13]. These guidelines are intended to satisfy MS4 permit requirements in addressing infiltration, evapotranspiration, and rainwater harvesting through incorporation of green infrastructure practices (GIP) that include bioretention, permeable pavements, strategies for infiltration and reuse, and reforestation[14]. LID guidelines require a variance and mitigation for projects that are not able to meet LID requirements on the site of the new development and is directly related to stormwater runoff generated by proposed actions.

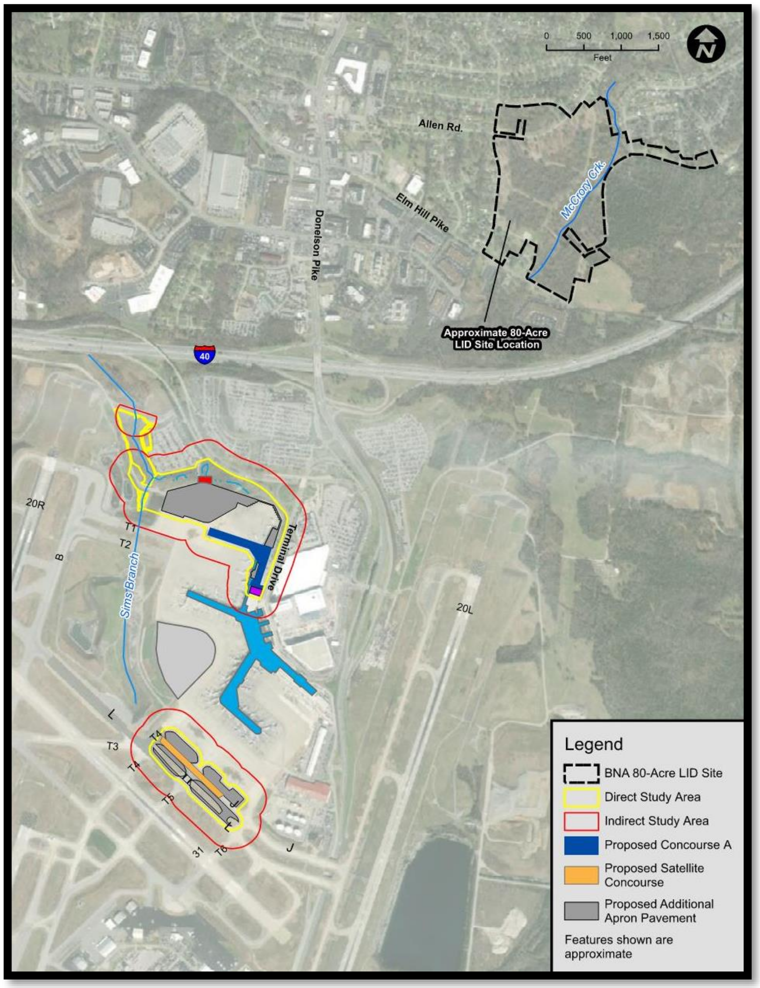

Figure 9: LID Site Location

The overall 80-acre LID off-site mitigation area shown in **Figure 9** was approved by FAA and evaluated in the Vision EA. A Memorandum of Agreement (MOA) between MNAA and MWS to comply with stormwater mitigation requirements of the MS4 permit for actions proposed at BNA was signed in 2018. Approximately 14.9 acres of the 80-acre LID mitigation area was utilized for mitigation of

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[12] Metro's MS4 permit No. TNS068047.
[13] Metro's Stormwater Management Manual, February 2016. _Nashville > Water Services > Developers > Low Impact Development_
[14] A *Low Impact Development (LID) Mitigation Bank Technical Report* was prepared by Garver in 2018 for MNAA.

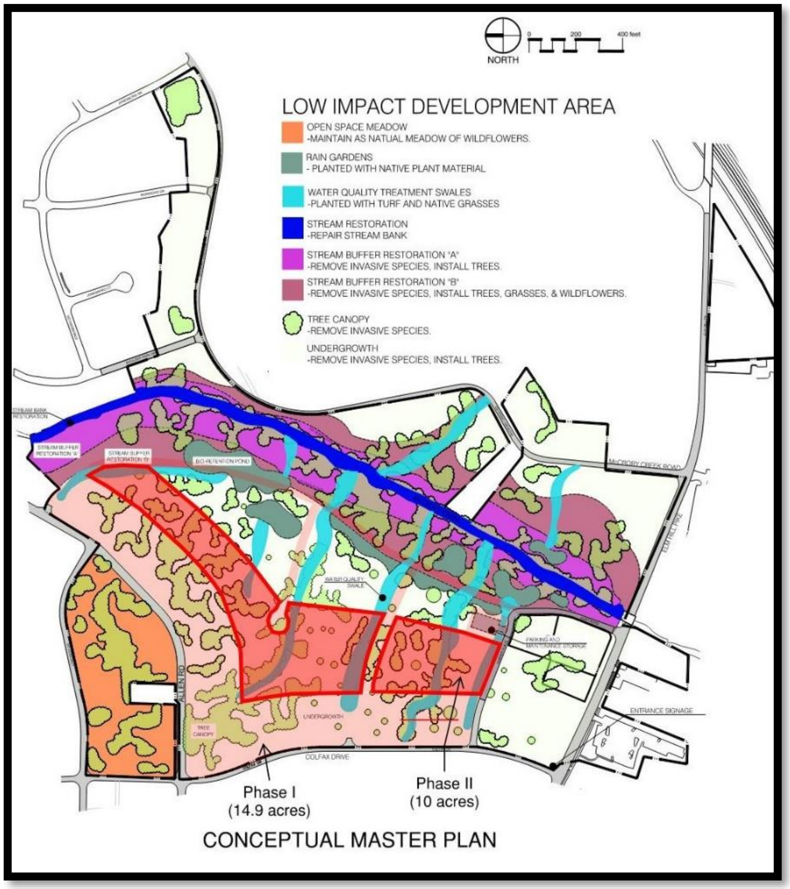


Figure 10: Proposed LID Site Layout

impacts associated with projects reviewed in the Vision EA and noted as Phase I in **Figure 10**. The LID site is owned by MNAA and is located along McCrory Creek northeast of the airport. Specific LID actions to be implemented are proposed to include invasive species removal. Invasive species proposed for removal include wild pear (*Pyrus* spp.), locust, privet (*Ligustrum sinense*), honeysuckle (*Lonicera* spp.) and wild rose (*Rosa multiflora*). No other LID actions are proposed.

The Tennessee Wildlife Resources Agency (TWRA) was contacted regarding potential effects on state-listed species. TWRA indicated they do not anticipate adverse impacts to state-listed species under their authority. In compliance with regulations related to restricting hazardous wildlife attractants on or near airports as documented in AC 150/5200-33C[15], off-site mitigation to meet LID requirements is proposed. Review of conceptual design layouts indicate the need to mitigate for approximately 435,600 ft^2 (10 acres) of development associated with the Proposed Action building structures. This area is identified as Phase II in **Figure 10**. Approximately 55 acres of the exiting LID site will remain usable for future projects at the airport.

3.2 Enabling Projects Consistent Between Alternatives

In addressing the needs identified in **Section 2.2** regarding terminal building improvements, the seven components of the Proposed Action that are described in this section were determined to be consistent between all alternatives considered. Construction of a satellite concourse and similar upgrades in Concourses B, C, and D would occur independent of the Proposed Action to meet the anticipated passenger use of the airport. Key components are discussed below.

[15] AC 150/5200-33C defines hazardous wildlife attractants on or near airports and defines land uses that have the potential to attract hazardous wildlife on or near public-use airports.

3.2.1 Concourse E: Satellite Concourse

As shown in **Figure 11**, Concourse E will be a new approximate 89,390 ft^2 satellite concourse that will add eight additional ADG III gates. Passengers will be transported between the terminal building and the satellite concourse via shuttle, by skybridge, or tunnel. The addition of the satellite concourse will include passenger boarding bridges and one mobile access point that is proposed at the main terminal, which will remove one gate from active use.

The new satellite concourse is proposed to be constructed over existing Taxiway J, as depicted in the MPU. Construction staging of Concourse A and the satellite terminal will result in a net offset of gate closures until both facilities are operational. The ultimate build-out of the new satellite concourse is identified in **Figure 11**.

Pavement expansion of approximately 170,000 ft^2 is required for the south apron expansion, which includes filling of 9.3 acres of infield grassed areas located between the existing terminal apron and Taxiway J. This expansion also includes decommissioning Taxiway J, demolition of the T5 connector taxiway and removal of an existing deicing pad.

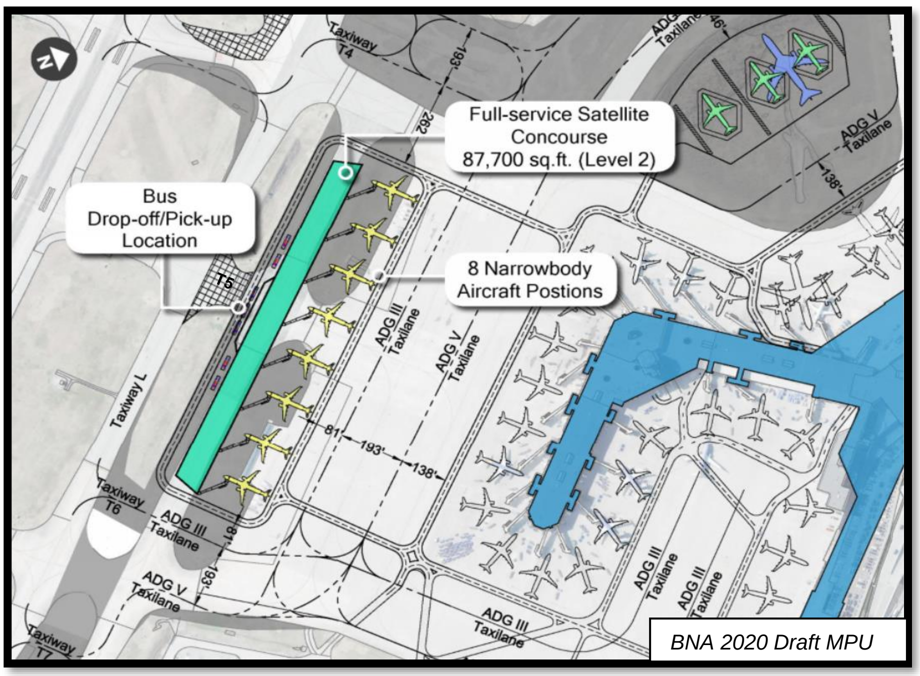


Figure 11: Proposed Action (Alternative 2) – Satellite Concourse

3.2.2 Amenities and Concessions

Public amenities that would be incorporated into the main terminal and associated with all build alternatives include the addition of restrooms, mediation rooms, lactation rooms, kids play areas, and other related spaces. Concession areas would be expanded through establishment of additional restaurant, food and beverage, and retailer spaces that would be included in the concourse design of each alternative. Additionally, a concession program is being implemented at the airport that will support similar concession costs as seen outside the airport.

3.2.3 Passenger Accessibility

Holdrooms and circulation areas would be expanded and redeveloped as part of concourse design for considered concourse alternatives. These expansions would be sized commensurate with the number of gates and passengers.

3.2.4 Ticket Lobby Expansion

The ticket lobby on the departures level (level 2) in the main terminal would be expanded to over 17,000 ft^2. All ticketing areas would be relocated and improved to provide more kiosks as technology moves toward the use of electronic device preferences.

3.2.5 Checked Baggage Inspection Systems (CBIS)

The CBIS to be improved by the Proposed Action include baggage screening and BMU. Outbound baggage systems would be redirected to tie into CBIS. Expansion of the CBIS was determined based on peak hour demand. These systems are proposed for expansion as demand increases through the 20-year planning period. The BMU that is connected to the CBIS in the main terminal would be expanded.

3.2.6 Taxiway Juliet Decommissioning

Because the satellite concourse would be considered an enabling project to any of the concourse expansion alternatives, a portion of Taxiway J would be decommissioned regardless of the selected alternative. The infield grassed areas would be paved and the Taxiway T5 connector would be removed from use. Aircraft would access the main apron via Taxiways T4 or T6.

3.2.7 Construction Support Areas

Use of additional airport-owned property for staging, mitigation, equipment storage, and/or as borrow and milling sites is proposed to occur. These areas were previously identified and approved by FAA in the Vision EA. The existing borrow and milling stockpile areas that are anticipated to be utilized for the Proposed Action are identified in **Figure 12.** The approximate 20-acre borrow site is currently being used as a staging and borrow area and has been completely disturbed in the past. The approximate 3.2-acre milling stockpile area is void of vegetation and has been utilized as a stockpile area for various projects at the airport since the late 1990’s.

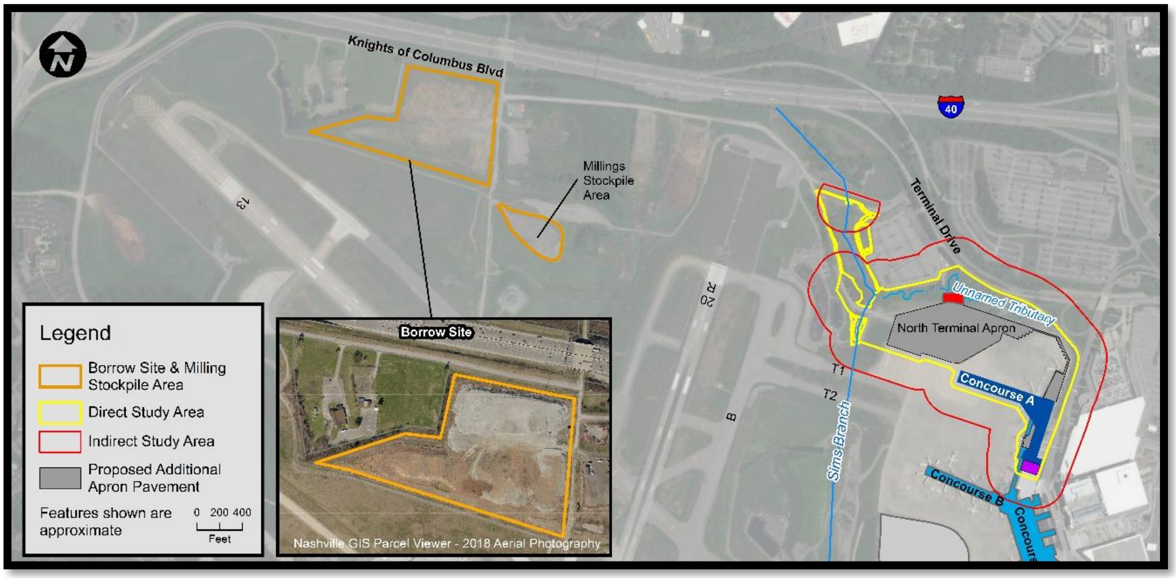


Figure 12: Borrow Site and Milling Stockpile Area

3.3 Proposed Action Construction Phasing

Before Concourse A is redeveloped, the satellite concourse would be constructed. The existing Concourse A will be demolished in one construction stage. Gate deficiencies will be mitigated by the opening of the satellite concourse. The Proposed Action is anticipated to be constructed in phases as outlined below:

- Satellite Terminal: 3rd Quarter 2021 – 2nd Quarter 2023
- South Apron and Taxiway connections: 1st Quarter 2022 – 2nd Quarter 2023
- North Apron: 3rd Quarter 2023 – 3rd Quarter 2025
- Concourse A Demolition/Construction (all gates): 3rd Quarter 2023 – 3rd Quarter 2025

4.0 Alternatives Considered and Dismissed

Five terminal gate redevelopment alternatives coupled with a satellite concourse were considered in achieving the purpose and need. Four of these five alternatives were dismissed and not carried forward for further review in this document due to greater environmental impacts, permitting and/or mitigation schedule risks, and failure to meet MNAA development objectives. The alternative carried forward is the Proposed Action described in **Section 3**. A No Action Alternative was also considered. The No Action Alternative will not meet the purpose and need for the project; however, it was retained to satisfy the requirements of NEPA and maintain a baseline to allow for a comparison of impacts.

As a result of temporary airline gate relocations during concourse construction, a satellite concourse is proposed as an enabling project and detailed in **Section 3.2**. Additionally, development and evaluation of a satellite concourse is described in detail in the MPU with further details. Three initial development options for the satellite concourse were evaluated in the MPU. An additional four satellite concourse access options were also evaluated in the MPU and included a skybridge, tunnel, and bus transfer options. Bus transfer options are the preferred options.

4.1 Alternatives Selection Criteria

Three key categories of selection criteria were identified during the alternative screening process. These selection criteria, which are outlined below and in detail in **Table 1**, were used to evaluate the Proposed Action (Alternative 2) and other alternatives. These elements were evaluated in meeting the purpose and need for the Proposed Action and alternatives and considers estimated footprints and conceptual layouts for alternatives.

4.1.1 Greater Environmental Impacts:

- Perennial stream impacts
- Business relocations related to the Ground Support Equipment (GSE)/Air Freight operational support buildings
- Hazardous material impacts
- Overall land disturbance
- Wildlife habitat impacts

4.1.2 Stream permitting and/or mitigation timeframes:

- Based on the estimated footprints of each conceptual alternative layout and evaluating the potential impacts for each, the alternatives analysis indicates that stream and stormwater impacts are likely the only resource impacts requiring mitigation.
- The permitting timeframe to mitigate for stream impacts within the same watershed would not meet the project schedule as noted in **Section 3.3**, thereby increasing the likelihood of encountering available mitigation credit shortages.

4.1.3 MNAA development objectives:

- Meet the needed gate capacity of 17 additional gates as identified in the Purpose and Need
- Provide for a full dual taxilane to service the additional gates
- Address existing Concourse A width deficiencies
- Provide for a double-loaded concourse to maximize the use of existing airport infrastructure and available space as consistent with the Airport's sustainability plan[16]

[16] As determined in the MPU, the *2017 Nashville International Airport Sustainability Plan Update* contains goals and objectives related to sustainability and maximizing use of existing infrastructure.

- Increase passenger experience by evaluating walking distances, and increasing amenities and concessions
- Meet the construction schedule outlined in **Section 3.3**

4.2 Alternatives Considered and Dismissed

The sections below briefly describe and compare potential impacts associated with the terminal gate development alternatives that were not carried forward in detailed evaluation in this Environmental Assessment (EA). **Figure 13** through **Figure 16** show alternatives considered and their respective study areas.

4.2.1 Alternatives 1A and 1B – Concourse A

Build Alternatives 1A and 1B are contained within the study area as shown in **Figure 13**. These alternatives provide two different layouts (see **Figures 14 and 15**) for expanding Concourse A, but neither satisfies the purpose and need by achieving the total required 65 gates by the year 2037. Additional concourse expansions beyond a satellite concourse would be required. Alternatives 1A and 1B components include:

- Concourse A would net one gate (in two different configurations)
- Alternative 1A would not address existing Concourse A width deficiencies, but Alternative 1B would
- Redeveloped concourse would remain a single-loaded concourse, continuing to restrict future development as a double-loaded concourse
- Would not require north apron expansion or dual taxilane
- Environmental impacts are equal to the Proposed Action; both incurring the fewest environmental impacts
- Would not provide new RON parking
- Walking distance is estimated at 1,800 feet

Figure 13: Alternatives 1A & 1B Study Area

Alternative 1A would expand the existing terminal and Alternative 1B would reconstruct the existing terminal. Both alternatives would utilize existing apron pavement, thereby not requiring expansion of the north apron, stream encapsulation, or additional stormwater management considerations. Relocation of the Airport Operations Area (AOA) security fence would not be required. Additionally, the conversion of additional land to aeronautical use would not be needed. Because these alternatives would require additional concourse expansions to meet the overall gate need, impacts to the construction phasing schedule could be realized by 2023. These alternatives were dismissed because neither satisfies MNAA development objectives.

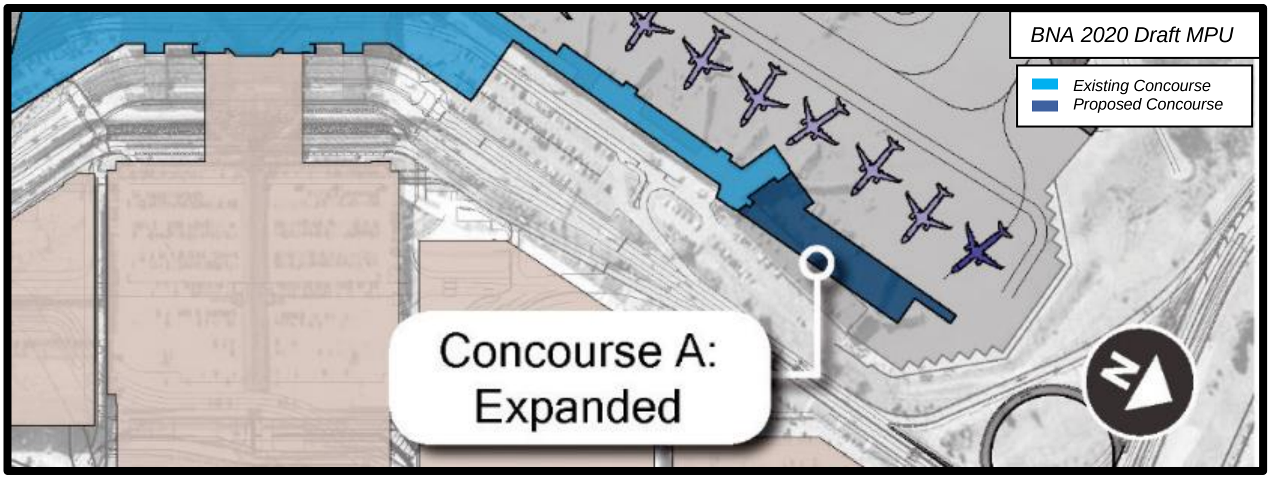


Figure 14: Alternative 1A Layout

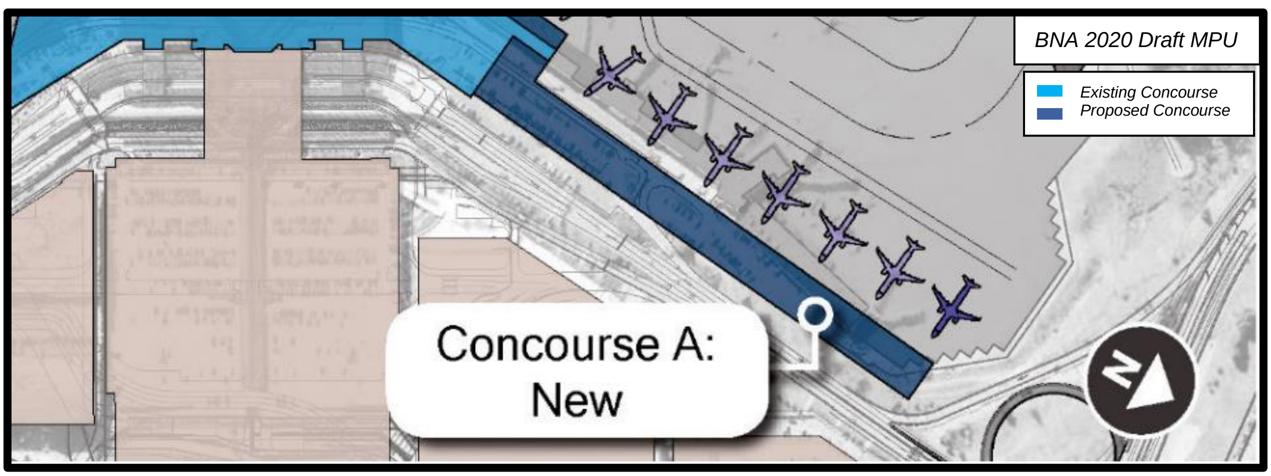


Figure 15: Alternative 1B Layout

4.2.2 Alternative 3 – Concourse B

Build Alternative 3 is contained within the study area as shown in **Figure 16**. There is one development layout for this alternative, which provides for a double-loaded concourse (see **Figure 17**). The alternative layout does not satisfy the purpose and need as it does not address Concourse A width deficiencies. Additionally, when combined with a satellite concourse, one additional gate would be needed to meet the 65 gates needed. Alternative 3 components include:

- Expansion by eight gates
- Provides a double-loaded concourse
- Would not address Concourse A width deficiencies
- Would not provide additional RON parking
- Walking distance is estimated at 1,625 feet
- Would incur similar stream impacts as Proposed Action
- Has less environmental impacts than Alternative 5 and greater impacts than Alternatives 1, 2, and 4

Figure 16: Alternative 3 Study Area

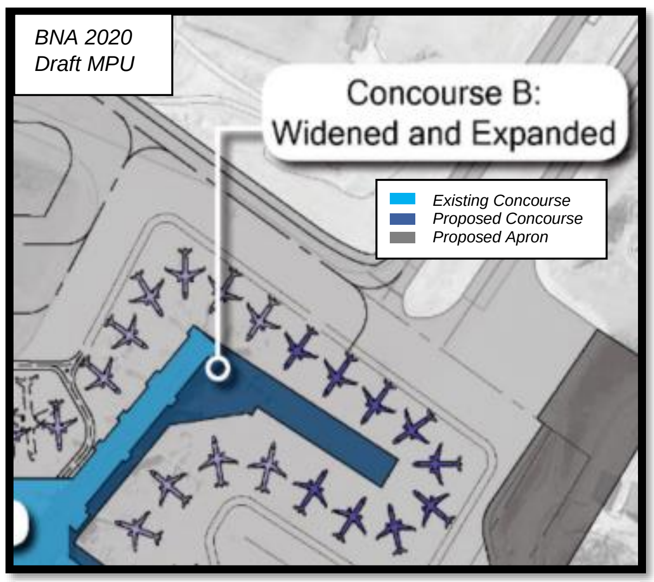


Figure 17: Alternative 3 Layout

Alternative 3 would build on the existing terminal end near Gate B-9 and extend north, requiring expansion of the north apron pavement. The apron expansion would include stream encapsulation and additional stormwater management considerations. Relocation of the AOA security fence and conversion of additional land to aeronautical use would also be required. Because this alternative would require an additional concourse expansion to meet the overall gate need, impacts to the construction phasing schedule could be realized by 2023. This alternative was dismissed because it does not satisfy MNAA development objectives and incurs environmental and permitting impacts.

4.2.3 Alternative 4 – Concourse C

Build Alternative 4 is contained within the study area as shown in **Figure 18**. One development layout was also considered for this alternative and provides for a double-loaded concourse (see **Figure 19**). The alternative layout does not satisfy the purpose and need for several reasons as noted below. When combined with the satellite concourse, additional concourse expansion alternatives would be required to meet the 65 gates needed. Alternative 4 components include:

- Expansion by four gates
- Provides a double-loaded concourse
- Would create aircraft circulation issues
- Requires west apron expansion to accommodate a dual taxilane
- Would not address Concourse A width deficiencies
- Would not impact RON parking
- Walking distance is estimated at 1,575 feet
- Would incur higher quality stream impacts than the Proposed Action and Alternatives 3 and 5
- Has less environmental impacts than Alternatives 3 and 5, but more than Alternatives 1 and 2

Figure 18: Alternative 4 Study Area

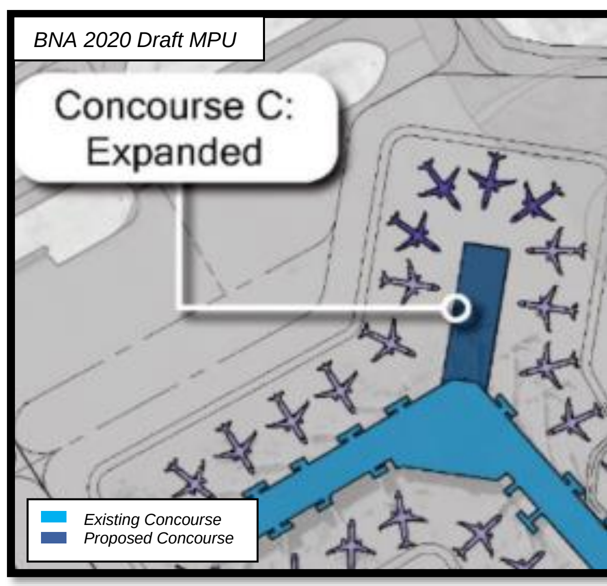


Figure 19: Alternative 4 Layout

Alternative 4 would build on the existing terminal end near Gate C-11 and extend west requiring expansion of the west apron pavement, which would include stream encapsulation of Sims

Branch and additional stormwater management considerations. This alternative would not require the relocation of the AOA security fence or conversion of additional land to aeronautical use. Because this alternative would require an additional concourse expansion to meet the overall gate need, impacts to the construction phasing schedule could occur. This alternative was dismissed because it does not satisfy MNAA development objectives and incurs environmental and permitting impacts.

4.2.4 Alternative 5 – Concourse D

Build Alternative 5 is contained within the study areas shown in **Figure 20**. One development layout was considered for this alternative (see **Figure 21**). The alternative layout does not satisfy the purpose and need as it does not provide the needed gates and when combined with the satellite concourse, additional concourse expansions would be required to meet the 65 gates needed. Alternative 5 components include:

- Expansion by three gates
- Would be a single-loaded concourse, continuing to restrict future development
- Incurs two relocations - Ground Support Equipment (GSE) and Air Freight (AF) Buildings, resulting in additional environmental impacts
- Requires access road improvements around the north side of the airport
- Would not address Concourse A width deficiencies
- Would not provide additional RON parking
- Walking distance is estimated at 2,050 feet
- Would incur stream impacts similar to Alternative 4
- Has more environmental impacts than all other build alternatives

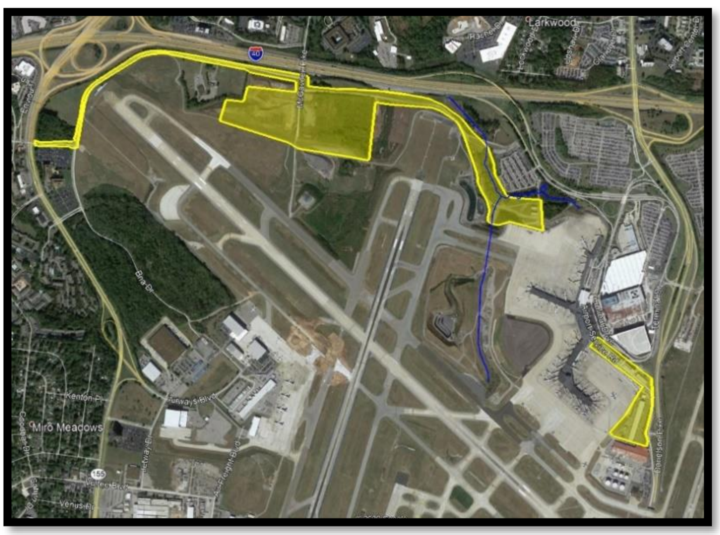


Figure 21: Alternative 5 Study Area

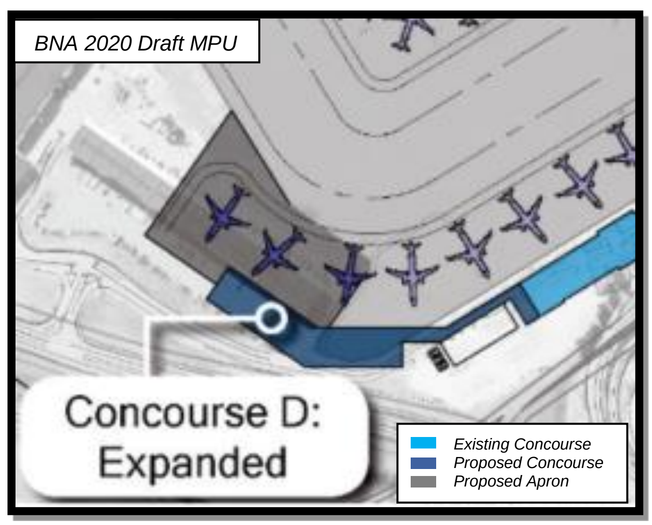


Figure 20: Alternative 5 Layout

Alternative 5 would build on the existing terminal end near Gate D-6 and extend south requiring relocation of the GSE and AF buildings. Available land on the north side of the airport between RW 20R and RW 13 was identified as a potential relocation area. Environmental impacts associated with relocating these facilities would include, but not be limited to stream encapsulation of Sims Branch and additional stormwater management considerations. This alternative would require the relocation of the AOA security fence and conversion of additional land to aeronautical use. Because this alternative would require an additional concourse expansion to meet the overall gate need, impacts to the construction phasing schedule could occur. This alternative was dismissed because it does not satisfy MNAA development objectives and incurs greater environmental and permitting impacts.

4.2.5 No Action Alternative

The No Action Alternative will not meet the purpose or need for the project; however, it was retained to satisfy the requirements of NEPA and maintain a baseline to allow for a comparison of impacts.

The No Action Alternative would not include construction of any proposed improvements. This alternative would retain existing facilities (i.e., 48 gates) and would not result in changes to the existing facilities thus, it does not provide adequate expansion to meet the purpose or need for the project. This alternative would not meet forecasted enplanements and would have a negative economic effect on the airport due to increased congestion and wait times and could result in a poor passenger experience.

Table 1 represents an impact screening matrix that evaluates the alternatives considered in achieving the purpose and need. See **Section 3.1** for a detailed description of the Proposed Action. This matrix summarizes the potential impacts of each alternative on the specific resources and takes into account development considerations. Weighting of associated impacts is based on a scale of one to five and accounts for the range of lowest to greatest impacts incurred per category. For example, the highest stream impact is 1,627 linear feet and would receive a score of 5 and the least impacts of 1,105 linear feet would receive a score of 1.

Table 1: Alternatives Impact Screening Matrix

Resource Category Impacted (Weighted Impact Factor)	Alternatives					
	No Action*	**1 Conc. A***	**2† Conc. A**	**3 Conc. B***	**4 Conc. C***	**5 Conc. D***
Passenger Experience - walking distance in feet	0 (0)	1,800 (2)	2,200 (5)	1,625 (1)	1,575 (1)	2,050 (4)
Development and Operations Objectives**	0 (0)	3 (10)	1 (2)	2 (6)	2 (6)	3 (10)
Provides Full Dual Taxiway****	No (5)	No (5)	Yes (0)	No (5)	Yes (2)	Yes (0)
Socioeconomic Impacts – Temporary Displacements*** – Environmental Justice Impacts	 0 (0) 0 (0)	 0 (0) 0 (0)	 1 (1) 0 (0)	 1 (1) 0 (0)	 1 (1) 0 (0)	 1 (1) 0 (0)
Relocations - number of businesses, entities	0 (0)	0 (0)	0 (0)	1 (2)	0 (0)	2 (10)
Land Use - zoned “CO” acres	0 (0)	0.3 (1)	12.6 (4)	8.5 (3)	12.5 (4)	16.7 (5)
Land Disturbance - unpaved acres	0 (0)	0.2 (1)	24.5 (2)	20.0 (2)	25.4 (2)	57.8 (5)
Biological Resources – Fish - LF of perennial stream – Wildlife Habitat - forested acres – Plants - acres of habitat	 0 (0) 0 (0) 0 (0)	 0 (0) 0 (0) 0.2 (1)	 0 (0) 6.7 (2) 21.3 (2)	 0 (0) 5.2 (1) 16.8 (2)	 1,105 (6) 0 (0) 22.2 (2)	 1,362 (15) 9.7 (5) 54.6 (5)
Federal T&E Habitat Present – Bat Species - forested acres – Nashville Crayfish - LF of perennial stream – Plant Species - acres of habitat	 0 (0) 0 (0) 0 (0)	 0 (0) 0 (0) 0 (0)	 6.7 (2) 0 (0) 4.1 (5)	 5.2 (1) 0 (0) 4.1 (5)	 0 (0) 1,105 (6) 0 (0)	 9.7 (5) 1,362 (15) 0.5 (1)
Hazardous Materials - fuel hydrants, tanks, oil/water separators, glycol tanks	0 (0)	0 (0)	10 (4)	13 (5)	9 (4)	3 (1)
Wetland Impacts - acres	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Stream Impacts - LF	0 (0)	0 (0)	1,627 (5)	1, 627 (5)	1,105 (1)	1,498 (4)
Floodplains/Floodway - acres	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Cultural Resource Impacts - number of sites	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)
Total Score of Weighted Impact Factor:	**N/A**	**20**	**34**	**39**	**35**	**87**
Higher scores are representative of greater impacts. Impacts are based on estimated likelihood of impacts from conceptual layouts provided in the 2020 MPU.						

* Does not meet purpose or need.
** Based on MNAA objectives for future sustainable development. The two objectives considered in this category include meeting gate capacity and providing a double-loaded concourse. Score of 1=meets both objectives, 2=meets one objective, 3=does not meet either objective.
*** Temporary displacements anticipated as a result of concourse demolition until construction of the new concourse is complete.
**** Full dual taxilanes address aircraft circulation. 0=dual taxilanes, 2=dual taxilanes with inefficiencies, 5=no dual taxilanes
† Proposed Action – Refer to Section 3 for detailed descriptions.
Borrow site and milling stockpile area impacts are included in this table.

5.0 Affected Environment, Environmental Consequences, and Mitigation

5.1 Introduction

This section describes the existing environmental conditions of the study area with the impacts of the alternatives combined under resource headings. Resources were identified and impacts evaluated according to FAA Orders 1050.1F, 1050.1F Desk Reference, and 5050.4B. This analysis, although brief, is a summary of in-depth evaluation of the respective resource impacts associated with Alternatives 2 (Proposed Action). As described in **Section 4.2**, the No Action Alternative is retained to satisfy the requirements of NEPA and provide an environmental baseline for the build alternatives. Agencies consulted during preparation of the EA also contributed to the evaluation of the potential effects on specific resources. The study area consists of an area totaling approximately 156 acres in size and is described below in detail.

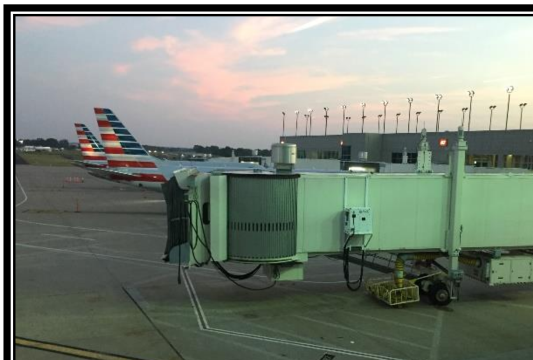
5.2 Study Area

The Vision 1.0 EA documented public use of the airport; therefore, the larger study area for this EA includes the greater Nashville area as identified in **Figure 1**. The expanded area is needed to adequately assess the level of travelers utilizing the airport. To adequately assess potential direct and indirect impacts incurred by the Proposed Action, this EA will focus on the study area specifically shown in **Figure 2**. The indirect study area is defined as the area in which visual effects could be observed and includes a 250-foot buffer around the direct (ground disturbance) study area. The indirect study area also includes areas in which audible impacts could occur because of noise level increases as identified in **Section 5.12**. Each resource may have its own study area.

The descriptions, photographs, and figures in this section depict current conditions within the study area and the areas that will be affected as the project moves forward through design and into construction. **Figure 22** (Study Area and Affected Environment Overview) shows the location where each photograph shown below was taken. The elevation differences between the north apron and undeveloped areas range from 30 to 80 feet. The direct study area is approximately 56.5 acres in size and includes portions of existing terminal aprons connecting to Taxiways T1 and T2, existing Concourse A, portions of the north side of Concourse B, and extends between T4 and T6 between the south apron and closed Taxiway J. The study area contains the following resources:

Commercial passenger terminal facilities▼ – Existing Concourse A contains nine gates, hold rooms, circulation areas, three restrooms, two restaurants, vending, and an art display area.

PH1 – Concourse A entrance from main terminal.



PH2 – Concourse A gates looking north.

Airfield▼ – Aprons, taxiways, airfield lighting, pavement markings, and signage.

PH3 – Existing north apron and Concourse A gate.

PH4 – Existing north apron with Concourse A right.

Support facilities► – Airport Rescue and Fire Fighting (ARFF), airport administrative areas, and maintenance facilities (two sand/salt buildings are shown in photograph 5).

PH5 – Existing sand/salt buildings.

PH6 – Service roads near north apron.

◄**Access and circulation** – On-airport access and service roads. The existing north apron is located to the right in the photo, which is over 50 feet higher in elevation relative to the point where this photograph was taken.

Utilities► – Water, stormwater, sanitary sewer, deicing facilities (i.e., waste glycol tank), heating and cooling, electric utilities, fuel transfer lines and pumps, and oil/water separators.

PH7 – Waste glycol tank facility on north apron.

PH8 – Confluence of Sims Branch & Stream 2.

◄**Natural resources** – Streams, undeveloped wooded areas, steep embankments.

Concourse and Gate Expansion

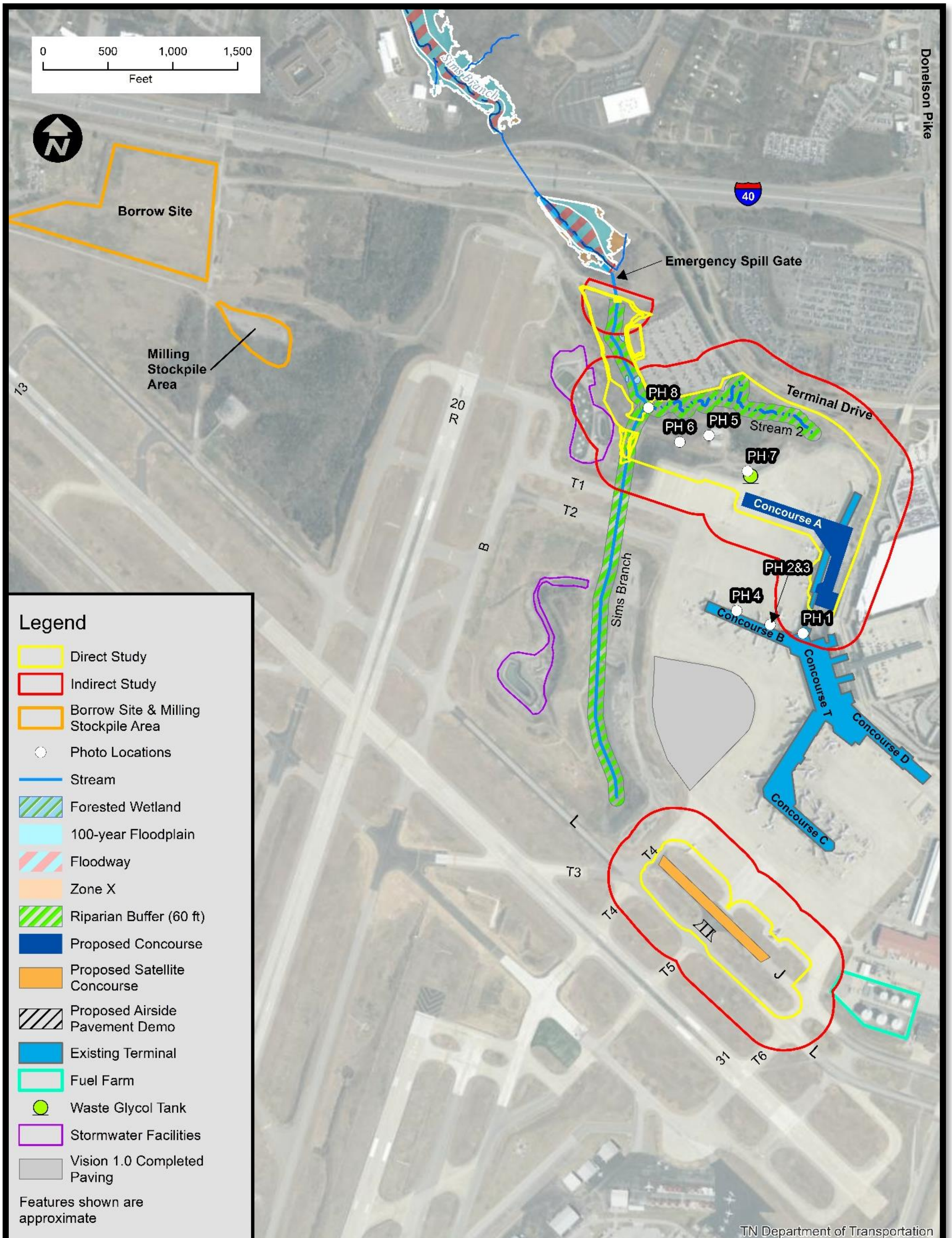


Figure 22: Study Area and Affected Environment Overview

5.3 Impact Assessment

Impact assessment includes documenting resource agency comments and concerns regarding agency-managed resources that may be affected by the project. On May 11, December 18, and December 21, 2020, letters were sent to applicable local, state, and federal agencies to assess the level of environmental consequences based on the purpose and need of the project. **Appendix B** contains agency correspondence. The Proposed Action and No Action Alternatives will not affect the below-listed resources.

- Coastal Resources – The project is not located in a coastal area
- Wild and Scenic Rivers – There are no Wild and Scenic Rivers in the project vicinity
- Farmlands – There are no farmlands in the project vicinity
- Environmental Justice (EJ) – There are no EJ populations impacted by the project

Resources potentially impacted by the Proposed Action and the No Action Alternatives are evaluated in this section in accordance with FAA Order 1050.1F. This section identifies direct and indirect effects of these alternatives.

As mentioned previously, an LID site currently owned by the airport is proposed for use as mitigation for stormwater impacts associated with the Proposed Action. A portion of the LID's remaining 65 acres will be utilized for offsetting stormwater impacts for compliance with Metro's MS4 program. The LID site is described in more detail in **Section 3.1.7**.

5.4 Air Quality

The US Environmental Protection Agency (EPA) established National Ambient Air Quality Standards (NAAQS) under the Clean Air Act (CAA) for six main pollutants: ozone, nitrogen dioxide, sulfur dioxide, carbon monoxide, lead, and particulate matter (PM_{10} and $PM_{2.5}$). Under the CAA, each state is required to implement a State Implementation Plan (SIP). Conformity to the SIP is required to be reviewed for the Proposed Action. In accordance with FAA Order 5050.4B and the 1050.1F Desk Reference, air quality impacts were evaluated for the Proposed Action.

EPA's response is included in **Appendix B** and includes recommendations to follow the SIP requirements and documenting applicable regulatory air quality requirements, attainment status and potential impacts to air quality, as well as avoidance and minimization.

5.4.1 Affected Environment

Davidson County is currently within an "attainment" area for all air quality standards as determined by the EPA; therefore, the General Conformity Rule does not apply. Additionally, the Vision 1.0 EA included a detailed review of air quality monitoring stations, concentrations, and regulations pertaining to the Vision 1.0 projects. However, due to the increase in aviation operations and construction activities associated with the Proposed Action, potential air quality impacts were evaluated for existing and future conditions.

5.4.2 Environmental Consequences

As documented in the air quality analysis report in **Appendix C** (HMMH, 2021), an analysis of the demolition of Concourse A and aircraft operation emissions was completed for the Proposed Action. The respective timeframes of demolition, square footage, and construction schedule were taken into account. As documented in the Vision 1.0 EA, air quality monitoring is conducted by the City of Nashville as part of their Air Pollution Control Program.

No Action Alternative

The No Action Alternative would not include construction activities and therefore, construction air emissions would not occur. Air operations would increase based on projected enplanements in the future but would be limited to the airport's existing gate capacity. As a result, the 2035 future No Action operations were included in the air quality analysis for comparison to the Proposed Action. The Aviation Environmental Design Tool (AEDT) was utilized to evaluate aircraft operational effects of the No Action Alternative.

- Direct Impacts

The No Action Alternative would result in increases in aircraft operations consistent with the limitations of the existing gate capacity and air traffic taxiway configurations. Taxi times were evaluated the same as the Proposed Action. Results of the 2021 air quality analysis performed by HMMH for operational emissions indicate the criteria air pollutant values will increase for all pollutant values as a result of the No Action Alternative. However, the increase between the No Action Alternative and Proposed Action emissions would be below EPA *de minimis* thresholds of significance.

- Indirect Impacts

Indirect air quality effects as a result of delayed queuing times and access to available gates are anticipated to be similar to the Proposed Action and discussed in the Proposed Action's indirect impacts section.

Proposed Action

- Direct Impacts

The Proposed Action would result in increases in aircraft operations that include auxiliary power units and ground support equipment (HMMH, 2021). The Airport Cooperative Research Board's Airport Construction Emissions Inventory Tool (ACEIT) was utilized to estimate construction emissions for each action (i.e., concourse and apron demolition and construction). Each major demolition and construction component of the Proposed Action was evaluated with respect to the six previously identified criteria air pollutants. The Proposed Action demolition and construction activities were evaluated for short-term changes in air emissions from construction equipment such as haul trucks, and site clearing and grading equipment. On-road vehicles evaluated included transport and delivery vehicles that would deliver materials and equipment to and from the site and construction worker trips. Additionally, fugitive dust emissions were evaluated for the

Proposed Action that included site preparation, land clearing, material handling, equipment movement and evaporative emission from asphalt paving operations. The above-listed activities and equipment were expected to occur over a 5-year construction timeframe. Results of the 2021 air quality analysis performed by HMMH for construction emissions is detailed in **Appendix C** and summarized in **Table 2** below and indicates that while criteria air pollutant values will increase as a result of the Proposed Action, they are below EPA *de minimis* thresholds; therefore, construction emission impacts are anticipated to be below the level of significance.

Table 2: Construction and Demolition Emissions Summary

Year	Criteria Pollutant Emissions (tons/year) EPA *de minimis* threshold = 100 tons/year for all listed pollutants					
	CO	**VOC**	**NO_2**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
2035	2.4	0.3	1.7	0.01	0.5	0.1
2022	6.5	0.9	3.1	0.03	1.5	0.2
2023	11.8	1.1	4.6	0.05	1.1	0.3
2024	29.8	1.9	4.9	0.04	0.6	0.1
2025	17.8	0.9	3.9	0.05	0.6	0.1

AEDT was utilized to evaluate aircraft operational impacts of the Proposed Action. Results of the study by HMMH indicate that, although criteria air pollutants due to aviation operations would increase for all pollutant values for the Proposed Action, they are below EPA *de minimis* thresholds; therefore, operation emission impacts are anticipated to be below the level of significance. Refer to **Table 3** for a summary of the results provided in the HMMH air quality analysis.

Table 3: Operational Emissions Summary

Year	Criteria Pollutant Emissions (tons/year) EPA *de minimis* threshold = 100 tons/year for all listed pollutants					
	CO	**VOC**	**NO_2**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
2035 No Action	1,102.0	141.0	1,185.0	90.3	11.8	11.7
2035 Proposed Action	1,124.0	143.0	1,223.0	92.9	12.1	12.1
Net Change	**+22**	**+2.0**	**+38**	**+2.6**	**+0.3**	**+0.4**

- Indirect Impacts

Indirect effects on air quality on and around the airport are anticipated based on projected growth of the Nashville area and are associated with construction and increased operations. However, as part of the City's Air Pollution Control Program, monitoring of air permits and new developments is undertaken which helps ensure compliance with NAAQS. Reviewing overall air quality data that is continually monitored by the Tennessee Department of Environment and Conservation (TDEC) and the Metro Public Health Department was conducted and evaluated as part of the air quality analysis. Ambient air quality data from EPA[17] for 2017 to 2019 were reviewed for criteria air pollutants in three locations closest to the airport, all of which show existing pollutant levels below the NAAQS thresholds of significance.

- Mitigation and Best Management Practices (BMPs)

Air quality impacts resulting from the implementation of the Proposed Action or No Action Alternative are anticipated to be below threshold levels of significance; however, the airport will work toward goals included in the MPU through Envision[18]

5.5 Biological Resources

5.5.1 Affected Environment

The United States Department of the Interior, Fish and Wildlife Service (USFWS), Tennessee Wildlife Resources Agency (TWRA), and TDEC were consulted early during the development of this EA. Agency responses are located in **Appendix B**. The study area for Biological Resources is considered the direct and indirect study areas as shown in **Figure 22**. A larger study area was retained for evaluating water quality associated with aquatic species and includes the entirety of Sims Branch downstream of the indirect study area until flowing off airport property.

Existing conditions on and surrounding the airport are consistent with a growing metropolitan area. The study area contains fragmented forested areas from highly developed industrial, commercial, and residential developments. The majority of the direct study area (approximately 49.8 acres of the 56.5 acres total) is previously developed/disturbed by grading, taxiway and apron paving, and access roads. Additionally, the 20-acre borrow site was entirely disturbed within the past few years. **Figure 22** shows that approximately 12% of the study area would be considered undisturbed, natural environment. Overall, the ground disturbance study area provides limited biotic resources within the undisturbed wooded riparian zone of an unnamed intermittent tributary (Stream 2 in **Figure 22**). There are several areas within the study area with maintained lawn grasses; however, the study area is dominated by impervious surfaces and fill slopes. The direct study area also contains a small, vegetated fringe around the existing stormwater detention basin centered on Sims Branch. No ground disturbance is proposed within this area around and along Sims Branch, with the exception of improvements to the stormwater outfall structure.

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[17] EPA out-door air quality values were obtained from: *https://www.epa.gov/outdoor-air-quality-data/monitor-values-report*
[18] Institute for Sustainable Infrastructure developed Envision

Fish

Within the study area, Sims Branch (Stream 1) is a perennial stream, which flows through an existing stormwater detention basin, and is surrounded by fill slopes. This reach of Sims Branch is listed as impaired (dissolved oxygen and anthropogenic substrate alterations) by TDEC. This stream originates just south of Taxiway T4 and flows north along the west apron to its confluence with Stream 2 within the study area before continuing downstream and under Interstate 40. Stream surveys conducted in 2017 (Amec Foster Wheeler), 2019 and 2020 (Wood) within Sims Branch through the entirety of its on-airport length, documented aquatic invertebrates but no fish south of the study area. However, during a Stream Assessment by Wood (Feb. 2020), biologists observed central stonerollers (*Campostoma anomalum*), creek chubs (*Semotilus atromaculatus*), and a darter species (*Etheostoma* sp.) in Sims Branch within the existing stormwater basin portion of the study area. The substrate of Sims Branch varies from bedrock, to rocky riffles, to soil.

Stream 2 flows west to its confluence with Sims Branch within the northern portion of the study area and is predominantly disconnected with intermittent pools and does not provide habitat for fish populations for extended periods of time. Stream assessments performed for Stream 2 at various times of the year over the past two years have not revealed fish species within the stream. The substrate consists of gravel and soil in the upper reaches and gravel, cobble, and bedrock in the lower reaches.

Wildlife

The presence of wildlife is limited at BNA by lack of habitat available within airport property. The majority of available habitat within the APE lies along Sims Branch and Stream 2 in an area zoned for conservation by the City of Nashville (*Nashville & Davidson County Community Character Manual*). This area consists of approximately 10.5 acres of mixed hardwood forest surrounded by some maintained grassland intersected by roads and a utility right-of-way. Wildlife which could be expected in the area include small mammals, birds, reptiles, amphibians, and terrestrial and aquatic invertebrates. The riparian zone along Sims Branch within the study area is routinely maintained by the removal of understory vegetation but contains mature hardwood species as identified below.

The indirect study area for assessing the affected environment for wildlife species includes auditory effects that reach farther out from the airport. Available wildlife habitat around the airport is also fragmented due to residential, commercial, and industrial developments. Tracts and small portions of forested areas would offer the most habitat for wildlife species in this setting.

Concourse and Gate Expansion

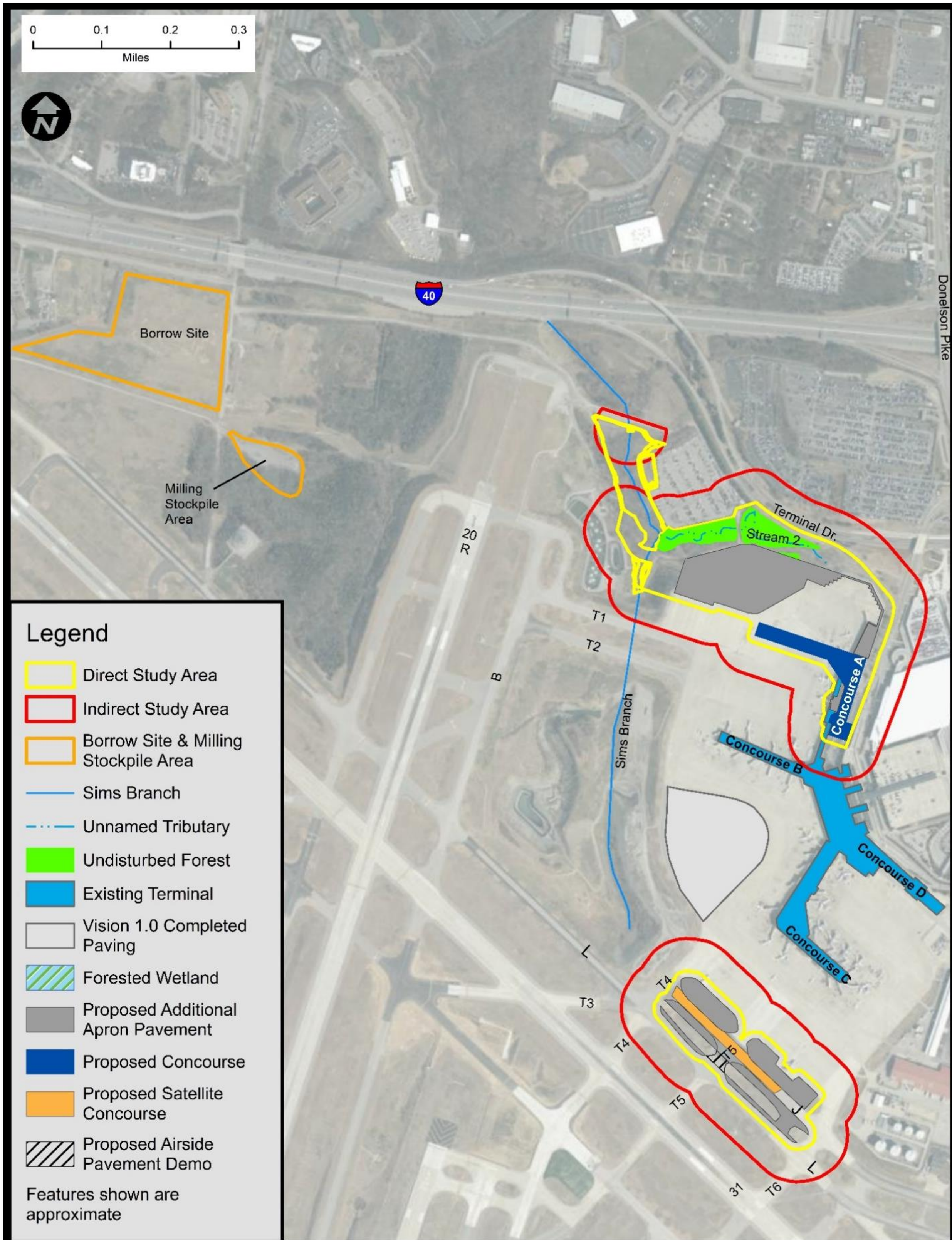

Figure 23: Biological Resources - Study Areas and Features

Plants

Outside of the conservation zone in the northern portion of the study area (along the two streams), vegetation is mostly herbaceous with maintained lawn grasses. The undisturbed forested areas within the study area are fragmented and isolated with no direct connection to other off-site forested habitat. Vegetation within this area has been documented by Wood and KS Ware as mixed hardwood forest with open to vegetated understory. Species composition includes: box elder (*Acer negundo*), black willow (*Salix nigra*), bush honeysuckle (*Lonicera maacki*), Chinese privet (*Ligustrum sinense*), eastern cottonwood (*Populus deltoides*), and American sycamore (*Platanus occidentalis*). The borrow site has developed some early successional herbaceous vegetation (approximately 3.3 acres) around its fringes. Suitable habitat for several federally listed threatened and endangered species and state listed rare species of plants were identified as potentially occurring within the study area, which are identified in **Tables 4** and **5**, respectively.

Federal and State Listed Species

The USFWS listed nine threatened or endangered species, identified in **Table 4**, as potentially occurring within Davidson County, which include: Gray Bat (*Myotis grisescens*), Indiana Bat (*Myotis sodalis*), Northern Long-eared Bat (*Myotis septentrionalis*), Nashville Crayfish (*Orconectus shoupi*), Braun's Rock-cress (*Arabis perstellata*), Guthrie's Ground-plum (*Astragalus bibullatus*), Leafy Prairie-clover (*Dalea foliosa*), Price's Potato-bean (*Apios priceana*), and Short's Bladderpod (*Physaria globose*). Potential habitat does occur within or adjacent to the direct study area for the Indiana Bat, Northern Long-eared Bat, Nashville Crayfish, and Price's Potato-bean. There is no designated critical habitat located within the project area. The official IPaC (Information for Planning and Consultation) list provided by the USFWS is located in **Appendix D**. The borrow site does not contain any suitable habitat for any listed federal or state listed species.

The Nashville Crayfish, which is endemic to the Mill Creek watershed, has potential to inhabit Sims Branch and has been observed in Sims Branch downstream and outside of the direct study area. Two biological assessments provided in **Appendix D** have been conducted to survey for the Nashville Crayfish within the study area; both resulted in no observations of the endangered species. In 2019 the USFWS proposed the Nashville Crayfish for delisting as a result of increased and robust populations of the species documented within the Mill Creek Watershed[19].

Potential habitat for the Indiana Bat and Northern Long-eared Bat occurs in the riparian zones along both streams. These species could use trees suitable for roosting (peeling bark, crevices, or cavities), during the summer season in addition to using the area for foraging. During early project planning, the USFWS indicated that the airport is outside the buffer zone of known federally listed bat roosts and does not have any concerns associated with bats or other federally listed species, except the Nashville Crayfish.

[19] *Proposed delisting of Nashville crayfish | U.S. Fish & Wildlife Service (fws.gov)*

Table 4: USFWS Federally Listed Species Within the Ground Disturbance Study Area

Species	Habitat Requirements	Habitat Present within Ground Disturbance Study Area
	Mammals	
Gray Bat** (*Myotis grisescens*)	Primarily use caves throughout the year, although they move from one cave to another seasonally. Males and young of the year use different caves in summer than females. Smaller colonies also occasionally roost under bridge structures.	No caves or mine portals were observed in or near the project area.
Indiana Bat** (*Myotis sodalis*)	Primarily use caves for hibernacula, although they are occasionally found in old mine portals. During summer, colonies are found behind slabs of exfoliating bark of dead trees, often in bottomland or floodplain habitats, but also in upland situations.	The ground disturbance study area may contain trees suitable for roosting. No caves or mine portals were observed in or near the project area.
Northern Long-eared Bat* (*Myotis septentrionalis*)	In winter, Northern Long-eared bats use caves, mine portals, abandoned tunnels, protected sites along cliff lines and similar situations that afford protection from cold. They are easily overlooked as they often wedge themselves back into wall cracks.	The ground disturbance study area may contain trees suitable for roosting. No caves or mine portals were observed in or near the project area.
	Crustaceans	
Nashville Crayfish** (*Orconectes shoupi*)	Inhabits well oxygenated flowing streams with clean bedrock or rocky bottoms. Large rocks are preferred for reproduction and molting. It is endemic to the Mill Creek Watershed.	Sims Branch and tributaries within the study area are located in the Mill Creek Watershed. Sims Branch exhibits bedrock and rocky habitat with moderate flow. Biological assessments in July 2017 and September 2019 did not discover any specimens.
	Plants	
Brauns Rock-cress** (*Arabis perstellata*)	Mesic forests with steep north-facing slopes with soils derived from limestone often with limestone outcrops. Prefers areas with little competition of scour, erosion, or animal disturbance.	Although there are some areas of mesic forest in the study area, they do not exhibit steep slopes with limestone outcrops.

Species	Habitat Requirements	Habitat Present within Ground Disturbance Study Area
Guthrie's Ground-plum** (*Astragalus bibullatus*)	Inhabits cedar glade ecosystems where it prefers the margins with deeper soils.	There are no cedar glade ecosystems located in the study area.
Leafy Prairie-clover** (*Dalea foliosa*)	Inhabits limestone glades with thin soil near stream, seeps, or other sources of seasonal moisture.	There are no limestone glades located in the study area.
Price's Potato-bean* (*Apios priceana*)	Inhabits open, mixed-oak forests, forest edges and clearings on river bottoms and ravines.	The study area exhibits forest edges along the unnamed tributary, which could support Price's Potato-Bean.
Short's Bladderpod** (*Physaria globosa*)	Prefers dry cedar glades, limestone cliffs, talus areas, or steep rocky slopes.	There are no dry limestone or cedar glades, talus areas, or steep rocky slopes located in the study area

*Federally listed threatened species. **Federally listed endangered species.

TDEC identified six state listed species as potentially occurring the area of the Proposed Action. Potential habitat for the state listed American Ginseng may occur within the study area. Refer to **Table 5** for state listed rare species within the Mill Creek watershed. Additionally, coordination with TWRA was completed for state-listed species. TWRA adopted, by reference, federally-listed species and state-listed species protection under Tennessee Rule 1660-01-32. Correspondence with TWRA indicated the Nashville Crayfish has been documented approximately 0.8 miles downstream of the APE in Sims Branch and that previous airport activities have adversely impacted the species. TWRA requested consultation with the USFWS regarding potential impacts to the Nashville Crayfish. Refer to **Section 5.5.2** for a discussion on coordination with the USFWS and results of a Biological Assessment completed for the Nashville Crayfish. TWRA also reviewed the LID site with respect to state-listed species, which are protected under Tennessee Code Annotated § 45-229.

Table 5: TDEC State-Listed Species Within the Ground Disturbance Study Area

Species	Habitat Requirements	Habitat Present within Ground Disturbance Study Area
	Birds	
Blue Heron - Rookery (*Ardea herodias*)	Nesting colonies are often located on islands or in wooded swamps in large trees; often in cypress trees.	There are no large bodies of water or swamps with large trees in the study area.
	Planarian	
A Cave Obligate Planarian (*Sphalloplana buchanani*)	Inhabits aquatic environments within caves.	No caves are located in the study area.
	Crustaceans	
Nashville Crayfish* (*Orconectes shoupi*)	Inhabits well oxygenated flowing streams with clean bedrock or rocky bottoms. Large rocks are preferred for reproduction and molting. It is endemic to the Mill Creek Watershed.	Sims Branch and the unnamed tributary. Sims Branch exhibits bedrock and rocky habitat with moderate flow. Biological assessments in July 2017 and September 2019 did not discover any specimens. The unnamed tributary is intermittent and does not provide required habitat.
	Plants	
Limestone Fameflower (*Talinum calcaricum*)	In habits limestone glades typically on outcrops or edges of outcrops.	There are no limestone glades located in the study area
Water Stitchwort (*Stellaria fontinalis*)	Found in wet limestone glades along streams or seeps.	There are no cedar glade ecosystems located in the study area.
American Ginseng (*Panax quinquefolius*)	Inhabits hardwood or mixed forests with moderate moisture and rich soil preferable over limestone parent material.	Mixed forest with moderate moisture is located along the unnamed tributary of Sims Branch at the north end of the study area.

*Federally listed endangered species.

5.5.2 Environmental Consequences

This section describes environmental consequences to biological resources for the Proposed Action and No Action Alternatives.

No Action Alternative

The No Action Alternative would not directly or indirectly impact fish, wildlife, or plant species within the study area as conditions related to air quality, noise, and water quality would change according to airport growth.

Proposed Action

- Direct Impacts

The north apron expansion will directly impact 1,627 linear feet of intermittent stream habitat (Stream 2) by filling and rerouting stream flows through a fully enclosed 72-inch reinforced concrete pipe (RCP) and partial open channel. However, the Proposed Action will have no direct impacts to the Nashville Crayfish.

Direct impacts to 6.7 acres of wooded areas will decrease available habitat for bat, bird, reptile, and mammal species habitat. **Table 6** provides information on impact quantities for each federal and state listed species. Vegetation removal is consistent with the airport's Wildlife Hazard Management Plan (WHMP) by removing potential hazardous wildlife attractants on the airport in accordance with AC 150/5500-33C.

The proposed capacity increase of the existing stormwater detention basin adjacent to the north apron may cause temporary flooding of Sims Branch within the basin after heavy rains. However, as this area already functions as a detention basin, little to no new impacts to Sims Branch are anticipated.

The south apron expansion will not impact any stream habitat or forested areas. Approximately 8.4 acres of in-field grassed areas between Taxiways T4 and T6 will be impacted by paving activities.

A Biological Assessment (BA) for the Nashville Crayfish was completed for the Proposed Action and submitted to the USFWS. The USFWS responded to the Proposed Action review request in January 2021 and provided justification as to why the Proposed Action adequately addresses potential direct, indirect, and cumulative effects to federally listed species and their habitats. This response is contingent upon three factors that included documentation of lack of presence of the Nashville Crayfish in the unnamed tributary. The two other factors are identified in the mitigation and BMPs section below.

TWRA determined that the Proposed Action is not anticipated to adversely impact state-listed species under their authority.

No known Northern Long-eared Bat maternity roost trees are within or near the project area according to the USFWS; therefore, the final 4(d) rule[20] would be in effect because the project will not result in purposeful take of the species.

Direct impacts associated with Price's Potato Bean and American Ginseng habitat is not anticipated due to the low-quality habitat. Additionally, coordination with the USFWS and TWRA did not reveal any concerns associated with Price's Potato Bean or American Ginseng, nor was additional information requested for these species.

Refer to the USFWS official IPaC list and USFWS correspondence located in **Appendix D**.

Table 6: Impact Summary of Federal and State Listed Species

Species	Acres of Habitat Present within Ground Disturbance Study Area	Acres of Impact for Proposed Action
Gray Bat*	0	0
Indiana Bat*	6.7	6.7
Northern Long-eared Bat*	6.7	6.7
Nashville Crayfish*	0	0
Brauns Rock-cress*	0	0
Guthrie's Ground-plum*	0	0
Leafy Prairie-clover*	0	0
Price's Potato-bean*	4.1	4.1
Short's Bladderpod*	0	0
Blue Heron - Rookery	0	0
A Cave Obligate Planarian	0	0
Limestone Fameflower	0	0
Water Stitchwort	0	0
American Ginseng	6.7	6.7

*Federally listed threatened or endangered species.

- Indirect Impact

The Proposed Action would include some benefits to biological resources by preventing streambank erosion within Stream 2, which could lead to downstream sedimentation of Nashville Crayfish habitat in Sims Branch. An emergency spill gate located at the downstream end of the

[20] According to Section 7 of the Endangered Species Act, Section 7 consultations are required, but streamlined for federal actions that may affect the species but that will not cause a prohibited take.

study area will also remain in-tact, providing a layer of water quality protection for downstream environments. Additionally, potential light emissions generated from the new Concourse A are anticipated to be minimal as a result of adhering to lighting standards and the fact that much of the viewshed of the new concourse is already illuminated by airport and street lighting.

The expansion of noise levels generated as a result of the Proposed Action is considered in determining indirect effects on wildlife around the airport. Noise analysis results indicate the 65 dB day-night sound level (DNL) would expand only by approximately 27 acres surrounding the entire airport. As noted previously, much of the surrounding land contains fragmented wildlife habitat and thus, indirect effects of noise levels on area wildlife are anticipated to be minimal.

- Mitigation and BMPs

In compliance with the USFWS response, the use of water quality control measures to prevent sedimentation and water quality effects downstream of the Proposed Action and an agreement to relocate crayfish from the direct areas of stream impacts is required. Mitigation for impacts to these aquatic resources is discussed in detail in **Section 5.15**. Best Management Practices (BMPs) will be installed prior to construction and maintained in accordance with the Airport's Industrial Stormwater Pollution Prevention Plan (SWPPP) per NPDES regulations, and in compliance with the anticipated Section 404, 401, and 402 permits, and Aquatic Resources Alteration Permit (ARAP). A construction SWPPP will be required prior to construction. Forested habitat clearing minimization and seasonal clearing restrictions are mitigation options that can be incorporated for habitat impacts.

5.6 Climate

Climate is addressed in this separate section of the EA per the Order 1050.1F and Desk Reference. According to FAA guidance, the EPA data indicates that the aviation industry contributes 4.1% of the world's green-house gas (GHG) emissions. The Council on Environmental Quality (CEQ) developed guidance on reporting GHG emissions and NEPA guidance. However, FAA has not identified significance thresholds.

5.6.1 Affected Environment

The study area for evaluating GHG is considered the greater Nashville area. In accordance with the CAA and Executive Order (EO) 13514, air quality and GHG emissions were determined for the Proposed Action. A qualitative analysis of the existing GHG emissions was completed for the Proposed Action's demolition and construction activities and operational emissions. This analysis performed by HMMH can be found in **Appendix C**.

No Action Alternative

The No Action Alternative would not change the current and projected GHG emissions and air quality.

Proposed Action

- Direct Impacts

No GHG emission impacts from construction activities associated with the Proposed Action would occur based on the analysis performed. GHG increases based on construction and aircraft operational activities were documented to comprise a very small fraction of the baseline emissions for Nashville and Davidson County (HMMH, 2021).

- Indirect Impacts

As there are no direct impacts to GHG emissions, indirect impacts from the Proposed Action would not occur.

5.7 Department of Transportation, Section 4(f)

Section 4(f) of the Department of Transportation (USDOT) Act of 1966[21] protects important public resources including public parks, recreation areas, wildlife or waterfowl refuges of national, state, or local significance, and historic sites. Land and Water Conservation Funds (LWCF) can also be applied to park properties; however, the LWCF Coalition website[22] indicates the Metro Soccer Complex has not received federal LWCF funding grants.

5.7.1 Affected Environment

The Metro Soccer Complex is a public recreation park located adjacent to the airport's eastern property boundary with access from Donelson Pike. This soccer complex is open between dawn and 11pm and overall park features include seven unlit soccer/football fields, portions of a multi-use trail with workout stations, restrooms, and associated parking. The park is owned by Metro's Industrial Development Board and was established in 1999.

Approximately 0.60 acre of the Metro Soccer Park is located within the indirect or auditory study area associated with the Proposed Action's noise contours as shown in **Figure 24**. The indirect study area is considered the difference in the 65 DNL noise contour between the No Action and Proposed Action alternatives. Park uses within the indirect study area include portions of a multi-use trail around an on-site pond located partially within the park boundaries. No soccer fields, football fields, or workout stations along the trail and within the park property are located in the indirect study area.

[21] Refer to 49 U.S.C. Section 303 for the US Department of Transportation Act of 1966.
[22] LWCF Coalition's website: *Map of LWCF — The Land and Water Conservation Fund (lwcfcoalition.org)*.

No Action Alternative

- Direct Impacts

Based on the results of the noise analysis performed for the No Action Alternative, approximately 29.2 acres of the park would fall within the estimated 65 DNL sound level contour generated by aircraft at the airport in the year 2035.

Proposed Action

- Direct Impacts

The 65 DNL noise level contour falling within the park is projected to expand by approximately 0.60 acre as a result of the anticipated increase in aircraft accommodated by the Proposed Action. Because the park is located on the side of existing runways and not within direct flight patterns, the 65 DNL sound level contour is anticipated to expand only by 18 feet compared to the No Action Alternative's 65 DNL sound level contour. The airport does not seek acquisition of the park property located within the 65 DNL expansion contour. The Proposed Action does not rise to the level of constructive use[23] of the Metro Soccer Park and will not harm the protected features, qualities, or activities that make the park important for recreation under Section 4(f).

[23] Constructive use includes proximity impacts that substantially impairs the features or attributes of the property that qualify the property for protection as described further in *23 CFR Section 774.15*.

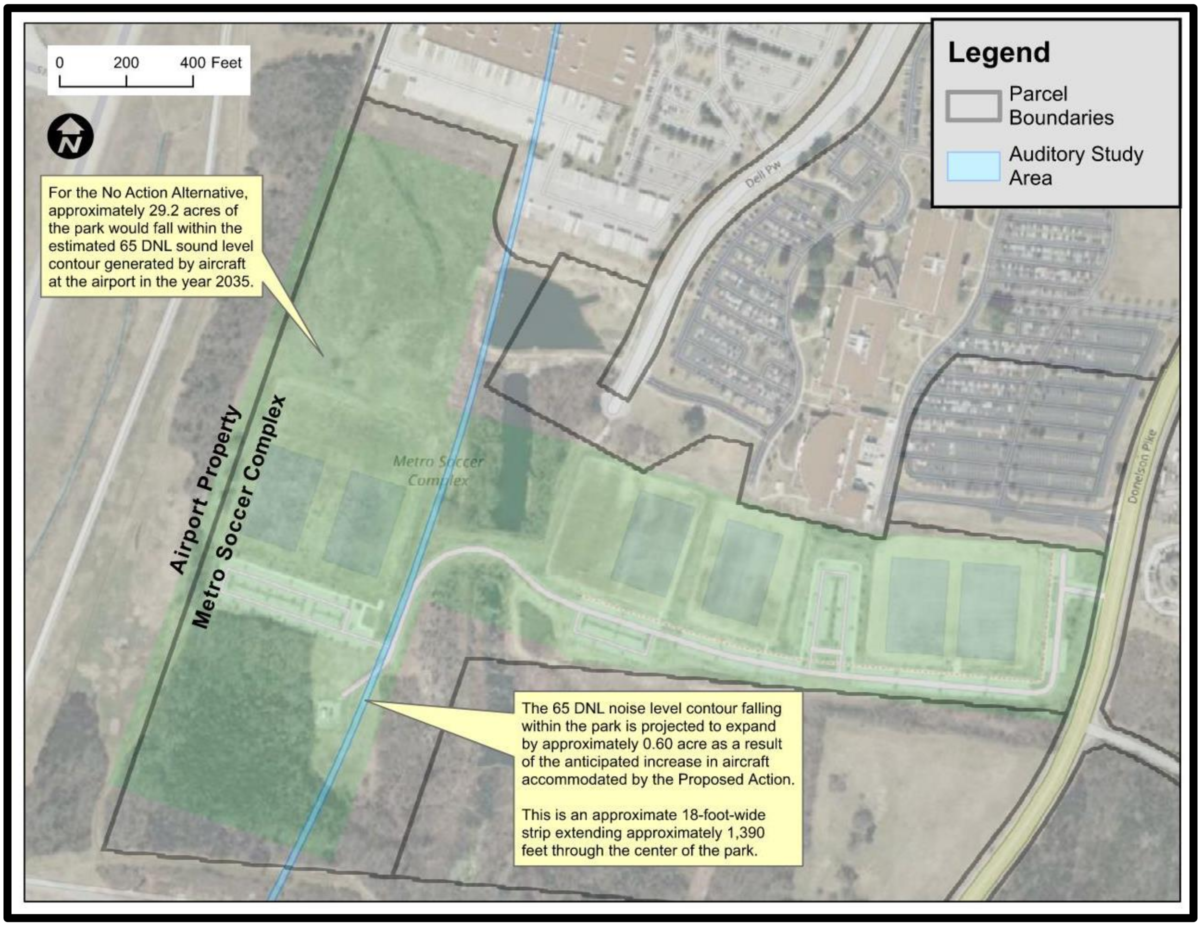

Figure 24: Section 4(f) Property and Indirect (Auditory) Study Area

5.8 Hazardous Materials, Solid Waste, and Pollution Prevention

Federal actions require consideration of hazardous material, solid waste, and pollution prevention impacts in NEPA documentation. Principal laws regulating the handling and disposal of hazardous materials, substances, and wastes that apply to FAA under guidance in Order 1050.1F include the Resource Conservation and Recovery Act (RCRA), as amended by the Federal Facilities Compliance Act of 1992; CERCLA, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA or Superfund); the Community Environmental Response Facilitation Act of 1992; the Pollution Prevention Act of 1990; and the Toxic Substances Control Act of 1976 (TSCA), as amended.

5.8.1 Affected Environment

The airport meets the oil storage capacity and other requirements listed in 40 CFR Part 112, and, as such, has prepared and implemented a Spill Prevention Control and Countermeasures (SPCC) plan. Additionally, MNAA has over 100 tenants and lessees operating independent businesses at

BNA and these tenants/lessees may also store and/or handle oil products in quantities that subjects them to federal regulation. MNAA makes every reasonable effort, through routine inspections and regular communication with tenants, to ensure that tenants are aware of and follow appropriate regulations.

The airport's fuel farm is located adjacent to the south end of the study area, approximately 0.2 mile southeast of Concourse D and approximately 450 feet east of the Proposed Action's satellite terminal. An underground fuel distribution system is used primarily to fuel aircraft at each gate where fuel hydrants are located. Mobile refuelers are also in use to service aircraft, as needed (MNAA SPCC, 2016). There are several active fuel lines currently located within the APE that carry aircraft fuel between the fuel farm and the gates. A 10,000-gallon capacity aboveground storage tank (AST) containing E36 aviation fuel is also located near the north edge of the existing north apron. **Figure 25** depicts the location of the underground fuel hydrant and distribution system and other petroleum products stored on-site.

The types of oil-products controlled by MNAA that are subject to SPCC regulations currently being stored, processed, or consumed include aviation fuel, diesel fuel, motor and lubrication oils, and small amounts of other miscellaneous oils. All bulk oil storage containers operated by MNAA have secondary containment. The secondary containment is accomplished by either an impervious secondary containment dike or by double-walled steel tanks.

The APE also contains a glycol dump tank (see **Figure 25**) at the north edge of the existing north apron, much of which is designated as a deicing area.

Lead-based paint (LBP) is another hazardous material known to occur at the airport and has been detected within the painted components (i.e. piping) at the facility (Frost Environmental Services, LLC., 2017).

The Vision 1.0 EA documented 21 remediation sites within a one-mile radius of the airport and there are several sites that are identified by TDEC within the airport property; however, none of the sites are located within the proposed project area. There are no National Priorities List sites near the project area.

Coordination with the TDEC Division of Remediation (DOR) indicates there are several reported sites on file with DOR; however, none of the sites are within the study area. Two closed sites (SRS190349 and SRS190793) were reported by DOR as located adjacent to the study.

Solid Waste

The airport generates typical industrial, construction, and municipal solid wastes that are disposed of by private waste management companies contracted by MNAA. For disposal of recyclable paper, cardboard, plastic, and metal, MNAA contracts the Metropolitan Nashville Department of Public Works Curby program. BNA recycled approximately 7% of total waste in 2010. The airport also recycles lamps/lighting, tires, batteries, and debris from maintenance and construction and demolition projects.

Pollution Prevention

The airport accomplishes pollution prevention through the implementation of a site-specific SPCC, industrial SWPPP, and individual NPDES permit. The airport's individual NPDES permit and SPCC have identified several potential pollution sources at BNA, some of which occur within or adjacent to the study area, such as aircraft anti-icing/deicing, aircraft fueling, aircraft lavatory services, building and grounds maintenance, cargo handling, chemical storage, construction areas, equipment cleaning/degreasing, equipment fueling, equipment storage, fuel storage, ground vehicle fueling, ground vehicle washing, pesticide/herbicide storage, runway anti-icing/deicing, and salt and sand storage and usage (ERM, 2016). Specifically, a waste glycol dump station and salt and sand storage areas are currently located on the north side of the north apron.

Sims Branch flows north through the existing stormwater basin in the study area. Uncontrolled spills and stormwater runoff from the BNA aprons could discharge to Streams 1 and 2 and eventually enter Mill Creek from the one identified storm water outfall within the study area.

5.8.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, no impact to hazardous materials, solid waste, or pollution prevention are expected to occur. MNAA would continue to operate its facilities in compliance with the same regulations associated with transport, storage, and use of existing hazardous materials as it does today. No increase in stormwater runoff or pollution would be expected by the No Action Alternative. Deicing operations would continue to occur as they have, which have the potential to affect the streams within the study area in the event of a spill or if unrecovered fluid enters these streams.

Proposed Action

- Direct Impacts

The Proposed Action will require that additional fuel systems be installed within the study area, particularly within the Concourse A expansion/redevelopment areas as well as the lines extending to the satellite concourse. The Proposed Action will require relocation of the waste glycol dump station tank and existing oil/water separators (OWS); however, it is not anticipated to introduce new regulated substances not currently utilized by the airport.

DOR site SRS190349 included underground storage tank removals that received a no further action letter from DOR. The Proposed Action will have no effect on this previously documented site. Although DOR site SRS190793 is located outside the ground disturbance study area, groundwater monitoring well (MW) #8 is located within the indirect study area as shown in **Figure 25**. MW #8 will be avoided by the Proposed Action.

The Proposed Action is evaluated in direct response to increasing aircraft capacity, which will cause an increase in the demand for aircraft fuel and/or other materials utilized for aircraft maintenance. The addition of any regulated substances will be stored and used in accordance with Federal, state, and local regulations. Modifications to existing infrastructure (i.e., existing trench drain system around the terminal gates), and associated storm water systems will be completed, as applicable, to manage stormwater drainage at the airport. Moreover, the existing SWPPP and SPCC will be updated to ensure compliance with local, state, and Federal regulations. The existing emergency spill gate located at the north end of the study area will continue to be utilized in the event of spills draining to Sims Branch.

In addition, existing discharge permits will be modified as needed to ensure compliance with local, state, and Federal regulations. Runoff from the aircraft deicing process will continue to be stored and treated in accordance with the airport’s SWPPP. The airport’s SWPPP will be updated as necessary to reflect potential changes in runoff due to the Proposed Action.

Short-term and temporary impacts will occur as a result of construction activities for the Proposed Action and include the temporary increase of petroleum fuels on-site that are utilized by construction equipment and trucks. Any temporary fuel tanks or the temporary storage of other regulated materials will comply with Federal, state, and local regulations.

Demolition of the entire existing Concourse A (110,353 ft^2) is required for redevelopment and the solid waste generated from the demolition and construction activities be handled and disposed of in accordance with applicable laws and regulations.

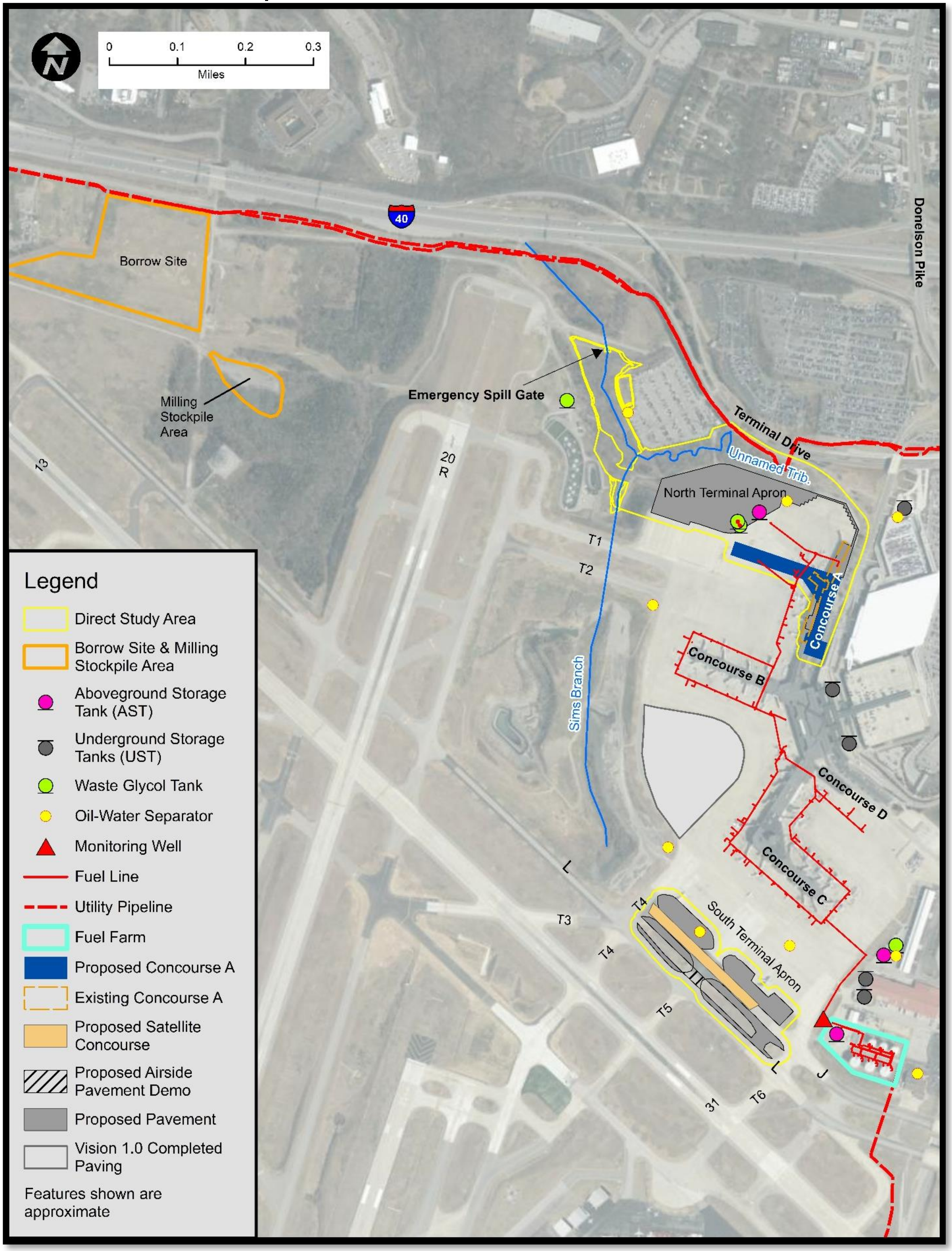

Figure 25: Hazardous Materials

During construction grading activities associated with the Proposed Action, especially at the north apron, the primary potential pollutant is sediment and silt entering storm water and receiving waters at the airport. This could affect biotic communities on airport property or downstream of the airport. However, prior to initiating construction activities associated with the Proposed Action, MNAA will obtain permit coverage under the Tennessee General Permit (No. TNR10-0000) for Storm Water Discharges from Construction Activities. As required by the Permit, a site-specific SWPPP will be developed and implemented for the Proposed Action and borrow site.

- Indirect Impacts

Indirect impacts associated with increased fuel storage and other regulated substances due to proposed increased aircraft capacity would occur. Refer to **Section 5.11** for more detailed discussion related to natural resource usage.

The Proposed Action will result in additional municipal solid waste by the operation of the new concourses and would include residual trash or garbage generated by passengers and staff. Solid wastes would be collected and disposed of according to current guidelines. No problems are anticipated to meet applicable Federal, state, and local regulations regarding solid waste management or disposal.

Potential indirect impacts on the water quality of downstream environments are discussed in **Section 5.15**.

- Mitigation and BMPs

General Construction BMPs (including silt fences, check dams, and other controls as appropriate) will be incorporated into construction plans to help prevent erosion and protect water quality in compliance with local erosion and sediment control regulations. Construction BMPs for the Proposed Action will include designating specific areas for construction equipment staging, maintenance, and fueling. These areas will be designed to provide appropriate secondary containment and other control measures to avoid and/or minimize potential, inadvertent, releases of fuels, oils, and other contaminants to stormwater, soil, and groundwater within the project area. Wastes associated with construction and operations at the site will be handled in accordance with the Solid and Hazardous Waste Rules and Regulations of the state. This includes all materials that would be classified as solid and/or hazardous wastes.

The airport will require construction contractors to maintain appropriate spill prevention plans and spill kits as applicable during construction activities. Spills would be handled in accordance with airport procedures and protocols, consistent with Federal, state, and local regulations. As a spill prevention BMP, MNAA has well-stocked spill kits located throughout the airport where fuel or other potential pollutants are stored or used. In addition, according to the BNA Vision 1.0 EA, in order to manage larger spills, MNAA recently purchased and equipped a spill response trailer. Several structural controls have been implemented at the BNA complex to reduce potential deicing impacts during routine, non-routine, and emergency operations. These controls include trench-drains around terminal gates at Concourse A, B, and C, OWS, stormwater treatment facilities, emergency spill gates, roofs and overhangs, secondary containment dikes, trenched aircraft deicing pad, glycol dump station, receiving port for OWS 2-5, south apron drainage basin diversion structure, detention ponds, and retention ponds (ERM, 2016).

If any hazardous materials are encountered on the site during excavations, relocations, or demolition, they will be appropriately identified and properly disposed of in accordance with all applicable regulations.

5.9 Historical, Architectural, Archeological, and Cultural Resources

The National Historic Preservation Act of 1966 requires that an initial review be made in order to determine if any properties are on, or eligible for inclusion in, the National Register of Historic Places (NRHP). In Accordance with 40 CFR 1507.2, CEQ regulations, and Section 106 of the National Historic Preservation Act, the Tennessee Historical Commission (THC) was consulted early in the process through FAA. THC was consulted a second time by FAA after the indirect auditory off-airport Area of Potential Effect (APE) was determined. As the entirety of the borrow site and milling stockpile area were previously disturbed, no cultural resources are anticipated to be encountered.

5.9.1 Affected Environment

The viewshed of the Proposed Action includes a buffer around the direct APE of 250 feet as well as the anticipated expansion of the 65 DNL contour difference defined as an area between the 2035 No Action Alternative and the 2035 Proposed Action scenarios. The indirect auditory APE contains commercial, one residence, and a cemetery located on Elm Hill Pike.

According to the Vision 1.0 EA, research performed at the THC revealed no above ground historic properties are located within 0.25 mile of the viewshed of the Vision 1.0 projects, which are in close proximity to the Proposed Action. The original terminal building has been altered over the years and has been considered not to be a significant historic site in terms of the viewshed. Additionally, there are no previously recorded archeological sites within the direct APE for the Proposed Action, as documented in the Vision 1.0 EA (2018) records review at the Tennessee Division of Archaeology (TDOA). The vast majority of the APE has been previously disturbed and/or contains steep slopes, which are not conducive to archaeological finds.

5.9.2 Environmental Consequences

One previously recorded archaeological site (Site 40DV428) is located on the northwest side of the airport and would be impacted by alternatives not carried forward as identified in this EA (Vision 1.0 EA). The borrow site is located adjacent to, but outside the boundary of this site. The environmental consequences of the above-ground historic resources are discussed below.

No Action Alternative

The No Action Alternative would not impact any historic or archaeological resources.

Proposed Action

Consultation with the State Historic Preservation Officer (SHPO) at THC confirmed no objections related to archaeological or historical sites eligible for or listed on the NRHP regarding the Proposed Action's APE on the airport. Additional coordination with THC for potential indirect effects associated with the auditory APE associated with increased noise levels off the airport was also completed. The off-airport indirect APE only affects one additional residence that has been determined not to be eligible for listing on the NRHP and is not located within an historic district. The off-airport indirect APE also expands the 65 DNL contour over the Bryantown Family Cemetery on Elm Hill Pike. This cemetery is not listed on the NRHP. In correspondence dated December 29, 2020, THC concurred that no historic properties would be affected by the Proposed Action for the off-airport APE.

- Direct and Indirect Impacts

The Proposed Action will have no direct impacts to historic or archaeological sites listed on or eligible for listing on the NRHP. As there are no direct impacts associated with the Proposed Action, no indirect impacts are anticipated.

- Mitigation and BMPs

If construction work uncovers buried archeological materials, work will be halted in the area of discovery and SHPO and the FAA will be immediately notified.

5.10 Land Use

FAA has not determined an impact threshold for land use; however, consideration of the significance of impacts is determined by other resources. The Metropolitan Government of Nashville and Davidson County (Metro) area zoning regulations pertain to BNA and surrounding land use restrictions. The Metropolitan Planning Commission adopted the *Community Character Manual, 2017* as amended, for guiding and coordinating development within the metropolitan area. Additionally, the MPU and Airport Layout Drawing (ALD) indicate existing and future land uses surrounding the airport.

Included in Metro's ordinances under Article VI – Airport Overlay District, the following provisions are included as ordinances passed to govern the height of structures with this district. Ordinance 17.36.230 provisions supplement the provisions provided in the Federal Aviation Act of 1958, 49 USC 1101 and Title 14 CFR Part 77.

Tennessee has several statutes in place that were developed to promote safe development in the areas surrounding its airport facilities. Title 42, Chapter 4, Section 42-4-107(9) provides authority to study and recommend zoning changes in the area around the airport with respect to noise, building or structure heights, and other aviation obstructions. Additional authority provided to MNAA by the same ordinance in Chapter 42-4-107(3) establishes provisions for acquisition and imposing land use restrictions in areas affected by aircraft noise.

5.10.1 Affected Environment

The Proposed Action is located within airport-owned property and is compatible with the land uses around the airport (**Figure 26**). Aviation-related noise and socioeconomic effects as they relate to off-airport land use planning are discussed in detail in their respective sections. Figures provided as part of the noise exposure maps provided in **Appendix C** reflect the current land use zoning around the airport within the 65 DNL noise contour. The entirety of the Proposed Action area is owned by MNAA and the off-airport study area is located within the airport overlay zoning area.

Within the study area, approximately 12 acres currently exists outside the AOA and is not considered to be in aeronautical use by FAA. This area north of the apron would be reclassified to aeronautical use due to the expansion of the apron. In compliance with 49 U.S.C. 47107(a)(10) and with *Article VI - Airport Overlay District* ordinance, zoning regulations for the industrial, commercial, and residential zoned areas around the airport have been developed and include provisions regulating potential development. Additionally, as shown in **Figure 27**, portions of the APE are considered Conservation and District Impact areas as identified in the Metro's *Community Character Manual*, which includes airports and does not restrict or impose development restrictions on the airport.

Existing land uses around the airport include industrial, commercial, residential, compatible public land, hotels, and transition areas where acquisition of residential land uses have occurred. The land uses located off-airport within 65 dB DNL have traditionally been acquired by MNAA or provided mitigation for noise-induced impacts. There are no NRHP listed sites within the noise contour impact zones.

Future land uses identified in reviewing master plans, planning documents, and other available resources were identified to the extent possible.

5.10.2 Environmental Consequences

No Action Alternative and Proposed Action

- Direct Impacts

According to information provided in the Vision 1.0 EA, continued growth around the airport is anticipated; however, all actions associated with the Proposed Action are located on airport-owned property and will result in no land use changes. This conclusion also applies to the LID location utilized by the airport for mitigation of stormwater impacts. Potential impacts associated with socioeconomics and noise are discussed in separate sections of this EA.

- Indirect Impacts

As there are no relocations involving the Proposed Action, no impacts to area land uses are anticipated. Any expansion of the 65 dB DNL contour would not hinder land uses identified in those areas. One additional residence would be impacted by the 65 DNL noise level expansion.

Concourse and Gate Expansion

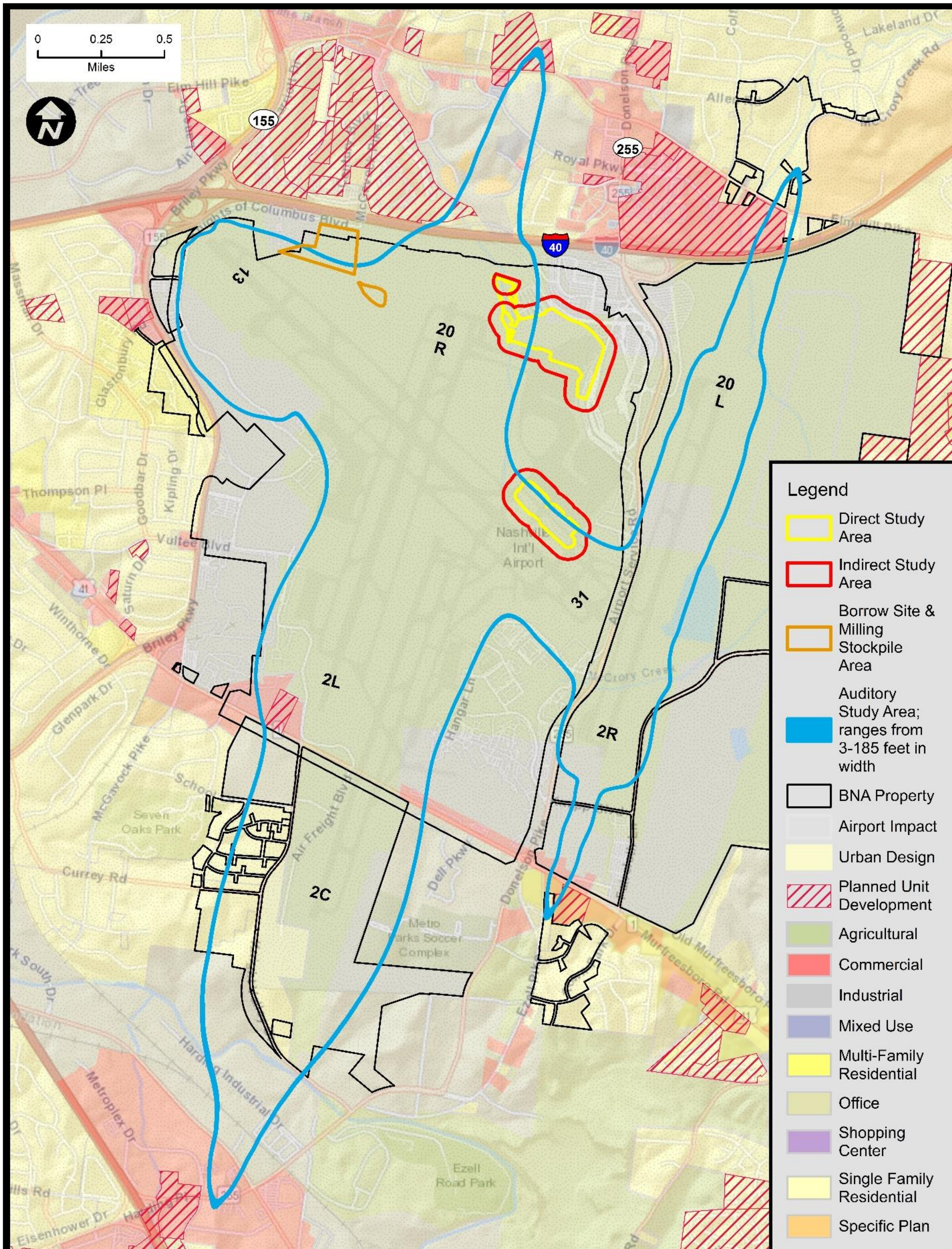

Figure 26: Zoning Map

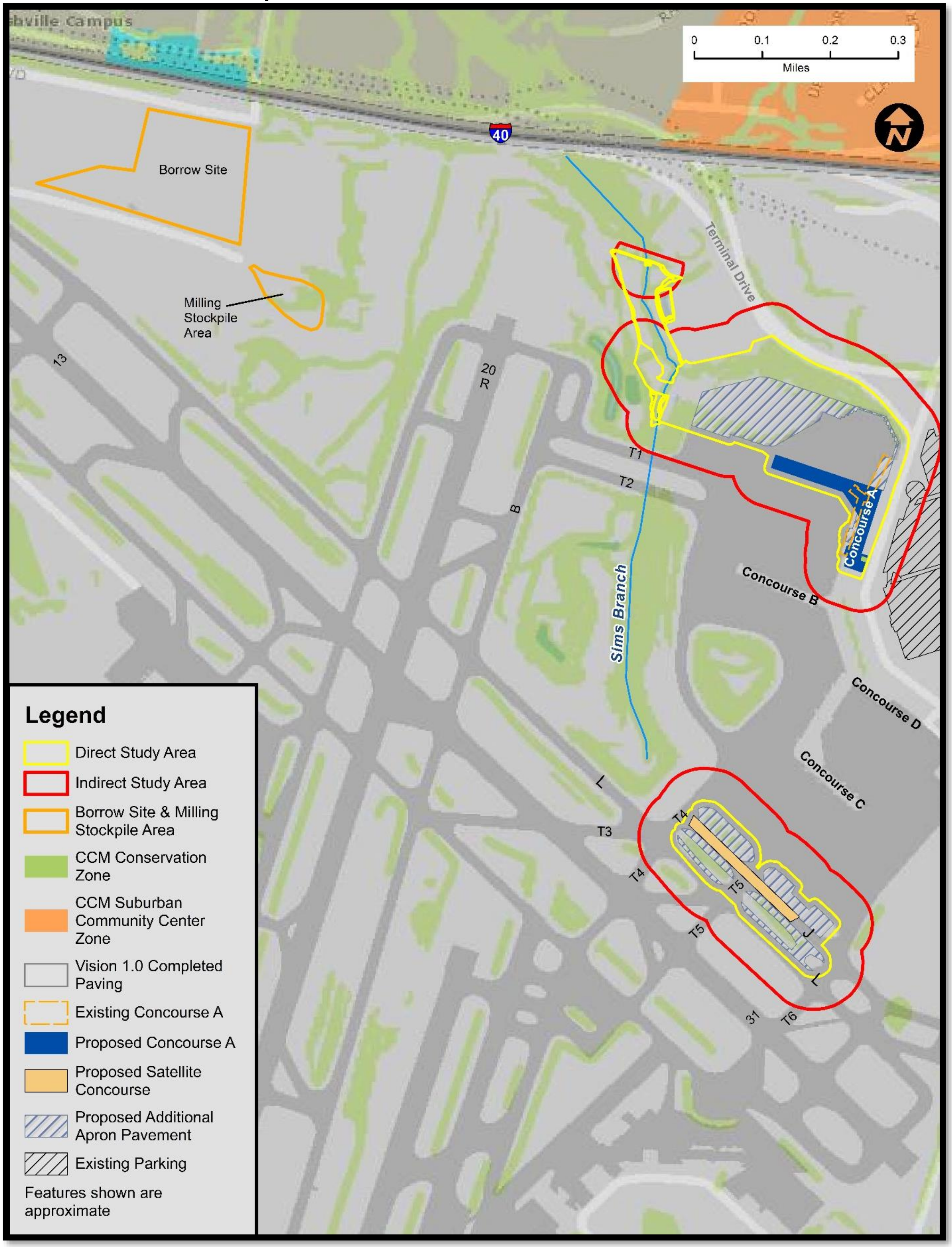

Figure 27: Community Character Manual Lands

5.11 Natural Resources and Energy Supply

A review of natural resources and energy supply was completed to compare the existing and proposed usage of these resources for the Proposed Action. These resources include water, asphalt, aggregate, wood, electricity, natural gas, and fuel. In accordance with FAA Order 1053.1 and 1050.1F, the airport has reviewed these resources including principles of sustainability. FAA policy encourages the use and development of sustainable technologies and practices and therefore should be considered whenever possible. The airport receives its electric supply from Nashville Electric Service (NES) and natural gas supply from Piedmont Natural Gas (PNG). Coordination with local officials and these energy providers is currently being completed and those responses will be provided in **Appendix B**.

5.11.1 Affected Environment

Based on available facility load data provided by BNA, the overall existing electrical load demand for the terminal building serving Concourses A, B, C, and D is 6,058 Kilowatts (kW). The main terminal building's energy demand is considerable and is mainly for indoor lighting and heating, ventilation, and cooling (HVAC) systems (Vision 1.0 EA). A review of energy consumption was completed for the Proposed Action and includes some information on comparisons to industry standards and statistics related to the types of existing electrical equipment, renovations/retrofit projects, and upgrades related to HVAC, lighting, and water systems. According to the Vision 1.0 EA, 25% of the main terminal electricity usage is billed to individual tenants (MNAA, 2012).

Based on coordination with NES, electrical service for the redeveloped Concourse A would come from the main terminal building and electricity for the satellite concourse associated with the Proposed Action would come from a new service connection at a point along Donelson Pike.

Fill material will be provided by material located at the borrow site. The milling stockpile area will be utilized for stockpiling any milling deemed reusable.

5.11.2 Environmental Consequences

No Action Alternative

The existing energy demand would increase with the increase in enplanements as a result of the No Action Alternative. Natural resource consumption would also increase commensurate with the increase in operations, although limited to existing gate capacity, through the year 2035.

Proposed Action

- Direct Impacts

The redeveloped Concourse A annual electrical load demand is estimated to be 2,773 kW and the annual load demand for the new permanent south satellite concourse is estimated to be 2,001 kW, which combined is approximately 19% of the overall estimated future annual load demand of 24,938 kW.

The energy review performed for the Proposed Action estimated a worst scenario assumption of energy use intensity (EUI) of 320 kilo-British thermal unit (kBtu) per square foot year (sf-yr), which is approximately 120 kBtu/sf-yr higher than the documented average energy efficient air terminal building as documented in the *Commercial Building Energy Consumption Survey* produced by the U.S. Energy Administration (Slade/SLK, 2020).

Airport development actions have the potential to temporarily increase energy demands and the consumption of natural resources as it relates to electricity and fuel consumption throughout the temporary construction phases of the project. However, the on-airport stockpile and borrow site will help reduce demands on fill material required for the Proposed Action. Potential long-term operational impacts associated with natural resources include increases in aviation fuel usage commensurate with enplanement increases over the 20-year planning period. Based on this information, no adverse effects or exceedances of natural resources and energy supplies are anticipated.

- Indirect Impacts

As mentioned below, sustainable practices are employed by the airport, who continues to incorporate energy conservation measures.

- Mitigation and BMPs

BNA has incorporated sustainable practices, pollution prevention, and energy conservation for many years. As documented in the Vision 1.0 EA, the implementation of BNA's geo-cooling system was estimated to reduce electricity usage by as much as 6,000 kilowatts during peak times, create an annual savings of 1.3 million kilowatt-hours and reduction in an estimated 30 million gallons of potable water. Additionally, annual savings could reach $430,000 (MNAA, 2016). Additionally, the recently designed parking garage included rainwater harvesting, a green screen vegetation wall, and a 50 kW solar panel system (Vision 1.0 EA) that will aid in reducing water and electricity consumption.

The energy analysis performed as part of this EA identified resiliency systems that could be incorporated to further reduce future demands. These systems include: solar; wind tower; backup generator replacement; and peak shaving of battery storage, existing power generation, and chilled water system thermal storage.

5.12 Noise and Noise-Compatible Land Use

The FAA also provides federal compatible land use guidelines for several land uses as a function of DNL (day-night average sound level) values. The DNL represents a 24-hour A-weighted noise dose and includes an adjustment for nighttime noise (from 10pm to 7am) of an additional 10 decibels (dB). FAA Order 5050.4B defines a noise sensitive area as "*an area where noise interferes with the area's typical activities or its uses*". Noise sensitive areas typically include residential homes, educational institutions, health care facilities, religious structures and sites, parks, recreational areas, areas with wilderness characteristics, wildlife refuges, and cultural and historical sites. FAA orders 1050.1F and 5050.4B define a significant noise impact as one which would occur if the proposed action would cause noise-sensitive areas to experience an increase in noise of 1.5 dB or more at or above the 65 DNL noise contour when compared to a No Action Alternative for the same time frame.

Based on the HMMH study completed for the Proposed Action, the forecast year of 2035 was used to analyze impacts in the future condition and assumed that operations would continue to increase based on the MPU baseline scenario levels (HMMH, 2021). The noise analysis incorporated passenger air carrier, cargo air carrier, general aviation, and military operations in the fleet mix used to complete the modeling. Noise contours were generated using the FAA-approved Aviation Environmental Design Tool (AEDT) for determining potential noise-related impacts to the surrounding land uses. These contours were developed based on the yearly DNL sound levels for which FAA measures noise impacts. The FAA considers a ≤65 DNL noise level as acceptable for residential developments per FAR Part 150.

Updated noise exposure maps (NEMs) were completed in 2012 and 2017 and were approved by FAA. A detailed noise analysis was completed in early 2021 by HMMH for the No Action (year 2035) and future conditions (year 2035) to document potential land use impacts related to noise levels associated with the Proposed Action. NEMs developed showing the differentials between the No Action Alternative and the Proposed Action depicted three levels of contours ranging from 75 DNL to 65 DNL to document potential off-airport noise impacts to surrounding properties and are located in **Appendix C**.

5.12.1 Affected Environment

There are several commercial and industrial developments around the airport that fall within the 65 dBA DNL; however, three residences, one new commercial entity, one place of worship, and one cemetery are located within this expanded noise contour area. Additional places of worship, residential areas, commercial and industrial developments are located within the immediate area in the indirect APE, all of which are located within the Airport Overlay District according to the Nashville Planning Department Geographical Information Systems (GIS) website (*Parcel Viewer (nashville.gov)*).

5.12.2 Environmental Consequences

No Action Alternative

The No Action Alternative was determined to represent projected operation increases through modeling year 2035. Future noise conditions around the airport will change slightly in the No Action condition as a direct result of population increases and future airport use demands; however, operations would be constrained to the existing gate capacity and airfield configuration.

Proposed Action

- Direct Impacts

Results of the noise analysis can be found in **Appendix C**, which indicate that an additional 21.9 acres would be exposed to the 65 DNL. The slightly larger area between the existing and future conditions related to the Proposed Action results in a 1.0% increase in the overall 65 DNL contour for BNA (HMMH, 2021). The noise analysis indicates five housing units are located within the 65-70 DNL contour, all of which have undergone previous mitigation and are considered compatible land uses. These noise sensitive land uses would be impacted by the Proposed Action compared to future No Action conditions. An estimated 0.60 acre (18-foot expansion over park extents) of the Metro Soccer Complex would be impacted by the expanded 65 DNL sound level contour. Only one additional park feature is located within the 65 DNL contour expansion and includes a workout station located along a public access trail. This trail is located on private property and the public Metro Soccer Complex property. Construction-related noise generated at the borrow site are not anticipated to change from the current operations at the site.

The airport overlay zone identifies where noise mitigation protocols are incorporated by the airport through State of Tennessee Ordinance Title 42, Chapter 4, Section 42-4-107(9). Additionally, the 65 DNL sound level contour would expand by approximately 16 feet over portions of Bryantown Family Cemetery located on Elm Hill Pike north of the airport. All areas located within the expanded 65 DNL are located within MNAA and Davidson County jurisdictional boundaries.

- Indirect Impacts

As documented in the Vision 1.0 EA, the average existing DNL of 67 dBA could be experienced as a result of combined aviation related noise and traffic noise from area highways such as I-40, Briley Parkway, Murfreesboro Road, and Donelson Pike. The cumulative effects of aviation-related noise generated by the Proposed Action and these surrounding highways is not anticipated to cause an incompatible land use as the areas falling within the Proposed Action's 65 DNL sound level contour are contained within the airport overlay zone mentioned above. Additionally, these highways are located further away from sensitive receivers where overlap of the 65 DNL occurs.

- Mitigation and BMPs

The three residential properties located within the 65 DNL have been previously mitigated by MNAA by meeting land acquisition goals as defined on the most recent ALP and as identified in the Noise Exposure Map Update (HMMH, 2021). The Airport also actively employs abatement noise measures that include diverting nighttime operations to Runway 13/31. In compliance with Part 150 and FAA's voluntary program, the Airport will continue to coordinate and implement aviation related noise abatement measures. Construction noise BMPs may include reduction in engine braking, ensuring functioning mufflers, and limiting night work. Additionally, some of the residential developments surrounding the airport fall within transition areas identified for mitigation measures.

5.13 Socioeconomics

FAA Order 1050.1F, describes the socioeconomic impacts associated with relocation or other community disruption, transportation, planned development, and employment. This evaluation also includes effects on Environmental Justice (EJ) and children's health and safety. As directed by EO 12898, the demographic profile of the surrounding area is considered with regards to EJ concerns.

5.13.1 Affected Environment

The study area for evaluating the socioeconomic conditions of the airport includes the study area as well as the greater Nashville area as identified in **Figure 1**. As documented in the Vision 1.0 EA and in **Appendix G**, the area is experiencing high rates of population and job growth. The population of the Nashville Metropolitan Statistical Area (MSA) is estimated at 1.8 million people (Slade, 2020; Garver, 2020; **Appendix G**).

Along with population growth, the Nashville MSA has experienced job growth of 26% over the past decade, making the region the second fastest growing metropolitan economy in the country since the Great Recession (Slade, 2020; **Appendix G**). The airport serves as a catalyst and nucleus for commercial, industrial, and residential expansion in the surrounding area. BNA is one of the fastest growing airports in the U.S., with almost 17.5 million passengers documented in 2019 and served 454 daily commercial flights in 2017, according to BNA data. An analysis conducted by Mary A. Lynch (2017) indicated total enplanements at BNA were forecasted to exceed 11 million by 2041, which is a 58% increase between 2017 and 2041 (Slade, 2020; **Appendix G**); however, July 2020 enplanements were at 12.2 million. The economic status of BNA on the region is realized by the over $6 billion impact and supporting over 67,000 jobs (MNAA, 2020).

Approximately 12% to 16% of individuals within the Nashville MSA have incomes below the poverty level. Thus, low-income populations are present within the project vicinity. Additionally, at least seven schools are present within this surrounding community with the closest school approximately 1.9 miles from the study area. Based on the socioeconomic studies prepared for the Proposed Action, Davidson County and the Nashville MSA are not considered to be high minority areas. However, no EJ communities are present within the off-airport indirect auditory APE.

Socioeconomic impacts can also include community disruption and/or transportation. BNA is located immediately south of I-40 and is east of I-24, which are the primary routes that people reach the airport. Donelson Pike, which is immediately east of BNA, provides the main access to the terminal. As documented in the Vision 1.0 EA, existing traffic congestion on roadways in the immediate vicinity of BNA (e.g., Donelson Pike and Terminal Drive) experience free flow traffic conditions (i.e., no congestion), while nearby segments of I-40 experience poor traffic conditions with delays expected. Donelson Pike has been proposed by the Tennessee Department of Transportation (TDOT) for realignment through the area east of the airport.

5.13.2 Environmental Consequences

No Action Alternative

Negative effects of the No Action Alternative include increased passenger congestion, reduced movement through the airport, and negative passenger experience. As a result of population growth and increasing enplanements, airport revenues would increase accordingly. However, the potential for increased revenue would be limited due to no improvements provided by the No Action Alternative.

Proposed Action

- Direct Impacts

BNA's expansion is in alignment with future growth for the Nashville economy. The Proposed Action will help to accommodate the forecasted increase in enplanements and total passengers at BNA, thus reducing passenger and airport congestion and giving passengers a more positive experience. Additionally, the increases in leasable space (concession areas) may result in additional opportunities for businesses at BNA. Traffic patterns will continue to independently experience increased volumes on area roadways as a result of population growth of the area. The Proposed Action is not anticipated to directly impact traffic patterns.

No direct effects on residential/business acquisition or relocations, disruptions in established communities or planned developments, or children's environmental health and safety are anticipated as a result of the Proposed Action. Thus, no mitigation is required.

- Indirect Impacts

There are no business or residential relocations, land acquisition, or rezoning required by the Proposed Action. One indirect noise impact to a residence located on McCrory Creek Road is anticipated; however, this parcel is located within an area previously defined for noise mitigation. These results also take into consideration audible impacts associated with potential noise-induced impacts.

- Mitigation and BMPs

During construction, MNAA will require contractors to develop a traffic management plan to minimize potential impacts to BNA customers and aircraft operations. Any mitigation resulting from noise impacts is discussed in the noise section (**Section 5.12**).

5.14 Visual Effects

5.14.1 Affected Environment

The location of the Proposed Action places improvements well inside the airport's property boundary and over 0.5-mile from potentially sensitive receptors. The borrow site is located adjacent to a potentially sensitive receptor, the Knights of Columbus, a charitable organization. The properties surrounding the indirect study area are commercial, industrial, and some residential areas north of I-40. The airport is illuminated by lights from various sources on the airside and landside in compliance with FAA standards for security, apron flood lighting, obstruction clearance, and navigation lighting. According to FAA Order 1050.1F, Order 1050.1F Environmental Desk Reference, and Order 5050.4B, light emissions and the visual character of the Proposed Action was evaluated. There are currently no special purpose laws or requirements for visual effects.

5.14.2 Environmental Consequences

No Action Alternative

The No Action Alternative would not change the existing visual character or have any additional light emission impacts.

Proposed Action

- Direct Impacts

The Proposed Action would produce additional light emissions associated with concourse lighting, apron flood lighting, security, and navigation lighting for the construction of Concourse A and the satellite concourse. Although the visual landscape of the airport as viewed from the existing terminal facility and portions of nearby Donelson Pike and Terminal Drive would change, no sensitive receptors would be impacted within the viewshed of the Proposed Action and the project's visual resources will be compatible with the existing visual character of the study area. As the Knights of Columbus location is located near the borrow site, the current viewshed will not change.

The overall setting of the airfield would not change drastically; therefore, no impacts to aircraft operations are anticipated. Temporary and additional safety lighting during construction is anticipated and will comply with design plans as developed.

- Indirect Impacts

The existing light emissions are not anticipated to contribute substantially to the indirect nature of light emissions experienced surrounding the airport. The Proposed Action may increase overall light emissions from the airport as a whole; however, the Proposed Action alone would not contribute to impacts to sensitive off-airport receptors, including wildlife species due to the already illuminated nature of the surrounding area.

- Mitigation and BMPs

Existing and future lighting fixtures at the airport will comply with FAA standards in AC 150/5345-53 so as to not create adverse lighting conditions to aircraft and off-airport sensitive receptors. Proposed lighting and fixtures will be designed to current FAA and airport standards. As the Proposed Action is compatible with the visual character and resources within the study area, no additional mitigation is proposed.

5.15 Water Resources

There are four primary water resources addressed in this section: wetlands, surface waters, floodplains, and groundwater. Federal and state statutes regulating these water resources were reviewed to analyze potential impacts for the Proposed Action; these are identified below.

- EO 11990 – Degradation of wetlands
- U.S. Department of Transportation (DOT) Order 5660.1A – DOT instructions on EO11990
- Clean Water Act (CWA)
- U.S. Army Corps of Engineers (USACE) – Section 404 of the CWA
- TDEC – Waters of the state regarding Aquatic Resource Alteration Permit (ARAP) and CWA Section 401 Water Quality Certification
- TDEC Division of Water Resources – NPDES Permitting
- EO 11988 – Floodplain management
- Rivers and Harbors Act of 1899

These statutes prevent/minimize the loss of wetlands, control discharges and pollution sources, establish water quality standards, protect drinking water systems, and protect aquifers and other sensitive ecological areas.

5.15.1 Affected Environment

The study area for water resources is considered the direct and indirect study areas as shown in **Figure 27**. Initial resources letters were submitted to the USACE, TDEC, Tennessee Department of Wildlife Resources (TWRA), Federal Emergency Management Agency (FEMA), USFWS, and EPA as the governing agencies of respective resources. Refer to **Section 6.2** regarding agency coordination. Additional coordination with these agencies has occurred and can also be found in **Appendix B**. The borrow site and milling stockpile area contain no surface waters.

Wetlands

A Wetland Delineation report, which is provided in **Appendix E,** was completed for the project area. Three small wetland areas were identified within the stormwater detention area along Sims Branch (KS Ware, 2020). The wetland delineation report and addendum were submitted to USACE for verification. The three wetlands identified within the study area total approximately 0.04 acre and are considered palustrine emergent wetlands[24] dominated by herbaceous vegetation. Vegetation within these small wetland pockets included sedge (*Cyperus* species), butterweed (*Packera glabella*), rush species (*Juncus* species), and buttercup (*Ranunculus* species).

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[24] Palustrine emergent wetlands are defined by the USFWS as wetlands that are dominated by persistent emergency (herbaceous) vegetation. *NPWRC :: Classification of Wetlands and Deepwater Habitats (fws.gov)*

Surface Waters

The study area is located in the northcentral portion of BNA and within the Lower Mill Creek watershed and includes the headwaters of Sims Branch. The north end of the study area contains two streams (Sims Branch and an unnamed tributary to Sims Branch). The perennial Sims Branch (Stream 1) flows north through the study area, while the intermittent unnamed tributary (Stream 2) near the north edge of the study area flows west. Both streams in the study area are depicted in **Figure 27**. In total, approximately 1,627 LF of intermittent stream and 1,100 LF of perennial stream occur within the APE.

Field assessments of the project area were conducted in January and September 2019 and in November 2020. Survey methods followed USACE Nashville District guidance and TDEC guidance for evaluating jurisdictional streams. The Hydrologic Determination (HD) Field Data Sheet (a stream determination tool developed by TDEC) was utilized to assess the jurisdictional classification and functional score of the on-site streams. The unnamed tributary is surrounded by wooded areas and would be considered a jurisdictional stream based on the HD score of 23.5. **Appendix E** contains the details associated with both hydrologic features.

Based on Tennessee's 2016 303(d) list, the portion of Sims Branch within the study area (segment TN05130202007_0150) has been designated as impaired habitat due to propylene glycol, low dissolved oxygen, and other anthropogenic substrate alterations. TDEC's Division of Water Pollution Control identified all tributaries within the Mill Creek watershed as Exceptional Tennessee Waters (ETW; Rule 1200-4-3-.06[4]) as the federally listed Nashville Crayfish inhabits streams within the watershed. TDEC also indicated an Individual Construction Stormwater Permit (CGP) would be required due to the amount of land disturbance as well as modifying the airport's Multi-Sector General SWPPP. Additionally, Mill Creek is located approximately 0.5 mile downstream of the Proposed Action and is listed on the 303(d) list.

Floodplains

No FEMA-mapped floodplains or floodways are present with the study area. The closest floodplain is located approximately 120 feet downstream of the existing detention basin associated with Sims Branch.

Groundwater

Nashville's public drinking water comes from the Cumberland River. No wellhead protection areas or private wells are known to occur within the study area, which is located within the Ordovician Carbonate Aquifer of Tennessee and in a karst area identified to contain less than 1% sinkholes (TDEC, 2016). Within karst areas, sinkholes usually develop as surface water percolates downward into the subsurface. Sinkholes and surface depressions receive precipitation runoff which filters down through the soil and rock strata into the cavities in the rock and becomes part of the groundwater regime. There is one potential sinkhole located on the west side of the airport. Additionally, springs/seeps have been found in the area adjacent to the west apron area.

Concourse and Gate Expansion

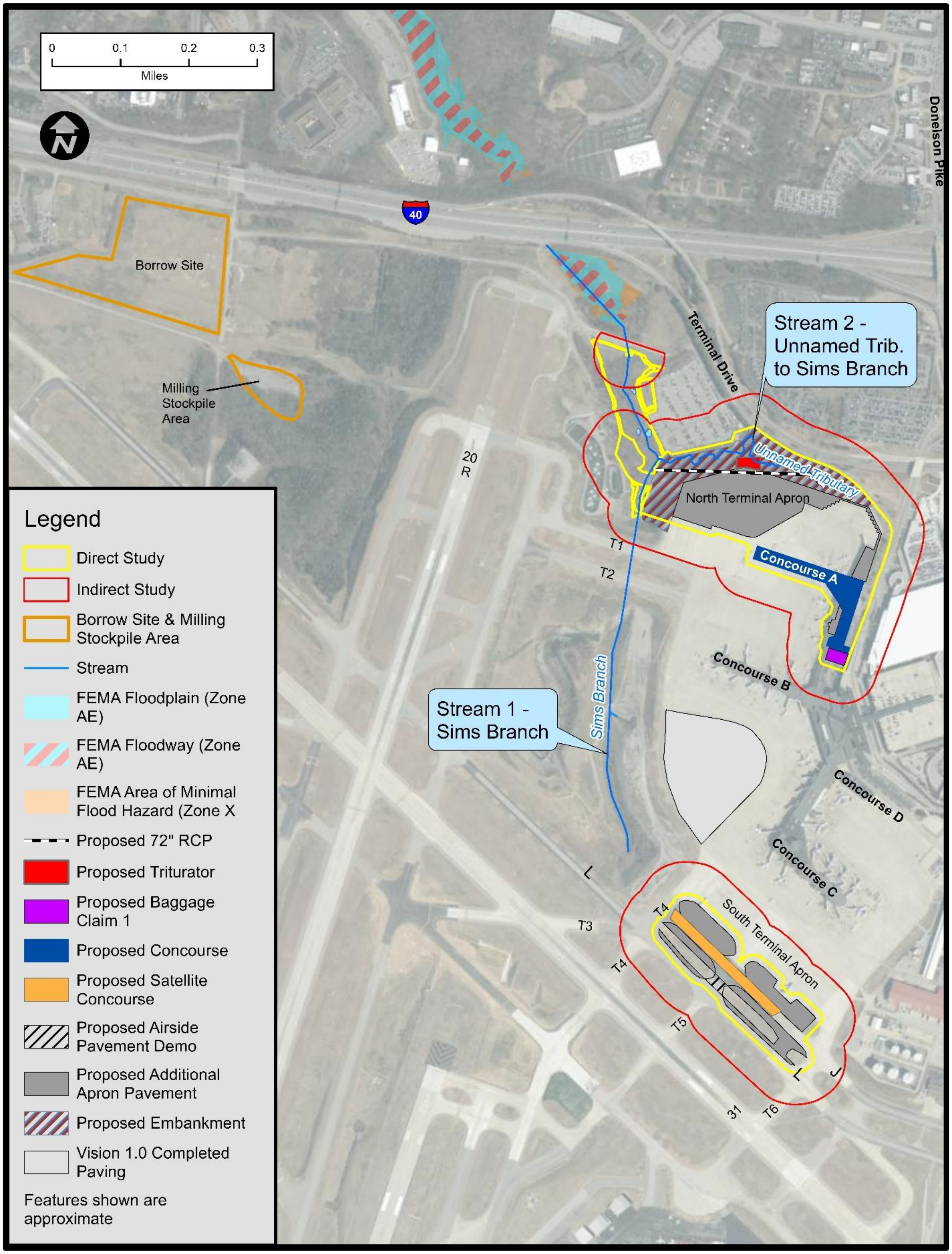

Figure 28: Water Resources

5.15.2 Environmental Consequences

No Action Alternative

No impacts to wetlands, surface waters, downstream floodplains, or groundwater will occur as a result of the No Action Alternative. Potential negative impacts associated with water quality of adjacent streams is possible in the event a future deicing or any large spill of a hazardous substance occurs.

Proposed Action

- Direct Impacts

Wetlands. Although three small wetlands were identified within the exiting detention basin proposed for expansion, no direct impacts will occur as there is no grading or fill activities expected in this area.

Surface Waters. The Proposed Action will require filling and re-routing, and encapsulation of 1,627 linear feet of intermittent Stream 2 in order to expand the north apron by 500,000 ft^2 and to implement the stormwater drainage improvements necessary to convey stream and stormwater flow under the proposed apron expansion. Refer to **Figure 29** for a conceptual layout of the proposed drainage system and stream impacts. Due to the significant elevation differences encountered in the area of the north apron, embankment slopes extend beyond the pavement footprint, resulting in stream impacts. These impacts have been minimized to the extent practicable and includes rerouting of approximately 423 linear feet of stream channel to an open channel. These stream impacts will require permits from both the USACE and TDEC prior to construction.

Potential impacts to water quality resulting from stormwater runoff during construction were also assessed. Temporary, short-term impacts to surface waters within the disturbed areas may occur from stormwater runoff during construction. These impacts, which may occur as a result of increased sedimentation and siltation resulting from land disturbance, may temporarily decrease water quality. However, these impacts are not anticipated to be significant as BMP measures and provisions and specifications of FAA Advisory Circular 150/5370-10F *Standards for Specifying Construction of Airports* will be implemented to avoid and/or minimize adverse construction activities. As a result of increased stormwater storage capacity on the airport, additional detention is proposed within the existing detention basin located along Sims Branch. Installation of a new outlet control device will increase the storage capacity of the existing basin by 1.8 feet, thereby creating enough on-site stormwater storage to accommodate the Proposed Action. No physical alternation of Sims Branch will occur, and the detained stormwater will drain out of the basin according to airport detention pond construction guidelines. No other long-term impacts to surface waters are anticipated under the Proposed Action.

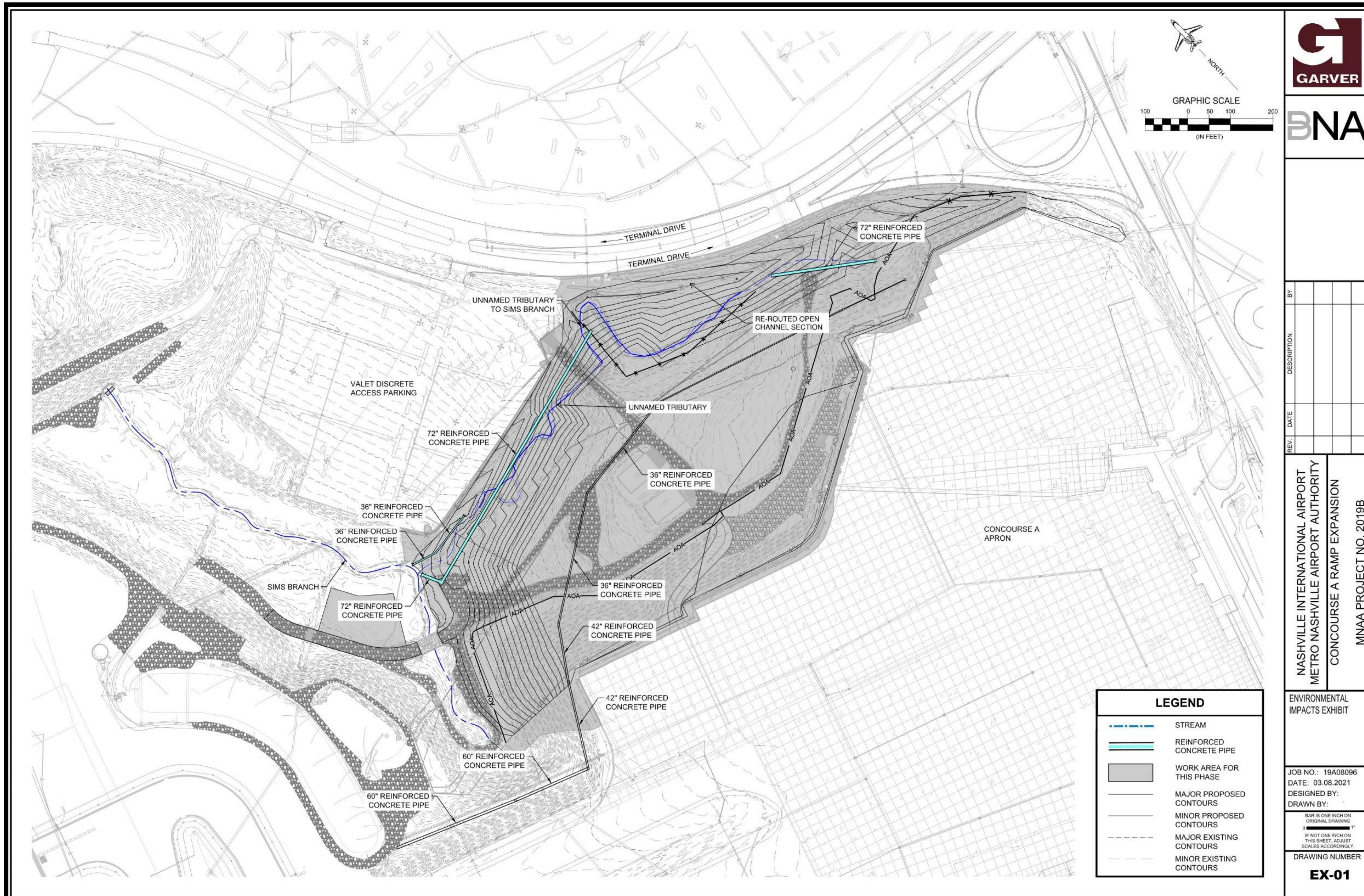

Figure 29: Conceptual Drainage Layout

Since construction activity will disturb more than one acre of ground (20 acres), a NPDES permit (Tennessee General Permit No. TNR10-0000 for Storm Water Discharges from Construction Activities) from TDEC will be obtained for stormwater runoff resulting from construction activities. Additionally, the existing NPDES permit that regulates the quantity and quality of stormwater discharged at the airport will need to be revised. The Proposed Action will not alter the airport's drainage conveyance system or change the number/location of outfalls. The airport's NPDES permit will be updated as needed to reflect these changes and the airport will continue to comply with NPDES stormwater requirements and all federal, state, and local water quality requirements. No other construction-related impacts to surface waters are anticipated as a result of the Proposed Action.

The appropriate Section 401 water quality certification shall be obtained in conjunction with the required Section 404 permit and ARAP. No other construction-related impacts to groundwater are anticipated as a result of the Proposed Action.

Groundwater. The Proposed Action is not expected to directly impact any public drinking water supplies, public wells, or groundwater resources. No direct impacts to known sinkholes are anticipated by the project. No springs were identified within project area and therefore no surface water interaction points will be impacted.

- Indirect Impacts

Surface Waters. Temporary indirect impacts could affect downstream portions of Sims Branch if sediment-laden water resulting from erosion during grading activities traveled off-site during construction. However, these impacts will be short-term and are anticipated to be minimal due to BMPs implemented during land disturbance. The Proposed Action will not alter the airport's current drainage system or change outfall locations.

Partial riparian zone impacts within the 60-foot TDEC-established water quality buffer along Sims Branch will occur, resulting in potential for increased sedimentation.

Groundwater. Indirect impacts to groundwater are not anticipated as no direct impacts to groundwater sources or karst features have been identified; however, groundwater seeps have been documented in the area.

Decreases in surface water quality may not necessarily result in groundwater impact. Additionally, the implementation of local, state, and federal regulatory programs to protect water quality and karst features will help prevent and/or reduce potential impacts.

- Mitigation and BMPs

Surface Waters. The Proposed Action will be subject to regulatory programs such as Sections 401 and 404 of the CWA (administered by TDEC and USACE) and the ARAP program (administered by TDEC), which protect surface waters by requiring improvements to meet water quality standards. Additionally, as the Proposed Action cannot fully avoid alterations to waters, comprehensive mitigation to provide replacement of lost aquatic resource benefits will be required. To mitigate for stream loss, MNAA proposes to purchase stream credits from a USACE and TDEC-approved compensatory mitigation bank, in-lieu-fee (ILF) area, and/or off-site permittee responsible mitigation in order to satisfy mitigation requirements determined by the USACE and TDEC during the permitting process. It is anticipated that all stream impacts can be mitigated and therefore would not be considered significantly adverse.

Stream mitigation. Stream mitigation for the encapsulation of a total of 1,627 linear feet of stream and 125 linear feet of riparian zone impacts to Sims Branch is proposed through the purchase of stream Functional Feet (FF) credits as determined using TDEC's SQT debit tool. The SQT debit tool was utilized to evaluate the ecological function of Stream 2 in terms of FF. There are currently no approved mitigation banks, ILF, or permittee responsible (on-site and off-site) mitigation options available within the Mill Creek Watershed (HUC 12) or within the larger HUC 8 watershed (HUC 05130202). As a result, a combination of mitigation bank and ILF credits are proposed for purchase to off-set jurisdictional impacts. Stream mitigation is estimated to cost $1.37 million. Mitigation banks have projects already in place and therefore do not incur additional temporal loss. As a result, mitigation banks are considered the USACE's environmentally preferred mitigation option (according to the regulatory hierarchy[25]). All approved mitigation banks in the surrounding area were contacted and evaluated as to their ability to provide estimated mitigation credits. Although ILF is the second mitigation option preferred by the USACE, given the lack of available mitigation bank credits within and adjacent to the watershed, this mitigation option would be environmentally preferable by both TDEC and the USACE.

Operational BMP measures and provisions and specifications of FAA AC 150/5370-10F *Standards for Specifying Construction of Airports* will be implemented to avoid and/or minimize adverse construction activities. Additionally, as required by the CWA Section 402 NPDES permitting process, a SWPPP for the Proposed Action will be developed and implemented. General construction BMPs (including silt fences, check dams, and other controls as appropriate) will be incorporated into construction plans to help prevent erosion, protect water quality, and ultimately to minimize potential impacts to surface water resulting from storm water runoff. In addition, BMPs will require measures to prevent or minimize the potential release of contaminants into surface waters, provide swift response to accidental spills, and define acceptable on-site storage of fuel and lubricants.

Groundwater. As no direct impacts from the Proposed Action are anticipated to groundwater and/or karst features, no mitigation is proposed and the same level of effort as the Proposed Action is expected regarding BMPs to protect groundwater and/or karst terrain. The project specific BMPs and available guidance will be followed if stormwater will be discharged into a known sinkhole.

Floodplains. Overall, the project will be designed to minimize adverse impacts to the downstream floodplain's natural and beneficial values. No net rise in the floodplain elevation is anticipated from the Proposed Action. Implementation of the Proposed Action will follow any local or state

[25] Section 404(b)(1) guidelines can be found at 40 CFR 230.

floodplain management plans. Coordination with the MWS will take place for concurrence of the grading plan and project approval.

6.0 Scoping and Public Involvement

6.1 Section Overview

This section explains the steps taken to correspond with agencies and the public during the completion of this EA. A list of agencies that were contacted is included in **Section 6.2** and the public notification process is provided in **Section 6.3**. On May 11, December 18, and December 21, 2020, scoping letters were sent to applicable local, state, and federal agencies to assess the level of environmental consequences based on the purpose and need of the project. Comments that were received from agency-managed resources that may be affected by the project are included in **Appendix B**.

6.2 Agency Scoping

The intent of the agency coordination is to solicit input early in the process regarding potential environmental, cultural, and archeological resources which could be impacted by the Proposed Action. Correspondence is provided in **Appendix B**. The following agencies were consulted during the preparation of this EA:

- U.S. Army Corps of Engineers (USACE)
- U.S. Fish and Wildlife Service (USFWS)
- U.S. Environmental Protection Agency (EPA)
- U.S. Forest Service (USFS)
- U.S. Coast Guard (USCG)
- Federal Highway Administration (FHWA)
- Federal Emergency Management Agency (FEMA)
- National Park Service (NPS)
- Natural Resources Conservation Service (NRCS)
- Tennessee Wildlife Resources Agency (TWRA)
- Tennessee Department of Environment and Conservation (TDEC)
- Tennessee Valley Authority (TVA)
- TDEC/Tennessee Historical Commission (THC)
- Tennessee Division of Archaeology (DOA)
- Tennessee Department of Transportation (TDOT)
- Tennessee Division of Forestry (TDF)
- Metropolitan Government of Nashville and Davidson County (METRO)

USACE and EPA requested a copy of the draft EA for review. Neither agency provided comments.

6.3 Environmental Assessment Notification and Distribution

The draft Environmental Assessment was completed in April 2021 and was prepared for public review and comment prior to holding a Public Hearing. On May 18, 2021, MNAA opened the public comment period by placing advertisements on their website (flynashville.com) and in the Nashville Tennessean, a newspaper of general circulation throughout Nashville and Davidson County, Tennessee. A copy of the advertisement and affidavit of publication are included in **Appendix H**. Hardcopies of the draft EA were made available for the public to review until Thursday, July 2, 2021, at 1370 Murfreesboro Pike, Building #3, Nashville, Tennessee 37127, or at the BNA website, http://www.flynashville.com. Opportunities were provided to the public to respond to the EA via letter, email, website comment response, or by telephone.

A public hearing was held on June 18, 2021, at the Nashville International Airport. Interested parties were able to ask additional questions and make comments on the EA document. There was no public attendance at the hearing. No public comments or questions were received at the public hearing or during the notice period. This document has been updated based on agency responses.

7.0 Commitments

- The airport will comply with all federal, state, and local development regulations, Executive Orders and permitting requirements.
- The airport will complete and maintain a construction Stormwater Pollution Prevention Plan and associated Best Management Practices throughout the duration of disturbance activities.
- The airport will update the existing Multi-Sector General SWPPP.
- Demolition compliance with TDEC Division of Solid Waste Management's policy, Management and Disposal of Lead-Based Paint Debris.
- Upon encountering any suspected contaminated groundwater, the contractor should notify MNAA and stop construction until proper officials and testing completed, if required.
- Mitigation stream credits will be determined and purchased prior to impacts to jurisdictional areas.
- MWS may require additional stream mitigation upon design completion. If this is considered a requirement by Metro, MNAA will provide the required stream mitigation.

8.0 Mitigation

- Stream mitigation is required for impacts to 1,627 linear feet of intermittent stream. The appropriate stream functional feet credits will be purchased by MNAA to compensate for these impacts through the Section 404/ARAP permitting processes.

- Stormwater mitigation is required for compliance with MWS LID requirements and will occur within the MNAA 80-acre LID site. Specific LID mitigation will be carried out as a commitment in this EA when design is sufficiently complete to determine specific mitigation requirements. LID mitigation will include invasive species removal.

9.0 Required Permits

- A National Pollutant Discharge Elimination System (NPDES) construction stormwater discharge permit.
- A Section 404 Individual Permit will be obtained.
- Individual Section 401 water quality certification will be obtained.
- An Individual Aquatic Resources Alteration Permit (ARAP) will be obtained.

10.0 List of Preparers

The individuals listed in the below tables assisted in the preparation of this EA. Resumes of each are provided in **Appendix I**.

Garver, LLC

Personnel	Degree	Years of Experience
Matt Koss	B.S. Civil Engineering	17
Zac Simpson	B.S. Civil Engineering	20
Ryan Mountain	B.S. Fisheries and Wildlife Management	20
Cassie Schmidt	B.S. Zoology, M.S. Biology	8
Colby Marshall	B.S. Biology	10
Bill McAbee	B.S. Wildlife Ecology/Management, M.S. Biology	23
Michele Lopez	B.S. Biology	21

KS Ware & Associates

Personnel	Degree	Years of Experience
Linda Main	B.S. Geology, M.S. Geology	43
Kelly Jordan	B.S. Environmental Health	22

Harris Miller Miller & Hanson Inc. (HMMH)

Personnel	Degree	Years of Experience
Katherine Larson	B.A. Mathematics and Education M.S. Applied Mathematics	11
Robert Mentzer	B.S. Meteorology	31
Phil DeVita	B.S. Meteorology, M.S. Environmental Studies	31
Rhea Gundry	B.S. Physics	11
Michael Hamilton	B.S. Geographical Information Systems A.S. Survey & Highway Engineering Technology	30

Heather Bruce	B.S. Applied Mathematics	9
Christopher Nottoli	B.S. Acoustics	6
Vincent Ma	B.S. Environmental Biology	4

Wood Environment & Infrastructure Solutions, Inc.

Personnel	Degree	Years of Experience
Stan Rudzinski	B.S. Natural Resources, M.S. Biology	27

Slade Environmental Services and General Contracting

Personnel	Degree	Years of Experience
L'Tryce Slade	B.A. Communication Studies and Political Science M.S. Regional Planning	19
Mohammed Tehranian	B. S. Mechanical Engineering M. S. Mechanical Engineering M. S. Energy Engineering	5

11.0 References

Corgan Architecture and Interior Design and Amec Foster Wheeler Environmental & Infrastructure, Inc. 2018. BNA Vision EA ("Vision 1.0 EA"). Prepared for the MNAA.

ERM. 2016. Nashville International Airport, Storm Water Pollution Prevention Plan (SWPPP), ERM, February 2016.

Executive Order (EO) 11990, Protection of Wetlands. May 24, 1977. 42 FR 26961, 3 CFR, 1977 Comp., p. 121.

FAA. 2006. FAA Order 5050.4B, National Environmental Policy Act (NEPA) Implementing Instructions For Airport Actions. US Department of Transportation, Federal Aviation Administration.

FAA. 2012. FAA Advisory Circular 150/5300-13A, *Airport Design*. US Department of Transportation, Federal Aviation Administration.

FAA. 2015. FAA Aviation Emissions and Air Quality Handbook. Version 3, Update 1. US Department of Transportation, Federal Aviation Administration Office of Environment and Energy.

FAA. 2015. FAA Order 1050.1F, Environmental Impacts: Policies and Procedures. US Department of Transportation, Federal Aviation Administration.

FAA. 2020. FAA Advisory Circular 150/5200-33C, *Hazardous Wildlife Attractants on or Near Airports*. US Department of Transportation, Federal Aviation Administration.

FAA. 2020. FAA 1050.1F Desk Reference. US Department of Transportation, Federal Aviation Administration Office of Environment and Energy.

LAWS.com - *42-4-107 - General powers. - Tennessee Statutes (laws.com)*

Lynch, Mary. 2017. Nashville International Airport Enplanements Forecast. Nashville: TransSolutions, LLC.

Metro Government of Nashville and Davidson County. 2020. *Article VI - Airport Overlay District*. Title 17, Chapter 17.36, Article VI. Available online at *http://nashville-tn.elaws.us/code/coor_title17_ch17.36_artvi*

MNAA BNA Vision 1.0 Environmental Assessment and FONSI. February 2018. Corgan Architecture and Interior Design. Amec Foster Wheeler Environment & Infrastructure, Inc.

Nashville, City of. 2020. Nashville.gov Mapping and GIS. Available online at *https://www.nashville.gov/Planning-Department/Mapping-and-GIS/Interactive-Maps.aspx*

TDEC. 2016. *Tennessee Ground Water Monitoring and Management Ground Water 305(b) Report.* TDEC Division of Water Resources, Drinking Water Unit.

TDEC. 2020. Water Resources Data and Map Viewers. *https://www.tn.gov/environment/program-areas/wr-water-resources/water-quality/water-resources-data-map-viewers.html*

U.S. Census Bureau. 2017. Available online at *https://data.census.gov/cedsci/*.

U.S. Department of Agriculture, Natural Resources Conservation Service. 2017. Web Soil Survey. Web. *https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx*

USGS. ESRI. 7.5 minute, 1:24,000 scale Nashville, Tennessee. Topographic Quadrangle Map.

APPENDIX A

BNA Enplanement Forecast Data

BNA Baseline Unconstrained Enplanement Forecast						
Year	**Total Enplanements**	**Air Carrier**	**Air Taxi**	**General Aviation**	**Military**	**Total Operations**
2017	7,076,371	135,135	30,540	36,577	3,550	205,802
2022	9,047,142	183,362	32,029	37,658	3,550	256,599
2027	9,938,318	191,530	36,595	42,249	3,550	273,924
2032	10,886,036	200,815	40,926	46,373	3,550	291,664
2037	11,935,070	210,387	45,569	51,608	3,550	311,114
Period						**CAGR**
2017 to 2022	5.0%	6.3%	1.0%	0.6%	0.0%	4.5%
2017 to 2027	3.5%	3.5%	1.8%	1.5%	0.0%	2.9%
2017 to 2037	2.7%	2.2%	2.0%	1.7%	0.0%	2.1%

Forecasts are from the AECOM BNA Airport Master Plan Update, 2020.

CAGR - Compound annual growth rate

APPENDIX B

Agency Coordination

U.S. Fish and Wildlife Service (USFWS)

Mountain, Ryan C.

From:	Alexander, Steven <steven_alexander@fws.gov>
Sent:	Monday, February 1, 2021 5:52 AM
To:	Rob Todd; Mountain, Ryan C.
Cc:	Mike Murdock; Sykes, Robbie; Stacy Saxton
Subject:	RE: [EXTERNAL] BNA Concourse and Gate Expansion - Project Review Request
Follow Up Flag:	Flag for follow up
Flag Status:	Flagged

Mr. Mountain –

The U.S. Fish and Wildlife Service (Service) has reviewed the above referenced project related to the potential presence of federally listed endangered and threatened species, sensitive habitats, and other potential environmental concerns. We have also reviewed the Section 10 recovery/scientific collection permit files for AECOM, specifically the report entitled "Sims Branch Biological Monitoring at Nashville International Airport Metropolitan Nashville Airport Authority, May 2019."

Our review indicates that the federally endangered Nashville crayfish (*Faxonius shoupi*) exists in Mill Creek immediately adjacent to and just downstream of MNAA property. Provided appropriate best management practices for the adequate control of site-related sediment and grout/concrete are implemented during the course of the proposed project, the Service believes that there would be no adverse effects to this species. In the future, please reference 2021-CPA-0154/2021-TA-0392 when inquiring of this specific activity in our office. Should you have any questions or need further assistance, please don't hesitate to contact me.

Sincerely,

From: Rob Todd <Rob.Todd@tn.gov>
Sent: Thursday, January 28, 2021 3:00 PM
To: Mountain, Ryan C. <RCMountain@GarverUSA.com>
Cc: Mike Murdock <Mike.Murdock@tn.gov>; Sykes, Robbie <robbie_sykes@fws.gov>; Alexander, Steven <steven_alexander@fws.gov>; Stacy Saxton <Stacy.Saxton@tn.gov>
Subject: [EXTERNAL] BNA Concourse and Gate Expansion - Project Review Request

This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.

Mr. Mountain:

The Tennessee Wildlife Resources Agency has reviewed the information that you provided regarding the proposed Nashville International Airport Concourse and Gate Expansion project and our response is in the attached file. Thank you for the opportunity to review and comment on this proposed project. If I may be of further assistance, please contact me.

Robert Todd
Fish & Wildlife Environmentalist
Tennessee Wildlife Resources Agency
Ellington Agricultural Center
5107 Edmondson Pike
Nashville, TN 37211
Office: 615-781-6572
Cell: 931-881-8240
Fax: 615-781-6667
Email: rob.todd@tn.gov

Mountain, Ryan C.

From:	Braswell, Aaron (FAA) <aaron.braswell@faa.gov>
Sent:	Wednesday, January 13, 2021 2:57 PM
To:	Mountain, Ryan C.
Cc:	Dillon, Caitlin
Subject:	FW: FWS #2021-CPA-0094 Nashville Airport Concourse A expansion

Response from USFWS

Aaron Braswell
Environmental Protection Specialist
Federal Aviation Administration
Memphis Airports District Office
2600 Thousand Oaks Boulevard
Suite 2250
Memphis, Tennessee 38118
aaron.braswell@faa.gov
901-322-8192

From: Pelren, David <david_pelren@fws.gov>
Sent: Wednesday, January 13, 2021 2:51 PM
To: Braswell, Aaron (FAA) <aaron.braswell@faa.gov>
Cc: Tennessee ES, FWS <tennesseeES@fws.gov>; Elbert, Daniel C <daniel_elbert@fws.gov>; Sykes, Robbie <robbie_sykes@fws.gov>; Alexander, Steven <steven_alexander@fws.gov>
Subject: FWS #2021-CPA-0094 Nashville Airport Concourse A expansion

Mr. Braswell -

Thank you for coordinating with the Tennessee Ecological Services Field Office to address the potential for environmental impacts relative to the proposed Concourse A and gate expansion project at the Nashville International Airport in Nashville, Davidson County, Tennessee (FWS #2021-CPA-0094). We have reviewed the email that you sent on December 21, 2020, with a letter of the same date and supporting materials. We have also reviewed a Biological Assessment (BA) report for the Nashville crayfish relative to this project, which was provided by Ryan Mountain, of Garver, with an email on December 22, 2020. This project would involve encapsulating of 1,664 linear feet of a stream to facilitate the proposed concourse and gate expansion activities. Although Nashville crayfish have been found downstream of the airport, the species presence was not documented during a survey of stream sections within the proposed project area. The “Impact Minimization” portion of the BA emphasized that erosion and sediment control measures would be implemented to minimize downstream aquatic impacts and that crayfish would be relocated from the direct areas of stream impact if necessary in an effort to avoid inadvertent injury or mortality to the Nashville crayfish.

Based on lack of documentation of any Nashville crayfish at the project site during the survey, use of water quality control measures to prevent downstream water quality degradation, and agreement to relocate crayfish from the direct areas of stream impact, we believe the project plan adequately addresses potential direct, indirect, and cumulative effects to federally listed species and their habitats. We conclude that the requirements of the Endangered Species Act (the Act) of 1973, as amended, are fulfilled for this project. Obligations under the Act should be reconsidered if (1) new information reveals impacts of the proposed action that may affect listed species or critical habitat in a manner not previously considered, (2) the proposed action is subsequently modified to include activities which were not considered during this consultation, or (3) new species are listed or critical habitat designated that might be affected by the proposed action.

Finally, we emphasize the point that it will be important to ensure all measures required by the Corps of Engineers and Tennessee Department of Environment and Conservation for the avoidance, minimization, and mitigation of stream impacts are appropriately implemented in association with this action.

Feel free to contact me if further coordination regarding this project will be helpful.

David Pelren
Fish and Wildlife Biologist
Ecological Services
U.S. Fish and Wildlife Service
446 Neal St.
Cookeville, TN 38501
office phone: 931-525-4974
mobile phone: 931-261-5844

U.S. Army Corps of Engineers (USACE)

Mountain, Ryan C.

From: Carnes, Floyd M CIV USARMY CELRN (USA) <Mark.Carnes@usace.army.mil>
Sent: Friday, January 29, 2021 3:18 PM
To: Mountain, Ryan C.
Subject: RE: BNA Concourse and Gate Expansion - Project Review Request

Ryan

After reviewing the submitted information, it was determined that a standard permit would be needed to process the request by the Metropolitan Nashville Airport Authority.
The expansion of Concourse A is part of the BNA Vision program in which Concourse A is proposed to be extended northward. The terminal apron ramp is also proposed for expansion to accommodate the safety of maneuvering aircraft around the expanded Concourse A. The north terminal apron would be expanded to the north by approximately 10.3 acres. The elevation differences between the existing terminal apron and the adjacent undeveloped areas to the north range from 30 to 80 feet and, as a result, fill slopes would be extended. Due to the fill slope, approximately 1,664 linear feet (0.08 acre) of an Unnamed Tributary to Sims Branch would be encapsulated.

Mark

From: Mountain, Ryan C. <RCMountain@GarverUSA.com>
Sent: Thursday, January 28, 2021 11:45 PM
To: Carnes, Floyd M CIV USARMY CELRN (USA) <Mark.Carnes@usace.army.mil>
Subject: [Non-DoD Source] FW: BNA Concourse and Gate Expansion - Project Review Request

Mark,
Would you be able to provide a review letter for this project? Please let me know if you have any questions or need additional information.

Thanks,
Ryan

Ryan Mountain, PWS
Garver
479-287-4628

From: Mountain, Ryan C. <RCMountain@GarverUSA.com>
Sent: Monday, December 21, 2020 9:29 AM
To: Wilder, Timothy C CIV USARMY CELRN (USA) <Timothy.C.Wilder@usace.army.mil>
Cc: Mountain, Ryan C. <RCMountain@GarverUSA.com>
Subject: BNA Concourse and Gate Expansion - Project Review Request

Tim,

Attached is a resource letter providing information on the proposed concourse and gate expansion project at the Nashville International Airport that we have discussed prevoiusly. We originally reached out in August with a letter but did not get a reply. This correspondence should serve to supplement that letter. We are in the process of completing the

Draft Environmental Assessment and would like to include the USACE's comments. We understand this project will require an Individual Section 404 permit and stream mitigation.

Please review this information and let me know if you have any questions or comments. We respectfully request your response at your earliest convenience. Thank you for your assistance.

Sincerely,

Ryan

Ryan Mountain, PWS
Senior Environmental Scientist/Specialist
Transportation Team

479-257-9188
479-903-2041

U.S. Environmental Protection Agency (EPA)

Mountain, Ryan C.

From: Gissentanna, Larry <Gissentanna.Larry@epa.gov>
Sent: Thursday, February 11, 2021 7:48 AM
To: Mountain, Ryan C.
Cc: Kajumba, Ntale
Subject: RE: Scoping Comments for Nashville International Airport Concourse and Gate Expansion Environmental Assessment MNAA Project No. 2019A

Dear Mr Ryan Mountain,

The U. S. Environmental Protection Agency has received the referenced scoping document dated 11 January 2021, in accordance with Section 309 of the Clean Air Act and Section 102(2)(C) of the National Environmental Policy Act (NEPA). The EPA appreciates the opportunity to review and provide comments on the proposed improvements at the Nashville International Airport (BNA).

According to the scoping letter, the Metropolitan Nashville Airport Authority (MNAA) proposed actions are to redevelop and expand Concourse A by adding nine gates to the main terminal building and the construction of a new satellite concourse that will add eight gates. We also understand that the construction of the satellite concourse will alleviate deficiencies and facilitate the completion of Concourse A, and that this proposed action meets the purpose and need by achieving the total required 65 gates by the year 2035 with the addition of 17 gates to the existing 48 gates.

Based on the EPA's preliminary review of the proposed project, the following comments are provided for your consideration in preparation of the draft environmental document.

(1) Waters of the United States: The U.S. EPA Final 2020 Clean Water Act section 303(d) list water quality decision document. (https://www.tn.gov/environment/program-areas/wr-water-resources/water-quality/water-quality-reports---publications.html) contains a list of lakes, rivers, and streams in Tennessee that fail to meet one or more water quality standards, to include pollutant information and TMDL prioritization. According to the CWA 303 (d) list, Mills Creek is identified as being within .5 mile of the project site. Construction activities can result in surface water and wetland habitat disruption and impacts. Pursuant to Section 404 of the Clean Water Act, the project should avoid and minimize impacts to jurisdictional waters, to the maximum extent practicable.

(2) Stormwater Management: The EPA encourages implementing best management practices during and after construction to minimize stormwater impacts on the streams in project area. Coverage under a statewide National Pollutant Discharge Elimination System construction stormwater general permit will be needed if the project disturbs one acre or more of contiguous land. The EPA recommends that the environmental document include a detailed explanation of stormwater management to accommodate major storm events and changes in rainfall, explain the potential impacts on the water quality of the waterbodies within the project area, and identify and discuss linear stormwater best management practices that will be implemented to prevent runoff from construction activities.

(3) Air Quality: The proposed project area is not located within a designated ozone Non-Attainment Area. The EPA recommends that the proposed project follow the applicable State Implementation Plan requirements to ensure compliance with the transportation conformity requirements. We recommend that the environmental document discuss the applicable regulatory air quality requirements, the attainment status, potential impacts of the project to air quality, and proposed measures to avoid or minimize impacts to air quality.

(4) Environmental Justice: Consider using The EPA's EJSCREEN mapping tool (http://www2.epa.gov/ejscreen) to report the demographics for federally protected populations. Please ensure protected populations are not

disproportionately or adversely impacted by the project. We recommend complying with Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency.

(5) Efforts should be made to divert any recyclable materials such as concrete, steel and asphalt away from landfills and repurpose the material instead. The appropriate NEPA document should also address potential environmental impacts to passengers and airport workers, to include the hazards of demolishing the older areas of existing terminal buildings, such as lead and asbestos latent materials. Consider sustainable building practices that utilize variable forms of proven renewable energy for the proposed project, for example, solar power for supplemental electricity and lighting for the ramps, aprons, terminals, and any aircraft maintenance hangers, parking lots or special buildings that may be proposed in the various projects. Please see the attached link for additional information: http://www.wbdg.org/references/federal_mandates.php.

Please keep the local community informed and involved throughout the project development process. Due to COVID-19, the EPA requests that future communication regarding NEPA documents be in an electronic format from a downloadable weblink or email. We also request that you continue to mail at least one hard copy of the Draft and or Final NEPA documents to the address below:

Thank you for the opportunity to comment. If you have any questions, please contact us via email or the information below.

Sincerely,

Larry O. Gissentanna
Project Manager, DoD & Federal Facilities

U.S. Environmental Protection Agency/ Region 4
Strategic Programs Office, NEPA Section
61 Forsyth Street, SW
Atlanta, GA 30303-8960
Office: 404-562-8248
gissentanna.larry@epa.gov

Mountain, Ryan C.

From: Mountain, Ryan C.
Sent: Monday, January 11, 2021 3:15 PM
To: 'Somerville.Amanetta@epa.gov'; 'Gissentanna, Larry'
Cc: Dillon, Caitlin; 'Braswell, Aaron (FAA)'
Subject: BNA Concourse and Gate Expansion - Project Review Request
Attachments: Gissentanna 2021-1-11 USEPA CAGE EA Initial Outgoing.pdf

Larry and Amanetta,

We are working with the Nashville International Airport (BNA) and have attached a resource letter providing information on a proposed concourse and gate expansion project at the airport. We are in the process of completing the Draft Environmental Assessment and would like to provide EPA with the opportunity to comment on the proposed project.

Please review this information and let me know if you have any questions or comments. Thank you for your assistance.

Sincerely,
Ryan

GARVER

Ryan Mountain, PWS
Senior Environmental Scientist/Specialist
Transportation Team

479-257-9188
479-903-2041

GARVER
361 Mallory Station Road
Suite 102
Franklin, TN 37067

TEL 615.377.1337
FAX 615.371.8195

www.GarverUSA.com

January 11, 2021

Mr. Larry Gissentanna or Ms. Amanetta Somerville
U.S. Environmental Protection Agency, Region 4
Sam Nunn Atlanta Federal Center, Atlanta, GA
Gissentanna.Larry@epa.gov
Somerville.Amanetta@epa.gov

Re: Concourse and Gate Expansion Environmental Assessment
MNAA Project No. 2019A
Nashville International Airport
Request for Information

Dear Mr. Gissentanna and Ms. Somerville:

The Metropolitan Nashville Airport Authority (MNAA) desires to expand their current Concourse A terminal and has retained Garver to prepare a National Environmental Policy Act (NEPA) Environmental Assessment (EA) for the referenced project. The purpose of the project is to meet current and projected enplanement demands commensurate with the economic growth of the greater Nashville area.

The proposed action's EA will draw upon the recently completed Vision 1.0 EA and Finding of No Significant Impact (March 2018), evaluate potential environmental impacts, and analyze alternatives to the proposed action. Detailed surveys will be completed early in the process, as needed, for resources that could potentially be impacted. Please refer to the project details below.

Contact Information:

- Garver, LLC
  Attn: Ryan Mountain, PWS
  4300 South J.B. Hunt Dr., Suite 240
  Rogers, AR 72758
  479-257-9188
  rcmountain@garverusa.com

Project Information:

- Lead Federal Agency: Federal Aviation Administration (FAA)
- Project Title: Concourse and Gate Expansion (CAGE) Environmental Assessment
- Project Location:
  - Nashville International Airport (BNA), 1 Terminal Drive, Nashville, TN 37214
  - Latitude: 36.131756° Longitude: -86.672327°

Project Description:

The proposed actions include redevelopment and expansion of Concourse A by adding nine gates to the main terminal building and construction of a new satellite concourse that will add eight gates. A detailed list of actions is included in Table 1. The satellite concourse is considered an enabling project for the completion of Concourse A as gate deficiencies will be mitigated by the opening of the satellite concourse. The proposed action meets the purpose and need by achieving the total required 65 gates by the year 2035 with the addition of 17 gates to the existing 48 gates (post Vision 1.0) and thereby addressing capacity needs. One active gate would be closed to serve as a passenger transfer point for access to the satellite concourse.

The proposed action is located entirely on airport property within two direct and two indirect Areas of Potential Effect (APE) as shown in Figures 1 and 2 below. The project's northern APE is currently utilized for sand and salt storage, access around the north apron, as a waste glycol recovery tank location, mobile fuel tank location, as an existing stormwater detention basin, and includes approximately 20 acres of undeveloped land. The remaining areas have been previously disturbed. The project's southern APE currently contains taxiways, portions of the south apron, remain overnight (RON) parking, and infield grassed areas. Past uses of both APE areas have remained the same in recent years. Prior to airport development, it appears that both APEs were undeveloped. In addition to the above-described APEs on airport-owned property, an off-airport indirect APE has been determined. The proposed action increases aircraft capacity and as such, the Airport is required to evaluate potential noise impacts. The off-airport indirect APE for potential audible impacts is included in the attached figures.

We are currently in the scoping process for the NEPA document and requesting that you review the proposed study area (see enclosed exhibits). Please notify us of any constraints or concerns you may have regarding the proposed project. We are seeking comments regarding issues such as unique environmental features or environmentally sensitive areas, socioeconomic issues, proposed urban developments, and permits or approvals that should be obtained prior to construction of the project.

We would appreciate your response within 30 days to help us maintain our project schedule. If you have any questions regarding this request, please contact me at 479-257-9188.

Sincerely,

Ryan Mountain

Ryan Mountain
Senior Environmental Scientist

Enclosures

cc: Caitlin Dillon – MNAA
Matt Koss – Garver
Zac Simpson – Garver

Table 1 – Proposed Actions

Proposed Action	Location and Description
Terminal Building: New Concourses, Amenity Upgrades & Passenger Accessibility	
Concourse A	• Redeveloped double-loaded concourse adds nine additional gates (351,200 square feet (ft^2)) • Demolition of approximately 110,353 ft^2 (entire existing concourse) • Amenities: hold rooms, concession areas, circulation area and new restrooms, moving walkways • Addition of passenger boarding bridges • Relocation of existing utilities: electric, sanitary sewer, heating and air conditioning services, emergency generator(s), and lighting
Satellite Concourse	• Satellite concourse adds eight additional gates (89,390 ft^2) • Amenities: hold rooms, concession areas, circulation area and restrooms • Addition of passenger boarding bridges and fuel systems • Mobile access from the main terminal (method to be determined) • One mobile access point is proposed at the main terminal that will remove one gate from active use
Baggage Claim/ Handling	• Concourse A additional baggage screening system and handling matrix will be constructed under the new concourse
North Terminal Expansion	• Additional baggage claim on Level 2 will be added • The ticket lobby on the departures level (level 3) of the main terminal will be expanded to add additional capacity
Apron Expansion Actions The new additional ramp areas are required to meet FAA specifications (*Advisory Circular 150/5300-13A*) for the safe and efficient maneuvering of aircraft. Equipment staging would be located within areas on the airport outside of the aircraft maneuvering areas.	
North Apron Expansion	• Pavement expansion of approximately 500,000 ft^2 that allows for dual parallel taxilanes and RON positions • Clearing and filling of approximately 20 acres • Relocation of 2,000 linear feet of Airport Operations Area (AOA) security fence and partial security fence removal • Encapsulation of 1,664 linear feet of unnamed tributary • Stormwater drainage improvements with shear key • Capacity increase of existing stormwater detention basin (raising level by 1.8 feet) through installation of new outlet structure at north end of basin • Waste glycol tank relocation • Deicing locations would be reconfigured • Reclassification of 12 acres of non-aeronautical use to aeronautical use • Relocation of oil/water separator(s) • Relocation of existing utilities: electric and sanitary sewer • Construction of a 24-foot wide asphalt haul road, guard rail, and retaining wall
South Apron Expansion	• Pavement expansion of approximately 170,000 ft^2 • Clearing and filling of approximately 9.3 acres of infield • Decommissioning of Taxiway J • Demolition of the T5 connector • Removal of an existing deicing pad
Fuel System	• Expansion of the fuel hydrant and distribution systems to account for the new gates, including piping, connections and hydrants for both the satellite concourse and Concourse A
Triturator	• A new 2-bay triturator will be installed adjacent to the north apron

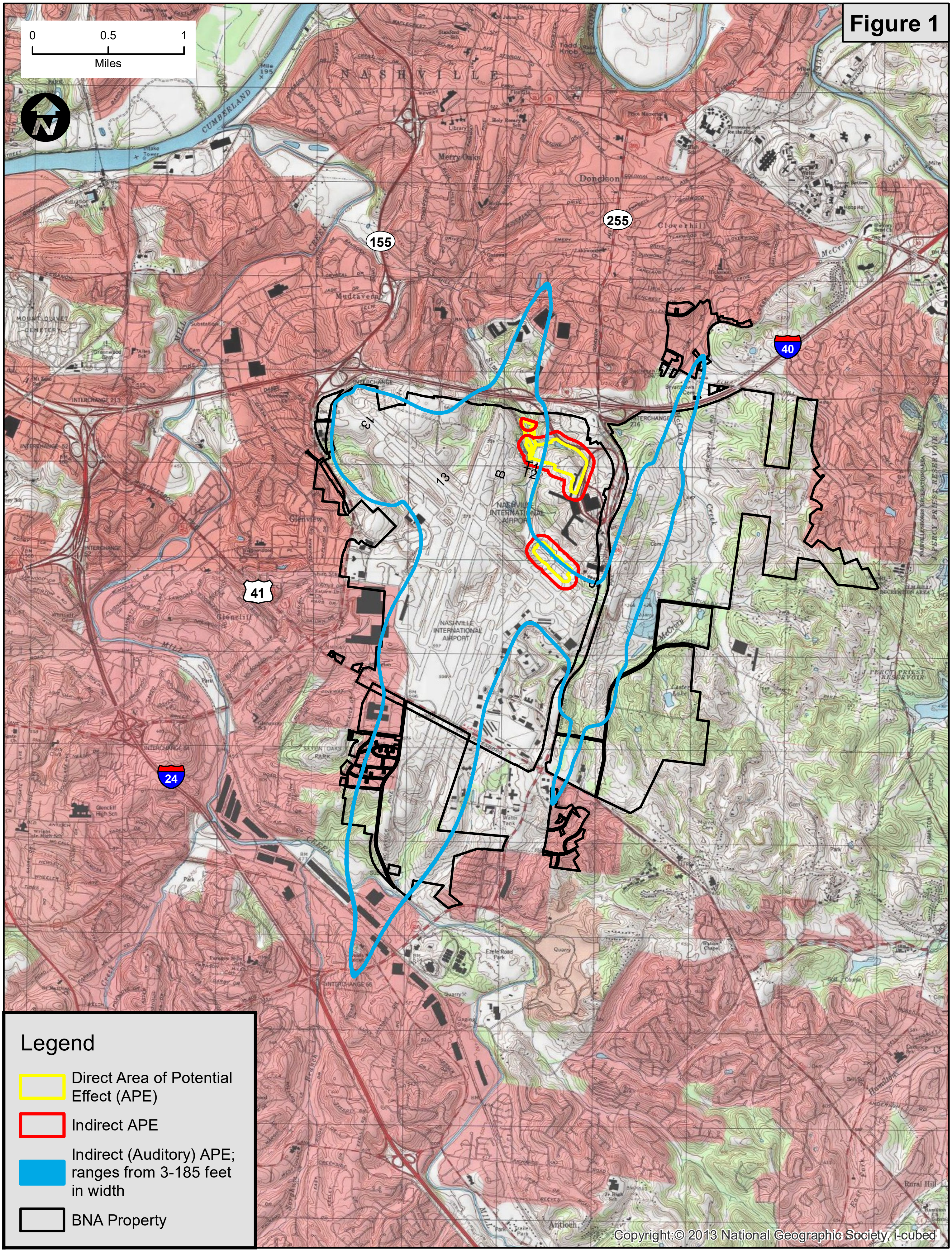

Figure 1
0
0.5
1
Miles
Legend
Direct Area of Potential Effect (APE)
Indirect APE
Indirect (Auditory) APE; ranges from 3-185 feet in width
BNA Property
155
255
40
41
24
NASHVILLE
Donelson
Cloverhill
NASHVILLE INTERNATIONAL AIRPORT
Copyright:© 2013 National Geographic Society, i-cubed

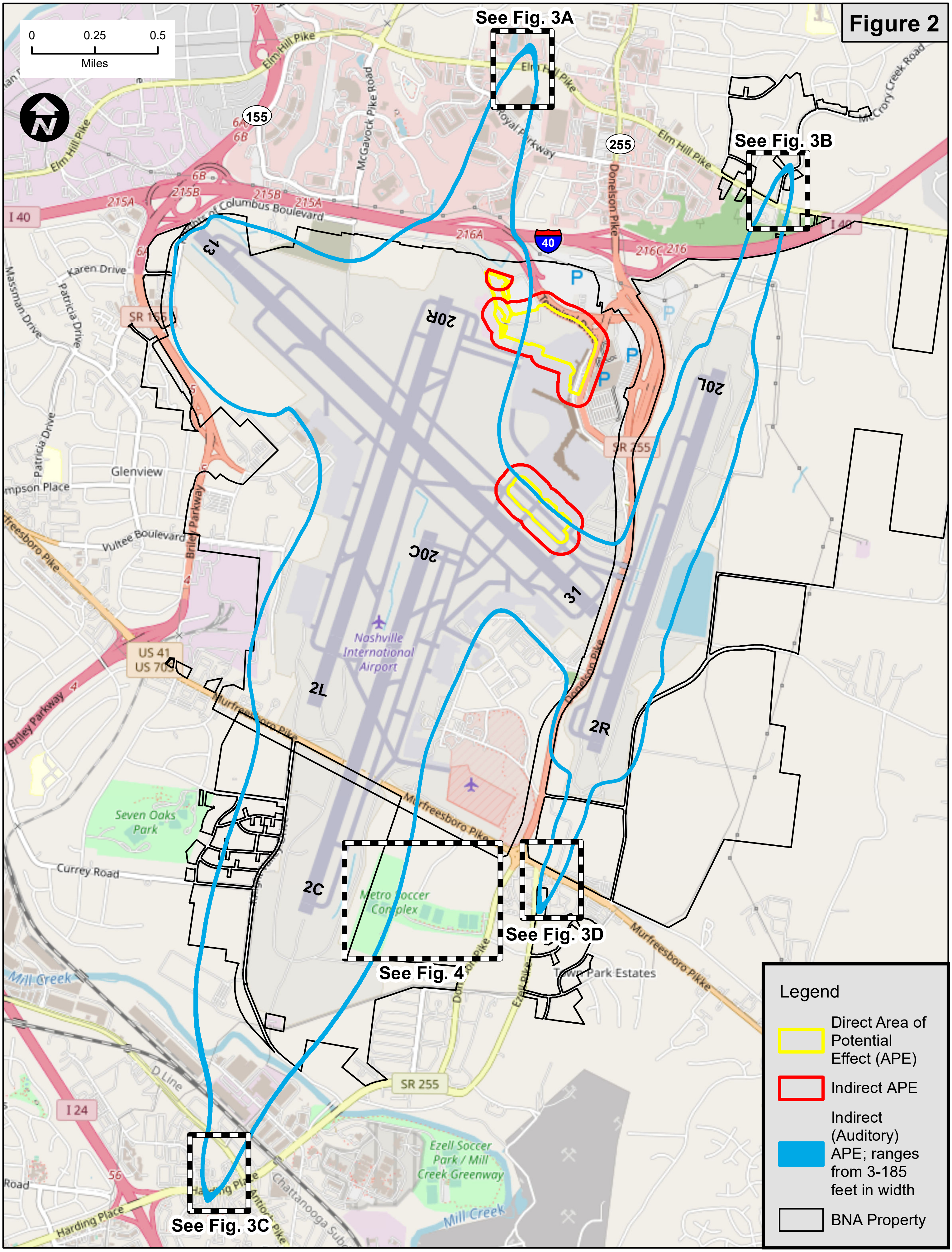
Figure 2
See Fig. 3A
See Fig. 3B
See Fig. 3C
See Fig. 3D
See Fig. 4
0
0.25
0.5
Miles
Nashville International Airport
Metro Soccer Complex
Seven Oaks Park
Ezell Soccer Park / Mill Creek Greenway
Mill Creek
Town Park Estates
Glenview
Elm Hill Pike
Murfreesboro Pike
Donelson Pike
Briley Parkway
Harding Place
Currey Road
Royal Parkway
McGavock Pike Road
Karen Drive
Patricia Drive
Massman Drive
Vultee Boulevard
Antioch Pike
Ezell Pike
McCrory Creek Road
D Line
Chattanooga Sub
I 40
I 24
SR 155
SR 255
US 41
US 70S
155
255
40
20R
20L
20C
2L
2R
2C
13
31
Legend
Direct Area of Potential Effect (APE)
Indirect APE
Indirect (Auditory) APE; ranges from 3-185 feet in width
BNA Property


Fig 3A
Elm Hill Pike
Royal Pkwy
Fig 3B
Elm Hill Pike
Fig 3C
Antioch Pike
Harding Pl
255
Fig 3D
0
200
400 Feet
N
41
Ezell Pike
Murfreesboro Pike
Legend
Indirect (Auditory) APE; ranges from 3-185 feet in width
BNA Property

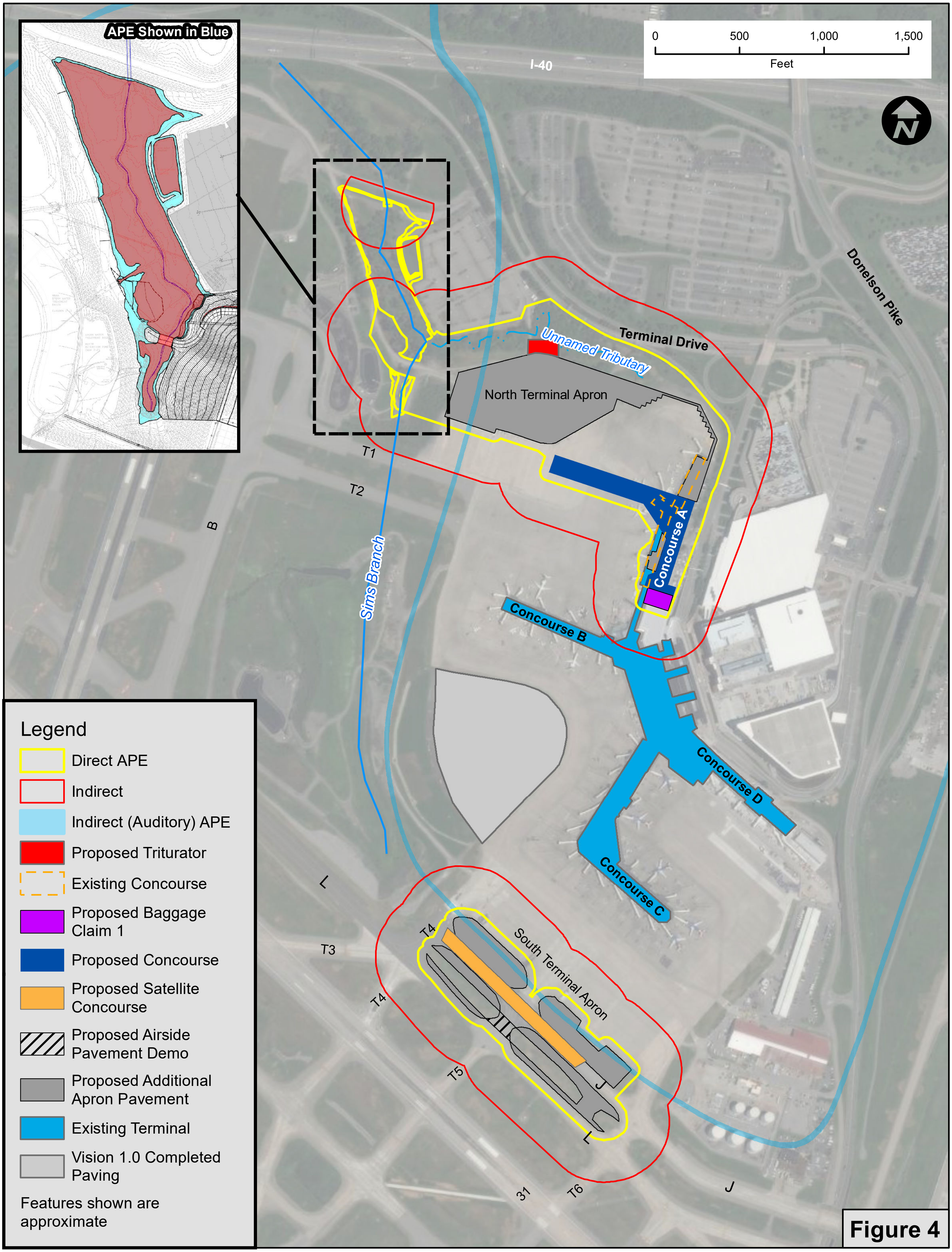
APE Shown in Blue
0
500
1,000
1,500
Feet
I-40
Donelson Pike
Terminal Drive
Unnamed Tributary
North Terminal Apron
Sims Branch
Concourse A
Concourse B
Concourse C
Concourse D
South Terminal Apron
T1
T2
T3
T4
T5
T6
B
L
J
31
Legend
Direct APE
Indirect
Indirect (Auditory) APE
Proposed Triturator
Existing Concourse
Proposed Baggage Claim 1
Proposed Concourse
Proposed Satellite Concourse
Proposed Airside Pavement Demo
Proposed Additional Apron Pavement
Existing Terminal
Vision 1.0 Completed Paving
Features shown are approximate

Figure 4

Tennessee Department of Environment and Conservation (TDEC) Division of Water Resources

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF WATER RESOURCES
William R. Snodgrass - Tennessee Tower
312 Rosa L. Parks Avenue, 11th Floor
Nashville, Tennessee 37243-1102

September 2, 2020

Mr. Ryan Mountain
Garver, LLC.
4300 South J.B. Hunt Drive
Suite 240
Rogers, AR 72758

re: Metro Nashville Airport Concourse and Gate Expansion Environmental Assessment
Davidson County, TN

Dear Mr. Mountain:

The Division has reviewed the information that was submitted regarding the proposed concourse and gate expansion for the Nashville Airport. The expansion will include redeveloping Concourse A and adding a temporary satellite concourse which will in total add 17 gates. There will be additional pavement expansion in addition, a total of 25 acres will be cleared and filled. The proposal also includes encapsulating 1,790 linear feet of an unnamed tributary of Simms Branch.

An individual Construction Storm Water Permit (CGP) will be required due to the considerable land disturbance as well as modification to the Multi-Sector General Stormwater Permit's Storm Water Pollution Prevention Plan (SWPPP). There is a concern that will have to be addressed in that the unnamed tributary is listed as Exceptional Tennessee Water (ETW) because of the federally listed Nashville crayfish. Encapsulating the tributary to Simms Branch will require an individual Aquatic Resource Alteration Permit (ARAP) and the purchase of compensatory stream mitigation credits.

If you have any further questions, I will be glad to try to assist you. You may reach me at (615) 532-0170 or tom.moss@tn.gov.

Sincerely,

Thomas A. Moss

Thomas A. Moss
Environmental Review Coordinator
Compliance and Enforcement Unit

cc: Tim Jennette, Nashville DWR EFO Manager
Matthew Taylor, TDEC Office of Policy and Sustainable Practices

Tennessee Department of Environment and Conservation (TDEC) Division of Remediation

GARVER
361 Mallory Station Road
Suite 102
Franklin, TN 37067
TEL 615.377.1337
FAX 615.371.8195
www.GarverUSA.com

RECEIVED
AUG 31 2020
DIVISION OF REMEDIATION

August 28, 2020

Mr. Andy Binford
TDEC Division of Remediation
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 14th Floor
Nashville, TN 37243

Re: Concourse and Gate Expansion Environmental Assessment
MNAA Project No. 2019A
Nashville International Airport
Request for Information

Dear Mr. Binford:

The Metropolitan Nashville Airport Authority (MNAA) desires to expand their current Concourse A terminal and has retained Garver to prepare a National Environmental Policy Act (NEPA) Environmental Assessment (EA) for the referenced project. The purpose of the project is to meet current and projected enplanement demands commensurate with the economic growth of the greater Nashville area.

The proposed action's EA will draw upon the recently completed Vision 1.0 EA and Finding of No Significant Impact (March 2018), evaluate potential environmental impacts and analyze alternatives to the proposed action. Detailed surveys will be completed early in the process, as needed, for resources that could potentially be impacted. Please refer to the project details below.

Contact Information:

- Garver, LLC
  Attn: Ryan Mountain, PWS
  4300 South J.B. Hunt Dr., Suite 240
  Rogers, AR 72758
  479-257-9188
  rcmountain@garverusa.com

Project Information:

- Lead Federal Agency: Federal Aviation Administration (FAA)
- Project Title: Concourse and Gate Expansion (CAGE) Environmental Assessment
- Project Location:
  - Nashville International Airport (BNA), 1 Terminal Drive, Nashville, TN 37214
  - Latitude: 36.131756° Longitude: -86.672327°

Project Description:

The proposed actions include redevelopment and expansion of Concourse A by adding nine gates to the main terminal building and construction of a new temporary satellite concourse that will add eight gates. A detailed list of actions is included in Table 1. The temporary south satellite concourse is considered an enabling project for the completion of Concourse A as gate deficiencies will be mitigated by the opening of the south satellite concourse. The proposed action meets the purpose and need by achieving the total required 65 gates by the year 2037 with the addition of 17 gates to the existing 48 gates (post Vision 1.0) and thereby addressing capacity needs. One active gate would be closed to serve as a passenger transfer point for access to the satellite concourse.

The proposed action is located entirely on airport property within two direct and two indirect Areas of Potential Effect (APE) as shown in Figures 1 and 2 below. The project's northern APE is currently utilized for sand and salt storage, access around the north apron, as a waste glycol recovery tank location, mobile fuel tank location, and includes approximately 20 acres of undeveloped land. The remaining areas have been previously disturbed. The project's southern APE currently contains taxiways, portions of the south apron, remain overnight (RON) parking, and infield grassed areas. Past uses of both APE areas have remained the same in recent years. Prior to airport development, it appears that both APEs were undeveloped.

We are currently in the scoping process for the NEPA document and requesting that you review the proposed study area (see enclosed exhibits). Please notify us of any constraints or concerns you may have regarding the proposed project. We are seeking comments regarding issues such as unique environmental features or environmentally sensitive areas, socioeconomic issues, proposed urban developments, and permits or approvals that should be obtained prior to construction of the project.

We would appreciate your response within 30 days to help us maintain our project schedule. If you have any questions regarding this request, please contact me at 479-257-9188.

Sincerely,

Ryan Mountain

Ryan Mountain
Senior Environmental Scientist

Enclosures

cc: Caitlin Dillon – MNAA
Traci Holton – MNAA
Matt Koss – Garver
Zac Simpson – Garver

Table 1 – Proposed Actions

Proposed Action	Location and Description
Terminal Building: New Concourses, Amenity Upgrades & Passenger Accessibility	
Concourse A	• Redeveloped double-loaded concourse adds nine additional gates (351,200 square feet (ft^2)) • Demolition of approximately 110,353 ft^2 (entire existing concourse) • Amenities: hold rooms, concession areas, circulation area and new restrooms, moving walkways • Addition of passenger boarding bridges • Relocation of existing utilities: electric, sanitary sewer, heating and air conditioning services, emergency generator(s), and lighting
South Satellite Concourse	• Temporary concourse adds eight additional gates (89,390 ft^2) • Amenities: hold rooms, concession areas, circulation area and restrooms • Addition of passenger boarding bridges and fuel systems • Mobile access from the main terminal (method to be determined) • One mobile access point is proposed at the main terminal that will remove one gate from active use
Baggage Claim/ Handling	• Concourse A additional baggage screening system and handling matrix will be constructed under the new concourse
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Apron Expansion Actions The new additional ramp areas are required to meet FAA specifications (*Advisory Circular 150/5300-13A*) for the safe and efficient maneuvering of aircraft. Equipment staging would be located within areas on the airport outside of the aircraft maneuvering areas.	
North Apron Expansion	• Pavement expansion of approximately 500,000 ft^2 that allows for dual parallel taxilanes and RON positions • Clearing and filling of approximately 20 acres • Relocation of 2,000 linear feet of Airport Operations Area (AOA) security fence and partial security fence removal • Encapsulation of 1,790 linear feet of unnamed tributary • Stormwater drainage improvements with shear key • Waste glycol tank relocation • Deicing locations would be reconfigured • Reclassification of 12 acres of non-aeronautical use to aeronautical use • Relocation of oil/water separator(s) • Relocation of existing utilities: electric and sanitary sewer • Construction of a 24-foot wide asphalt haul road, guard rail and retaining wall
South Apron Expansion	• Pavement expansion of approximately 170,000 ft^2 • Clearing and filling of approximately 5 acres of infield • Decommissioning of Taxiway J • Demolition of the T5 connector • Removal of a blast pad
Fuel System	• Expansion of the fuel hydrant and distribution systems to account for the new gates, including piping, connections and hydrants for both the satellite concourse and Concourse A
Triturator	• A new 2-bay triturator will be installed adjacent to the north apron

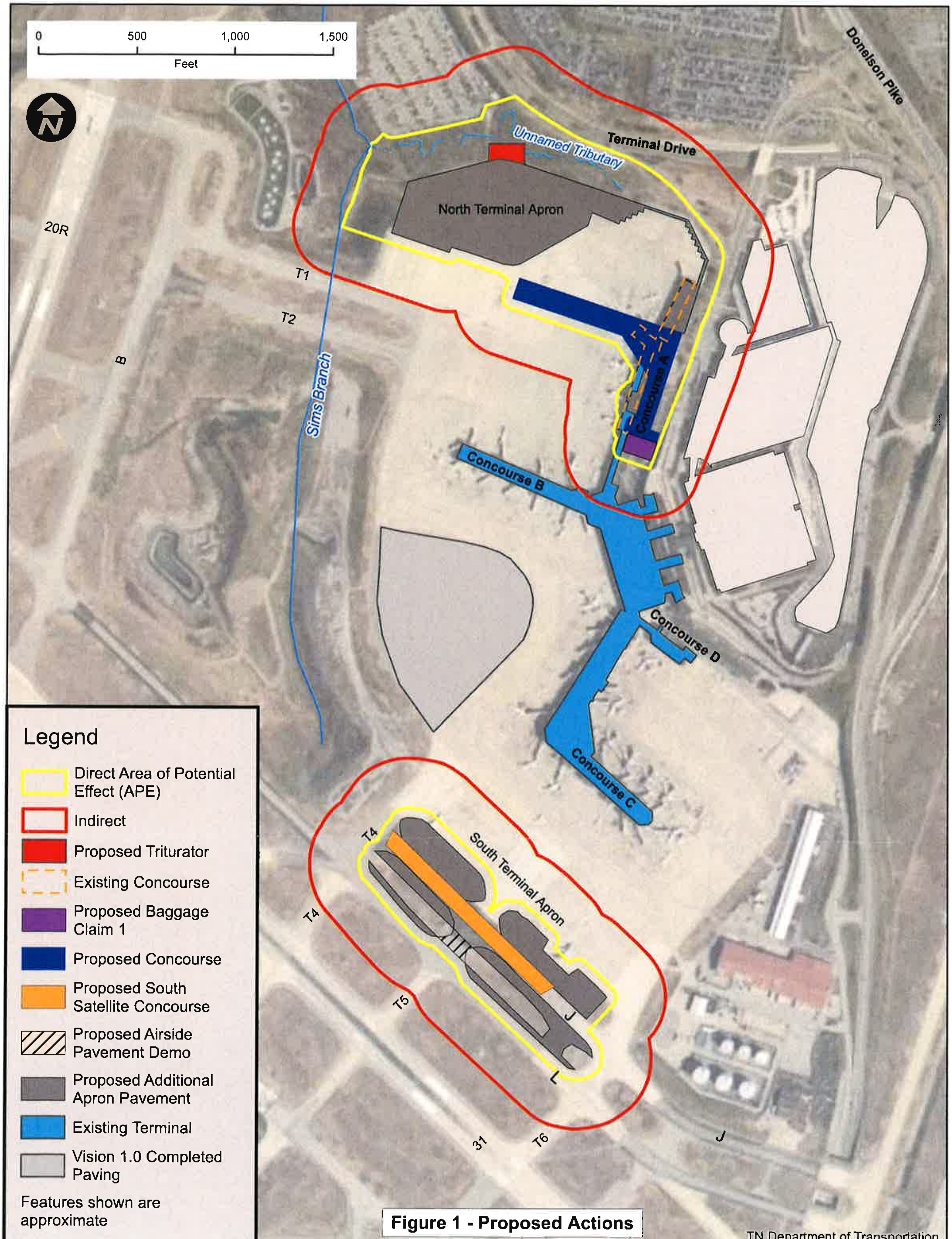


Figure 1 - Proposed Actions

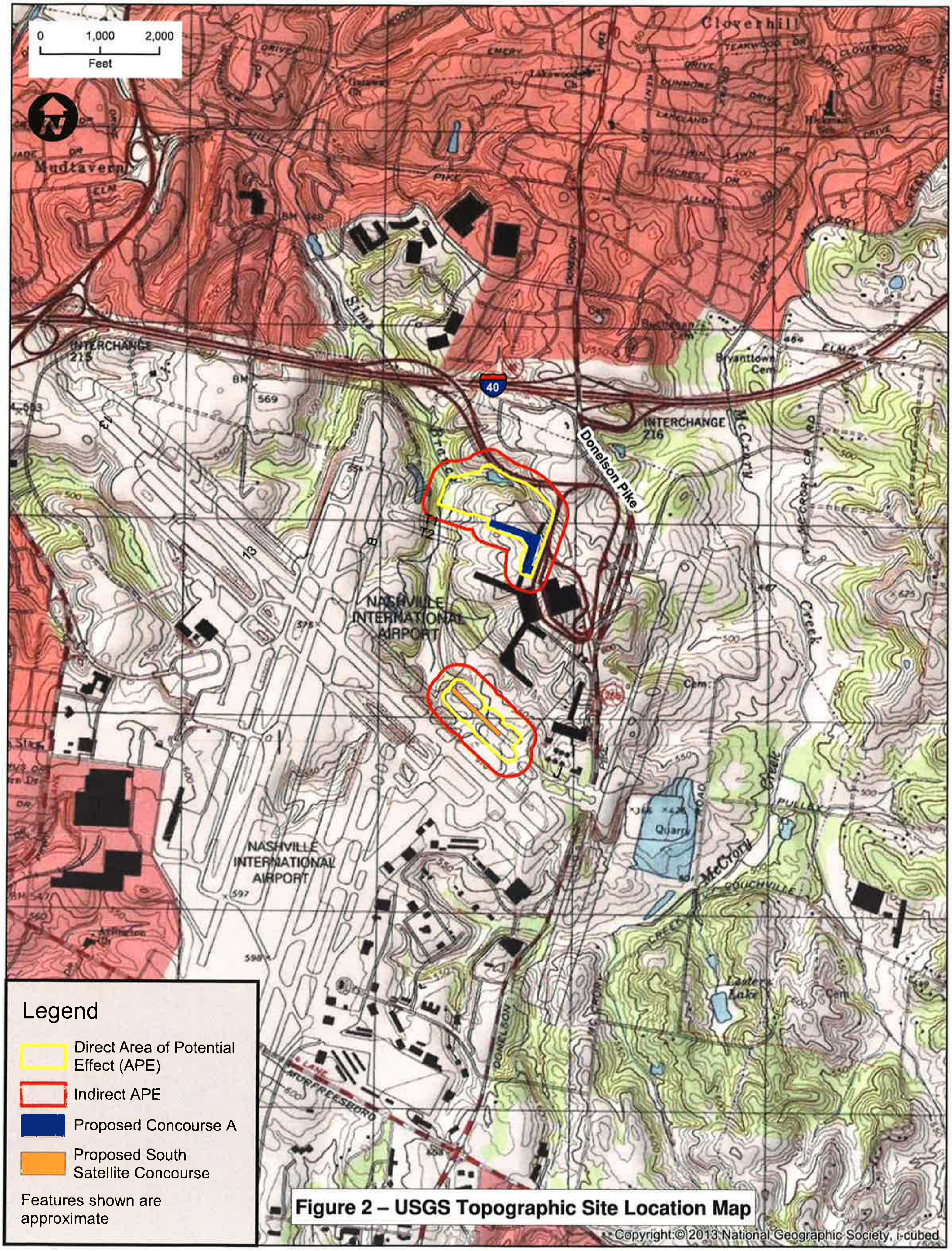


Figure 2 – USGS Topographic Site Location Map

Mountain, Ryan C.

From: Division Remediation <Division.Remediation@tn.gov>
Sent: Thursday, September 3, 2020 10:23 AM
To: Mountain, Ryan C.
Cc: Justin M. Meredith
Subject: Concourse and Gate Expansion- MNAA Project 2019A
Attachments: 0122_001.pdf

Good morning Mr. Mountain,

I will be handling your request for information from the TN Department of Environment and Conservation's Division of Remediation (TDEC-DOR) regarding the concourse and gate expansion project at the Nashville International Airport. Andy Binford has retired and is no longer with the state.

While TDEC-DOR has several sites associated with the airport, it does not appear that TDEC-DOR has sites within the Direct Area of Potential Effect or the Indirect Area of Potential Effect based on the maps you provided in your request. However, there are two older closed sites that are adjacent to the indirect area. I am providing a Dropbox link to download the files for these two sites for your information.

The TDEC-DOR files have been uploaded to the following link. This link will expire on 9/10/2020. **Please let me know when you have downloaded the files so I can free up the space sooner as space is very limited.**
https://www.dropbox.com/sh/dp8asl17ql2uj3b/AACJ97ZqrZ3lS2HAK3WJqn_oa?dl=0

Let me know if I met your expectations by completing the ***TDEC Customer Survey***

TN Department of Environment & Conservation

Alison Hensley | Environmental Consultant
Division of Remediation
William R. Snodgrass TN Tower, 14th Floor
312 Rosa L. Parks Ave, Nashville, TN 37243
p. 615-532-0932 f. 615-741-1115
Alison.Hensley@TN.gov
tn.gov/environment/program-areas/rem-remediation.html

Tennessee Historical Commission State Historic Preservation Office (SHPO)

TENNESSEE HISTORICAL COMMISSION
STATE HISTORIC PRESERVATION OFFICE
2941 LEBANON PIKE
NASHVILLE, TENNESSEE 37243-0442
OFFICE: (615) 532-1550
www.tnhistoricalcommission.org

September 3, 2020

Mr. Ryan Mountain
Garver Engineering
4300 South J.B. Hund Dr.
Suite 240
Rogers, AR 72758

RE: FAA / Federal Aviation Administration, Nashville International Airport, Concourse A and Gate Expansion, 36.131756, -86.672327, Nashville, Davidson County, TN

Dear Mr. Mountain:

In response to your request, we have reviewed the documents you submitted regarding your proposed undertaking. Our review of and comment on your proposed undertaking are among the requirements of Section 106 of the National Historic Preservation Act. This Act requires federal agencies or applicant for federal assistance to consult with the appropriate State Historic Preservation Office before they carry out their proposed undertakings. The Advisory Council on Historic Preservation has codified procedures for carrying out Section 106 review in 36 CFR 800 (Federal Register, December 12, 2000, 77698-77739).

After considering the documentation submitted, it is our opinion that there are no National Register of Historic Places listed or eligible properties affected by this undertaking. We have made this determination because either: no National Register listed or eligible Historic Properties exist within the undertaking's area of potential effects, the specific location, size, scope and/or nature of the undertaking and its area of potential effects precluded affects to Historic Properties, the undertaking will not alter any characteristics of an identified eligible or listed Historic Property that qualify the property for listing in the National Register, or it will not alter an eligible Historic Property's location, setting or use. We have no objections to your proceeding with your undertaking.

This current review letter does not include potential auditory effects. Per your correspondence, it is our understanding that you will be submitting the potential auditory effects associated with the undertaking as a separate review request at a later date.

If your agency proposes any modifications in current project plans or discovers any archaeological remains during the ground disturbance or construction phase, 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. If you are applying for federal funds, license or permit, you should submit this letter as evidence of consultation under Section 106 to the appropriate federal agency, which, in turn, should contact us as required by 36 CFR 800. If you represent a federal agency, you should submit a formal determination of eligibility and effect to us for comment. You may direct questions or comments to ((615) 687-4780, Jennifer.Barnett@tn.gov). This office appreciates your cooperation.

Sincerely,

E. Patrick McIntyre, Jr. JB

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

EPM/jmb

TENNESSEE HISTORICAL COMMISSION
STATE HISTORIC PRESERVATION OFFICE
2941 LEBANON PIKE
NASHVILLE, TENNESSEE 37243-0442
OFFICE: (615) 532-1550
www.tnhistoricalcommission.org

December 29, 2020

Mr. Aaron Braswell
Federal Aviation Administration
Memphis Airports District Office
2600 Thousand Oaks Boulevard, Suite 2250
Memphis, TN 38118

RE: FAA / Federal Aviation Administration, Nashville International Airport, Concourse A and Gate Expansion, 36.131756, -86.672327, Nashville, Davidson County, TN

Dear Mr. Braswell:

In response to your request, we have reviewed the additional documents you submitted regarding your proposed undertaking. Our review of and comment on your proposed undertaking are among the requirements of Section 106 of the National Historic Preservation Act. This Act requires federal agencies or applicant for federal assistance to consult with the appropriate State Historic Preservation Office before they carry out their proposed undertakings. The Advisory Council on Historic Preservation has codified procedures for carrying out Section 106 review in 36 CFR 800 (Federal Register, December 12, 2000, 77698-77739).

After considering the additional documentation submitted, it is our opinion that there are no National Register of Historic Places listed or eligible properties affected by this undertaking. We have made this determination because either: no National Register listed or eligible Historic Properties exist within the undertaking's area of potential effects, the specific location, size, scope and/or nature of the undertaking and its area of potential effects precluded affects to Historic Properties, the undertaking will not alter any characteristics of an identified eligible or listed Historic Property that qualify the property for listing in the National Register, or it will not alter an eligible Historic Property's location, setting or use. We have no objections to your proceeding with your undertaking.

If your agency proposes any modifications in current project plans or discovers any archaeological remains during the ground disturbance or construction phase, please contact this office to determine what further action, if any, will be necessary to comply with Section 106 of the National Historic Preservation ActYou may direct questions or comments to ((615) 687-4780, Jennifer.Barnett@tn.gov). This office appreciates your cooperation.

Sincerely,

E. Patrick McIntyre, Jr. JB

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

EPM/jmb

Tennessee Wildlife Resources Agency (TWRA)

Mountain, Ryan C.

From: Rob Todd <Rob.Todd@tn.gov>
Sent: Wednesday, March 3, 2021 8:19 AM
To: Mountain, Ryan C.
Cc: Dillon, Caitlin; Dillon Blankenship; David Withers; Robbie_Sykes@fws.gov
Subject: RE: CAGE EA - Additional site

Follow Up Flag: Flag for follow up
Flag Status: Flagged

Mr. Mountain:

Thank you for the additional information. The Tennessee Wildlife Resources Agency has reviewed the information that you provided regarding the proposed invasive vegetation removal project at an offsite property associated with the Metropolitan International Airport and provides the following comments. It is our understanding that runoff from the offsite property will drain to McCrory Creek, vegetation removal will be by mechanical methods, and the project will not disturb the existing grade of the property. Based on these understandings, we do not anticipate adverse impacts to state listed species under our authority due to the project as proposed. Thank you for the opportunity to review and comment on this proposed project. If I may be of further assistance, please contact me.

Robert Todd
Fish & Wildlife Environmentalist
Tennessee Wildlife Resources Agency
Ellington Agricultural Center
5107 Edmondson Pike
Nashville, TN 37211
Office: 615-781-6572
Cell: 931-881-8240
Fax: 615-781-6667
Email: rob.todd@tn.gov

-----Original Message-----
From: Mountain, Ryan C. <RCMountain@GarverUSA.com>
Sent: Tuesday, March 2, 2021 9:24 PM
To: Rob Todd <Rob.Todd@tn.gov>
Cc: Dillon, Caitlin <Caitlin.Dillon@flynashville.com>
Subject: [EXTERNAL] RE: CAGE EA - Additional site

Mr. Todd,

Invasive species removal is proposed to be conducted by mechanical methods that will not disturb the existing grade. Areas within the drip zone of trees and within 10ft of drainage ditches and/or other drainage features are to be removed by hand. Vines attached to trees are to be remove by hand. Trees are to be inventoried before and after clearing activities.

Please let me know if you have any other questions or need anything else.

Thanks,

-----Original Message-----
From: Rob Todd <Rob.Todd@tn.gov>
Sent: Tuesday, March 2, 2021 1:38 PM
To: Mountain, Ryan C. <RCMountain@GarverUSA.com>
Subject: RE: CAGE EA - Additional site

Mr. Mountain:

How is the invasive species to be removed? It appears that runoff from this site would drain into McCrory Cree. It this correct?

Robert Todd
Fish & Wildlife Environmentalist
Tennessee Wildlife Resources Agency
Ellington Agricultural Center
5107 Edmondson Pike
Nashville, TN 37211
Office: 615-781-6572
Cell: 931-881-8240
Fax: 615-781-6667
Email: rob.todd@tn.gov

-----Original Message-----
From: Mountain, Ryan C. <RCMountain@GarverUSA.com>
Sent: Tuesday, March 2, 2021 1:10 PM
To: Rob Todd <Rob.Todd@tn.gov>
Subject: [EXTERNAL] RE: CAGE EA - Additional site

Mr. Todd,
Thanks for the quick reply. I've attached a site location map that shows the additional, approximate area (Lat. 36.148305°, -86.657233°). The area is approximately 10 acres in size and work would include invasive species removal.

Please let me know if you need a more defined study area.

Thanks,
Ryan

-----Original Message-----
From: Rob Todd <Rob.Todd@tn.gov>
Sent: Tuesday, March 2, 2021 10:39 AM
To: Mountain, Ryan C. <RCMountain@GarverUSA.com>
Subject: RE: CAGE EA - Additional site

Mr. Mountain:

A brief description of the proposed project, lat/long for the project, and a map of the project. If I need additional information for the specific project, I will request it.

Robert Todd
Fish & Wildlife Environmentalist
Tennessee Wildlife Resources Agency
Ellington Agricultural Center
5107 Edmondson Pike
Nashville, TN 37211
Office: 615-781-6572
Cell: 931-881-8240
Fax: 615-781-6667
Email: rob.todd@tn.gov

-----Original Message-----
From: Mountain, Ryan C. <RCMountain@GarverUSA.com>
Sent: Tuesday, March 2, 2021 9:55 AM
To: Rob Todd <Rob.Todd@tn.gov>
Subject: [EXTERNAL] CAGE EA - Additional site

Rob,

We need to evaluate an offsite area as part of this project for offsite stormwater LID mitigation. What would you need in order to evaluate it?

We anticipate a habitat assessment will be completed for the area, which is located between Harper Pl. and Allen Rd. North of Elm Hill Pike, north of BNA. I can send a location map later today if needed.

Thanks,
Ryan Mountain
479-903-2041

Sent from my iPhone

TENNESSEE WILDLIFE RESOURCES AGENCY

ELLINGTON AGRICULTURAL CENTER
5107 EDMONDSON PIKE
NASHVILLE, TENNESSEE 37211

January 28, 2021

Ryan Mountain
Garver
361Mallory Station Road
Franklin, TN 37067

Re: TWRA Comments Regarding Concourse and Gate Expansion
MNA Project No. 2019A
Nashville International Airport

Dear Mr. Mountain:

The Tennessee Wildlife Resources Agency has reviewed the information that you provided regarding the proposed Nashville International Airport Concourse and Gate Expansion project and provides the following comments. It is our understanding that the northern Area of Potential Effect (APE) includes an unnamed tributary to Sims Branch and part of Sims Branch itself. Sims Branch is known to be inhabited by the state and federally endangered Nashville Crayfish (*Faxonius shoupi*). The Nashville Crayfish has been documented approximately 0.8 miles downstream from the APE in Sims Branch. Since this is a federally listed species, we request that you consult with the Tennessee Field Office of the U.S. Fish and Wildlife Service regarding potential impacts to this species. Activities at the airport have adversely impacted the Nashville Crayfish in the past and measures should be implemented to ensure that adverse impacts to this species are minimized during the construction activities associated with this project.

Thank you for the opportunity to comment on this project.

Sincerely,

Robert M. Todd

Robert M. Todd
Fish and Wildlife Environmentalist

cc: Mike Murdock, Region II Habitat Biologist
Stacey Saxton, TWRA
Robbie Sykes, USFWS
Steve Alexander, USFWS

.

APPENDIX C

Noise, Climate and Air Quality Analysis

HMMH
700 District Avenue, Suite 800
Burlington, Massachusetts 01803
781.229.0707
www.hmmh.com

UPDATED TECHNICAL MEMORANDUM

To:	Ryan Mountain Garver 361 Mallory Station Road, Suite 102 Franklin, TN 37067
From:	Kate Larson, Senior Consultant Phil DeVita, Principal Consultant
Date:	January 7, 2021
Subject:	Noise and Air Quality Analysis for BNA CAGE EA
Reference:	HMMH Project Number 310880

HMMH is assisting Garver in preparing an Environmental Assessment (EA) for the Concourse A Gate Expansion (CAGE) at Nashville International Airport (BNA). The purpose of this technical memorandum is to present the noise and air quality modeling approach, input data, assumptions, and draft results.

In accordance with the scope of work, the noise and air quality analyses include a No Action and a Proposed Action case for 2035, based on the forecast levels of operations in the airport Master Plan. The air quality analysis also considers construction emissions that would occur during the concourse expansion process; that assessment assumes that the construction would be completed in 2025.

The subsequent sections address the noise and air quality assessment separately. Both analyses include modeling with the Federal Aviation Administration (FAA)'s Aviation Environmental Design Tool (AEDT). FAA guidance on use of the AEDT specifies using the most recent version of the model that is available at the time the project commences. In this case, it is AEDT Version 3b[1]. All AEDT modeling conducted for this study adheres to "*Guidance on Using the AEDT to Conduct Environmental modeling for FAA Actions Subject to NEPA*" [2]

1. Noise Analysis

The noise analysis for this Environmental Assessment (EA) was conducted in accordance with FAA Order 1050.1F and its associated Environmental Desk Reference. These documents specify several requirements for evaluating noise impacts, including:

- Acceptable noise models to be used and the circumstances under which their use is required.
- The metrics to be used for characterizing the noise environment and quantifying impacts; and
- Thresholds of significance for determining whether the effects of an action would constitute a significant impact under the National Environmental Policy Act (NEPA).

For an action occurring on, or in the vicinity of a single airport, the Environmental Desk Reference directs the use of the latest version of the Aviation Environmental Design Tool (AEDT) for detailed noise modeling or another model, as approved by FAA. The model must be used to produce Day-Night Average Sound Level (DNL) 65 dB, DNL 70 dB, and DNL 75 dB contours, and others as needed. FAA considers DNL 65 dB as the threshold below which all land uses are compatible.

FAA Orders 1050.1F and 5050.4B determine a significant noise impact to be a DNL increase of 1.5 dB or more at a noise-sensitive location with a DNL of 65 dB or higher. For example, an increase from 63.5 dB to 65 dB

[1] Released September 24, 2019 https://aedt.faa.gov/3b_information.aspx
[2] Published September 12, 2016

within the same timeframe due to the Proposed Project would be considered a significant impact. If a noise increase is determined to be a significant impact to any of the surrounding noise sensitive properties, as defined in FAA Order 1050.1F, mitigation would be required.

Most aircraft noise studies focus on Day-Night Average Sound Level (DNL), the metric adopted by FAA and Environmental Protection Agency (EPA) as the most appropriate long-term measure of airport noise. DNL is determined by adding up the noise energy from all modeled aircraft activity at every individual point of a large array of grid points around an airport. In the DNL calculation, a 10-decibel weighting is applied to night[3] operations. Appendix A provides an overview of basic airport noise terminology, including details of how DNL is calculated.

Computer-generated estimates of DNL are often depicted as noise contours reflecting lines of equal exposure around an airport (much as topographic maps indicate contours of equal elevation). The contours usually reflect long-term (annual average) operating conditions, accounting for the average flights per day, how often each runway is used throughout the year, and where over the surrounding communities the aircraft normally fly.

The FAA requires that the following information must be disclosed for each modeled scenario that is analyzed:

- The number of residences or people residing within each noise contour where aircraft noise exposure is at or above DNL 65 dB, and the net increase or decrease in the number of people or residences exposed to that level of noise.
- The location and number of noise sensitive uses in addition to residences (e.g., schools, hospitals, parks, recreation areas) exposed to DNL 65 dB or greater.
- The identification of noise sensitive areas within the DNL 60 dB contour that are exposed to aircraft noise at or above DNL 60 dB, but below DNL 65 dB, and are projected to experience a noise increase of DNL 3 dB or more, only when DNL 1.5 dB increases are documented within the DNL 65 dB contour.
- Discussion of the noise impact on noise sensitive areas within the DNL 65 dB contour; and
- Mapping providing land use data, noise contours, and flight tracks for each scenario.

1.1 Noise Modeling Methodology and Inputs

AEDT noise model inputs are developed under the following categories:

- Physical description of the airport layout
- Aircraft operations
- Aircraft noise and performance characteristics
- Runway utilization
- Aircraft maintenance runup activity
- Flight track geometry and usage
- Meteorological conditions
- Terrain data

Section 1.1.1 through Section 1.1.8 address the noise model inputs for each of these categories. Section 1.2 presents the resulting DNL contours.

1.1.1 *Physical Description of the Airport Layout*

BNA is located within Davidson County, approximately six miles southeast of downtown Nashville, TN. **Figure 1** depicts the BNA airfield layout. As shown in the figure, the airport includes four 150-foot wide runways,

[3] Night is defined as 10 pm to 7 am

three of which are parallel, oriented in a north-northeast to south-southwest direction, and one "crosswind" runway that is roughly perpendicular to the parallel runways.

Each runway end is designated by a number that, with the addition of a trailing "0," reflects the magnetic heading of the runway to the nearest 10°, as seen by the pilot. Thus, "Runway 13-31" has the designation "13" at the west end of the pavement looking eastward, indicating that it is aligned on a magnetic heading of approximately 130°, while the opposite end of the same piece of pavement has the designation "31" indicating its orientation on an approximate heading of 310°. Runway 13-31 is 11,030 feet long. The three parallel runways, 2L-20R, 2C-20C and 2R-20L, are oriented on approximate magnetic headings of 20° and 200° and are 7,704 feet, 8,001 feet and 8,001 feet long, respectively. The parallel runways are distinguished from each other with letter endings "L", meaning left, "C", meaning center, and "R", meaning right, as seen by the pilot.

The parallel runways provide BNA with the greatest capacity to accommodate high numbers of aircraft operations. The crosswind runway is used for late night operations and occasionally at other times during strong crosswinds.

Runway length, runway width, instrumentation, and declared distances do not directly affect noise calculations. However, these parameters may affect which aircraft might use a particular runway and under what conditions, and therefore how often a runway would be used relative to the other runways at the airport.

Table 1 provides the detailed parameters for each runway end. Note that each end of Runway 13/31 has a displaced landing threshold; the arrival thresholds are at the physical end of all other runways. All departures are assumed to start at the physical runway end on all runways.

Table 1. Runway Details

Sources: approach plates published on http://airnav.com/airport/KBNA and FAA Form 5010, https://www.faa.gov/airports/airport_safety/airportdata_5010/, as of 6/9/2020

Runway End	Latitude (dd-mm-ss)	Longitude (dd-mm-ss)	Latitude (degrees)	Longitude (degrees)	Elevation (feet, MSL)	Displaced Landing Threshold (feet)	Glide Slope (degrees)	Threshold Crossing Height (feet)	Magnetic Orientation (degrees)
2C	36-06-11.9 N	86-41-16.6 W	36.103331	-86.687961	569	None	3	60	18
2L	36-07-03.6 N	86-41-11.3 W	36.117679	-86.686474	598	None	3	55	18
2R	36-06-45.7 N	86-40-03.5 W	36.112713	-86.667642	590	None	3	59	18
13	36-08-28.6 N	86-41-43.2 W	36.141276	-86.695355	536	801	3	55	133
20C	36-07-27.2 N	86-40-46.5 W	36.124233	-86.679597	572	None	3	68	198
20R	36-08-16.2 N	86-40-42.8 W	36.137842	-86.678566	556	None	3	79	198
20L	36-08-01.0 N	86-39-33.4 W	36.133614	-86.659277	540	None	3	47	198
31	36-07-13.7 N	86-40-05.4 W	36.120496	-86.668178	582	741	3	52	313
PAD 1	36-06-37.3 N	86-41-1.2 W	36.110385	-86.683677	577	Note: This is a helipad used to model helicopter operations at the intersection of Taxiways S and T4			

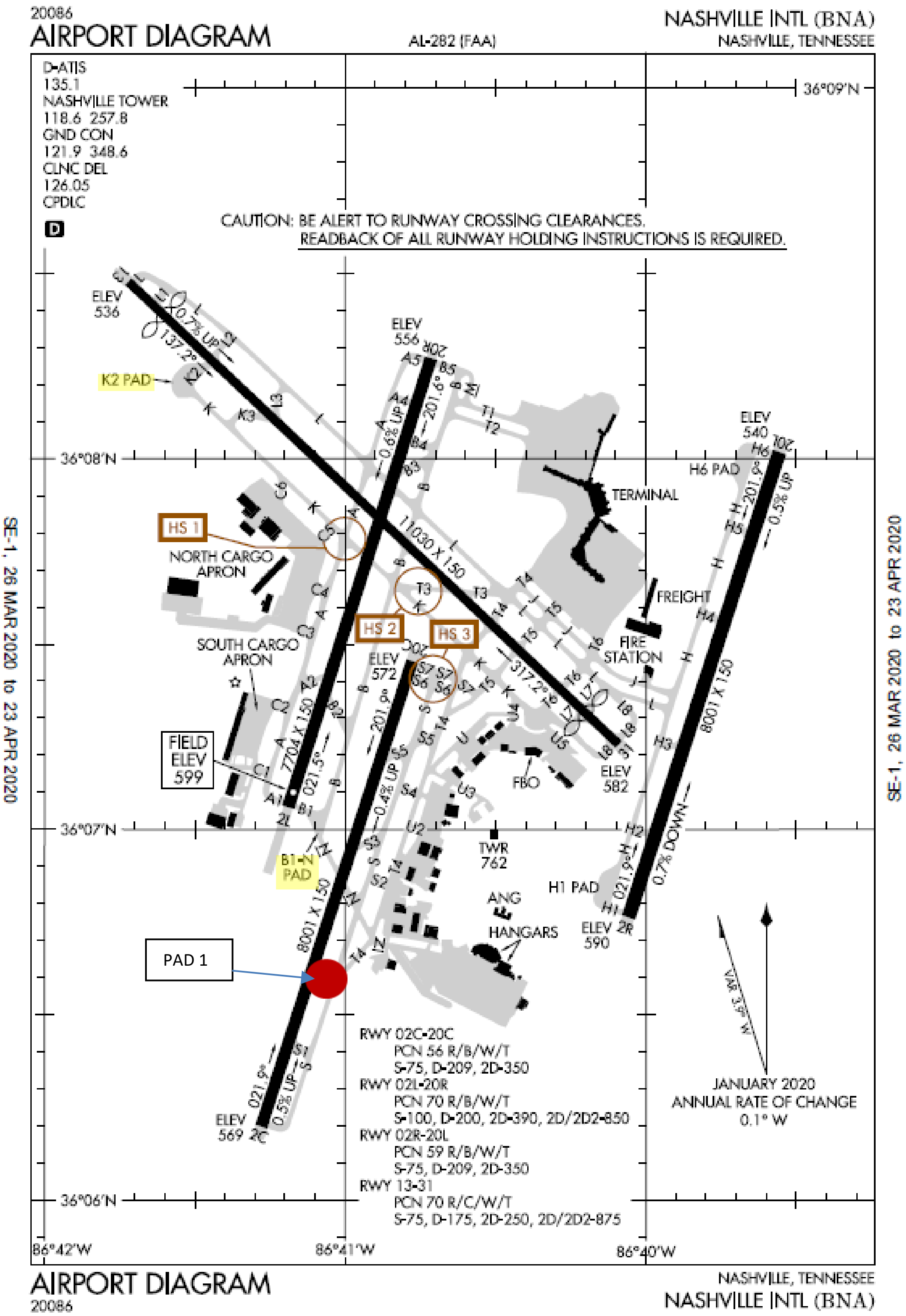


Figure 1. Existing BNA Airport Layout

Sources: FAA, MNAA

Note: Modeled Helipad location "PAD 1" indicated by red dot, modeled runup locations highlighted

1.1.2 *Aircraft Operations*

The No Action and Proposed Action cases in this Environmental Assessment (EA) are representative of forecast year operations for 2035. The Master Plan Baseline Scenario forecast data was interpolated to 2035 levels from data provided in the AECOM Master Plan Forecast document (dated Aug 21, 2018), using compound annual growth rates, to form the basis for the 2035 Proposed Action case. Because the proposed action includes the construction of 17 new gates, the number of forecasted air carrier passenger operations in the 2035 Proposed Action Case was reduced by 6,768 annual operations[4] to represent the 2035 No Action case. **Table 2** presents the annual operations modeled for the two cases.

Table 2. Modeled Annual Aircraft Operations

Sources: AECOM Master Plan Forecast, 8/21/2018, Garver and HMMH 2020

Case	Air Carrier		General Aviation		Military	Total Annual Operations	Total Average Daily Operations
	Passenger	Cargo	Air Taxi	Other GA			
2035 No Action	195,954	3,782	43,652	49,446	3,550	**296,384**	**812.0**
2035 Proposed Action	202,722	3,782	43,652	49,446	3,550	**303,152**	**830.6**

The derivative forecast prepared by AECOM for the NEM Update included specific fleet mix assumptions for all categories of aircraft operating at BNA. It also separated arrival and departure operations by the day and night time periods used in the calculation of DNL (7:00 a.m. to 10:00 p.m. for daytime and 10:00 p.m. to 7:00 a.m. for nighttime, as discussed in Appendix A), and further divided departure operations by stage length (discussed in section 1.1.3).

For this analysis, in addition to scaling the Master Plan derivative forecast operations by category to the 2035 yearly totals shown in **Table 2**, several specific aircraft type changes were made to represent a likely future fleet mix for 2035, based on observed trends and expectations in fleet retirements at this time. The Airbus A319 operations were replaced by Airbus A320 NEO, while the passenger Boeing 757 operations were replaced by Airbus A321 NEO. Additionally, it was assumed that about 75 percent of the operations being flown by A320 or A321 aircraft in the five-year forecast would also be replaced by A320 NEO and A321 NEO, respectively. Many of the smaller passenger jet operations by Boeing 717 or Canadair and Embraer models in the five-year forecast would occur in Airbus 220-100 or Airbus 220-300 aircraft instead. The 2035 forecast assumes that Boeing 737 operations would be upgraded to the "MAX" versions of those aircraft and the share of operations by Boeing 787-8 aircraft was increased slightly. In the cargo category, the Airbus A300 and Boeing 767-200 aircraft would be replaced by Boeing 767-300s, and the Boeing 757s would be replaced by 737-800s. In the GA category, 50 percent of the Gulfstream 400/450 aircraft were assumed to be replaced by the Gulfstream 650.

Table 3 presents the 2035 No Action case detailed forecast of average daily operations by aircraft type for arrivals and departures. **Table 4** contains the modeled average daily operations for the 2035 Proposed Action case. The fleet mix percentages and the day/night split of operations for the Proposed Action case were assumed to be the same as for the No Action case; the only difference is the total number of operations by the passenger air carrier category. The column labeled "Runway Use Group" in **Table 3** and **Table 4** indicates how the operations with similar runway requirements were combined, as discussed in section 1.1.4.

[4] The 6,768 operations represent the portion of the change in operations from the five-year forecast case in the BNA Noise Exposure Map (NEM) Update to the 2035 Proposed Action case which could be attributed to the 35 percent increase in gates comprised by the Action.

1.1.3 *Aircraft Noise and Performance Characteristics*

AEDT requires the use of specific noise and performance data for each aircraft type operating at the airport. Noise data are specified in the form of Sound Exposure Level (SEL) at a range of distances (from 200 feet to 25,000 feet) from a receiver on the ground to a particular aircraft with engines operating at a range of thrust levels. Performance data include thrust, speed and altitude profiles for takeoff and landing operations. The AEDT automatically accesses the noise and performance data for takeoff and landing operations by those aircraft types.

Within the AEDT database, aircraft departure profiles are defined by a range of trip distances identified as "stage lengths." Higher stage lengths (longer trip distances) are associated with heavier aircraft due to the increase in fuel requirements for the flight. The noise calculations presented in this document used the standard AEDT departure profiles.

Table 3. Modeled Average Daily Aircraft Operations for 2035 No Action

Sources: AECOM MP forecast, Garver, and HMMH, 2020

Runway Use Group	Aircraft Type	AEDT Type	Departures		Arrivals	
			Day	Night	Day	Night
Passenger Air Carrier						
Narrow-Body	Airbus 220-100	737-700	16.26	2.94	17.90	1.30
Narrow-Body	Airbus 220-300	737-700	21.06	1.65	19.30	3.40
Narrow-Body	Airbus320 Neo	A320-271N	17.76	2.40	16.53	3.63
Narrow-Body	Airbus 321 Neo	A321-232	4.53	0.28	4.52	0.28
Narrow-Body	Airbus A320	A320-211	2.37	0.17	2.34	0.21
Narrow-Body	Airbus A321	A321-232	1.42	0.08	1.41	0.08
Narrow-Body	Boeing 737 MAX 8	737MAX8	1.64	0.21	1.69	0.16
Narrow-Body	Boeing 737-700 Max	737MAX8	87.21	12.62	86.33	13.50
Narrow-Body	Boeing 737-800 Max	737MAX8	35.57	8.91	36.73	7.75
Narrow-Body	Boeing 737-900 Max	737800	1.42	0.10	1.37	0.16
Wide-Body Jet	Boeing 787-8	7878R	1.76	0.00	1.76	0.00
Other Jet	Canadair Regional Jet 900	CRJ9-ER	12.74	3.79	14.62	1.91
Other Jet	DHC-8-400 Dash 8Q	DHC830	1.09	0.00	1.09	0.00
Other Jet	Embraer RJ135	EMB175	0.96	0.18	0.89	0.25
Other Jet	Embraer 170	EMB170	3.45	0.07	3.48	0.03
Other Jet	Embraer 175 (long wing)	EMB175	15.73	1.76	15.48	2.01
Other Jet	Embraer 175 (short wing)	EMB175	8.04	0.27	7.80	0.52
Passenger Air Carrier Subtotals			**233.00**	**35.43**	**233.24**	**35.19**
Cargo Air Carrier						
Turboprop	Beechcraft 1900	1900D	0.01	0.02	0.01	0.01
Cargo	Boeing 737-800	737800	0.97	2.68	0.65	3.01
Cargo	Boeing 767-300	767300	0.26	1.16	0.45	0.97
Turboprop	Cessna 208 Caravan	CNA208	0.02	0.02	0.03	0.00
Cargo	McDonnell Douglas MD-11	MD11PW	0.02	0.00	0.02	0.00
Turboprop	SWEARINGEN Merlin 4	DHC6	0.01	0.02	0.02	0.01
Cargo Air Carrier Subtotals			**1.28**	**3.90**	**1.18**	**4.00**
General Aviation						
Other Jet	Beech Jet	MU3001	5.15	0.74	5.37	0.51
Other Jet	Cessna 525 Citation Jet	CNA525C	6.31	0.91	6.58	0.63
Other Jet	Cessna 525B Citation Jet III	CNA525C	3.48	0.50	3.63	0.35

Runway Use Group	Aircraft Type	AEDT Type	Departures		Arrivals	
			Day	Night	Day	Night
Other Jet	Cessna 550 Citation II	CNA55B	5.61	0.81	5.86	0.56
Other Jet	Citation Excel	CNA560U	5.47	0.78	5.70	0.55
Other Jet	Cessna 500 Citation II	CNA500	0.52	0.08	0.55	0.05
Other Jet	CJ1	CNA525C	0.24	0.03	0.25	0.02
Other Jet	CJ2	CNA525C	2.56	0.37	2.68	0.26
Other Jet	CJ4	CNA525C	3.52	0.51	3.67	0.35
Other Jet	Embraer 145XR	EMB14L	0.36	0.05	0.37	0.04
Other Jet	Embraer 170	EMB170	0.28	0.04	0.29	0.03
Other Jet	Embraer Phenom 100	CNA510	2.36	0.34	2.46	0.24
Other Jet	Embraer Phenom 300	CNA55B	2.90	0.42	3.03	0.29
Other Jet	Falcon 50	FAL900EX	6.20	0.89	6.47	0.62
Other Jet	Falcon 7	GIV	0.60	0.09	0.63	0.06
Other Jet	Falcon 9	FAL900EX	8.59	1.23	8.97	0.86
Other Jet	Global Express	BD-700-1A10	1.12	0.16	1.17	0.11
Other Jet	Gulfstream 400/450	GIV	2.82	0.40	2.94	0.28
Other Jet	Gulfstream 650	G650ER	2.82	0.40	2.94	0.28
Other Jet	Gulfstream 500	GV	2.89	0.41	3.01	0.29
Other Jet	Learjet 35	LEAR35	0.39	0.06	0.40	0.04
Other Jet	Mitsubishi MU-300	MU3001	0.04	0.01	0.04	0.00
Turboprop	Beech 200 Super King Air	DHC6	9.90	1.04	10.31	0.62
Turboprop	Beech 350 Super King Air	DHC6	7.64	0.80	7.96	0.48
Turboprop	Beech 90 King Air	DHC6	5.27	0.55	5.49	0.33
Turboprop	Cessna 208 Grand Caravan	CNA208	0.56	0.06	0.58	0.04
Turboprop	Pilatus PC-12 Eagle	CNA208	4.65	0.49	4.84	0.29
Piston	Beech 58 Baron	BEC58P	3.29	2.17	4.11	1.36
Piston	Beech Bonanza	GASEPV	0.22	0.28	0.48	0.01
Piston	Cessna 172 Skyhawk	CNA172	5.05	6.35	11.09	0.30
Piston	Cirrus SR-22	COMSEP	1.67	2.11	3.68	0.10
Piston	Piper Cherokee	PA28	0.89	1.12	1.96	0.05
General Aviation Subtotals			**103.36**	**24.17**	**117.53**	**10.01**
Military						
Helicopter	Blackhawk Helicopter	S70	3.09	0.00	3.09	0.00
Other Jet	F18H - F/A 18 Hornet	F-18	0.41	0.00	0.41	0.00
Narrow-Body	Boeing 737-700	737700	0.11	0.01	0.11	0.01
Wide-Body Jet	Boeing 747 All Series	747400	0.01	0.00	0.01	0.00
Wide-Body Jet	Boeing KC-135 Stratotanker	KC135R	0.03	0.00	0.03	0.00
Turboprop	Lockheed 130 Hercules	C130	0.23	0.01	0.22	0.02
Other Jet	Bombardier Learjet 35/36	LEAR35	0.43	0.01	0.43	0.01
Piston	Raytheon Texan 2	GASEPV	0.28	0.00	0.28	0.00
Turboprop	Beech 200 Super King	CNA441	0.26	0.00	0.25	0.01
Military Subtotals			**4.85**	**0.03**	**4.83**	**0.03**
Grand Totals			**342.49**	**63.53**	**356.78**	**49.22**
			406.02		**406.00**	

Notes: Totals and sub-totals may not match exactly due to rounding. Operations are carried to out to 8 decimal places but are only presented to 2 decimals (1/100th). 1/100th of an average annual day operation is less than 4 flights per year.

* The passenger aircraft type DHC-8 is not a jet aircraft, but was modeled with the same runway usage as the "Other Jet" group

hmmh

Table 4. Modeled Average Daily Aircraft Operations for 2035 Proposed Action

Sources: AECOM MP forecast, Garver, and HMMH, 2020

Runway Use Group	Aircraft Type	AEDT Type	Departures		Arrivals	
			Day	Night	Day	Night
Passenger Air Carrier						
Narrow-Body Jet	Airbus 220-100	737-700	16.82	3.04	18.51	1.35
Narrow-Body Jet	Airbus 220-300	737-700	21.78	1.71	19.97	3.52
Narrow-Body Jet	Airbus 320 Neo	A320-271N	18.38	2.48	17.10	3.75
Narrow-Body Jet	Airbus 321 Neo	A321-232	4.68	0.29	4.68	0.29
Narrow-Body Jet	Airbus A320	A320-211	2.45	0.18	2.42	0.22
Narrow-Body Jet	Airbus A321	A321-232	1.47	0.08	1.46	0.09
Narrow-Body Jet	Boeing 737 MAX 8	737MAX8	1.69	0.22	1.74	0.17
Narrow-Body Jet	Boeing 737-700 Max	737MAX8	90.22	13.06	89.32	13.96
Narrow-Body Jet	Boeing 737-800 Max	737MAX8	36.80	9.21	38.00	8.01
Narrow-Body Jet	Boeing 737-900 Max	737800	1.47	0.11	1.41	0.16
Wide-Body Jet	Boeing 787-8	7878R	1.82	0.00	1.82	0.00
Other Jet	Canadair Regional Jet 900	CRJ9-ER	13.18	3.93	15.13	1.97
Other Jet	DHC-8-400 Dash 8Q	DHC830	1.13	0.00	1.13	0.00
Other Jet	Embraer RJ135	EMB175	0.99	0.19	0.92	0.26
Other Jet	Embraer 170	EMB170	3.56	0.07	3.60	0.03
Other Jet	Embraer 175 (long wing)	EMB175	16.27	1.82	16.01	2.08
Other Jet	Embraer 175 (short wing)	EMB175	8.32	0.28	8.07	0.54
Passenger Air Carrier Subtotals			**241.05**	**36.65**	**241.30**	**36.40**
Cargo Air Carrier						
Turboprop	Beechcraft 1900	1900D	0.01	0.02	0.01	0.01
Cargo	Boeing 737-800	737800	0.97	2.68	0.65	3.01
Cargo	Boeing 767-300	767300	0.26	1.16	0.45	0.97
Turboprop	Cessna 208 Caravan	CNA208	0.02	0.02	0.03	0.00
Cargo	McDonnell Douglas MD-11	MD11PW	0.02	0.00	0.02	0.00
Turboprop	SWEARINGEN Merlin 4	DHC6	0.01	0.02	0.02	0.01
Cargo Air Carrier Subtotals			**1.28**	**3.90**	**1.18**	**4.00**
General Aviation						
Other Jet	Beech Jet	MU3001	5.15	0.74	5.37	0.51
Other Jet	Cessna 525 Citation Jet	CNA525C	6.31	0.91	6.58	0.63
Other Jet	Cessna 525B Citation Jet III	CNA525C	3.48	0.50	3.63	0.35
Other Jet	Cessna 550 Citation II	CNA55B	5.61	0.81	5.86	0.56
Other Jet	Citation Excel	CNA560U	5.47	0.78	5.70	0.55
Other Jet	Cessna 500 Citation II	CNA500	0.52	0.08	0.55	0.05
Other Jet	CJ1	CNA525C	0.24	0.03	0.25	0.02
Other Jet	CJ2	CNA525C	2.56	0.37	2.68	0.26
Other Jet	CJ4	CNA525C	3.52	0.51	3.67	0.35
Other Jet	Embraer 145XR	EMB14L	0.36	0.05	0.37	0.04
Other Jet	Embraer 170	EMB170	0.28	0.04	0.29	0.03
Other Jet	Embraer Phenom 100	CNA510	2.36	0.34	2.46	0.24
Other Jet	Embraer Phenom 300	CNA55B	2.90	0.42	3.03	0.29
Other Jet	Falcon 50	FAL900EX	6.20	0.89	6.47	0.62
Other Jet	Falcon 7	GIV	0.60	0.09	0.63	0.06

Runway Use Group	Aircraft Type	AEDT Type	Departures		Arrivals	
			Day	Night	Day	Night
Other Jet	Falcon 9	FAL900EX	8.59	1.23	8.97	0.86
Other Jet	Global Express	BD-700-1A10	1.12	0.16	1.17	0.11
Other Jet	Gulfstream 40/450	GIV	2.82	0.40	2.94	0.28
Other Jet	Gulfstream 650	G650ER	2.82	0.40	2.94	0.28
Other Jet	Gulfstream 500	GV	2.89	0.41	3.01	0.29
Other Jet	Learjet 35	LEAR35	0.39	0.06	0.40	0.04
Other Jet	Mitsubishi MU-300	MU3001	0.04	0.01	0.04	0.00
Turboprop	Beech 200 Super King Air	DHC6	9.90	1.04	10.31	0.62
Turboprop	Beech 350 Super King Air	DHC6	7.64	0.80	7.96	0.48
Turboprop	Beech 90 King Air	DHC6	5.27	0.55	5.49	0.33
Turboprop	Cessna 208 Grand Caravan	CNA208	0.56	0.06	0.58	0.04
Turboprop	Pilatus PC-12 Eagle	CNA208	4.65	0.49	4.84	0.29
Piston	Beech 58 Baron	BEC58P	3.29	2.17	4.11	1.36
Piston	Beech Bonanza	GASEPV	0.22	0.28	0.48	0.01
Piston	Cessna 172 Skyhawk	CNA172	5.05	6.35	11.09	0.30
Piston	Cirrus SR-22	COMSEP	1.67	2.11	3.68	0.10
Piston	Piper Cherokee	PA28	0.89	1.12	1.96	0.05
General Aviation Subtotals			**103.36**	**24.17**	**117.53**	**10.01**
Military						
Helicopter	Blackhawk Helicopter	S70	3.09	0.00	3.09	0.00
Other Jet	F18H - F/A 18 Hornet	F-18	0.41	0.00	0.41	0.00
Narrow-Body	Boeing 737-700	737700	0.11	0.01	0.11	0.01
Wide-Body Jet	Boeing 747 All Series	747400	0.01	0.00	0.01	0.00
Wide-Body Jet	Boeing KC-135 Stratotanker	KC135R	0.03	0.00	0.03	0.00
Turboprop	Lockheed 130 Hercules	C130	0.23	0.01	0.22	0.02
Other Jet	Bombardier Learjet 35/36	LEAR35	0.43	0.01	0.43	0.01
Piston	Raytheon Texan 2	GASEPV	0.28	0.00	0.28	0.00
Turboprop	Beech 200 Super King	CNA441	0.26	0.00	0.25	0.01
Military Subtotals			**4.85**	**0.03**	**4.83**	**0.03**
Grand Totals			**350.54**	**64.76**	**364.83**	**50.44**
			415.29		**415.27**	

Notes: Totals and sub-totals may not match exactly due to rounding. Operations are carried to out to 8 decimal places but are only presented to 2 decimals (1/100th). 1/100th of an average annual day operation is less than 4 flights per year.

* The passenger aircraft type DHC-8 is not a jet aircraft, but was modeled with the same runway usage as the "Other Jet" group

1.1.4 *Runway Utilization*

Weather, particularly wind direction and wind speed, is the primary factor affecting runway use at airports. Additional factors that may affect runway use include the position of a facility (such as a passenger terminal) relative to the runways and temporary runway closures, generally for airfield maintenance and construction.

In the development of the updated BNA noise exposure maps, runway usage rates were calculated for six aircraft groups sharing common runway use characteristics, using actual operations data from the Metropolitan Nashville Airport Authority (MNAA) Flight Track Monitoring System (FTMS). Large jet aircraft are divided into wide-body and narrow-body categories, and cargo jet aircraft are in their own category. Smaller passenger jets (regional jets) and general aviation jets are in the "other jet" category. Non-jet aircraft are the piston and turboprop groups. With no anticipation of significant difference in runway use for the five-year forecast, the same runway usage was modeled for the five-year forecast as for the existing conditions.

No change in runway use is anticipated from the NEM conditions to the 2035 forecast cases, nor for the Proposed Action case in comparison to the No Action case. **Table 5** provides the modeled jet runway use percentages for departures and arrivals for the day and nighttime periods used in the calculation of DNL. **Table 6** provides the same information for the non-jet aircraft.

Table 5. Modeled Average Daily Jet Runway Use for Both 2035 Cases

Source: BNA Noise Exposure Map (NEM) Update, 2020

Runway	Departure		Arrival	
	Daytime	Nighttime	Daytime	Nighttime
Runway	**Wide-Body Jet**			
2L	17.0%	39.2%	20.0%	15.4%
2C	2.8%	--	10.0%	7.7%
2R	6.6%	--	7.9%	3.8%
13	2.8%	3.6%	0.7%	--
20L	--	--	21.4%	19.2%
20C	23.6%	17.9%	1.4%	3.8%
20R	27.4%	17.9%	31.5%	23.1%
31	19.8%	21.4%	7.1%	27.0%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Runway	**Narrow-Body Jet**			
2L	19.4%	14.5%	9.0%	12.4%
2C	3.8%	1.7%	19.4%	17.3%
2R	15.0%	10.5%	20.1%	14.8%
13	0.1%	0.1%	0.1%	0.6%
20L	1.1%	6.6%	29.5%	26.3%
20C	40.8%	32.7%	3.2%	2.1%
20R	9.2%	8.3%	17.6%	20.1%
31	10.6%	25.6%	1.1%	6.4%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Runway	**Cargo**			
2L	33.6%	36.7%	30.1%	25.3%
2C	3.7%	0.6%	11.4%	5.7%
2R	4.5%	0.2%	8.1%	0.4%
13	--	0.1%	--	--
20L	0.7%	0.2%	10.2%	5.0%
20C	30.6%	15.6%	2.5%	2.4%
20R	20.9%	34.1%	36.0%	42.0%
31	6.0%	12.5%	1.7%	19.2%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Runway	**Other Jet**			
2L	7.7%	4.4%	4.1%	3.6%
2C	21.9%	12.5%	32.3%	31.4%
2R	7.6%	5.0%	11.7%	6.6%
13	0.1%	--	--	--
20L	1.1%	1.9%	21.7%	19.7%
20C	50.0%	43.7%	20.1%	19.0%
20R	2.6%	1.3%	9.1%	10.2%
31	9.0%	31.2%	1.0%	9.5%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Note: Individual entries may not add exactly to 100% due to rounding.				

Table 6. Modeled Average Daily Non-Jet Runway Use for Both 2035 Cases

Source: BNA Noise Exposure Map (NEM) Update, 2020

	Departure		Arrival	
	Daytime	Nighttime	Daytime	Nighttime
Runway	**Piston**			
2L	5.9%	-	2.0%	3.8%
2C	20.6%	6.1%	34.1%	61.9%
2R	8.0%	2.9%	12.2%	-
13	-	-	-	-
20L	0.9%	-	19.6%	6.1%
20C	51.9%	77.4%	24.1%	17.2%
20R	3.7%	2.5%	5.2%	1.1%
31	9.0%	11.1%	2.8%	9.9%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Runway	**Turboprop**			
2L	14.3%	-	16.0%	17.5%
2C	15.1%	19.8%	25.3%	32.9%
2R	5.0%	3.6%	6.4%	-
13	-	-	0.1%	-
20L	0.6%	-	15.9%	9.5%
20C	38.6%	58.9%	14.2%	20.4%
20R	16.8%	3.0%	21.8%	13.9%
31	9.6%	14.7%	0.3%	5.8%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Note: Individual entries may not add exactly to 100% due to rounding.				

1.1.5 *Aircraft Maintenance Runup Activity*

The DNL contours include the effect of maintenance engine runup activity conducted at two designated on-airfield runup locations. Those locations are marked as K2 and B1-N on the airport diagram (**Figure 1**). For the purposes of this analysis, the five-year forecast level of runup operations from the NEM Update are scaled up by 12.5 percent (the increase in total operations from the NEM five-year forecast case to the 2035 No Action case). Also, corresponding to what was done for the modeling of the flight operations, specific aircraft type changes[5] were made from the 2025 fleet to represent a likely future fleet mix for 2035. **Table 7** shows the maintenance runup modeling details for the 2035 cases.

[5] A description of the fleet modernization assumptions is provided prior to Error! Reference source not found..

Table 7. Modeled Average Daily Runup Operations for Both 2035 Cases

Sources: BNA Noise Exposure Map (NEM) Update and HMMH, 2020

Aircraft	Runup Location	Heading (Deg. Mag.)	Percent Power	Duration (Seconds)	Runups Per Day	
					7 am – 10 pm	10 pm – 7 am
DHC6	K2	310	80	600	0.023	0.000
DHC6	B1-N	200	80	600	0.023	0.000
GASEPV	K2	310	80	600	0.045	0.000
GASEPV	B1-N	200	80	600	0.045	0.000
MU3001	K2	310	100	180	0.045	0.000
MU3001	K2	310	75	600	0.045	0.000
BEC58P	K2	310	80	600	0.023	0.000
BEC58P	B1-N	200	80	600	0.023	0.000
CNA500	K2	310	100	180	0.180	0.000
CNA500	K2	310	75	600	0.180	0.000
CNA55B	K2	310	100	180	0.045	0.000
CNA55B	K2	310	75	600	0.045	0.000
CNA560U	K2	310	100	180	0.045	0.000
CNA560U	K2	310	75	600	0.045	0.000
CNA525C	K2	310	100	180	0.045	0.000
CNA525C	K2	310	75	600	0.045	0.000
LEAR35	K2	310	100	180	0.045	0.000
LEAR35	K2	310	75	600	0.045	0.000
FAL900EX	K2	310	100	120	0.018	0.000
GIV	B1-N	200	50	180	0.074	0.000
A320-271N	K2	310	100	180	0.000	0.014
A320-271N	B1-N	200	100	180	0.000	0.068
737-700	K2	310	100	180	0.000	0.005
737-700	B1-N	200	100	180	0.000	0.009
737MAX8	K2	310	100	180	0.000	0.041
737MAX8	B1-N	200	100	180	0.000	0.011
A321-232	K2	310	100	180	0.000	0.020
A321-232	B1-N	200	100	180	0.000	0.011
737-700	K2	310	85	180	0.000	0.111
EMB170	K2	310	85	180	0.000	0.445
737-700	B1-N	200	90	300	0.000	0.562
737-700	K2	310	90	300	0.000	0.562
EMB175	B1-N	200	90	300	0.000	0.981
EMB175	K2	310	90	300	0.000	0.981

1.1.6 *Flight Track Geometry and Use*

In addition to runway usage, radar data from the MNAA's FTMS provided an ideal source of information for identifying where aircraft fly and how often they use different flight corridors in the vicinity of the airport. In the development of the updated BNA NEM, sets of prototypical flight tracks were defined for noise modeling. Known as "backbones," these tracks follow the central tendency of more dispersed paths flown by aircraft along each major flight corridor. Additional tracks were created to either side of the backbones to account for the dispersion within each corridor, and traffic is distributed normally[6] onto each track group to reflect the spreading of noise along the corridor.

Aircraft are assigned to specific modeling tracks based on historical averages determined through analysis of the radar data. Knowledge of destinations for departures from the airport or points of origin for arrivals to the airport are also considered. The standard procedure for model track development entails separating tracks by operation type, (e.g., arrival or departure) and runway end. Next, the destination direction (e.g. northeast, south, west, etc.) defines flight track groups. HMMH analyzed flight tracks with the same operation type, runway end, and destination direction for similar geometry and this resulted in the final flight track bundles used to create model tracks.

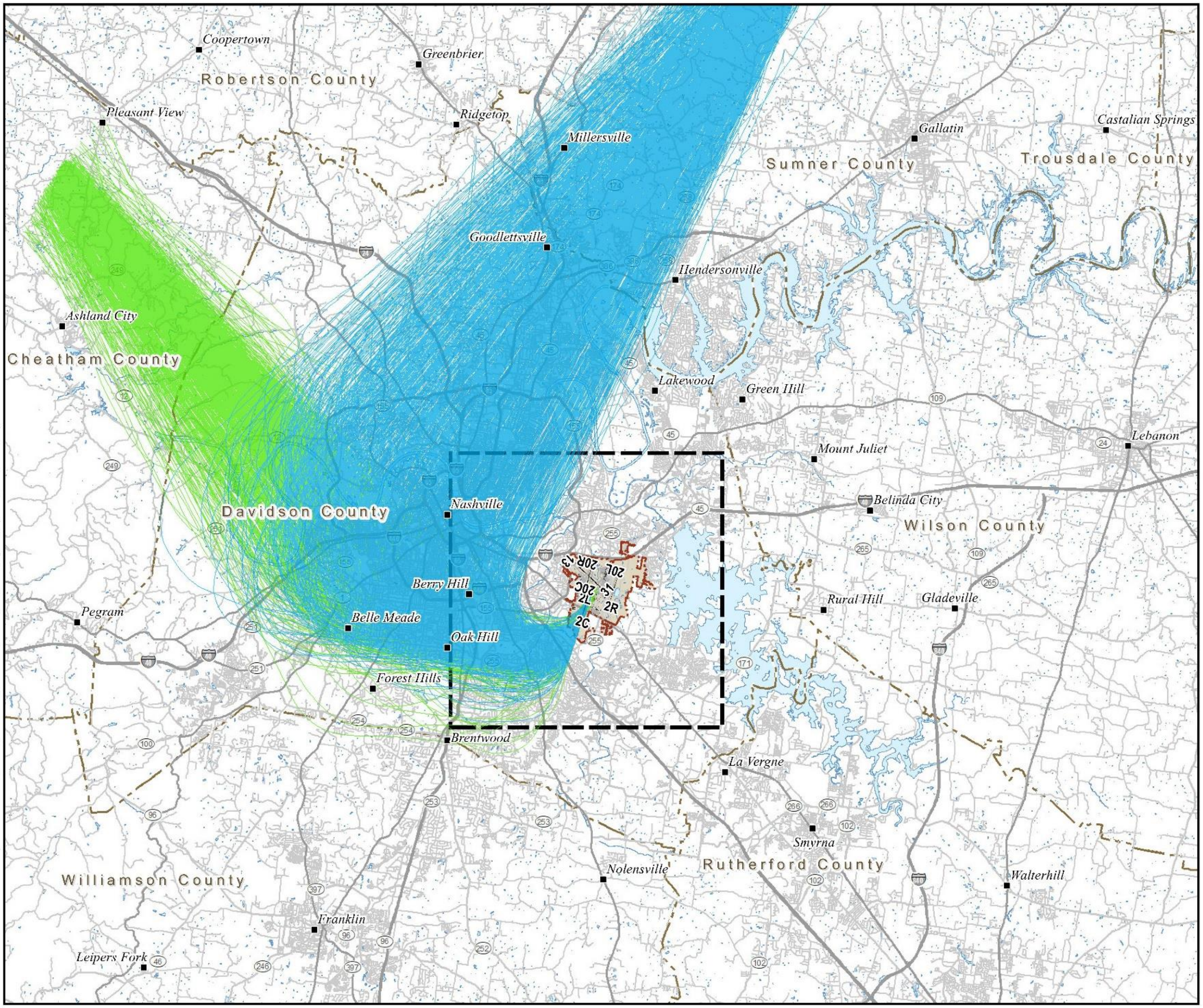
This process is illustrated in **Figure 2** and **Figure 3**. **Figure 2** displays jet radar tracks from Runway 20C to the northwest and northeast destinations in different colors and **Figure 3** displays just the northeast set of Runway 20C jet departures with the AEDT model backbone and sub-tracks. Model flight tracks are labeled with a number following the designations distinguish tracks that take different routes from the same runway end. For example, flight track ADJD20C_14 identifies the time of day (D for day, as opposed to N for night), the primary aircraft type, (J for jet, as opposed to N for non-jet), a departure flight track (D, as opposed to A if it were an arrival) from Runway 20C (20C). The number at the end of the track name differentiates it from others in its group.

All fixed-wing aircraft flight tracks start or end at runway ends (or at displaced landing thresholds for arrivals to both ends of Runway 13-31). Helicopter tracks generally start and end at a defined helipad and thus are modeled as flights to and from the midfield area (the helipad “PAD 1” identified in **Table 1** and marked on **Figure 1**).

Figure 4 and **Figure 5** present the modeled flight track geometry, for north- and south-flow operations, respectively. These tracks were developed using calendar year 2017 and 2018 data from the MNAA’s FTMS. The set of flight tracks reflects existing operations following RNAV departures and some Required Navigational Performance (RNP) arrival procedures, which are a subset of the more advanced Performance Based Navigation (PBN) procedures that the FAA is in the process of implementing across the U.S. There was no reason to anticipate any significant difference in flight track geometry or usage for the five-year forecast, so the same flight track inputs were modeled for both sets of BNA NEM contours. In considering the EA cases, there is again no reason to expect significant differences in flight track geometry or usage; therefore, the same model tracks and tracks use are applied to this EA analysis.

No change in flight track geometry or usage is anticipated for the Proposed Action case in comparison to the No Action case. **Table 8** presents the modeled flight track usage rates by runway end and aircraft type category, for arrivals and departures. The usage rates were developed using the same sample of radar data that formed the basis of the runway use and flight track geometry.

[6] According to a statistical normal (Gaussian) distribution



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Environmental Assessment

Figure 2

Jet Departure Radar Tracks from Runway 20C with Northwest or Northeast Destinations

Radar Tracks Northeast (Departure)
Radar Tracks Northwest (Departure)

BNA Airport Boundary (Approximate)
Runway
BNA Study Area
State Boundary
County Boundary
Water / Stream
Highway
Major Roads
Minor Roads

0 3 6 NMi

N

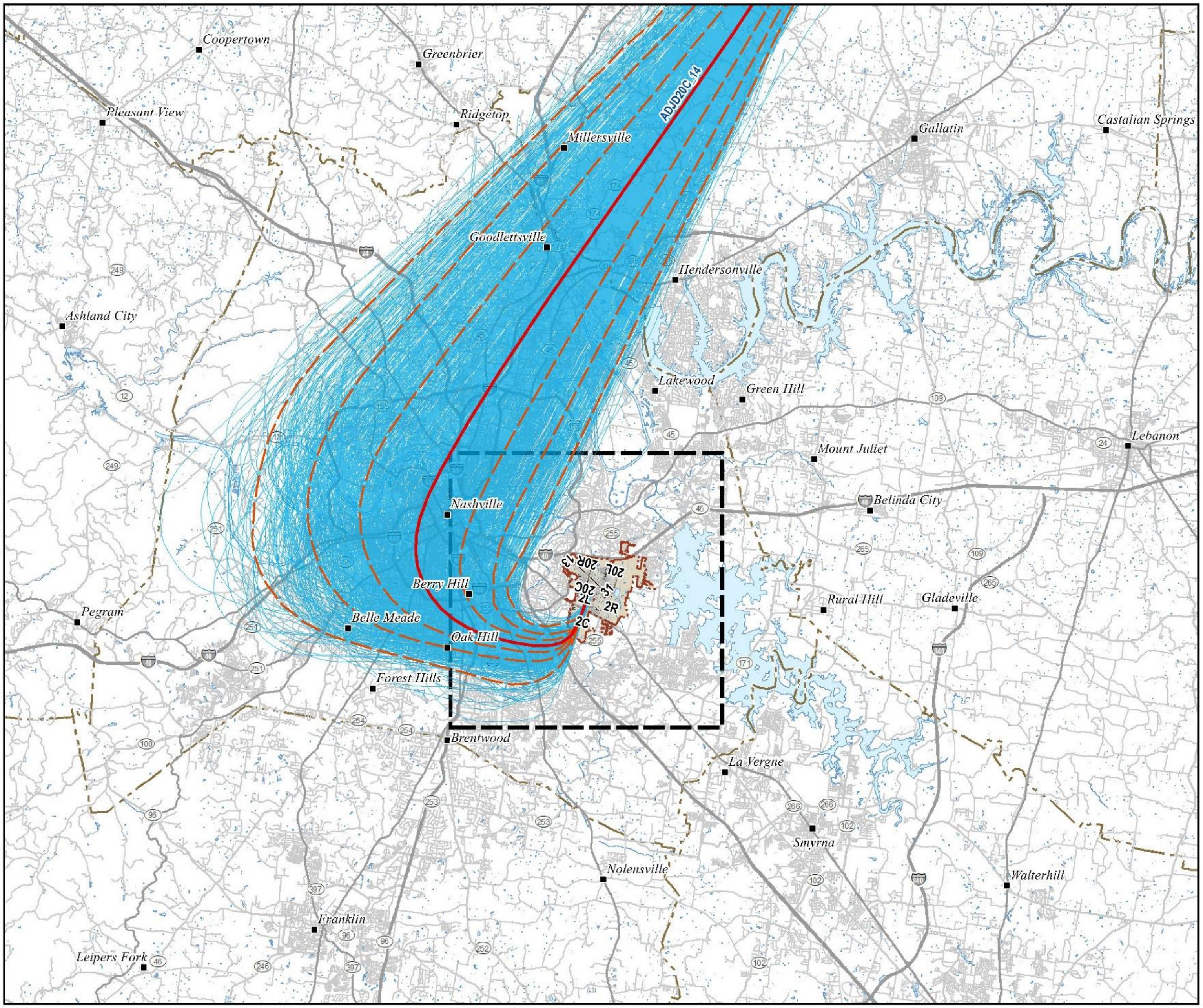

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Figure 3

Jet Departure Radar Tracks and AEDT Model Track Set from Runway 20C with Northeast Destinations

- Model Backbone Track (Departure)
- Model Track Backbone (Departure)
- Radar Tracks Northeast (Departure)
- BNA Airport Boundary (Approximate)
- Runway
- BNA Study Area
- State Boundary
- County Boundary
- Water / Stream
- Highway
- Minor Roads
- Major Roads

0 3 6 NMi

N

hmmh

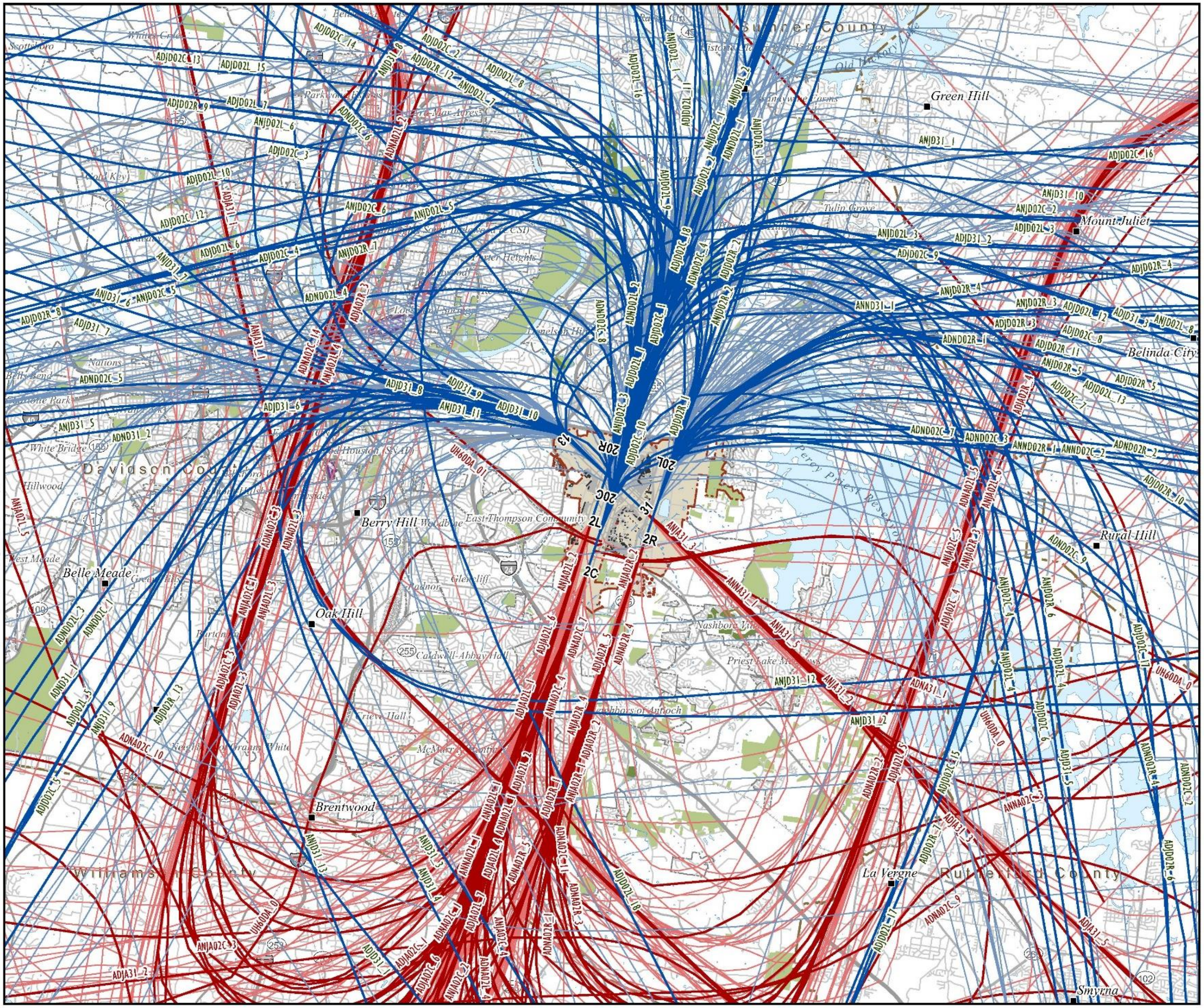

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Figure 4

North Flow Arrival and Departure Flight Tracks

- Model Backbone Track (Arrival)
- Model Backbone Track (Departure)
- Model Track (Arrival)
- Model Track (Departure)
- BNA Airport Boundary (Approximate)
- Runway
- State Boundary
- Municipal Boundary
- Highway
- Minor Roads
- Major Roads
- Railroad
- Recreational / Open Space / Golf
- Water / Stream

0 10,000 20,000 Feet

N

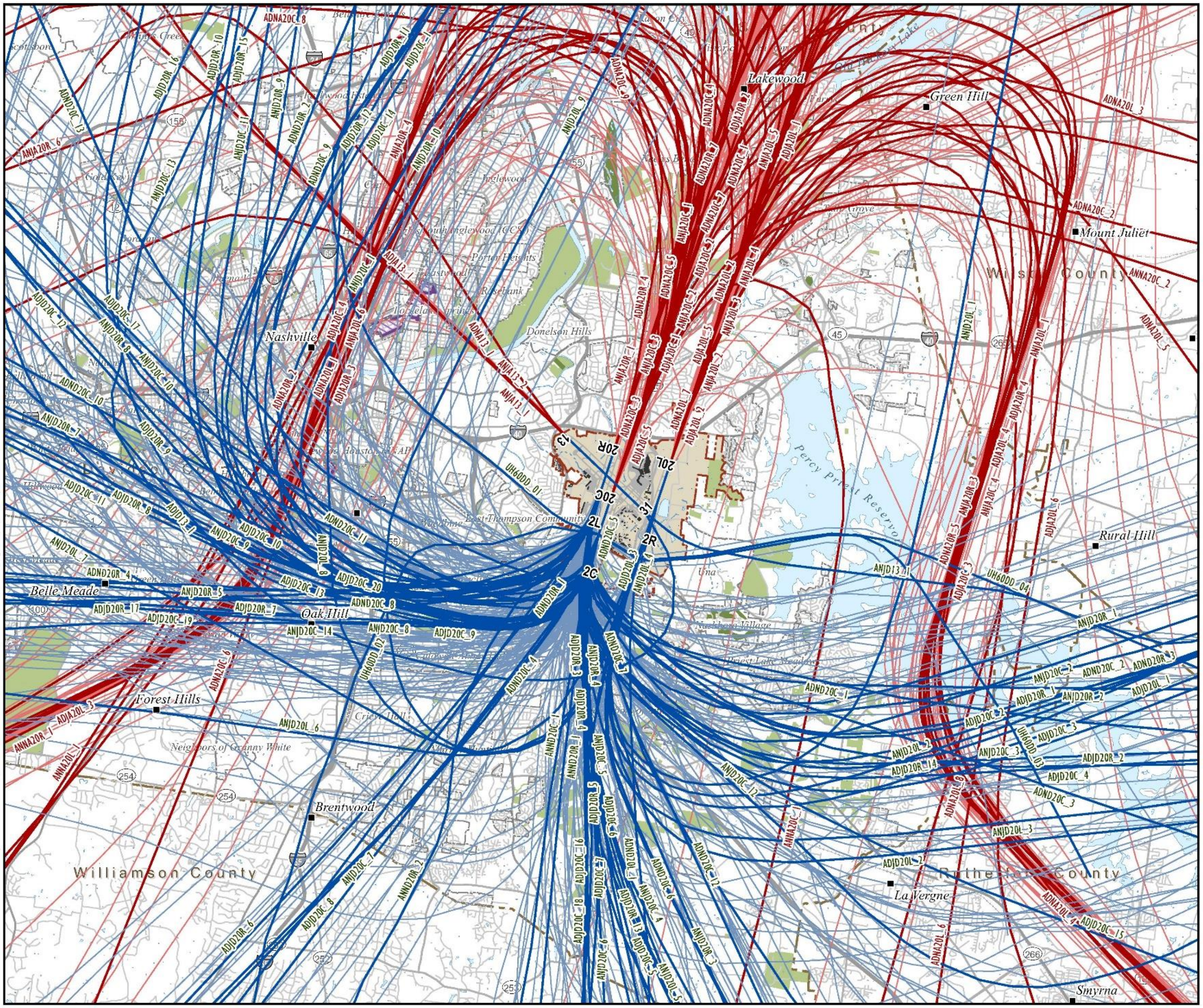

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Figure 5

South Flow Arrival and Departure Flight Tracks

- Model Backbone Track (Arrival)
- Model Backbone Track (Departure)
- Model Track (Arrival)
- Model Track (Departure)
- BNA Airport Boundary (Approximate)
- Runway
- State Boundary
- Municipal Boundary
- Highway
- Minor Roads
- Major Roads
- Railroad
- Recreational / Open Space / Golf
- Water / Stream

0 10,000 20,000 Feet

N

hmmh

Table 8. Modeled Jet Flight Track Utilization

Source: BNA Noise Exposure Map (NEM) Update, 2020

Jet						
Runway	Departures			Arrivals		
	Track ID	Percent Use		Track ID	Percent Use	
		Day	Night		Day	Night
2C	ADJD02C_1 (1)	3.42%	-	ADJA02C_1 (7)	39.18%	-
	ADJD02C_2 (1)	5.75%	-	ADJA02C_2 (7)	15.60%	-
	ADJD02C_3 (3)	11.51%	-	ADJA02C_3 (7)	32.71%	-
	ADJD02C_4 (3)	8.89%	-	ADJA02C_4 (7)	11.04%	-
	ADJD02C_5 (1)	3.06%	-	ADJA02C_5 (3)	1.28%	-
	ADJD02C_6 (3)	6.63%	-	ADJA02C_6 (1)	0.19%	-
	ADJD02C_7 (1)	2.11%	-	ANJA02C_1 (5)	-	36.64%
	ADJD02C_8 (3)	6.92%	-	ANJA02C_2 (5)	-	26.48%
	ADJD02C_9 (3)	12.89%	-	ANJA02C_3 (5)	-	9.93%
	ADJD02C_10 (3)	17.48%	-	ANJA02C_4 (5)	-	17.73%
	ADJD02C_12 (1)	3.57%	-	ANJA02C_5 (5)	-	9.22%
	ADJD02C_13 (1)	1.46%	-	ANJA02C_1 (5)	-	36.64%
	ADJD02C_14 (1)	3.57%	-			
	ADJD02C_15 (1)	3.35%	-			
	ADJD02C_16 (1)	2.04%	-			
	ADJD02C_17 (1)	5.68%	-			
	ADJD02C_18 (1)	1.68%	-			
	ANJD02C_1 (5)	-	29.23%			
	ANJD02C_2 (5)	-	16.92%			
	ANJD02C_3 (5)	-	13.08%			
	ANJD02C_4 (3)	-	16.15%			
	ANJD02C_5 (3)	-	14.62%			
	ANJD02C_6 (3)	-	10.00%			
	Total	**100.0%**	**100.0%**	**Total**	**100.0%**	**100.0%**
2L	ADJD02L_1 (3)	7.70%	-	ADJA02L_1 (7)	28.10%	-
	ADJD02L_2 (7)	24.77%	-	ADJA02L_2 (5)	18.64%	-
	ADJD02L_3 (3)	2.68%	-	ADJA02L_3 (7)	27.86%	-
	ADJD02L_4 (3)	3.80%	-	ADJA02L_4 (1)	0.56%	-
	ADJD02L_5 (3)	4.07%	-	ADJA02L_5 (7)	23.19%	-
	ADJD02L_6 (7)	19.73%	-	ADJA02L_6 (1)	1.22%	-
	ADJD02L_7 (7)	23.80%	-	ADJA02L_7 (1)	0.43%	-
	ADJD02L_8 (3)	7.92%	-	ANJA02L_1 (7)	-	21.47%
	ADJD02L_9 (1)	0.65%	-	ANJA02L_2 (7)	-	15.57%
	ADJD02L_10 (1)	0.35%	-	ANJA02L_3 (5)	-	33.08%
	ADJD02L_11 (1)	0.50%	-	ANJA02L_4 (5)	-	1.67%
	ADJD02L_12 (1)	1.32%	-	ANJA02L_5 (5)	-	1.81%
	ADJD02L_13 (1)	0.57%	-	ANJA02L_6 (7)	-	26.41%
	ADJD02L_15 (1)	0.82%	-			
	ADJD02L_16 (1)	0.44%	-			
	ADJD02L_17 (1)	0.49%	-			
	ADJD02L_18 (1)	0.39%	-			
	ANJD02L_1 (5)	-	10.06%			
	ANJD02L_2 (3)	-	35.25%			
	ANJD02L_3 (5)	-	4.00%			
	ANJD02L_4 (5)	-	5.88%			
	ANJD02L_5 (5)	-	20.69%			
	ANJD02L_6 (5)	-	15.56%			

Jet						
Runway	Departures			Arrivals		
	Track ID	Percent Use		Track ID	Percent Use	
		Day	Night		Day	Night
	ANJD02L_7 (5)	-	5.63%			
	ANJD02L_8 (5)	-	2.94%			
	Total	**100.0%**	**100.0%**	**Total**	**100.0%**	**100.0%**
2R	ADJD02R_1 (1)	0.37%	-	ADJA02R_1 (3)	2.77%	-
	ADJD02R_2 (3)	2.38%	-	ADJA02R_2 (7)	45.08%	-
	ADJD02R_3 (7)	35.31%	-	ADJA02R_3 (3)	1.40%	-
	ADJD02R_4 (3)	2.26%	-	ADJA02R_4 (7)	49.64%	-
	ADJD02R_5 (7)	17.96%	-	ADJA02R_5 (1)	1.12%	-
	ADJD02R_6 (7)	31.51%	-	ANJA02R_1 (5)	-	10.60%
	ADJD02R_7 (3)	4.54%	-	ANJA02R_2 (5)	-	34.25%
	ADJD02R_8 (3)	1.94%	-	ANJA02R_3 (5)	-	42.96%
	ADJD02R_9 (1)	1.10%	-	ANJA02R_4 (5)	-	12.19%
	ADJD02R_10 (1)	0.99%	-			
	ADJD02R_11 (1)	0.92%	-			
	ADJD02R_12 (1)	0.38%	-			
	ADJD02R_13 (1)	0.34%	-			
	ANJD02R_1 (3)	-	3.16%			
	ANJD02R_2 (5)	-	7.23%			
	ANJD02R_3 (7)	-	38.08%			
	ANJD02R_4 (5)	-	3.62%			
	ANJD02R_5 (5)	-	13.33%			
	ANJD02R_6 (5)	-	32.77%			
	ANJD02R_7 (5)	-	1.81%			
	Total	**100.0%**	**100.0%**	**Total**	**100.0%**	**100.0%**
13	ADJD31_1 (1)	6.69%	-	ADJA31_1 (1)	21.65%	-
	ADJD31_2 (1)	10.55%	-	ADJA31_2 (1)	10.31%	-
	ADJD31_3 (1)	5.48%	-	ADJA31_3 (1)	20.62%	-
	ADJD31_5 (1)	4.87%	-	ADJA31_5 (1)	47.42%	-
	ADJD31_6 (1)	19.68%	-	ANJA31_1 (5)	-	5.95%
	ADJD31_7 (3)	23.12%	-	ANJA31_2 (5)	-	38.70%
	ADJD31_8 (1)	14.00%	-	ANJA31_3 (5)	-	45.71%
	ADJD31_9 (1)	3.65%	-	ANJA31_5 (5)	-	9.63%
	ADJD31_10 (1)	11.97%	-			
	ANJD31_1 (5)	-	8.82%			
	ANJD31_2 (3)	-	1.33%			
	ANJD31_3 (3)	-	16.35%			
	ANJD31_4 (3)	-	1.73%			
	ANJD31_5 (3)	-	17.48%			
	ANJD31_6 (3)	-	17.36%			
	ANJD31_7 (5)	-	5.03%			
	ANJD31_8 (3)	-	14.78%			
	ANJD31_9 (5)	-	1.09%			
	ANJD31_10 (5)	-	1.09%			
	ANJD31_11 (5)	-	5.03%			
	ANJD31_12 (5)	-	7.45%			
	ANJD31_13 (5)	-	2.46%			
	Total	**100.0%**	**100.0%**	**Total**	**100.0%**	**100.0%**
20C	ADJD20C_1 (7)	14.34%	-	ADJA20C_1 (3)	19.06%	-
	ADJD20C_2 (7)	11.88%	-	ADJA20C_2 (5)	24.86%	-
	ADJD20C_3 (3)	2.87%	-	ADJA20C_3 (5)	26.92%	-

Jet						
Runway	Departures			Arrivals		
	Track ID	Percent Use		Track ID	Percent Use	
		Day	Night		Day	Night
	ADJD20C_4 (7)	7.45%	-	ADJA20C_4 (5)	27.42%	-
	ADJD20C_5 (7)	9.87%	-	ADJA20C_5 (1)	1.73%	-
	ADJD20C_6 (3)	2.28%	-	ANJA20C_1 (5)	-	25.13%
	ADJD20C_7 (3)	3.26%	-	ANJA20C_2 (5)	-	31.94%
	ADJD20C_8 (5)	3.97%	-	ANJA20C_3 (5)	-	14.66%
	ADJD20C_9 (7)	10.70%	-	ANJA20C_4 (5)	-	28.27%
	ADJD20C_10 (3)	0.98%	-			
	ADJD20C_11 (7)	13.16%	-			
	ADJD20C_12 (7)	7.51%	-			
	ADJD20C_13 (1)	0.57%	-			
	ADJD20C_14 (7)	9.16%	-			
	ADJD20C_15 (1)	0.55%	-			
	ADJD20C_16 (1)	0.38%	-			
	ADJD20C_17 (1)	0.41%	-			
	ADJD20C_18 (1)	0.25%	-			
	ADJD20C_19 (1)	0.16%	-			
	ADJD20C_20 (1)	0.23%	-			
	ANJD20C_1 (3)	-	15.26%			
	ANJD20C_2 (7)	-	21.26%			
	ANJD20C_3 (3)	-	8.82%			
	ANJD20C_4 (5)	-	13.69%			
	ANJD20C_5 (5)	-	2.50%			
	ANJD20C_6 (3)	-	1.12%			
	ANJD20C_7 (5)	-	1.80%			
	ANJD20C_8 (5)	-	10.13%			
	ANJD20C_9 (5)	-	12.47%			
	ANJD20C_10 (7)	-	3.11%			
	ANJD20C_11 (7)	-	6.60%			
	ANJD20C_12 (3)	-	0.48%			
	ANJD20C_13 (3)	-	1.60%			
	ANJD20C_14 (5)	-	1.15%			
	Total	**100.0%**	**100.0%**	**Total**	**100.0%**	**100.0%**
20L	ADJD20L_1 (3)	52.38%	-	ADJA20L_1 (7)	8.69%	-
	ADJD20L_2 (1)	21.09%	-	ADJA20L_2 (7)	39.88%	-
	ADJD20L_3 (1)	26.53%	-	ADJA20L_3 (7)	7.08%	-
	ANJD20L_1 (3)	-	5.74%	ADJA20L_4 (7)	41.64%	-
	ANJD20L_2 (5)	-	17.05%	ADJA20L_5 (3)	2.48%	-
	ANJD20L_3 (5)	-	11.48%	ADJA20L_6 (1)	0.22%	-
	ANJD20L_4 (3)	-	9.84%	ANJA20L_1 (5)	-	29.73%
	ANJD20L_5 (5)	-	14.75%	ANJA20L_2 (5)	-	12.73%
	ANJD20L_6 (5)	-	13.44%	ANJA20L_3 (5)	-	16.06%
	ANJD20L_7 (3)	-	17.05%	ANJA20L_4 (5)	-	19.93%
	ANJD20L_8 (5)	-	3.61%	ANJA20L_5 (5)	-	10.86%
	ANJD20L_9 (3)	-	7.05%	ANJA20L_6 (5)	-	10.69%
	Total	**100.0%**	**100.0%**	**Total**	**100.0%**	**100.0%**
20R	ADJD20R_1 (3)	13.37%	-	ADJA20R_1 (7)	36.98%	-
	ADJD20R_2 (1)	1.91%	-	ADJA20R_2 (5)	9.69%	-
	ADJD20R_3 (5)	15.88%	-	ADJA20R_3 (7)	47.08%	-
	ADJD20R_4 (3)	3.55%	-	ADJA20R_4 (5)	5.91%	-
	ADJD20R_5 (1)	2.31%	-	ADJA20R_5 (1)	0.35%	-

<table>
<tr><th colspan="7">Jet</th></tr>
<tr><th rowspan="3">Runway</th><th colspan="3">Departures</th><th colspan="3">Arrivals</th></tr>
<tr><th rowspan="2">Track ID</th><th colspan="2">Percent Use</th><th rowspan="2">Track ID</th><th colspan="2">Percent Use</th></tr>
<tr><th>Day</th><th>Night</th><th>Day</th><th>Night</th></tr>
<tr><td rowspan="22"></td><td>ADJD20R_6 (1)</td><td>1.33%</td><td>-</td><td>ANJA20R_1 (7)</td><td>-</td><td>22.70%</td></tr>
<tr><td>ADJD20R_7 (3)</td><td>10.11%</td><td>-</td><td>ANJA20R_2 (5)</td><td>-</td><td>31.49%</td></tr>
<tr><td>ADJD20R_8 (3)</td><td>13.66%</td><td>-</td><td>ANJA20R_3 (5)</td><td>-</td><td>11.35%</td></tr>
<tr><td>ADJD20R_9 (3)</td><td>11.64%</td><td>-</td><td>ANJA20R_4 (5)</td><td>-</td><td>27.69%</td></tr>
<tr><td>ADJD20R_10 (3)</td><td>6.58%</td><td>-</td><td>ANJA20R_5 (5)</td><td>-</td><td>4.86%</td></tr>
<tr><td>ADJD20R_11 (5)</td><td>13.77%</td><td>-</td><td>ANJA20R_6 (5)</td><td>-</td><td>1.90%</td></tr>
<tr><td>ADJD20R_12 (1)</td><td>2.22%</td><td>-</td><td rowspan="15"></td><td rowspan="15"></td><td rowspan="15"></td></tr>
<tr><td>ADJD20R_13 (1)</td><td>0.84%</td><td>-</td></tr>
<tr><td>ADJD20R_14 (1)</td><td>0.78%</td><td>-</td></tr>
<tr><td>ADJD20R_15 (1)</td><td>0.92%</td><td>-</td></tr>
<tr><td>ADJD20R_16 (1)</td><td>0.43%</td><td>-</td></tr>
<tr><td>ADJD20R_17 (1)</td><td>0.69%</td><td>-</td></tr>
<tr><td>ANJD20R_1 (5)</td><td>-</td><td>20.74%</td></tr>
<tr><td>ANJD20R_2 (3)</td><td>-</td><td>4.36%</td></tr>
<tr><td>ANJD20R_3 (3)</td><td>-</td><td>7.27%</td></tr>
<tr><td>ANJD20R_4 (3)</td><td>-</td><td>4.55%</td></tr>
<tr><td>ANJD20R_5 (3)</td><td>-</td><td>15.70%</td></tr>
<tr><td>ANJD20R_7 (3)</td><td>-</td><td>3.20%</td></tr>
<tr><td>ANJD20R_8 (5)</td><td>-</td><td>8.04%</td></tr>
<tr><td>ANJD20R_9 (5)</td><td>-</td><td>9.30%</td></tr>
<tr><td>ANJD20R_10 (5)</td><td>-</td><td>26.84%</td></tr>
<tr><td>Total</td><td>100.0%</td><td>100.0%</td><td>Total</td><td>100.0%</td><td>100.0%</td></tr>
<tr><td rowspan="4">31</td><td>ADJD13_1 (1)</td><td>100.00%</td><td>-</td><td>ADJA13_1 (1)</td><td>100.00%</td><td>-</td></tr>
<tr><td>ANJD13_1 (1)</td><td>-</td><td>100.00%</td><td>ANJA13_1 (5)</td><td>-</td><td>64.29%</td></tr>
<tr><td></td><td></td><td></td><td>ANJA13_2 (3)</td><td>-</td><td>35.71%</td></tr>
<tr><td>Total</td><td>100.0%</td><td>100.0%</td><td>Total</td><td>100.0%</td><td>100.0%</td></tr>
<tr><td colspan="7">Note: the parentheses following each track name indicates the number of sub-tracks used to model the dispersion</td></tr>
</table>

Table 9. Modeled Non-Jet and Helicopter Flight Track Utilization

Source: BNA Noise Exposure Map (NEM) Update, 2020

Non-Jet						
Runway	Departure			Arrival		
	Track ID	Percent Use		Track ID	Percent Use	
		Day	Night		Day	Night
2C	ADND02C_1 (3)	10.98%	-	ADNA02C_1 (7)	22.22%	-
	ADND02C_2 (1)	3.33%	-	ADNA02C_2 (3)	18.54%	-
	ADND02C_3 (3)	20.98%	-	ADNA02C_3 (3)	11.05%	-
	ADND02C_4 (1)	17.25%	-	ADNA02C_6 (3)	9.96%	-
	ADND02C_5 (3)	23.53%	-	ADNA02C_7 (3)	17.63%	-
	ADND02C_6 (1)	4.51%	-	ADNA02C_9 (1)	1.51%	-
	ADND02C_7 (1)	8.04%	-	ADNA02C_10 (3)	10.02%	-
	ADND02C_8 (1)	4.51%	-	ADNA02C_11 (1)	5.74%	-
	ADND02C_9 (1)	6.86%	-	ADNA02C_13 (1)	1.81%	-
	ANND02R_1 (1)	-	100.00%	ADNA02C_14 (1)	1.51%	-
				ADNA02C_1 (7)	22.22%	-
				ADNA02C_2 (3)	18.54%	-
				ADNA02C_3 (3)	11.05%	-
				ADNA02C_6 (3)	9.96%	-
				ANNA02C_1 (3)	-	54.13%
				ANNA02C_2 (5)	-	16.12%
				ANNA02C_3 (5)	-	18.18%
				ANNA02C_4 (5)	-	11.57%
	Total	**100.0%**	**100.0%**	**Total**	**100.0%**	**100.0%**
2L	ADND02L_1 (3)	27.47%	-	ADNA02L_1 (5)	76.10%	-
	ADND02L_2 (1)	6.04%	-	ADNA02L_2 (1)	9.17%	-
	ADND02L_3 (3)	55.77%	-	ADNA02L_3 (1)	5.78%	-
	ADND02L_4 (1)	10.71%	-	ADNA02L_4 (1)	6.00%	-
	ANND02C_2 (5)	-	100.00%	ADNA02L_5 (1)	2.94%	-
	Total	**100.0%**	**100.0%**	**Total**	**100.0%**	**0.0%**
2R	ADND02R_1 (3)	39.43%	-	ADNA02R_1 (3)	58.09%	-
	ADND02R_2 (1)	32.11%	-	ADNA02R_2 (3)	18.98%	-
	ADND02R_4 (5)	28.46%	-	ADNA02R_3 (1)	11.55%	-
				ADNA02R_4 (1)	3.63%	-
				ADNA02R_5 (1)	7.76%	-
	Total	**100.0%**	**0.0%**	**Total**	**100.0%**	**0.0%**
13	ADND31_1 (5)	61.11%	-	ADNA31_1 (1)	100.00%	-
	ADND31_2 (5)	38.89%	-	ANNA31_1 (5)	-	100.00%
	ANND31_1 (1)	-	100.00%			
	Total	**100.0%**	**100.0%**	**Total**	**100.0%**	**100.0%**
20C	ADND20C_1 (5)	18.30%	-	ADNA20C_1 (1)	8.53%	-
	ADND20C_2 (5)	14.22%	-	ADNA20C_2 (3)	34.46%	-
	ADND20C_3 (5)	4.43%	-	ADNA20C_3 (1)	6.76%	-
	ADND20C_4 (5)	11.22%	-	ADNA20C_4 (3)	24.64%	-
	ADND20C_5 (5)	7.08%	-	ADNA20C_5 (1)	9.02%	-
	ADND20C_6 (5)	9.44%	-	ADNA20C_6 (1)	3.86%	-
	ADND20C_7 (5)	2.07%	-	ADNA20C_7 (1)	5.48%	-
	ADND20C_8 (5)	10.08%	-	ADNA20C_8 (1)	3.86%	-
	ADND20C_9 (5)	9.72%	-	ADNA20C_9 (1)	3.38%	-
	ADND20C_10 (5)	8.43%	-	ANNA20C_1 (5)	-	55.38%
	ADND20C_11 (5)	1.43%	-	ANNA20C_2 (1)	-	44.62%
	ADND20C_12 (5)	2.07%	-			

Non-Jet						
Runway	Departure			Arrival		
	Track ID	Percent Use		Track ID	Percent Use	
		Day	Night		Day	Night
	ADND20C_13 (5)	1.50%	-			
	ANND20C_1 (1)	-	100.00%			
	Total	**100.0%**	**100.0%**	**Total**	**100.0%**	**100.0%**
20L	ADND20L_1 (5)	100.00%	-	ADNA20L_1 (3)	12.16%	-
				ADNA20L_2 (3)	28.66%	-
				ADNA20L_3 (1)	8.44%	-
				ADNA20L_4 (3)	27.54%	-
				ADNA20L_5 (1)	6.58%	-
				ADNA20L_6 (1)	5.96%	-
				ADNA20L_7 (1)	4.71%	-
				ADNA20L_8 (1)	5.96%	-
				ANNA20L_1 (1)	-	100.00%
	Total	**100.0%**	**0.0%**	**Total**	**100.0%**	**100.0%**
20R	ADND20R_1 (5)	76.99%	-	ADNA20R_1 (1)	4.65%	-
	ADND20R_2 (5)	15.04%	-	ADNA20R_2 (5)	68.44%	-
	ADND20R_3 (5)	4.53%	-	ADNA20R_3 (3)	11.76%	-
	ADND20R_4 (5)	3.44%	-	ADNA20R_4 (1)	7.28%	-
	ANND20R_1 (1)	-	75.00%	ADNA20R_5 (1)	1.69%	-
	ANND20R_2 (1)	-	25.00%	ADNA20R_6 (1)	3.47%	-
				ADNA20R_7 (1)	2.71%	-
				ANNA20R_1 (1)	-	100.00%
	Total	**100.0%**	**100.0%**	**Total**	**100.0%**	**100.0%**
31				ADNA13_1 (1)	100.00%	-
	Total	**0.0%**	**0.0%**	**Total**	**100.0%**	**0.0%**
Runway	Helicopter					
	Departures			Arrivals		
	Track ID	Percent Use		Track ID	Percent Use	
		Day	Night		Day	Night
PAD_1				UH60DA_01 (1)	69.56%	-
				UH60DA_02 (1)	4.35%	-
				UH60DA_03 (1)	8.70%	-
				UH60DA_04 (3)	17.39%	-
	Total	**0.00%**	**0.00%**	**Total**	**100.00%**	**0.00%**
PAD_1	UH60DD_01 (1)	10.59%	-			
	UH60DD_03 (1)	17.65%	-			
	UH60DD_02 (3)	70.00%	-			
	UH60DD_04 (1)	1.76%	-			
	Total	**100.00%**	**0.00%**	**Total**	**0.00%**	**0.00%**

Notes: All helicopter operations occur in daytime hours (between 7:00 am and 10:00 pm
The parentheses following each track name indicates the number of subtracks used to model the dispersion

1.1.7 *Meteorological Data*

Meteorological settings within the AEDT affect its calculation of aircraft performance profiles and sound propagation. These settings include average annual temperature, barometric pressure, relative humidity, and average headwind speed. The AEDT contains standard reference climatological data for airports throughout the US.

The noise modeling utilized the following average data for BNA from the AEDT database:

- Temperature: 59.9° F
- Station Pressure: 995.81 mbar
- Sea Level Pressure: 1017.96 mbar
- Dew point: 48.73° F
- Relative humidity: 67.88%

The headwind speed was set to the AEDT default of 6.11 knots.

1.1.8 *Terrain*

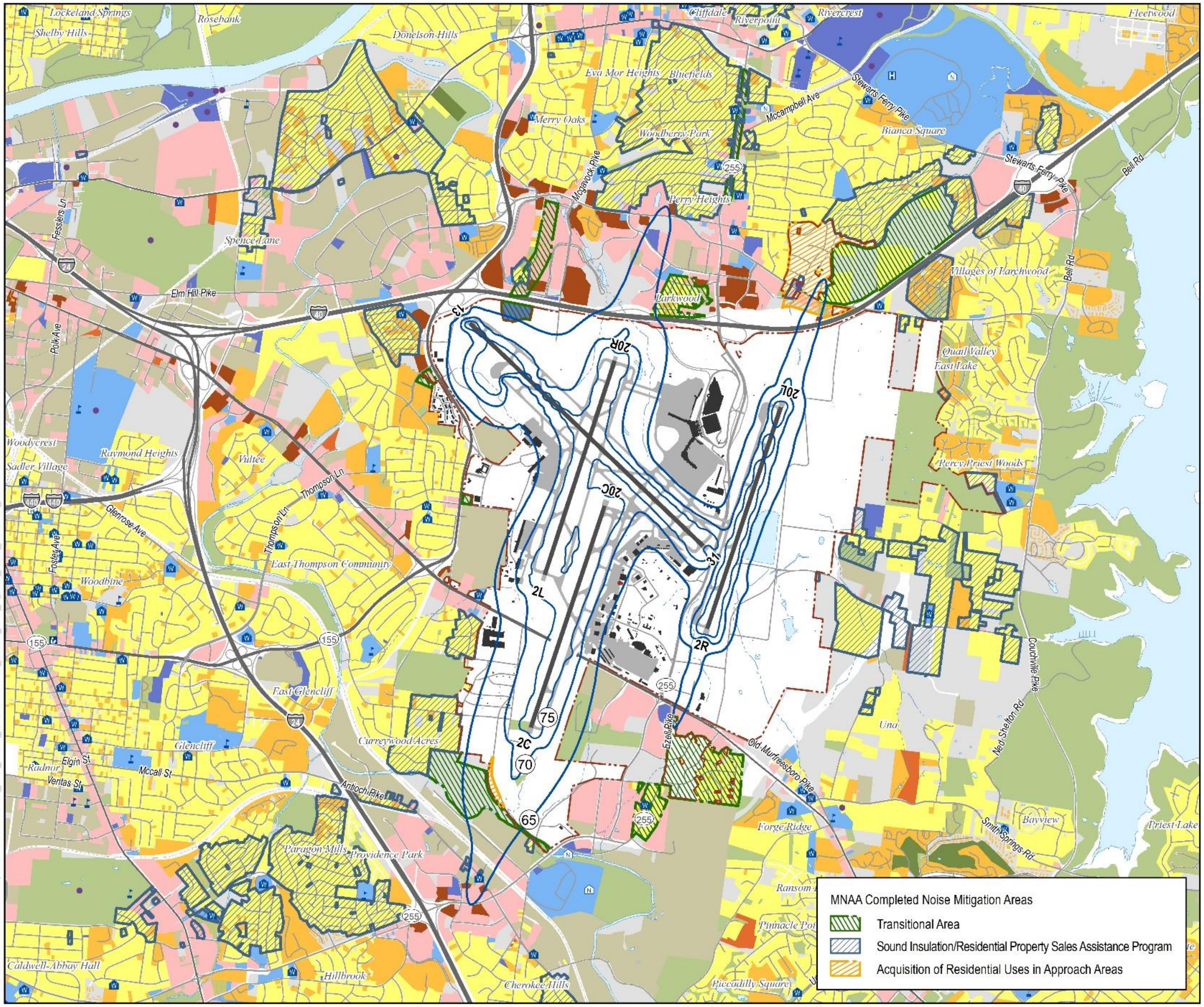
Terrain data describes the elevation of the ground surrounding the airport, and on airport property. The AEDT uses terrain data to adjust the ground level under the flight paths. The terrain data does not affect the aircraft's performance or noise levels but does affect the vertical distance between the aircraft and a "receiver" on the ground. This in turn affects assumptions about how noise propagates over ground. The National Elevation Dataset (NED) 1/3 arc second terrain data were obtained from the United States Geological Survey (USGS).[7] The NED data set has a resolution of 10 meters or 33 feet.

1.2 Noise Modeling Results

The AEDT uses the model inputs described above to calculate DNL at every individual point of a large array of grid points around an airport. The program then connects points of equal value to produce the DNL contour lines.

Figure 6 shows the annual average day DNL contours for the 2035 No Action case and **Figure 7** displays the DNL contours for the 2035 Proposed Action case. **Figure 8** shows a comparison of the two 2035 cases. Compared to the No Action case, the Proposed Action 65 DNL contour encompasses a slightly larger area. The difference in size of the noise exposure contours is a result of the expected increase in passenger aircraft operations related to the concourse expansion. The shape of the contours is essentially the same, as runway usage, flight track geometry, and flight track usage assumptions were held constant.

[7] Data downloaded from https://viewer.nationalmap.gov/basic/?howTo=true on 03/07/2018 in 1/3 Arc second GridFloat format.



BNA Nashville International Airport

Concourse A Gate Expansion Environmental Assessment

Figure 6

BNA CAGE EA Forecast 2035 No Action Case DNL Contours

2035 No Action Contours (65-75 dB DNL)

BNA Airport Boundary (Approximate)
Runway
State Boundary
Municipal Boundary
Highway
Minor Roads
Major Roads
Railroad

Land Use

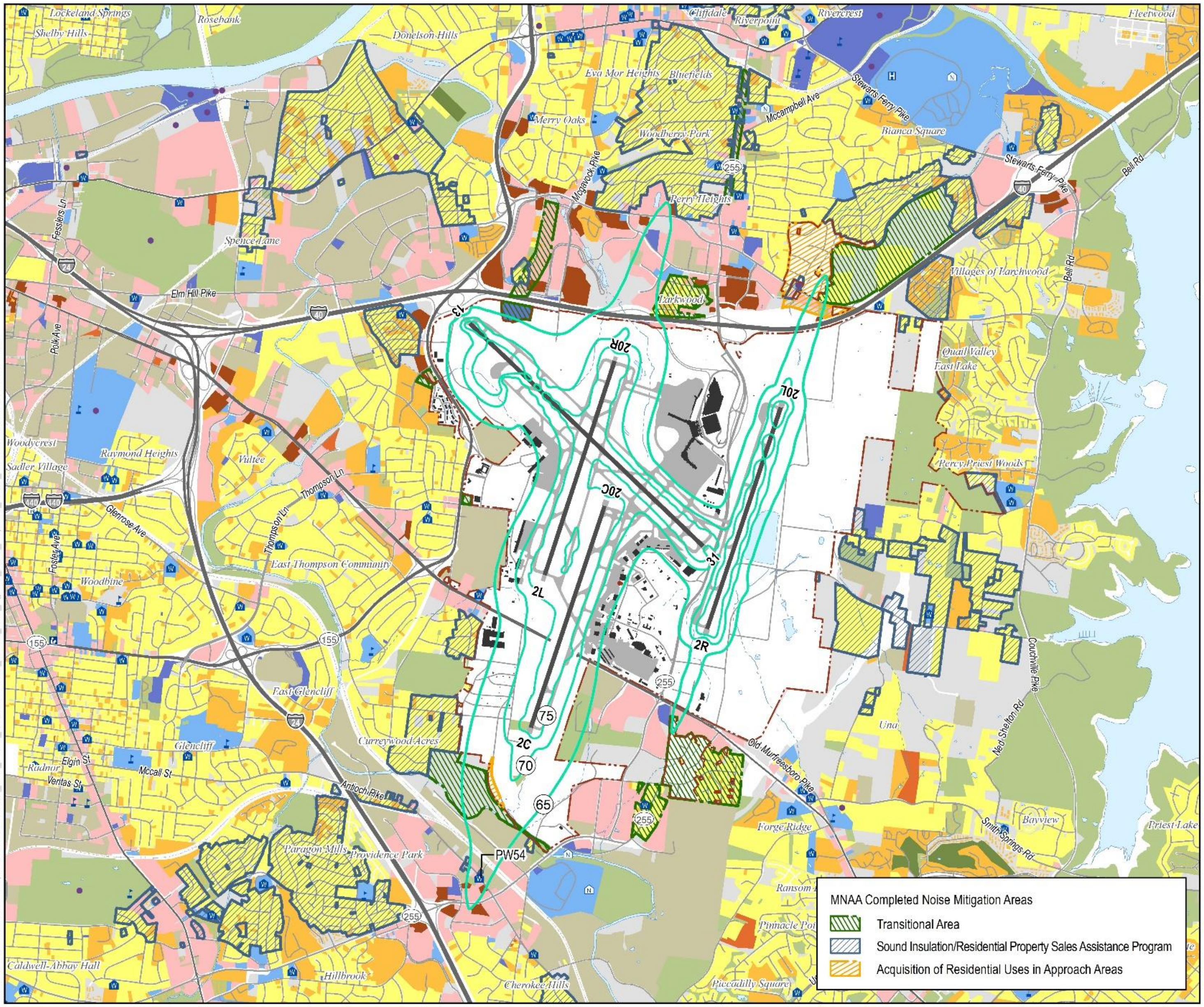
Residential
Multi-Family Residential
Mobile Home Park
Transient Lodging
Public Use (Non-Compatible)
Public Use (Compatible)
Recreational / Open Space / Golf
Commercial Use
Manufacturing and Production
Vacant / Undefined
Water / Stream

School
Place of Worship
Library
Hospital
Nursing Home
National Register of Historic Places

0 3,000 6,000 Feet

N

hmmh



BNA Nashville International Airport

Concourse A Gate Expansion
Environmental Assessment

Figure 7
BNA CAGE EA
Forecast 2035 Proposed Action
Case DNL Contours

2035 Proposed Action (CAGE EA) Contours (65-75 dB DNL)

BNA Airport Boundary (Approximate)
Runway
State Boundary
Municipal Boundary
Highway
Minor Roads
Major Roads
Railroad

Land Use

Residential
Multi-Family Residential
Mobile Home Park
Transient Lodging
Public Use (Non-Compatible)
Public Use (Compatible)
Recreational / Open Space / Golf
Commercial Use
Manufacturing and Production
Vacant / Undefined
Water / Stream
School
Library
Nursing Home
Place of Worship
Hospital
National Register of Historic Places

0 3,000 6,000 Feet

N

hmmh

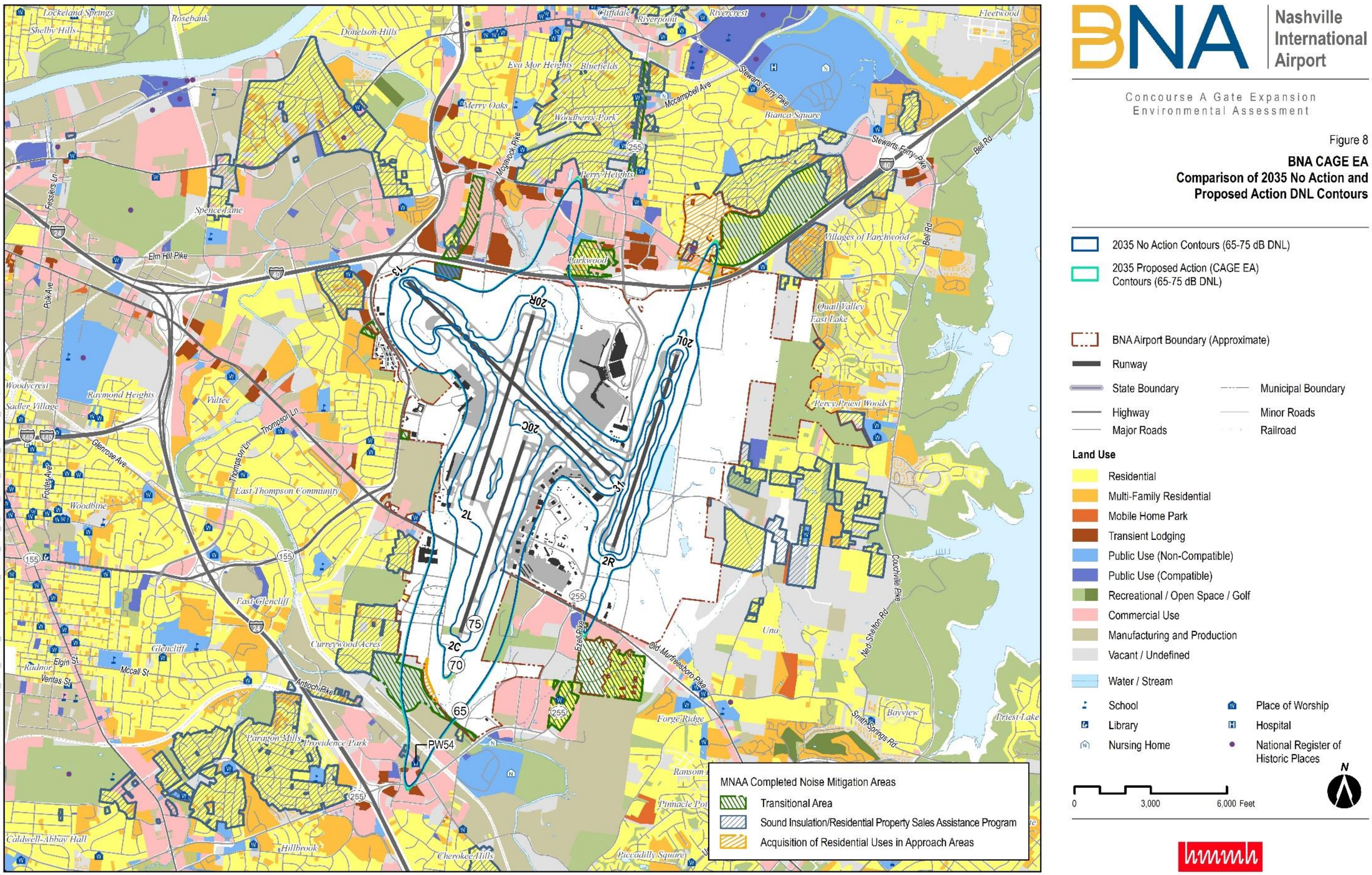


Figure 8
BNA CAGE EA
Comparison of 2035 No Action and Proposed Action DNL Contours

Table 10 presents the calculated land area within each contour interval for both analysis cases. The 2035 Proposed Action adds only about 27 acres to the area exposed to 65 DNL or higher, for a total of 2554.1 acres as compared to the 2035 No Action result of 2527.2 acres; the land area increase is approximately 1.0 percent.

Both sets of DNL contours for 2035 are significantly smaller than the NEM DNL contours despite an increase in aircraft operations. This is due to the assumption of quieter aircraft as airline fleets continue to modernize.

Table 10. Comparison of Land Area Enclosed by the No Action and Proposed Action Contours

Source: HMMH

Analysis Case	Land area within noise contour interval (in acres)			Total acreage within 65 DNL
	65-70 dB DNL	70-75 dB DNL	75+ dB DNL	
2035 No Action	1,362.7	587.7	576.8	**2,527.2**
2035 Proposed Action	1,384.5	587.7	581.9	**2,554.1**
2035 Change	**21.9**	**0.0**	**5.1**	**26.9**

FAA Order 1050.1F defines a "significant impact" as an increase of 1.5 dB in DNL at noise-sensitive land use locations (e.g., residences, schools, etc.) exposed to aircraft noise of 65 DNL or higher under the proposed action. For example, an increase from 63.5 dB to 65 dB is considered a significant impact. A noise exposure grid analysis checked for areas of significant impact resulting from the Proposed Action. The results of the analysis indicated that no points within the 65 DNL contour would experience an increase of 1.5 dB or more as a result of the proposed action.

An inventory of noise sensitive land uses within the 65 DNL contour has been prepared for the No Action and the Proposed Action cases for 2035. **Table 11** charts the estimated population, number of housing units, and other identified noise-sensitive parcels within the 65 DNL contour, listed by 5-dB contour intervals. The data in **Table 11** indicate an increase of three people in two housing units between the 2035 No Action and Proposed Action cases. There are no population or housing units within the 70 DNL contour in either case. There are no noise sensitive parcels that move into a higher 5 dB contour band within the 65 DNL contour as a result of the proposed action.

Table 11. Noise Sensitive Parcels and Estimated Population within 65 DNL contour for the 2035 No Action and Proposed Action Contours

Source: HMMH

DNL (dB)	No Action			Proposed Action		
	Estimated Population	Housing Units Note 1	Other Noise Sensitive Parcels Note 2	Estimated Population	Housing Units Note 1	Other Noise Sensitive Parcels Note 2
65-70	9	3	1	12	5	1
70-75	0	0	0	0	0	0
75+	0	0	0	0	0	0
Total within 65 DNL	**9**	**3**	**1**	**12**	**5**	**1**

Notes:
1. Of the housing units within the 65 DNL contour, all are in noise mitigation areas.
2. Noise Sensitive Parcels include schools, places of worship, hospitals, nursing homes, and designated historical sites. Only one identified such noise sensitive parcel is within the 65 DNL contour for either case: it is the Meades Chapel Church of Christ (place of worship).

As shown in **Figure 8,** the 65 DNL contours for both of the 2035 cases do not extend into residential areas on the south side of the airport, and barely reach into a residential area on the north side of the airport.

* The 2035 No-Action 65-70 DNL contour interval encompasses three housing units. Of these, all have been mitigated and none are considered noncompatible.
* The 2035 Proposed Action 65-70 DNL contour interval encompasses five housing units. Of these, all have been mitigated and none are considered noncompatible.
* There are no noise-sensitive land uses within the 70 dB DNL contour for either of the 2035 cases.

2. Air Quality Analysis

This section presents and discusses the potential for air quality impacts from the Proposed Action associated with (1) the construction and demolition activities of the Concourse A expansion, and (2) additional aircraft and associated auxiliary operations. Comparing the inventory of air pollutant emissions associated with each of those items to the General Conformity *de minimis* thresholds for significance is the basis for evaluating the potential for impacts.

2.1 Affected Environment

2.1.1 *National Ambient Air Quality Standards*

Under the National Environmental Policy Act (NEPA), federal agencies must consider the impact their actions will have on the environment compared to a no-action alternative. According to FAA NEPA implementing guidance (FAA Order 1050.1F and Desk Reference, and FAA Order 5050.4B), impacts to air quality must be considered as part of the environmental analysis under NEPA. Potential effects of the proposed action are evaluated against the National Ambient Air Quality Standards (NAAQS), as promulgated by the EPA under the Federal Clean Air Act (CAA).

The EPA currently regulates six criteria pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM), and lead (Pb). Particulate matter is divided into two particle size categories: coarse particles with a diameter less than 10 micrometers (PM_{10}) and fine particles with a diameter of less than 2.5 micrometers ($PM_{2.5}$). The NAAQS are expressed in terms of pollutant concentration measured (or averaged) over a defined period of time and are two-tiered. The first tier (the "primary standard") is intended to protect public health; the second tier (the "secondary standard") is intended to protect public welfare and prevent further degradation of the environment.

Table 12 shows the primary and secondary NAAQS for the criteria pollutants. Section 176(c) of the CAA states that federal agencies cannot engage, support, or provide financial assistance for licensing, permitting, or approving any project that could cause or contribute to the severity and/or number of violations of the NAAQS, or could inhibit the expeditious attainment of these standards.

The standards in **Table 12** apply to the concentration of a pollutant in outdoor ambient air. If the air quality in a geographic area is equal to or better than the national standard, the EPA will typically designate the region as an "attainment area." An area where air quality does not meet the national standard is typically designated by the EPA as a "non-attainment area." Once the air quality in a non-attainment area improves to the point where it meets the standards and the additional requirements outlined in the CAA, the EPA can re-designate the area to attainment upon approval of a Maintenance Plan, and these areas are then referred to as "maintenance areas." Each state is required to prepare a State Implementation Plan (SIP) that outlines measures that regions within the state will implement to attain the applicable air quality standard in non-attainment areas for applicable criteria air pollutant, and to maintain compliance with the applicable air quality standard in maintenance areas. The status and severity of pollutant concentrations in a particular area will impact the types of measures a state must take to reach attainment with the NAAQS. The EPA must review and approve each state's SIP to ensure the proposed measures are sufficient to either attain or maintain compliance with the NAAQS within a set period of time.

The Clean Air Act Amendments (CAAA) of 1990 require states to make recommendations to the EPA regarding the attainment status of all areas within their borders when the EPA finalizes an update to any NAAQS. Under its CAAA authority, the EPA further classifies non-attainment areas for some pollutants – such as ozone – based on the severity of the NAAQS violation as marginal, moderate, serious, severe, and extreme. To further improve the nation's air quality, the EPA lowered the ozone standard in 2015 to 0.070 parts per million (ppm).

Table 12. National Ambient Air Quality Standards

Source: U.S. EPA NAAQS https://www.epa.gov/criteria-air-pollutants/naaqs-table

Pollutant	Averaging Time	Primary Standards	Secondary Standards
CO	Eight-hour	9 parts per million (ppm)	None
	One-hour	35 ppm	
Pb	Rolling Three-Month Average	0.15 micrograms (µg) /cubic meter of air (m^3)	Same as Primary
NO_2	Annual Arithmetic Mean	0.053 ppm (100 µg/m^3)	Same as Primary
	One-hour	0.100 ppm Note 2	None
O_3	Eight-hour (2015 standard) Note 4	0.070 ppm	Same as Primary
$PM_{2.5}$	Annual Arithmetic Mean	12 µg/m^3 Note 1	15 µg/m^3
	24-hour	35 µg/m^3	Same as Primary
PM_{10}	24-Hour	150 µg/m^3 Note 1	Same as Primary
SO_2	One-hour	75 parts per billion (ppb) Note 3	None
	Three-hour	None	0.5 ppm

Table Notes:

1. For PM_{10}, the 24-hour standard not to be exceeded more than once per year on average over three years. For $PM_{2.5}$, the 24-hour standard is attained when 98% of the daily concentrations, averaged over three years, are equal to or are less than the standard.

2. To attain this standard, the three-year average of the 98th percentile of the daily maximum one-hour average at each monitor within an area must not exceed 0.100 ppm (effective January 22, 2010).

3. Final rule signed June 2, 2010. To attain this standard, the three-year average of the 99th percentile of the daily maximum one-hour average at each monitor within an area must not exceed 75 ppb.

4. EPA updated the NAAQS for O_3 to strengthen the primary eight-hour standard to 0.07 ppm on October 1, 2015. An area will meet the standard if the fourth-highest maximum daily eight-hour ozone concentration per year, averaged over three years is equal to or less than 70 ppb.

2.1.2 *Attainment Status*

Air quality in the BNA area (i.e., Davidson County) is designated by EPA as being in attainment for all criteria pollutants. Since the area is designated as attainment with the current EPA air quality standards, the General

Conformity Rule does not apply. However, the net change in air emissions was still compared to the applicable U.S. EPA *de minimis* levels for determining significant impacts[8] for the purposes of NEPA.

2.1.3 *General Conformity Rule*

The General Conformity Rule defines a federal action as any activity engaged in by a department, agency, or instrumentality of the federal government, or any activity that a department, agency, or instrumentality of the federal government supports in any way, provides financial assistance for, licenses, permits, or approves. General Conformity is defined as demonstrating that a project or action conforms to the SIP's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of such standards. Federally funded and approved actions at airports are subject to the U.S. EPA's general conformity regulations. The General Conformity Rule[9] applies to all federal actions except for certain highway and transit programs which must comply with the Transportation Conformity Plans.[10]

The General Conformity Rule includes annual emissions thresholds for nonattainment and maintenance areas that trigger the need for a General Conformity determination and defines projects that are typically excluded from General Conformity requirements. Since the General Conformity Rule applies to federally funded projects in EPA-designated non-attainment and maintenance areas, the General Conformity requirements *do not* apply to projects at BNA[11].

2.1.4 *Representative Monitoring Data*

Existing air quality conditions in the BNA area can be reflected through the current status of the NAAQS attainment (as discussed above) and the recent ambient air monitoring data collected by the state agencies.

The Tennessee Department of Environment and Conservation Air Pollution Control Division along with the Metro Public Health Department operates and collects the state of Tennessee's air monitoring sites to continuously monitor pollutant levels throughout the state, including ambient (i.e., outdoor) air monitoring sites. This data is used to monitor compliance with federal and state ambient air quality standards and is provided to the public in annual reports.

The latest three years of values (2017-2019) were obtained from the EPA Outdoor Air Quality Data Monitor Values Report[12] and were reviewed for carbon monoxide, ozone, nitrogen dioxide, sulfur dioxide and particulate matter. **Table 13** summarizes data from the three closest monitoring stations to BNA in Davidson County where relevant data are available. These sites are considered representative of the study area. **Table 13** shows that the Davidson County measured value for each pollutant is below the NAAQS level.

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[8] emissions below the *de minimis* levels are considered not significant

[9] Revisions to the General Conformity Rule are codified under 40 CFR Parts 51 and 93, Subpart W, Revisions to the General Conformity Regulations, Final Rule (April 2010).

[10] 40 CFR Part 93, Subpart A

[11] BNA is located in an EPA designated attainment area for all pollutants

[12] https://www.epa.gov/outdoor-air-quality-data/monitor-values-report (accessed on March 5, 2020)

Table 13. 2017 to 2019 Davidson County Monitor Values at Nearby Representative Measurement Locations

Source: https://www.epa.gov/outdoor-air-quality-data/monitor-values-report

Site ID	Address	Pollutant	Period	2017	2018	2019	NAAQS
				Concentration			
470370040	Elm Hill Pike	CO	1-hour	1.9 ppm	1.8 ppm	1.5 ppm	35 ppm
			8-hour	1.5 ppm	1.6 ppm	1.2 ppm	9 ppm
470370011	1015 Trinity Lane	NO_2	1-hour	36 ppb	33 ppb	35 ppb	100 ppb
			Annual	7.88 ppb	7.83 ppb	6.47 ppb	53 ppb
470370011	1015 Trinity Lane	Ozone	8-hour 4th Max	0.064 ppm	0.068 ppm	0.064 ppm	0.07 ppm
470370040	Elm Hill Pike	$PM_{2.5}$	24-hour	19 $\mu g/m^3$	18 $\mu g/m^3$	18 $\mu g/m^3$	35 $\mu g/m^3$
			Annual	9.7 $\mu g/m^3$	9.2 $\mu g/m^3$	10.8 $\mu g/m^3$	15 $\mu g/m^3$
470370040	105 South 17th Street	PM_{10}	24-hour	34 $\mu g/m^3$	41 $\mu g/m^3$	32 $\mu g/m^3$	150 $\mu g/m^3$
470370011	1015 Trinity Lane	SO_2	1-hour	5 ppb	4 ppb	8 ppb	75 ppb

2.2 Environmental Consequences of Proposed Action

Potential air quality impacts associated with construction and demolition of the Proposed Action are discussed in this section. After construction, the Proposed Action would induce additional aircraft operations or passengers beyond expected growth but will not change the aircraft fleet or taxi times using BNA. Therefore, additional aircraft operation emissions were also inventoried and evaluated.

2.2.1 *Demolition and Construction Activities*

The demolition and construction associated with the Proposed Action would result in short-term changes in air emissions from sources such as exhaust from nonroad construction equipment such as:

- haul trucks,
- site clearing, and
- grading.

On-road vehicles include those associated with:

- transport and delivery of supplies,
- materials and equipment to and from the site, and
- construction worker trips.

Additionally, fugitive dust emissions sources include:

- site preparation,
- land clearing,
- material handling,
- equipment movement on unpaved roads and
- evaporative emissions from the application of asphalt paving.

Demolition and construction activities associated with the Proposed Action are expected to begin in the third quarter of 2021 and be completed in the third quarter of 2025. **Table 14** presents the primary components of the Proposed Action, including estimated activity costs, area estimates (square feet) and anticipated start and end dates of construction. These costs and area estimates were used for deriving construction activity emission estimates with the Airport Cooperative Research Board's (ACRP) Airport Construction Emissions Inventory Tool (ACEIT)[13].

Table 14. Proposed Action Construction and Demolition

Source: Garver, December 2020

Project Action Component	Estimated Project Costs ($)	Area (Square Feet)	Construction Start	Construction End
Concourse Area Demolition	2.5M	110,353	2023: QTR 3	2025: QTR 3
Concourse Area Construction	857.5M	351,200	2023: QTR 3	2025: QTR 3
Terminal Apron Demolition	25.0M	10,000	2021: QTR 3	2023: QTR 2
Terminal Apron Construction	25.0M	499,800	2021: QTR 3	2025: QTR 3
Satellite Concourse Construction	80.0M	89,390	2021: QTR 3	2023: QTR 2

The ACRP ACEIT model[14] was used to estimate the construction schedule of equipment for each project component based on the project dimensions and project costs for each activity. The model has the ability to generate construction schedules for a variety of standard airport construction projects including the associated activity types and the equipment used for this project.

ACEIT can also produce emission factors for nonroad and on-road construction equipment, as well as for fugitive emission sources using EPA and industry standard models and methodologies. However, the current version of ACEIT includes an older version of the U.S EPA's Motor Vehicle Emission Simulator (MOVES) emission model, MOVES2010a and NONROADs, which have both been updated over the years. For this analysis, the current MOVES2014b and NONROAD model versions were used to develop on-road and nonroad emission factors for Davidson County[15], applied to estimates of vehicle miles traveled (VMT) and construction equipment (hours, horsepower, load factor), respectively, as generated in ACEIT for each construction activity and year. Emission factors generated in NONROAD assume the phasing of Tier 1, Tier 2, Tier 3, and Tier 4 engines over time based on EPA regulations[16]. Construction-related emissions of criteria pollutants during the construction period 2021 to 2025 are summarized in **Table 15.**

[13] ACRP, 2014 https://crp.trb.org/acrp0267/acrp-report-102-guidance-for-estimating-airport-construction-emissions/
[14] http://onlinepubs.trb.org/onlinepubs/acrp/docs/ACRP02-33_FR.pdf
[15] Construction emissions used in NONROAD2008a assumed a blend of Tier 1, Tier 2, Tier 3, and Tier 4 for Davidson County based on EPA phasing ratios of older equipment in future years and does not reflect the primary use of either Tier 1 thru 4 engines. MOVES emission factors are specific to Davidson County as generated within MOVES for each year.
[16] Exhaust and Crankcase Emission Factors for Nonroad Compression-Ignition Engines in MOVES2014b (PDF) (177 pp, 15.4 MB, EPA-420-R-18-009, July 2018)

Table 15. Construction Emission Inventory - Proposed Action

Source: HMMH, 2021, Based on ACEIT, NONROAD2008a and MOVES2014b results using construction information provided by Garver, December 2020

Year	Relevant Criteria Pollutant Emissions (tons per year)						
	CO	VOC Note 1	NO_2 Note 1	SO_2	PM_{10}	$PM_{2.5}$	CO_2e Note 2
2021	2.4	0.3	1.7	0.01	0.5	0.1	1,786
2022	6.5	0.9	3.1	0.03	1.5	0.2	4,653
2023	11.8	1.1	4.6	0.05	1.1	0.3	7,709
2024	29.8	1.9	4.9	0.04	0.6	0.1	10,637
2025	17.8	0.9	3.9	0.05	0.6	0.1	8,112

Notes:
1. Following standard industry practice, ozone was evaluated by evaluating emissions of VOC and NO_x, which are precursors in the formation of ozone.
2. CO_2e emissions are in metric tons per year equivalent relevant to their GWP.

2.2.2 *Aircraft Operational Activities*

As discussed above, implementation of the Proposed Action would increase the number of aircraft operations compared to the No Action alternatives, therefore operational emissions were estimated. To satisfy NEPA requirements, the operational emissions change related to the Proposed Action were compared to General Conformity *de minimis* levels for significance. It should be noted the Proposed Action would only change the number of operations and will not change how the aircraft maneuver around the airfield, therefore estimated taxi times will remain unchanged for both the Proposed and No Action Alternatives.

The AEDT produced emissions estimates for both the No Action and the Proposed Action cases for 2035, using the same set of model inputs that were used for the noise calculations, as documented in Section 1 of this memorandum. Both of the cases assume that runway and taxiway configurations remain unchanged from the existing conditions. The forecast Proposed Action case assumes changes to the aircraft operations only. The net change in aircraft operational emissions includes emissions from the ground support equipment and auxiliary power units associated with the Proposed Action. **Table 16** provides the forecast No Action and Proposed Action operational emissions for 2035, as calculated by the AEDT. The net change in emissions is provided in bold.

Table 16. Operational Emissions Inventory of the Forecast No Action and Proposed Action Cases

Source: HMMH, 2020

Aircraft Operations Case	Relevant Criteria Pollutant Emissions (tons per year)[Note 2]					
	CO	VOC[Note 1]	NO_2[Note 1]	SO_2	PM_{10}	$PM_{2.5}$
2035 No Action	1,102.0	141.0	1,185.0	90.3	11.8	11.7
2035 Proposed Action	1,124.0	143.0	1,223.0	92.9	12.1	12.1
2035 Net Change	**+22**	**+2.0**	**+38**	**+2.6**	**+0.3**	**+0.4**

Notes:
1. Following standard industry practice, ozone was evaluated by evaluating emissions of VOC and NO_x, which are precursors in the formation of ozone.

2. Operational emissions denote emissions associated with aircraft operations only.

3. All analysis cases assumed default taxi times in AEDT.

2.2.3 *General Conformity Applicability Analysis*

As discussed above, the Airport is located in Davidson County, which is designated as attainment with the NAAQS by EPA for all criteria pollutants, therefore the General Conformity Rule does not apply. However, for NEPA purposes, the emissions associated with the Proposed Action for both Construction and Operations are compared to the General Conformity *de minimis* levels for attainment/maintenance areas for determining significant impacts[17].

Table 17 presents the total emissions associated with demolition and construction of the Proposed Action for each year of the construction period (2021 through 2025), compared with the appropriate *de minimis* thresholds. As the table shows, the total emissions for each construction year (i.e. 2021, 2022, 2023, 2024, and 2025) would be below established *de minimis* thresholds for all pollutants and would not result in a significant air quality impact.

[17] emissions below the *de minimis* levels are considered not significant and have minimal emissions increase

Table 17. Total Construction and Demolition Emissions Compared to *De Minimis* Thresholds

Source: HMMH, 2021

Year	Relevant Criteria Pollutant Emissions (tons per year)					
	CO	VOC	NO_2	SO_2	PM_{10}	$PM_{2.5}$
2021						
Total Emissions of Construction and Demolition	2.4	0.3	1.7	0.01	0.5	0.1
EPA De Minimis Threshold	**100**	**100**	**100**	**100**	**100**	**100**
Emissions below *de minimis* thresholds?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
2022						
Total Emissions of Construction and Demolition	6.5	0.9	3.1	0.03	1.5	0.2
EPA De Minimis Threshold	**100**	**100**	**100**	**100**	**100**	**100**
Emissions below *de minimis* thresholds?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
2023						
Total Emissions of Construction and Demolition	11.8	1.1	4.6	0.05	1.1	0.3
EPA De Minimis Threshold	**100**	**100**	**100**	**100**	**100**	**100**
Emissions below *de minimis* thresholds?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
2024						
Total Emissions of Construction and Demolition	29.8	1.9	4.9	0.04	0.6	0.1
EPA De Minimis Threshold	**100**	**100**	**100**	**100**	**100**	**100**
Emissions below *de minimis* thresholds?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
2025						
Total Emissions of Construction and Demolition	17.8	0.9	3.9	0.05	0.6	0.1
EPA De Minimis Threshold	**100**	**100**	**100**	**100**	**100**	**100**
Emissions below *de minimis* thresholds?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

Table 18 presents the net change in operational emissions from the implementation of the Proposed Action and compares those emissions changes to the appropriate *de minimis* thresholds for significance determination. As the table shows, the net change would be below established *de minimis* thresholds for all pollutants and therefore the Proposed Action would not result in a significant air quality impact.

Table 18. Net Operational Emission Changes Compared to *De Minimis* Thresholds

Source: HMMH, 2020

	Relevant Criteria Pollutant Emissions (tons per year)					
	CO	VOC	NO_2	SO_2	PM_{10}	$PM_{2.5}$
2035 Net Change in Operational Emissions due to the Proposed Action	**+22.0**	**+2.0**	**+38.0**	**+2.6**	**+0.3**	**+0.4**
EPA De Minimis Threshold	**100**	**100**	**100**	**100**	**100**	**100**
Emissions below *de minimis* thresholds?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

2.2.4 *No Action Alternative*

The No-Action Alternative assumes that the proposed action is not implemented, and air quality would remain unchanged. Therefore, no additional air quality impacts would occur as a result of the No-Action case.

2.2.5 *Mitigation*

As indicated above, impacts to air quality with the implementation of the Proposed Action would not be significant when compared to the No Action; therefore, no mitigation measures are required.

2.3 Climate

Climate change is a global phenomenon that can have local impacts.[18] Scientific measurements show that Earth's climate is warming, with concurrent impacts including warmer air temperatures, increased sea level rise, increased storm activity, and an increased intensity in precipitation events. Increasing concentrations of greenhouse gas (GHG) emissions in the atmosphere affect global climate.[19,20,] GHG emissions result from anthropogenic sources, including the combustion of fossil fuels. GHGs include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), ozone (O_3), and fluorinated gases.[21] CO_2 is the most important anthropogenic GHG because it is a long-lived gas that remains in the atmosphere for up to 100 years.

2.3.1 *Regulatory Framework*

Although no federal standards have been set for GHG emissions, it is well established that GHG emissions can affect climate. Based on guidance from the FAA Order 1050.1F Desk Reference, state and local policies and programs that address climate change are discussed in this section. The guidance recommends consideration of: (1) the potential effects of a proposed action or its alternatives on climate change as indicated by its GHG

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[18] As explained by the EPA, "greenhouse gases, once emitted, become well mixed in the atmosphere, meaning U.S. emissions can affect not only the U.S. population and environment but other regions of the world as well; likewise, emissions in other countries can affect the United States." U.S. Environmental Protection Agency, Climate Change Division, Office of Atmospheric Programs, *Technical Support Document for Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act 2-3*, 2009, https://www.epa.gov/ghgemissions/technical-support-document-endangerment-and-cause-or-contribute-findings-greenhouse (accessed September 28, 2018).

[19] Intergovernmental Panel on Climate Change, *Fifth Assessment Report*, 2014, https://www.ipcc.ch/report/ar5/syr/ 9 (accessed September 28, 2018).

[20] U.S. Global Change Research Program, *Global Climate Change Impacts in the United States*, 2009, http://www.globalchange.gov/what-we-do/assessment/previous-assessments/global-climate-change-impacts-in-the-us-2009 (accessed September 28, 2018).

[21] U.S. Environmental Protection Agency, Overview of Greenhouse Gases, http://www3.epa.gov/climatechange/ghgemissions/gases.html (accessed May 11, 2017).

emissions; (2) the implications of climate change for the environmental effects of a proposed action or alternatives.

2.3.2 *Affected Environment*

Nashville Electric Service worked with the Department of Health to inventory existing Metropolitan Government of Nashville and Davidson County (Metro) GHG sources to provide an understanding of its emission sources. The Metro GHG baseline emissions inventory was also conducted to develop a baseline for which environmental efforts can be measured and indicate where improvement may be needed. Information for the GHG baseline emissions inventory was collected from various local utilities, Metro government operations and employees, as well as Metro Nashville Public School (MNPS). Nashville and Davidson County community produced approximately 14.4 million tons of CO_2 equivalents (CO_2e) in 2005.

2.3.3 *Analysis Methodology*

For this analysis, GHG emissions associated with the Proposed Action were prepared for carbon dioxide, methane, and nitrous oxide and presented as carbon dioxide equivalent (CO_2e) in metric tons per year relevant to their global warming potential. The carbon dioxide equivalent is estimated by taking the mass equivalent of each pollutant (TPY) and multiplying by the global warming potential equivalent (GWP) of each pollutant and adding them together. For example, the GWP of CO_2 is 1, CH_4 is 28 GWP, and N_2O is 265 GWP, according to the IPCC Fifth Assessment Report[22].

The methodology and assumptions for the GHG analysis are consistent with the air quality analysis discussed in Section 2.2.1 and 2.2.2. GHG emissions associated with the construction and demolition activities as well as the increase in GHG emissions due to operational changes of the Proposed Action were qualitatively evaluated. The results are compared to U.S., local, and global levels.

2.3.4 *Environmental Consequences of Proposed Action Alternative*

Table 19 presents the annual greenhouse gas emissions for demolition and construction activities as well as operational emissions associated with the future Proposed Action and No Action for 2035.

There are no defined significance thresholds for aviation GHG emissions, nor has FAA identified any factors to consider in making a significance determination for GHG emissions. As shown in Section 2.2.3, construction emissions under the Proposed Action would not result in a significant air quality impact. Similarly, any greenhouse gas emissions increase from construction and operational activity associated with the Proposed Action would comprise a very small fraction of the baseline Nashville and Davidson County GHG emissions of 14.4 million metric tons of carbon dioxide equivalents ($MMTCO_2e$), the U.S. based emissions of 6,472 $MMTCO_2e$, and even less than the 49 gigatons of carbon dioxide equivalent global GHG emissions[23,24,25]. Mitigation measures for the Proposed Action would not be required.

In summary, while there are no significance thresholds established for climate impacts, GHGs associated with the Proposed Action have been calculated in accordance with the latest FAA guidelines (1050.1F) for climate impacts in a NEPA document[26].

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[22] https://www.ipcc.ch/assessment-report/ar5/

[23] https://www.nashville.gov/Portals/0/SiteContent/Sustainability/2009GreenhouseGasInventory.pdf

[24] https://www.epa.gov/sites/production/files/2019-02/documents/us-ghg-inventory-2019-main-text.pdf

[25] http://ipcc.ch/publications_and_data/ar4/syr/en/contents.html

[26] 1050.1F Desk Reference, https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order/desk_ref/media/3-climate.pdf

Table 19. GHG Emissions Associated with Construction and Operations for the Proposed Action
Source: HMMH 2021

Year	Greenhouse Gases (metric tons/year)			CO_2e (metric tons/year)[Note 3]
	CO_2	CH_4	N_2O	
Construction[Note 1]				
2021	1,785	0.01	0.01	**1,786**
2022	4650	0.02	0.01	**4,652**
2023	7,706	0.02	0.01	**7,709**
2024	10,628	0.04	0.03	**10,637**
2025	8,106	0.02	0.02	**8,112**
Operational[Note 2]				
2035 Proposed Action	208,382	0.12	0.0	**208,386**
2035 No Action	202,526	0.11	0.0	**202,530**

Notes: 1. Construction emissions derived from ACEIT,MOBILE2014b, and NONROADs2008a.

2. Operational emissions derived from AEDT.

3. Emissions are reported as metric tons of carbon dioxide equivalents to present a normalized unit of greenhouse gas emissions based on the global warming potential of each gas. CO_2e is a combination of CO2 emissions with the CO2-equivalent emissions of other greenhouse gases.

2.3.5 *Environmental Consequences of No Action Alternative*

The No Action alternatives would not result in increases in fuel burn or GHG emissions. No changes to GHG emissions would occur and there would be no impact as a result of implementation of the No Action alternative.

Appendix A – Basic Noise Terminology

Noise is a very complex physical quantity. The properties, measurement, and presentation of noise involve specialized terminology that is often difficult to understand. To assist reviewers in interpreting the complex noise metrics used in evaluating airport noise, this appendix introduces six acoustical descriptors of noise, roughly in increasing degree of complexity:

* Decibel, dB
* A-Weighted Decibel, dBA
* Maximum A-Weighted Sound Level, L_{max}
* Sound Exposure Level, SEL
* Equivalent A-Weighted Sound Level, L_{eq}
* Day-Night Average Sound Level, DNL

These noise metrics form the basis for the majority of noise analyses conducted at U.S. airports.

Decibel, dB

All sounds come from a sound source -- a musical instrument, a voice speaking, an airplane passing overhead. It takes energy to produce sound. The sound energy produced by any sound source is transmitted through the air in sound waves -- tiny, quick oscillations of pressure just above and just below atmospheric pressure. The ear detects these oscillating pressures interpreting it as “sound.”

Our ears are sensitive to a wide range of sound pressures. Although the loudest sounds that we hear without pain have about one million times more energy than the quietest sounds we hear, our ears are incapable of detecting small differences in these pressures. Thus, to better match how we hear this sound energy, we compress the total range of sound pressures to a more meaningful range by introducing the concept of sound pressure level.

Sound pressure level (SPL) is measured in decibels (dB). Decibels are logarithms of a ratio, the numerator being the pressure of the sound source of interest, and the denominator being the reference pressure (equivalent to the quietest sound that an average healthy young adult can hear):

$$\textit{Sound Pressure Level (SPL)} = 20 * Log\left(\frac{P_{source}}{P_{reference}}\right) dB$$

The logarithmic conversion of sound pressure to sound pressure level means that the quietest sound that we can hear (the reference pressure) has a sound pressure level of about 0 dB, while the loudest sounds that we hear without pain have sound pressure levels of about 120 dB. Most sounds in our day-to-day environment have sound pressure levels on the order of 30 to 100 dB.

Because decibels are logarithmic, combining decibels is unlike common arithmetic. For example, if two sound sources each produce 100 dB and they are then operated together, they produce 103 dB -- not the 200 decibels we might expect. Four equal sources operating simultaneously produce another three decibels of noise, resulting in a total sound pressure level of 106 dB. For every doubling of the number of equal sources, the sound pressure level goes up another three decibels. A tenfold increase in the number of sources makes the sound pressure level go up 10 dB. A hundredfold increase makes the level go up 20 dB, and it takes a thousand equal sources to increase the level 30 dB.

If one noise source is much louder than another, the two sources together will produce virtually the same sound pressure level (and sound to our ears) as the louder source alone. For example, a 100 dB source plus an 80 dB source produce approximately 100 dB when operating together (actually, 100.04 dB). The louder source "masks" the quieter one. But if the quieter source gets louder, it will have an increasing effect on the total sound pressure level such that, when the two sources are equal, as described above, they produce a level three decibels above the sound of either one by itself.

Conveniently, people also hear or interpret sound pressure in a logarithmic fashion. Two useful rules of thumb to remember when comparing sound pressure levels are: (1) a 6 to 10 dB increase is generally perceived to be about a doubling of loudness, and (2) changes in sound pressure level of less than about three decibels are not readily detectable outside of a laboratory environment.

A-Weighted Decibel, dBA

An important characteristic of sound is its frequency, or "pitch." This is the per-second rate of repetition of the sound pressure oscillations as they reach our ear, expressed in units known as Hertz (Hz), formerly called cycles per second.

When analyzing the total noise of any source, acousticians often break the noise into frequency bands to determine how much is low-frequency noise, how much is middle-frequency noise, and how much is high-frequency noise. This breakdown is important for two reasons:

* Our ear is better equipped to hear mid and high frequencies and is less sensitive to lower frequencies. Thus, we find mid- and high-frequency noise more annoying.
* Engineering solutions to a noise problem are different for different frequency ranges. Low-frequency noise is generally harder to control.

The normal frequency range of hearing for most people extends from a low of about 20 Hz to a high of about 10,000 to 15,000 Hz. People respond to sound most readily when the predominant frequency is in the range of normal conversation, typically around 1,000 to 2,000 Hz. The acoustical community has defined several “filters,” which approximate this sensitivity of our ear and thus, help us to judge the relative loudness of various sounds made up of many different frequencies.

The so-called "A" filter (“A weighting”) generally does the best job of matching human response to most environmental noise sources, including natural sounds and sound from common transportation sources. Because of the correlation with our hearing, the U. S. Environmental Protection Agency (EPA) and nearly every other federal and state agency have adopted A-weighted decibels as the metric for use in describing environmental and transportation noise.

Figure A-10 depicts A-weighting adjustments to sound from approximately 20 Hz to 10,000 Hz. As the figure shows, A-weighting significantly de-emphasizes noise content at lower and higher frequencies where we do not hear as well, and has little effect, or is nearly "flat,” in for mid-range frequencies between 1,000 and 5,000 Hz.

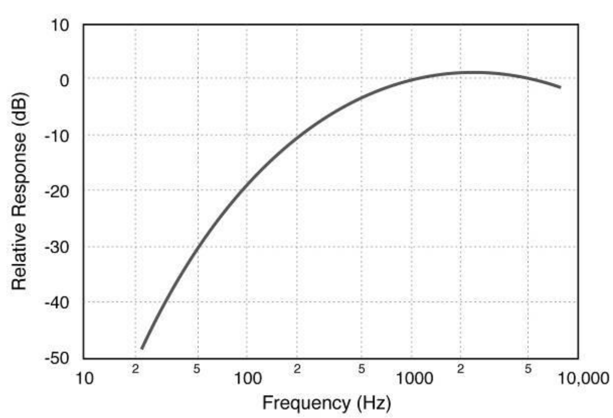


Figure A-10 Frequency-Response Characteristics of Various Weighting Networks

Source: HMMH, 2011

Figure A-11 depicts representative A-weighted sound levels for a variety of common sounds.

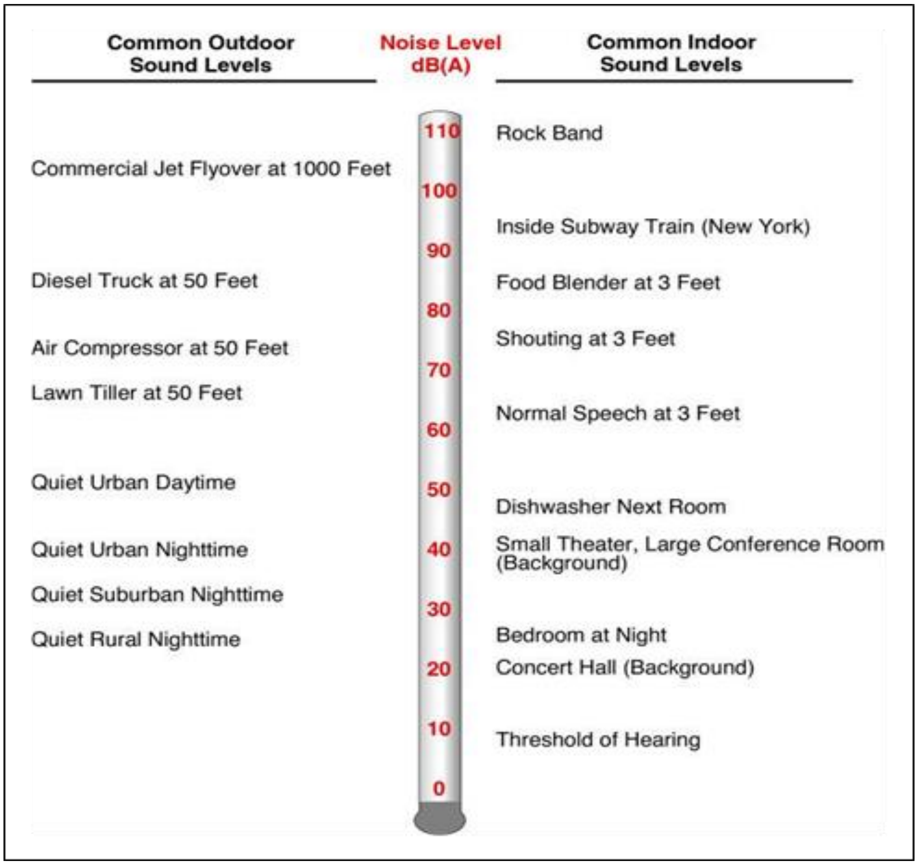


Figure A-11 Representative A-Weighted Sound Levels
Source: HMMH, 2011

Maximum A-Weighted Sound Level, L_{max}

An additional dimension to environmental noise is that A-weighted levels vary with time. For example, the sound level increases as an aircraft approaches, then falls and blends into the background as the aircraft recedes into the distance (though even the background varies as birds chirp, the wind blows, or a vehicle passes by). This is illustrated in **Figure A-12**.

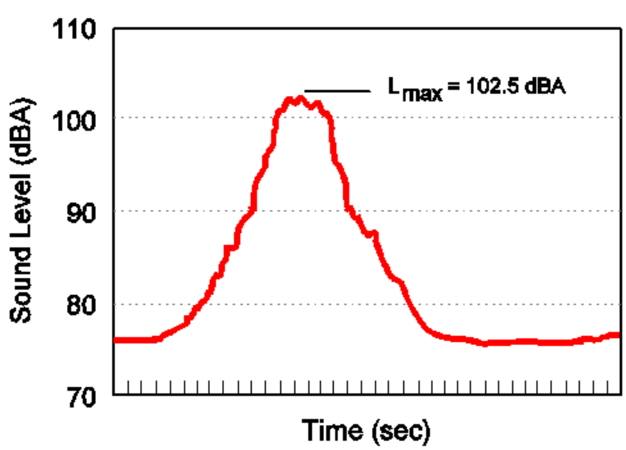


Figure A-12 Variation in the A-Weighted Sound Level over Time

Source: HMMH, 2011

Because of this variation, it is often convenient to describe a particular noise "event" by its maximum sound level, abbreviated as L_{max} (or LA_{max}, if the decibel abbreviation dB is used). In Figure A-12 the L_{max} is approximately 102.5 dBA.

While the maximum level is easy to understand, it suffers from a serious drawback when used to describe the relative “noisiness” of an event such as an aircraft flyover; i.e., it describes only one dimension of the event and provides no information on the event’s overall, or cumulative, noise exposure. In fact, two events with identical maximum levels may produce very different total exposures. One may be of very short duration, while the other may continue for an extended period and be judged much more annoying. The next sections introduce two closely related measures that account for this concept of a noise "dose," or the cumulative exposure associated with an individual “noise event” such as an aircraft flyover.

Sound Exposure Level, SEL

The most commonly used measure of cumulative noise exposure for an individual noise event, such as an aircraft flyover, is the Sound Exposure Level, or SEL. SEL is a summation of the A-weighted sound energy over the entire duration of a noise event. SEL expresses the accumulated energy in terms of the one-second-long steady-state sound level that would contain the same amount of energy as the actual time-varying level.

In simple terms, SEL “compresses” the energy into a single second. **Figure A-13** depicts this compression:

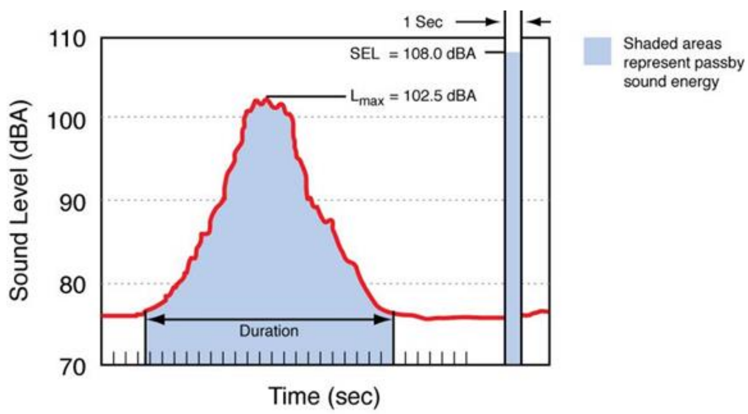


Figure A-13 Graphical Depiction of Sound Exposure Level
Source: HMMH, 2011

Note that because SEL is normalized to one second, it almost always will be higher than the event’s L_{max}. In fact, for most aircraft flyovers, SEL is on the order of five to 12 dB higher than L_{max}.

SEL provides a basis for comparing noise events that generally match our impression of their overall “noisiness,” including the effects of both duration and level; the higher the SEL, the more annoying a noise event is likely to be. **Figure A-14** illustrates this concept; of the two noise events shown, the event on the left has the higher maximum level, but the event on the right lasts longer and is therefore perceived as “noisier”. Compressing or “normalizing” the equivalent sound energy to a one-second interval results in a higher SEL value for the event on the right.

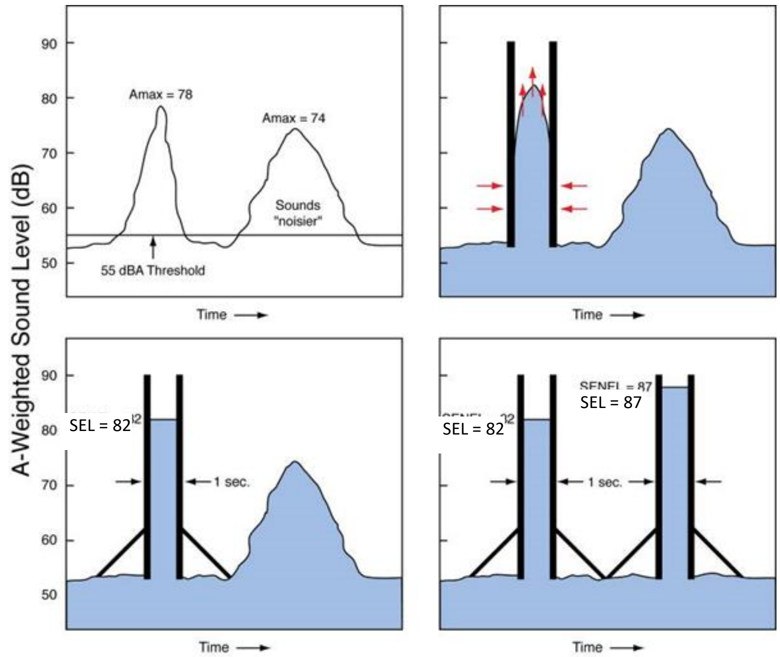


Figure A-14 Graphical Depiction of Sound Exposure Level for Two Noise Events with Different Maximums and Durations

Source: HMMH, 2011

Equivalent A-Weighted Sound Level, L_{eq}

The Equivalent Sound Level, abbreviated L_{eq}, is a measure of the exposure resulting from the accumulation of sound levels over a particular period of interest; e.g., an hour, an eight-hour school day, nighttime, or a full 24-hour day. The applicable period should always be identified or clearly understood when discussing the metric.

L_{eq} may be thought of as a constant sound level over the period of interest that contains as much sound energy as the actual varying level. It is a way of assigning a single number to a time-varying sound level. This is illustrated in **Figure A-15**.

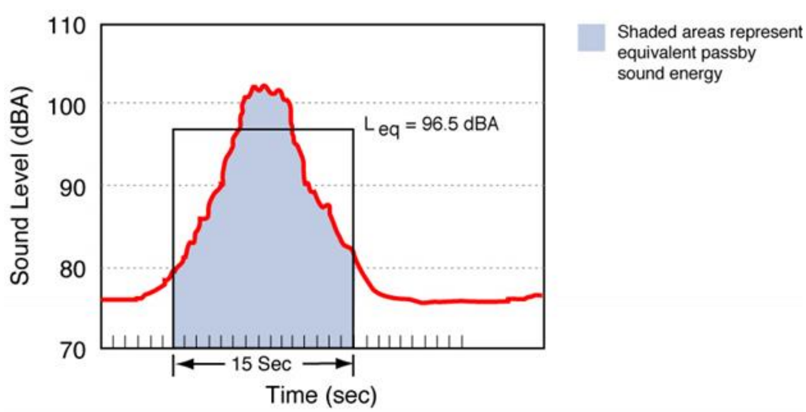


Figure A-15 Example of a One-Minute Equivalent Sound Level

Source: HMMH, 2011

In airport noise applications, L_{eq} is often presented for consecutive one-hour periods to illustrate how the hourly noise dose rises and falls throughout a 24-hour period as well as how certain hours are significantly affected by a few loud aircraft.

Day-Night Average Sound Level, DNL or L_{dn}

The previous sections address noise measures that account for short term fluctuations in A-weighted levels as sound sources come and go affecting the overall noise environment. The Day-Night Average Sound Level (abbreviated as DNL or L_{dn}) represents a 24-hour A-weighted noise dose. DNL is essentially equal to the 24-hour A-weighted L_{eq}, with one important adjustment: noise occurring at night – from 10 pm through 7 am – is "factored up." The factoring up can be made in one of two ways:

* Weighting, by counting each nighttime noise contribution 10 times; e.g., if DNL is calculated by summing the SEL of aircraft operations over a 24-hour period, each nighttime operation is represented by 10 identical daytime operations.
* Penalizing, by adding 10 dB to all nighttime noise contributions; e.g., if DNL is calculated from the SEL of aircraft operations occurring over a 24-hour period, 10 dB are added to the SEL values for nighttime operations.

The 10 dB adjustment accounts for our greater sensitivity to nighttime noise and the fact lower ambient levels at night tend to make noise events, such as aircraft flyovers, more intrusive. **Figure A-16** depicts this adjustment graphically.

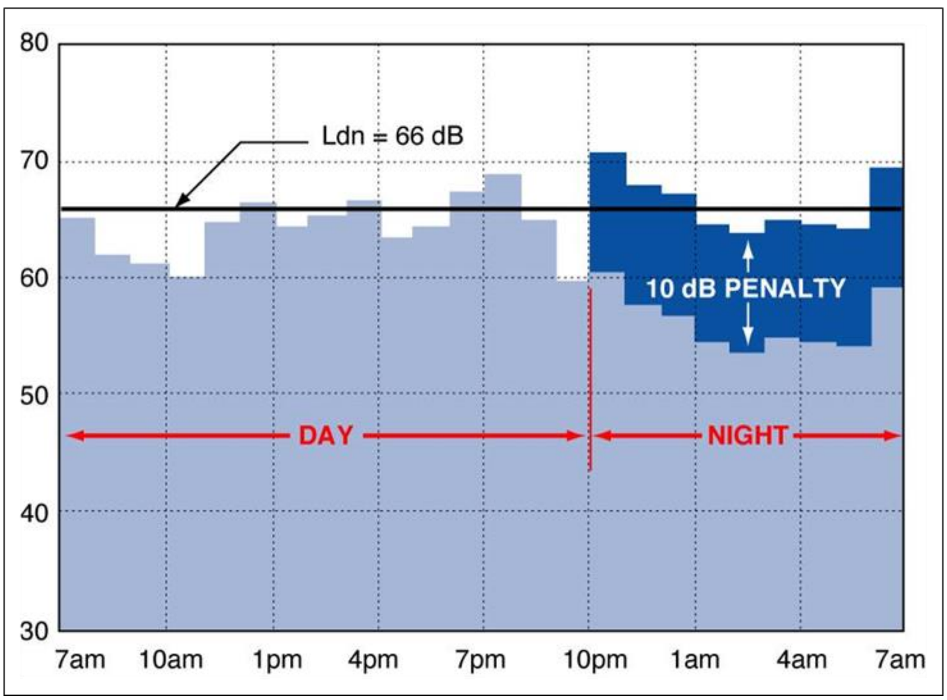


Figure A-16 Example of a Day-Night Average Sound Level Calculation
Source: HMMH, 2011

Most aircraft noise studies utilize computer-generated estimates of DNL, determined by adding up the energy from the SELs from each event, with the 10 dB penalty / weighting applied to night operations. Computed values of DNL are often depicted as noise contours reflecting lines of equal exposure around an airport (much as topographic maps indicate contours of equal elevation). The contours usually reflect long-term (annual average) operating conditions, taking into account the average flights per day, how often each runway is used throughout the year, and where over the surrounding communities the aircraft normally fly. Alternative time frames may also be helpful in understanding shorter term aspects of a noise environment.

Why is DNL used to describe noise around airports? The U.S. Environmental Protection Agency identified DNL as the most appropriate measure of evaluating airport noise based on the following considerations:

* It is applicable to the evaluation of pervasive long-term noise in various defined areas and under various conditions over long periods of time.
* It correlates well with known effects of noise on individuals and the public.
* It is simple, practical, and accurate. In principal, it is useful for planning as well as for enforcement or monitoring purposes.
* The required measurement equipment, with standard characteristics is commercially available.
* It was closely related to existing methods currently in use.

Representative values of DNL in our environment range from a low of 40 to 45 dB in extremely quiet, isolated locations, to highs of 80 or 85 decibels immediately adjacent to a busy truck route. DNL would typically be in the range of 50 to 55 dB in a quiet residential community and 60 to 65 decibels in an urban residential neighborhood. **Figure A-17** presents representative outdoor DNL values measured at various U.S. locations.

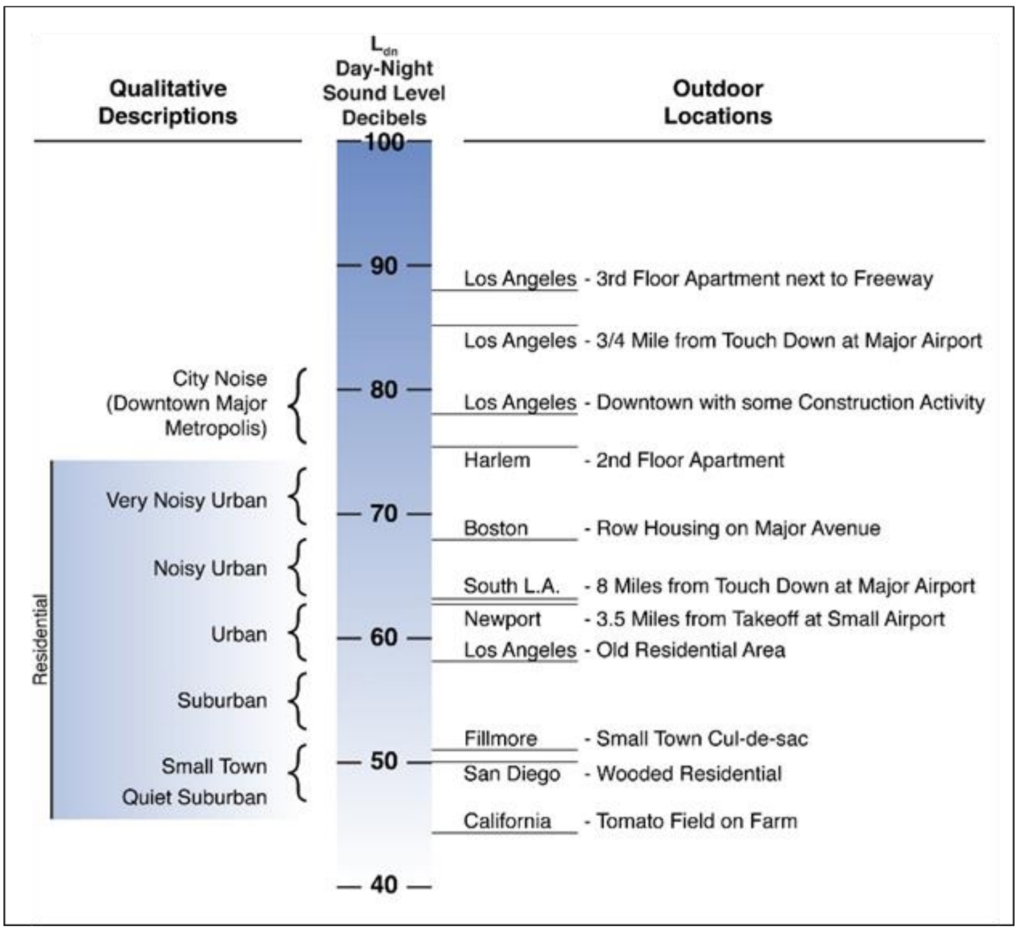


Figure A-17 Examples of Measured Day-Night Average Sound Levels
Source: HMMH, 2011

When preparing environmental noise analyses, the FAA considers a change of 1.5 dB within the DNL 65 dB contour to be "significant." If a change of 1.5 dB is observed, analysts should look between the 60 and 65 dB contours to see if there are areas of change of 3 dB or more; this is considered a "reportable impact."

The first section of this appendix provided rules of thumb for interpreting moment-to-moment changes in sound level; the following table presents guidelines for interpreting changes in cumulative exposure:

Table A-20 Guidelines for Interpreting Changes in Cumulative Exposure
Source: HMMH, 2011

DNL Change	Community Response	Mitigation
0 – 2 dB	May be noticeable	Abatement may be beneficial
2 – 5 dB	Generally noticeable	Abatement should be beneficial
Over 5 dB	A change in community reaction is likely	Abatement definitely beneficial

Most public agencies dealing with noise exposure, including the Federal Aviation Administration (FAA), Department of Defense, and Department of Housing and Urban Development (HUD), have adopted DNL in their guidelines and regulations.

APPENDIX D

Federal and State Listed Species and Reports

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Tennessee Ecological Services Field Office
446 Neal Street
Cookeville, TN 38501-4027
Phone: (931) 528-6481 Fax: (931) 528-7075

In Reply Refer To: November 23, 2020
Consultation Code: 04ET1000-2021-SLI-0191
Event Code: 04ET1000-2021-E-00356
Project Name: Nashville International Airport Concourse and Gate Expansion Environmental Assessment

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

To Whom It May Concern:

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

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

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

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

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

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

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

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

Attachment(s):

- Official Species List
- Migratory Birds
- Wetlands

Official Species List

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

This species list is provided by:

Tennessee Ecological Services Field Office
446 Neal Street
Cookeville, TN 38501-4027
(931) 528-6481

Project Summary

Consultation Code: 04ET1000-2021-SLI-0191

Event Code: 04ET1000-2021-E-00356

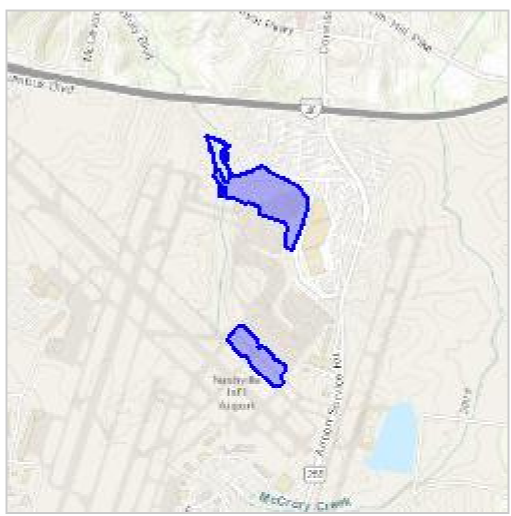
Project Name: Nashville International Airport Concourse and Gate Expansion Environmental Assessment

Project Type: TRANSPORTATION

Project Description: The purpose of the Proposed Action is to address current and forecasted passenger, air carrier and stakeholder needs by providing Nashville International Airport with 17 additional gates within the 20-year planning period. To accomplish this, Concourse A will be redeveloped, the north and south aprons will be expanded and a satellite concourse will be added to the south apron. Stormwater improvements, stream encapsulation, utility infrastructure improvements and security fence relocations would result from the Proposed Action, which is currently in the Environmental Assessment phase.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/36.136190731830276N86.67128773343453W



Counties: Davidson, TN

Endangered Species Act Species

There is a total of 9 threatened, endangered, or candidate species on this species list.

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

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

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

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

Mammals

NAME	STATUS
Gray Bat *Myotis grisescens* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6329	Endangered
Indiana Bat *Myotis sodalis* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5949	Endangered
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Crustaceans

NAME	STATUS
Nashville Crayfish *Orconectes shoupi* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7181	Endangered

Flowering Plants

NAME	STATUS
Braun's Rock-cress *Arabis perstellata* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/4704	Endangered
Guthrie's (=pyne's) Ground-plum *Astragalus bibullatus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1739	Endangered
Leafy Prairie-clover *Dalea foliosa* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5498	Endangered
Prices Potato-bean *Apios priceana* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7422	Threatened
Short's Bladderpod *Physaria globosa* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7206	Endangered

Critical habitats

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

Migratory Birds

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

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

---

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

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

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

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31
Blue-winged Warbler *Vermivora pinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds May 1 to Jun 30

NAME	BREEDING SEASON
Kentucky Warbler *Oporornis formosus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 20
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Rusty Blackbird *Euphagus carolinus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability Of Presence Summary

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

Probability of Presence (■)

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

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

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12

(0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

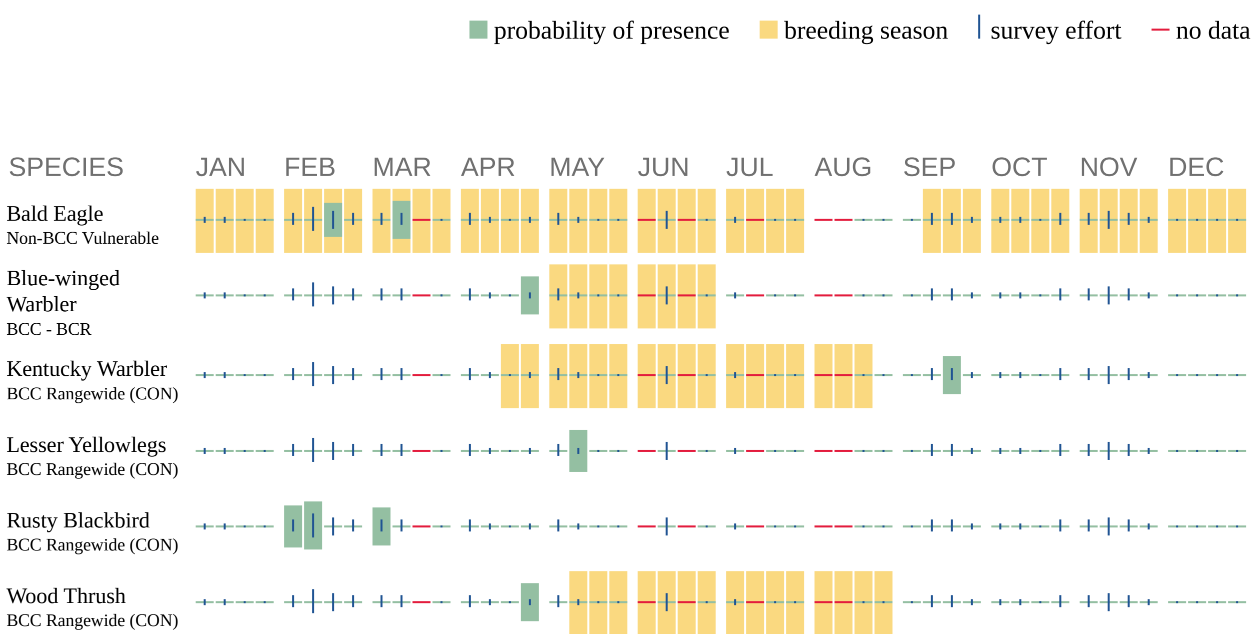
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

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

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

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

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



Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

Migratory Birds FAQ

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

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

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

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

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

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

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

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

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

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

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

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

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

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

Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

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

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

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

Wetlands

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

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

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

FRESHWATER FORESTED/SHRUB WETLAND

- PFO1A

FRESHWATER POND

- PUBHx

RIVERINE

- R4SBC

Department of State **Division of Publications** 312 Rosa L. Parks Avenue, 8th Floor Snodgrass/TN Tower Nashville, TN 37243 Phone: 615-741-2650 Email: publications.information@tn.gov	**For Department of State Use Only** Sequence Number: ________ Rule ID(s): ________ File Date: ________ Effective Date: ________

Rulemaking Hearing Rule(s) Filing Form

Rulemaking Hearing Rules are rules filed after and as a result of a rulemaking hearing (Tenn. Code Ann. § 4-5-205).

Pursuant to Tenn. Code Ann. § 4-5-229, any new fee or fee increase promulgated by state agency rule shall take effect on July 1, following the expiration of the ninety (90) day period as provided in § 4-5-207. This section shall not apply to rules that implement new fees or fee increases that are promulgated as emergency rules pursuant to § 4-5-208(a) and to subsequent rules that make permanent such emergency rules, as amended during the rulemaking process. In addition, this section shall not apply to state agencies that did not, during the preceding two (2) fiscal years, collect fees in an amount sufficient to pay the cost of operating the board, commission or entity in accordance with § 4-29-121(b).

Agency/Board/Commission:	Tennessee Wildlife Resources Agency
Division:	Biodiversity
Contact Person:	Lisa Crawford
Address:	PO Box 40747, Nashville, TN
Zip:	37204
Phone:	615-781-6606
Email:	Lisa.Crawford@tn.gov

Revision Type (check all that apply):

____ Amendment
_X_ New
____ Repeal

Rule(s) (**ALL** chapters and rules contained in filing must be listed here. If needed, copy and paste additional tables to accommodate multiple chapters. Please make sure that **ALL** new rule and repealed rule numbers are listed in the chart below. Please enter only **ONE** Rule Number/Rule Title per row)

Chapter Number	**Chapter Title**
1660-01-32	Rules and Regulation for In Need of Management, Threatened, and Endangered Species
Rule Number	**Rule Title**
1660-01-32-.01	Adoption of Federal Endangered Species Act
1660-01-32-.02	Threatened and Endangered Species Lists and Rules
1660-01-32-.03	Wildlife In Need of Management List and Rules

New Rules

1660-01-32-.01, Adoption of Federal Endangered Species Act, is added as a new rule to read as follows:

(1) The Tennessee Wildlife Resources Agency hereby adopts by reference the species and subspecies protected by the Federal Endangered Species Act of 1973, as amended, 16 USCA, Ch. 35. A list of Tennessee's Federally threatened and endangered species under the Endangered Species Act may be found at 50 C.F.R. §17.11.

Authority: *T.C.A. §§70-1-206, 70-8-104, 70-8-106 and 70-8-107.* ***Administrative History****:*
Original rule filed _______________________; effective __________________.

1660-01-32-.02, Threatened and Endangered Species Lists and Rules, is added as a new rule to read as follows:

(1) The following species or subspecies are listed as state endangered.

(a) Crayfish

Common Name	**Scientific Name**
Big South Fork Crayfish	*Cambarus bouchardi*
Mountain Crayfish	*Cambarus conasaugaensis*
Conasauga Blue Burrower	*Cambarus cymatilis*
Valley Flame Crayfish	*Cambarus deweesae*
Chickamauga Crayfish	*Cambarus extraneus*
Obey Crayfish	*Cambarus obeyensis*
Pristine Crayfish	*Cambarus pristinus*
Speckled Crayfish	*Cambarus lentiginosus*
Hatchie Burrowing Crayfish	*Creaserinus hortoni*
Blood River Crayfish	*Faxonius burri*
Flint River Crayfish	*Faxonius cooperi*
Tennessee Cave Crayfish	*Orconectes incomptus*
Hardin Crayfish	*Faxonius wrighti*

(b) Fish

Common Name	**Scientific Name**
Lake Sturgeon	*Acipenser fulvescens*
Ashy Darter	*Etheostoma cinereum*
Crown Darter	*Etheostoma corona*
Barrens Darter	*Etheostoma forbesi*
Tuckasegee Darter	*Etheostoma gutselli*
Egg-mimic Darter	*Etheostoma pseudovulatum*
Barrens Topminnow	*Fundulus julisia*
Coosa Chub	*Macrhybopsis sp. 1*
Silverjaw minnow	*Notropis buccatus*

(c) Amphibians

Common Name	**Scientific Name**
Streamside Salamander	*Ambystoma barbouri*
Hellbender	*Cryptobranchus alleganiensis*

(d) Birds

Common Name	**Scientific Name**
Bachman's Sparrow	*Peucaea aestivalis*

(2) The following species or subspecies are listed as state threatened.

(a) Crayfish

Common Name	**Scientific Name**
Tennessee Bottlebrush Crayfish	*Barbicambarus simmonsi*
Hiwassee Crayfish	*Cambarus hiwasseensis*
Greensaddle Crayfish	*Cambarus manningi*
Cocoa Crayfish	*Cambarus stockeri*
Brawleys Fork Crayfish	*Cambarus williami*
Crescent Crayfish	*Faxonius taylori*

(b) Fish

Common Name	**Scientific Name**
Western Sand Darter	*Ammocrypta clara*
Blue sucker	*Cycleptus elongatus*
Coppercheek Darter	*Etheostoma aquali*
Holiday Darter	*Etheostoma brevirostrum*
Coldwater Darter	*Etheostoma ditrema*
Redlips Darter	*Etheostoma maydeni*
Striated Darter	*Etheostoma striatulum*
Trispot Darter	*Etheostoma trisella*
Saddled Madtom	*Noturus fasciatus*
Frecklebelly Madtom	*Noturus munitus*
Longhead Darter	*Percina macrocephala*
Sickle Darter	*Percina williamsi*

(c) Amphibians

Common Name	Scientific Name
Berry Cave Salamander	*Gyrinophilus gulolineatus*
Tennessee Cave Salamander	*Gyrinophilus palleucus*
Pale Salamander	*Gyrinophilus palleucus palleucus*
Big Mouth Cave Salamander	*Gyrinophilus palleucus necturoides*

(d) Reptiles

Common Name	Scientific Name
Alligator Snapping Turtle	*Macroclemys temminckii*
Northern Pine Snake	*Pituophis melanoleucus*
Western Pigmy Rattlesnake	*Sistrurus miliarius streckeri*

(e) Birds

Common Name	Scientific Name
Henslow's Sparrow	*Ammodramus henslowii*
Golden-winged Warbler	*Vermivora chrysoptera*

(f) Mammals

Common Name	Scientific Name
Little Brown Bat	*Myotis lucifugus*
Tri-colored Bat	*Perimyotis subflavus*

Authority: *T.C.A. §§70-1-206, 70-8-104, 70-8-106 and 70-8-107.* ***Administrative History****:* *Original rule filed _________________________; effective ____________________.*

New Rule

1660-01-32-.03, Wildlife In Need of Management List and Rules, is added as a new rule to read as follows:

(1) The following species or subspecies are listed as state wildlife in need of management

(a) Crayfish

Common Name	Scientific Name
Bottlebrush Crayfish	*Barbicambarus cornutus*
Short Mountain Crayfish	*Cambarus clivosus*
Prickly Cave Crayfish	*Cambarus hamulatus*

Spiny Scale Crayfish	*Cambarus jezerinaci*
Florence Crayfish	*Cambarus andersoni*
Alabama Crayfish	*Faxonius alabamensis*
Barren River Crayfish	*Faxonius barrenensis*
Cumberland Plateau Cave	*Orconectes barri*
Mammoth Cave Crayfish	*Orconectes pellucidus*

(b) Fish

Common Name	**Scientific Name**
Naked Sand Darter	*Ammocrypta beanii*
Scaly Sand Darter	*Ammocrypta vivax*
American Eel	*Anguilla rostrata*
Alligator Gar	*Atractosteus spatula*
Highfin Carpsucker	*Carpiodes velifer*
Tennessee Dace	*Chrosomus tennesseensis*
Rugby Dace	*Chrosomus sp 1*
Smoky Dace	*Clinostomus funduloides ssp. 1*
Emerald Darter	*Etheostoma baileyi*
Teardrop Darter	*Etheostoma barbouri*
Splendid Darter	*Etheostoma barrenense*
Orangefin Darter	*Etheostoma bellum*
Chickasaw Darter	*Etheostoma cervus*
Golden Darter	*Etheostoma denoncourti*
Redband Darter	*Etheostoma luteovinctum*
Smallscale Darter	*Etheostoma microlepidum*
Lollypop Darter	*Etheostoma neopterum*
Sooty Darter	*Etheostoma olivaceum*
Firebelly Darter	*Etheostoma pyrrhogaster*
Arrow Darter	*Etheostoma sagitta*
Tippecanoe Darter	*Etheostoma tippecanoe*
Tuscumbia Darter	*Etheostoma tuscumbia*
Wounded Darter	*Etheostoma vulneratum*
Golden Topminnow	*Fundulus chrysotus*
Flame Chub	*Hemitremia flammea*
Plains Minnow	*Hybognathus placitus*
Lined Chub	*Hybopsis lineapunctata*
Southern Brook Lamprey	*Ichthyomyzon gagei*
Silver Lamprey	*Ichthyomyzon unicuspis*
Sturgeon Chub	*Macrhybopsis gelida*
Sicklefin Chub	*Macrhybopsis meeki*
Rainbow Shiner	*Notropis chrosomus*
Bigmouth Shiner	*Notropis dorsalis*
Bedrock Shiner	*Notropis rupestris*
Piebald Madtom	*Noturus gladiator*
Tangerine Darter	*Percina aurantiaca*

Blotchside Logperch	*Percina burtoni*
Slenderhead Darter	*Percina phoxocephala*
Olive Darter	*Percina squamata*
Frecklebelly Darter	*Percina stictogaster*
Riffle Minnow	*Phenacobius catostomus*
Blackfin Sucker	*Thoburnia atripinnis*
Southern Cavefish	*Typhlichthys subterraneus*

(c) Amphibians

Common Name	**Scientific Name**
Cumberland Dusky Salamander	*Desmognathus abditus*
Seepage Salamander	*Desmognathus aeneus*
Black Mountain Salamander	*Desmognathus welteri*
Pygmy Salamander	*Desmognathus wrighti*
Junaluska Salamander	*Eurycea junaluska*
Four-toed Salamander	*Hemidactylium scutatum*
Wehrle's Salamander	*Plethodon wehrlei*
Weller's Salamander	*Plethodon welleri*

(d) Reptiles

Common Name	**Scientific Name**
Mississippi Green Water Snake	*Nerodia cyclopion*
Eastern Slender Glass Lizard	*Ophisaurus attenuatus longicaudus*
Coal Skink	*Plestiodon anthracinus*

(e) Birds

Common Name	**Scientific Name**
Golden Eagle	*Aquila chrysaetos*
Little Blue Heron	*Egretta caerulea*
Wood Thrush	Hylocichla mustelina
Least Bittern	*Ixobrychus exilis*
Loggerhead Shrike	*Lanius ludovicianus*
Swainson's Warbler	*Limnothlypis swainsonii*
Black-crowned Night-heron	*Nycticorax nycticorax*
King Rail	*Rallus elegans*
Cerulean Warbler	*Setophaga cerulea*
Bewick's Wren	*Thryomanes bewickii*

(f) Mammals

Common Name	**Scientific Name**
Star-nosed Mole	*Condylura cristata*
Rafinesque's Big-eared Bat	*Corynorhinus rafinesquii*
Southern Rock Vole	*Microtus chrotorrhinus carolinensis*

Eastern Small-footed Bat	*Myotis leibii*
Southern Appalachian Woodrat	*Neotoma floridana haematoreia*
Eastern Woodrat	*Neotoma floridana illinoensis*
Allegheny Woodrat	*Neotoma magister*
Hairy-tailed Mole	*Parascalops breweri*
Long-tailed Shrew	*Sorex dispar*
American Water Shrew	*Sorex palustris*
Southern Bog Lemming	*Synaptomys cooperi*

***Authority:** T.C.A. §§70-1-206, 70-8-104, 70-8-106 and 70-8-107.* ***Administrative History**: Original rule filed ________________________; effective __________________.*

* If a roll-call vote was necessary, the vote by the Agency on these rulemaking hearing rules was as follows:

Board Member	**Aye**	**No**	**Abstain**	**Absent**	**Signature (if required)**
Chad Baker					
Angie Box					
Jeff Cook					
Bill Cox					
Dennis Gardner					
Kurt Holbert					
Connie King					
Brian McLerrin					
Tony Sanders					
James Stroud					
Bill Swan					
Kent Woods					
Jamie Woodson					

I certify that this is an accurate and complete copy of rulemaking hearing rules, lawfully promulgated and adopted by the Tennessee Fish & Wildlife Commission on 12/08/2017 (mm/dd/yyyy), and is in compliance with the provisions of T.C.A. § 4-5-222.

I further certify the following:

Notice of Rulemaking Hearing filed with the Department of State on: *10/06/2017*

Rulemaking Hearing(s) Conducted on: (add more dates). *12/08/2017*

Date: ____________________

Signature: ____________________

Name of Officer: Ed Carter

Title of Officer: Executive Director

Subscribed and sworn to before me on: ____________________

Notary Public Signature: ____________________

My commission expires on: 03-10-2019

All rulemaking hearing rules provided for herein (Rule 1660-01-32, Rules and Regulation for In Need of Management, Threatened, and Endangered Species) have been examined by the Attorney General and Reporter of the State of Tennessee and are approved as to legality pursuant to the provisions of the Administrative Procedures Act, Tennessee Code Annotated, Title 4, Chapter 5.

____
Herbert H. Slatery III
Attorney General and Reporter

____
Date

Department of State Use Only

Filed with the Department of State on: ______________________

Effective on: ______________________

____
Tre Hargett
Secretary of State

Public Hearing Comments

One copy of a document containing responses to comments made at the public hearing must accompany the filing pursuant to T.C.A § 4-5-222. Agencies shall include only their responses to public hearing comments, which can be summarized. No letters of inquiry from parties questioning the rule will be accepted. When no comments are received at the public hearing, the agency need only draft a memorandum stating such and include it with the Rulemaking Hearing Rule filing. Minutes of the meeting will not be accepted. Transcripts are not acceptable.

PUBLIC COMMENTS AND RESPONSES

Comment: No written or verbal comments were received by the Commission.
Response: N/A

Regulatory Flexibility Addendum

Pursuant to T.C.A. §§ 4-5-401 through 4-5-404, prior to initiating the rule making process, all agencies shall conduct a review of whether a proposed rule or rule affects small business.

(1) The type or types of small business and an identification and estimate of the number of small businesses subject to the proposed rule that would bear the cost of, and/or directly benefit from the proposed rule;

This rule would have minimal impact on small business. The impact to small business would in most instances occur during construction projects when any of the following permits are required Aquatic Resources Alteration Permit, General Construction Permit, National Pollution Discharge Elimination System Permit, or Injection Well Permit; a 404 Dredge and Fill Permit from the U.S. Army Corps of Engineers; or they are required to develop an Environmental Impact Statement or Environmental Assessment where impacts could occur to listed species. Any entity obtaining federal funds is also required to consult with state and federal wildlife agencies per the National Environmental Policy Act on species that could be impacted within the project area. Small business that would potentially be impacted would include construction, real estate, manufacturing, utilities, and mining. We estimate that less than 50 small businesses a year potentially could be impacted by this rule.

Small businesses that would directly benefit from this rule are consulting firms which are contracted by other business, local governments, or the state to complete surveys for In Need of Management, Threatened, or Endangered species that may occur within the boundaries of a project that could be impacted by that projects activities. We estimated that at least 15 small businesses annually could benefit from this rule.

(2) The projected reporting, recordkeeping and other administrative costs required for compliance with the proposed rule, including the type of professional skills necessary for preparation of the report or record;

This rule requires a skill set found in most wildlife consulting firms and carried out by a wildlife biologist. The skills include knowledge of species and subspecies habitats, surveying techniques for listed species, proper handling techniques of species in order to minimize stress, and the use of geographic information systems to map habitat. Also skills are needed to write necessary reports.

(3) A statement of the probable effect on impacted small businesses and consumers;

There will be minimal impact to small businesses and consumers. The cost of surveys and mitigations will typically be less than $5,000 and will likely only impact business during construction or other activities that could impact threatened, endangered, and in need of management species habitat or directly impact individuals; and when any of the following permits are required Aquatic Resources Alteration Permit, General Construction Permit, National Pollution Discharge Elimination System Permit, or Injection Well Permit; a 404 Dredge and Fill Permit from the U.S. Army Corps of Engineers; or they are required to develop an Environmental Impact Statement or Environmental Assessment where impacts could occur to listed species. Any entity obtaining federal funds is also required to consult with state and federal wildlife agencies per the National Environmental Policy Act on species that could be impacted with in the project area

We expect minimal impact to consumers.

(4) A description of any less burdensome, less intrusive or less costly alternative methods of achieving the purpose and/or objectives of the proposed rule that may exist, and to what extent, such alternative means might be less burdensome to small business;

Due to the minimal cost associated with this rule we do not see any alternative methods that would reduce the burden on small businesses while still reducing impacts to those species listed in the rule.

(5) A comparison of the proposed rule with any federal or state counterparts; and

The Federal Endangered Species Act of 1973 makes it unlawful for a person to take a listed animal without a permit. Take defined in the federal endangered species act is defined as to harass, harm, pursue, hunt, shoot wound, kill trap, capture, or collect or attempt to engage in any such activity. The act makes it unlawful to significantly modify habitat or degrade habitat where it actually kills or injures listed wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering. The federal law allows landowners, citizens, corporations, and states take through section 10 permits. Current Tennessee T.C.A. makes it unlawful for take of state listed species. This rule like the federal section 10 permits will allow small business, corporations, local government to continue projects while working to minimize impacts to species listed in the rule.

(6) Analysis of the effect of the possible exemption of small businesses from all or any part of the requirements contained in the proposed rule.

Due to the number of different small businesses that may have impact on state listed in need of management, threatened, and endangered species it would be very difficult to exempt small business from all or part of the rule. Exempting small businesses would still mean that they would be required to meet federal endangered species act requirements in many parts of Tennessee. It would also be difficult to exempt some business due to both state and federal law requirements for taking into consideration listed species during the permitting process.

Impact on Local Governments

Pursuant to T.C.A. §§ 4-5-220 and 4-5-228 "any rule proposed to be promulgated shall state in a simple declarative sentence, without additional comments on the merits of the policy of the rules or regulation, whether the rule or regulation may have a projected impact on local governments." (See Public Chapter Number 1070 (http://state.tn.us/sos/acts/106/pub/pc1070.pdf) of the 2010 Session of the General Assembly)

Will passage of this rule have a projected financial impact on local governments?

The Commission is aware that the passage of this rule could have a small financial impact on local government.

Please describe the increase in expenditures or decrease in revenues:

The increase in expenditures is in relations to preforming surveys and mitigation of listed species in relation to those that may occur within a proposed construction projects footprint. It is not expected that there will be a decrease in revenues as this rule mainly effects projects during construction. Once a project is completed and efforts are made to reduce or mitigate impacts on listed species it is not expected that the entity will be further impacted by this rule.

Additional Information Required by Joint Government Operations Committee

All agencies, upon filing a rule, must also submit the following pursuant to T.C.A. § 4-5-226(i)(1).

(A) A brief summary of the rule and a description of all relevant changes in previous regulations effectuated by such rule;

The rule lists threatened, endangered, and in need of management species or subspecies indigenous to Tennessee. The only changes to previous regulations which were set out in Tennessee Wildlife Resources Agency proclamations 00-14 and 00-15 were changes in the species or subspecies listed.

(B) A citation to and brief description of any federal law or regulation or any state law or regulation mandating promulgation of such rule or establishing guidelines relevant thereto;

T.C.A. §70-8-104 Nongame species Promulgation of regulations prohibited acts (a) states that the executive director shall conduct investigation on nongame wildlife in order to determine management measures necessary for their continued ability to sustain themselves successfully. On the basis of this information the fish and wildlife commission shall issue regulations and development management programs to ensure the continued ability of nongame, endangered, or threatened wildlife. Such regulations shall set forth species or subspecies of nongame wildlife that the executive director deems in need of management. T.C.A. 70-8-105 Endangered or threatened species list on the basis of investigation on nongame wildlife in 70-8-104, and other scientific data and after consultation with other agencies and organizations the fish and wildlife commission shall by regulation propose a list of species or subspecies indigenous to the state that are determined to be endangered or threatened. The commission shall conduct a review of the state list no more than two years form effective date and every two years after. In the event the United States' List of Endangered Native fish and Wildlife is modified subsequent to 1974 the commission may accept such modification for the state. T.C.A. 70-8-107 Rule making authority, The fish and wildlife commission shall issue regulations as necessary to carry out the purposed of 70-8.

(C) Identification of persons, organizations, corporations or governmental entities most directly affected by this rule, and whether those persons, organizations, corporations or governmental entities urge adoption or rejection of this rule;

This rule will have a direct impact on any entity required to obtain Aquatic Resources Alteration Permit, General Construction Permit, National Pollution Discharge Elimination System Permit, or Injection Well Permit from TDEC, obtain a 404 Dredge and Fill Permit from the U.S. Army Corps of Engineers, or required to develop an Environmental Impact Statement or Environmental Assessment where impacts could occur to listed species. Any entity obtaining federal funds is also required to consult with state and federal wildlife agencies per the National Environmental Policy Act on species that could be impacted with in the project area. Due to both State and Federal law requiring consultation on listed species this rule would be supported by those entities affected as it clarifies protected species and dealing with impacts to those species and allows permitting to meet state and federal law. Tennessee Wildlife Resources Agency will be directly impacted by this rule as it is required by law to working with entities to mitigate impacts to listed species. TWRA urges the adoption of the rule as it defines listed species and allows for mitigation.

(D) Identification of any opinions of the attorney general and reporter or any judicial ruling that directly relates to the rule or the necessity to promulgate the rule;

We are not aware of any opinions of the attorney general or any judicial ruling that directly relate to this rule.

(E) An estimate of the probable increase or decrease in state and local government revenues and expenditures, if any, resulting from the promulgation of this rule, and assumptions and reasoning upon which the estimate is based. An agency shall not state that the fiscal impact is minimal if the fiscal impact is more than two percent (2%) of the agency's annual budget or five hundred thousand dollars ($500,000), whichever is less;

The impact to state government revenues and expenditures is minimal as cost to contract surveys and to mitigate impacts is typically <$5,000 as related to state listed species. There will be no increase in revenue from this rule.

(F) Identification of the appropriate agency representative or representatives, possessing substantial knowledge and understanding of the rule;

Andrea English, Assistant Chief of Biodiversity (Pandy.English@tn.gov); Brian Flock, Wildlife Diversity Coordinator, (brian.flock@tn.gov)

(G) Identification of the appropriate agency representative or representatives who will explain the rule at a scheduled meeting of the committees;

Chris Richardson, TWRA Special Assistant to the Director/Policy and Legislation, will explain the rule at the scheduled meeting of the Government Operations Committee.

(H) Office address, telephone number, and email address of the agency representative or representatives who will explain the rule at a scheduled meeting of the committees; and

Chris Richardson, Tennessee Wildlife Resources Agency, P.O. Box 40747, Nashville, TN 37204, (615) 837-6016, Chris.Richardson@tn.gov

(I) Any additional information relevant to the rule proposed for continuation that the committee requests.

n/a

BIOLOGICAL ASSESSMENT

THE NASHVILLE CRAYFISH (*Orconectes shoupi*)

Concourse and Gate Expansion (CAGE)

Metro Nashville Airport Authority
Nashville International Airport
Davidson County, Tennessee

Prepared for:

Metro Nashville Airport Authority
Nashville, TN

Garver, LLC
Franklin, TN

Prepared by:

wood.

Wood Environment & Infrastructure Solutions, Inc.
3800 Ezell Road, Suite 100
Nashville, TN 37211

Wood Project Number: 7650-19-1222

February 2020

This document was prepared by Wood Environment & Infrastructure Solutions, Inc. in support of the Concourse and Gate Expansion Environmental Assessment at the Nashville International Airport being conducted by Garver, LLC for the Metro Nashville Airport Authority.

FEDERALLY LISTED SPECIES

Wood Environment & Infrastructure Solutions, Inc. (Wood) has prepared this Biological Assessment to address the potential impact to the federally listed endangered Nashville Crayfish (*Orconectes shoupi*) from the Concourse and Gate Expansion (CAGE) project at Nashville International Airport. The Nashville Crayfish is known to occur in Mill Creek and its tributaries. Sims Branch is a direct tributary to Mill Creek (Figure 1). Even though the Nashville Crayfish was not found during the site visit on September 30, 2019 (and other previous surveys conducted within the airport property), it has been documented to occur further downstream in Sims Branch and Mill Creek and could be affected by construction activities.

PROJECT DESCRIPTION

Sims Branch originates on the airport property and empties directly into Mill Creek. The construction associated with CAGE will include impacts to Sims Branch and the surrounding upland areas. The project area includes previously developed and undeveloped areas of the airport property. In-stream construction is anticipated.

SITE DESRIPTION

The project site was visited on September 30, 2019. The area adjacent to the stream ranges from existing paved surfaces, mowed and maintained undeveloped property, and wooded areas with a mix of herbaceous vegetation (see Photographs 1 through 7). The herbaceous vegetation generally includes mowed grasses. The wooded species bordering the stream were primarily box elder (*Acer negundo*), sycamore (*Platanus occidentalis*), black willow (*Salix nigra*), and cottonwood (*Populus deltoides*). Shrub species included Chinese privet (*Ligustrum sinense*) and bush honeysuckle (*Lonicera maackii*).

Sims Branch and one unnamed tributary to Sims Branch originates near the north central portion of the airport. Sims Branch generally flows north for approximately 1 mile before exiting the airport property at a culvert located at I-40. From that point, Sims Branch flows approximately 1.85 miles northwest to its confluence with Mill Creek. The unnamed tributary originates near Terminal Drive, east of Sims Branch, and flows approximately 0.25 miles to its confluence with Sims Branch.

When visited on September 30, 2019 there was water present throughout the entire length of Sims Branch (Photographs 1-3, 5-7). The perennial stream was approximately 2 feet wide and had a flow depth of approximately 3-8 inches at the upper most sample location. The stream widens to approximately 20 feet and a depth of 6-16 inches near the northern most sample location. The stream consisted of a soil and gravel substrate in the upper reaches to bedrock, gravel, and cobble sized substrate mixed with sand and silt in the lowers reaches. Various fish were present during our assessment. The unnamed tributary was approximately 1 foot wide and generally dry channel at the upper most reach near Terminal Drive. The stream widens to approximately 10 feet and with intermittent pools until its confluence with Sims Branch. The intermittent stream consisted of a soil and gravel substrate in the upper reaches to bedrock, gravel, and cobble sized substrate mixed with sand and silt in the lowers reaches.

NASHVILLE CRAYFISH (*Orconectes* shoupi)

STATUS

Endangered throughout its range: U.S.A. (TN) (51 FR 34412, September 26, 1986). Recovery Plan completed in 1988 (Nashville Crayfish Recovery Plan). This species was recently proposed for delisting on November 26, 2019, pending public comment and further review after publishing in the Federal Register.

Species Description

This pigmented crayfish with well-developed eyes ranges from 1/4 to 7 inches in total length. Like many crayfish, this species probably feeds on a variety of organic material, both vegetation fragments and animal matter (USFWS 1988).

The crayfish is a good benthic walker and a good swimmer. The Nashville crayfish is most active in the summer. The crayfish's activity level is low in the winter, but it does move about under ice (Nature Serve Explorer 2002).

Reproduction and Development

Reproductive activity begins in spring and egg-laying probably occurs in late winter and early spring (Nature Serve Explorer 2002 and USFWS 1988). Females with eggs and young are found in the spring when they are secluded under large objects (rocks, pieces of metal, and other debris) along the stream banks (USFWS 1988). Females brood eggs below the abdomen. Young are released early in the summer (Nature Serve Explorer 2002).

Range and Population Level

The Nashville crayfish is currently known only from Mill Creek and six of its tributaries in Davidson and Williamson Counties, Tennessee (O'Bara et al. 1985, Bouchard 1984). The crayfish continues to exist in six Mill Creek tributaries: Sevenmile Creek, Sims Branch, Whittemore Branch, Indian Creek, Owl Creek, and Edmonson Branch. All tributary populations except Sevenmile Creek are concentrated near the creek mouths (O'Bara et al. 1985, Bouchard 1984).

Habitat

The Nashville crayfish has been observed to inhabit pools and riffle areas with moderate current (USFWS 1986). The substrate of the animal's main habitat, Mill Creek, is mainly bedrock which is covered in some areas with gravel and scattered limestone slabs. The pools, backwater areas, and stream margins are covered with silt and sand. Riverweed (*Podostemum sp.*) occurs on rocks in some swift water areas, and water willow (*Justicia sp.*) occurs along some shallow gravel shoals. Much of the stream bank is vegetated with trees and shrubs (Bouchard 1976).

The Nashville crayfish has been found in a wide range of environments including gravel and cobble runs, pools with up to 10 centimeters (cm) of settled sediment, and under slabrocks and other cover (the largest crayfish are usually under cover) (USFWS 1988). The species is highly photosensitive and is usually found under cover during the day (Bouchard 1976). Canopy cover appears important, as O'Bara et al. (1985) reported that all sites they sampled had canopy cover of 60 to 90 percent. The species has been found in small pools where the flow was intermittent (Stark 1986, Miller and Hartfield 1985). Gravel-cobble substrate provides good cover for juveniles (Stark 1986, Miller and Hartfield 1985). Females seek out large slabrocks when they are carrying eggs and young. These secluded places are also needed for molting (USFWS 1988).

The animal's need for clean, high quality water is strongly indicated, despite the fact that it can exist (no data on how long) in polluted-by-silt situations (Nature Serve Explorer 2002). The Nashville crayfish requires non-turbid, well-oxygenated water and clean substrate. However, the species does appear to be more tolerant of short-term, less favorable conditions than originally believed.

Past Threats

The species is threatened by siltation, stream alterations, urban runoff, and general water quality deterioration resulting from development pressures in the urbanized areas surrounding Nashville, Tennessee. The species is endangered by water quality and other habitat deterioration from development within the watershed. The U.S. Department of the Army, Corps of Engineers (COE) concluded in 1981 that the uppermost segment of Mill Creek was degraded by organic enrichment and had very poor water quality (USFWS 1986).

The Nashville crayfish's restricted range makes it vulnerable to a single catastrophic event, such as a chemical spill. COE (1984) reported that occasional spills and discharges have occurred along Mill Creek in the past (USFWS 1986).

Nashville International Airport experienced a de-icer spill in 2010 that impacted much of Sims Branch. Biological monitoring has been conducted by MNAA since 2010. Nashville crayfish have not previously been documented during these monitoring events or other subsequent crayfish sampling conducted by Wood.

Current Threats

The Nashville crayfish is endangered by water quality deterioration from development within the watershed. The Nashville crayfish's restricted range continues to make it vulnerable to spill that could affect a large portion of its range.

Much of the Mill Creek system is within the Nashville City limits and water quality degradation in this area does not appear to have reduced the range of the Nashville crayfish. Continued growth and development in northeast Williamson County, and the potential impacts to the upper portion of the Mill Creek watershed also provide a potential source of impacts to this species.

Threats to the species could also come from other activities in the watershed such as road and bridge construction, stream channel modifications, impoundments, land use changes and other projects, if such activities are not planned and implemented with the survival of this geographically restricted species in mind (USFWS 1986).

Crayfish are frequently taken in the southeastern United States for food or bait. Over-utilization for these purposes could become a problem if the species' specific habitat were identified to the extent required for designation of critical habitat (USFWS 1986).

METHODS

The Nashville Crayfish was not collected during the field survey conducted on September 30, 2019; however, due to the proposed construction location being located directly on Sims Branch, impacts to areas downstream and within Mill Creek could occur and may be affected by construction activities. Protection of the site should include protection of the riparian zone, sediment control and bank stabilization in the construction area. Again, even though not found on September 30, 2019, the permitting agencies may require that crayfish be collected and relocated just before and during construction. Seven locations were sampled during this assessment (Figure 2). Crayfish sampling data sheets are located in Appendix A. The Nashville Crayfish was not collected at any of the seven sampling loactions.

IMPACT MINIMIZATION

The proposed construction activity is to be completed in conjunction with approved BMP's to protect the stream channel. Detailed construction plans are not available at this time; however, specific notes will be placed on the project plans to give attention to erosion and sediment control measures. Stream buffer requirement may also apply. In addition to sediment and erosion control measures, if stipulated by the permitting agencies, biologists will collect all crayfish in the vicinity of the proposed stream impacts just prior to and during construction activities. All crayfish will be documented and transported a minimum of 150 feet upstream of construction activities. All activities will be coordinated and approved by the USFWS.

SUMMARY

The Nashville Crayfish do not appear to occur in the project area in the Sims Branch or the unnamed tributary to Sims Branch. Nevertheless, the construction activities may affect the populations of Nashville crayfish present in the lower reaches of Sims Branch and in Mill Creek. If required by the permitting agency all crayfish will be relocated prior to construction. Approved sediment and erosion control methods will be used in the construction zone to minimize impacts. A biologist familiar with the Nashville Crayfish, and holding valid state and federal permits, will coordinate the relocation activities. All activities will be coordinated with the U. S. Fish and Wildlife Service.

REFERENCES

Bouchard, R.W. 1976. Investigations on the status of fourteen species of freshwater decapod crustaceans in the United States, Part I. Troglobitic shrimp and western North American crayfishes. Report to Office of Endangered Species, Department of the Interior. 26 pp.

Bouchard, R.W. 1984. Distribution and status of the endangered crayfish *Orconectes shoupi* (Decapoda: Cambaridae). U.S. Fish and Wildlife Service, Tennessee Cooperative Fishery Research Unit, Tennessee Tech University, Cookeville, Tennessee. 27 pp.

Miller, A. C. and P. D. Hartfield. 1985. A study of *Orconectes shoupi*, Mill Creek Basin, Tennessee, 1985. U.S. Army Corps of Engineers, Nashville, TN. 25 pp.

Nature Serve Explorer. An online encyclopedia of life [web application]. 2001. Version 1.6. Arlington, Virginia, USA: Nature Serve. Available: http://www.natureserve.org/explorer (Accessed: March 13, 2002).

O'Bara, C. J., A. J. Korgi, and G. J. Stark. 1985. Final report, status survey of the Nashville crayfish (*Orconectes shoupi*). Report to U.S. Fish and Wildlife Service, Asheville, NC. 17 pp.

Stark, G. J. 1986. Microhabitat use by the crayfish community of the Mill Creek Basin. Thesis, Tennessee Technological University, Cookeville, TN. 44 pp.

U.S. Army Corps of Engineers, Nashville District. 1981. Water quality along Mill Creek. Nashville, Tennessee. 35 pp.

U.S. Army Corps of Engineers, Nashville District. 1984. Mill Creek, Wimpole Drive area, Nashville, Davidson County, Tennessee. Final detailed project report and environmental assessment. 331 pp.

U.S. Fish and Wildlife Service. 1986. Endangered and threatened wildlife and plants; determination of endangered status for the Nashville crayfish. 51 Federal Register 34412.

U.S. Fish and Wildlife Service. 1988. Nashville crayfish Recovery Plan (1st revision). U.S. Fish and Wildlife Service, Atlanta, Georgia. 16 pp.

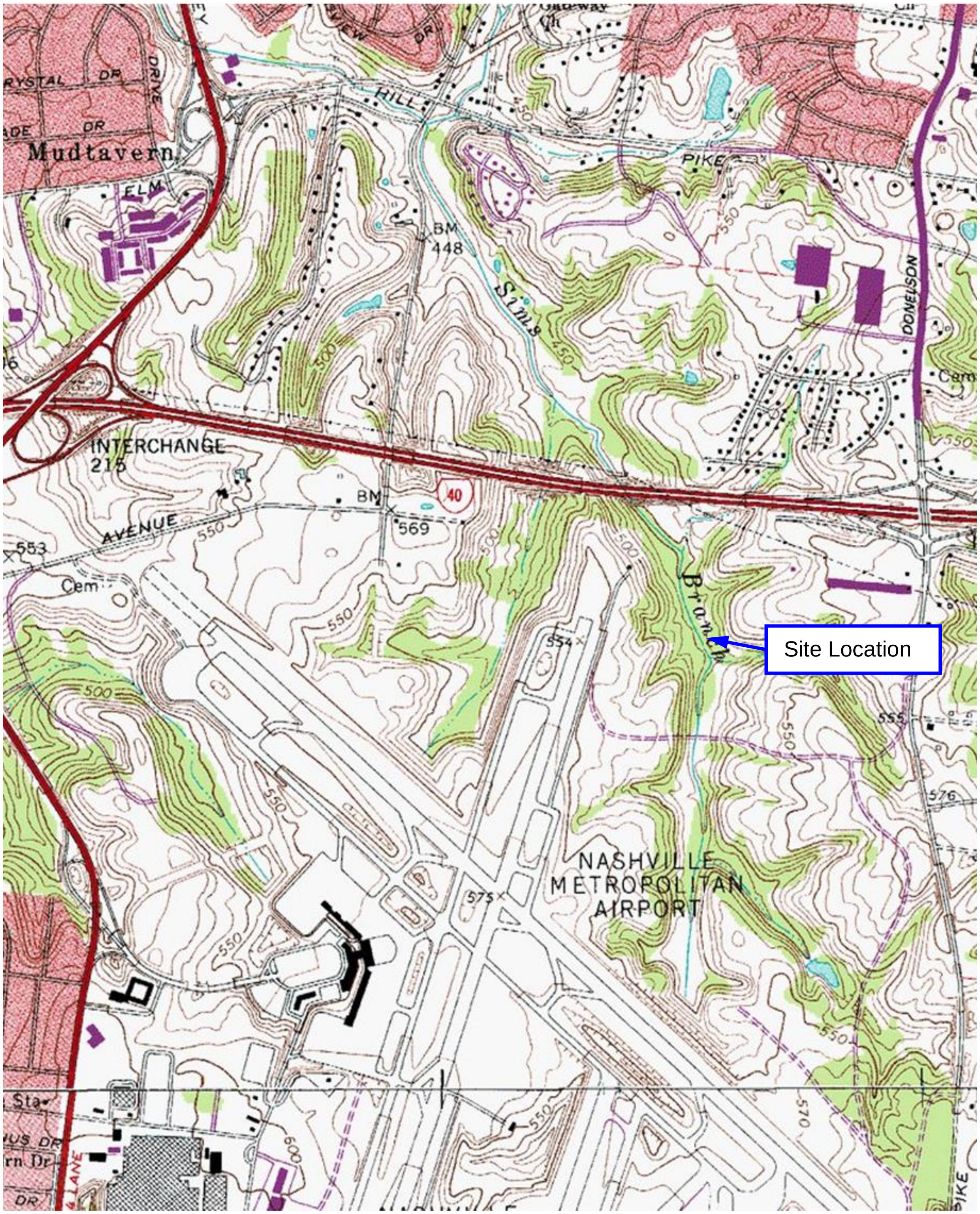


Figure 1. Approximate Site Location Project No. 7650-19-1222, Nashville International Airport, Davidson County, Tennessee

Figure 2. Approximate Crayfish Sampling Locations Project No. 7650-19-1222, Nashville International Airport, Davidson County, Tennessee

Photo 1. Sims Branch, Location 1, facing upstream (south).

Photo 2. Sims Branch, Location 2, facing upstream (south).

Photo 3. Sims Branch, Location 3, facing downstream (north).

Photo 4. Sims Branch, Location 4, facing downstream (northeast).

Photo 5. Unnamed tributary to Sims Branch, Location 5, facing upstream (east).

Photo 6. Sims Branch, Location 6, facing upstream (south).

Photo 7. Sims Branch, Location 7, facing downstream (northwest).

APPENDIX A
Crayfish Field Data Sheets

CRAYFISH FIELD DATA SHEET

wood.

DATE: 9/30/19
SITE NAME: BNA - Additional Gates
PROJECT NUMBER: 7650-19-1222
SAMPLING CREW: Rudzinski, Glover

PURPOSE FOR SITE VISIT (Circle One): SURVEY RELOCATION

CONSTRUCTION ACTIVITIES PLANNED (i.e., Road Crossing):
Airport Expansion

SITE DESCRIPTION (i.e., Land Use):
Airport property

STREAM DESCRIPTION:
Sims Branch

Location 1

36.130986, -86.675212

SPECIES	QUANTITY	TOTAL PER SPECIES
1.) Orconectes durelli	1	1
2.) Cambarus striatus	1	1
3.)		
4.)		
5.)		
6.)		

Form Completed By	SBR	Form Checked By	FSG	TOTAL COLLECTED	2

CRAYFISH FIELD DATA SHEET

wood.

DATE: 9/30/19
SITE NAME: BNA - Additional Gates
PROJECT NUMBER: 7650-19-1222
SAMPLING CREW: Rudzinski, Glover

PURPOSE FOR SITE VISIT (Circle One): SURVEY RELOCATION

CONSTRUCTION ACTIVITIES PLANNED (i.e., Road Crossing):
Airport Expansion

SITE DESCRIPTION (i.e., Land Use):
Airport Property

STREAM DESCRIPTION:
Sims Branch near T2

Location 2

36.133375, -86.674953

SPECIES	QUANTITY	TOTAL PER SPECIES
1.) Cambarus striatus	11	11
2.) Orconectes durelli	10	10
3.)		
4.)		
5.)		
6.)		

Form Completed By	SBR	Form Checked By	FSG	TOTAL COLLECTED	21

CRAYFISH FIELD DATA SHEET

wood.

DATE: 9/30/19
SITE NAME: BNA - Additional Gates
PROJECT NUMBER: 7650-19-1222
SAMPLING CREW: Rudzinski, Glover

PURPOSE FOR SITE VISIT (Circle One): SURVEY RELOCATION

CONSTRUCTION ACTIVITIES PLANNED (i.e., Road Crossing):
Airport Expansion

SITE DESCRIPTION (i.e., Land Use):
Airport Property

STREAM DESCRIPTION:
Sims Branch

Location 3

36.136414, -86.674377

SPECIES	QUANTITY	TOTAL PER SPECIES
1.) Orconectes durelli	10	10
2.) Cambarus striatus	4	4
3.)		
4.)		
5.)		
6.)		

Form Completed By	SBR	Form Checked By	FSG	TOTAL COLLECTED	14

CRAYFISH FIELD DATA SHEET

wood.

DATE: 9/30/19
SITE NAME: BNA - Additional Gates
PROJECT NUMBER: 7650-19-1222
SAMPLING CREW: Radzinski, Glover

PURPOSE FOR SITE VISIT (Circle One): SURVEY RELOCATION

CONSTRUCTION ACTIVITIES PLANNED (i.e., Road Crossing):
Airport Expansion

SITE DESCRIPTION (i.e., Land Use):
Airport Property

STREAM DESCRIPTION:
Sims Branch

Location 4

36.137262, -86.674045

SPECIES	QUANTITY	TOTAL PER SPECIES
1.) Orconectes durelli	13	13
2.)		
3.)		
4.)		
5.)		
6.)		

Form Completed By	SBR	Form Checked By	FSG	TOTAL COLLECTED	13

PAGE 1 OF 1

CRAYFISH FIELD DATA SHEET

wood.

DATE: 9/30/19
SITE NAME: BNA - Additional Gates
PROJECT NUMBER: 7650-19-1222
SAMPLING CREW: Rudzinski, Glover
PURPOSE FOR SITE VISIT (Circle One): SURVEY RELOCATION

CONSTRUCTION ACTIVITIES PLANNED (i.e., Road Crossing):
Airport Expansion

SITE DESCRIPTION (i.e., Land Use):
Airport Property

STREAM DESCRIPTION:
Unnamed Tributary to Sims Branch
Location 5

36.137116, -86.673360

SPECIES	QUANTITY	TOTAL PER SPECIES
1.) Cambarus striatus	3	3
2.) Orconectes durelli	1	1
3.)		
4.)		
5.)		
6.)		
Form Completed By SBR	Form Checked By FSG	TOTAL COLLECTED 4

CRAYFISH FIELD DATA SHEET

wood.

DATE: 9/30/19
SITE NAME: BNA - Addition of Gates
PROJECT NUMBER: 7650-19-1222
SAMPLING CREW: Rudzinski, Glover

PURPOSE FOR SITE VISIT (Circle One): SURVEY RELOCATION

CONSTRUCTION ACTIVITIES PLANNED (i.e., Road Crossing):
Airport Property - Airport Expansion

SITE DESCRIPTION (i.e., Land Use):
Airport Property

STREAM DESCRIPTION:
Sims Branch

Location 6

36.139059, -86.674779

SPECIES	QUANTITY	TOTAL PER SPECIES
1.) Orconectes durelli	8	8
2.) Cambarus striatus	4	4
3.)		
4.)		
5.)		
6.)		

Form Completed By	SBR	Form Checked By	FSG	TOTAL COLLECTED	12

CRAYFISH FIELD DATA SHEET

wood.

DATE: 9/30/19
SITE NAME: BNA - Additional Gates
PROJECT NUMBER: 7650-19-1222
SAMPLING CREW: Rudzinski, Glover

PURPOSE FOR SITE VISIT (Circle One): SURVEY RELOCATION

CONSTRUCTION ACTIVITIES PLANNED (i.e., Road Crossing):
Airport Expansion

SITE DESCRIPTION (i.e., Land Use):
Airport Property

STREAM DESCRIPTION:
Sims Branch just south of I-40 | Location 7

36.140395, -86.675300

SPECIES	QUANTITY	TOTAL PER SPECIES
1.) Orconectes durelli	25	25
2.)		
3.)		
4.)		
5.)		
6.)		

Form Completed By	SBR	Form Checked By	FSG	TOTAL COLLECTED	25

PAGE ____ OF ____

Tennessee Department of Environment & Conservation

Rare Species (Listed by Watershed)

Huc 12	Huc 12 Name	Type	Category	Scientific Name	Common Name	Global Rank	State Rank	Fed Status	State Status	Habitat Description	Wet Habitat Flag
051302020102	Mill Creek Lower	Vascular Plant	Flowering Plant	Phemeranthus calcaricus	Limestone Fame-flower	G3	S3	--	S	Glades	Upland
051302020102	Mill Creek Lower	Invertebrate Animal	Planarian	Sphalloplana buchanani	A Cave Obligate Planarian	G1G2	S1	--	Rare, Not State Listed	Aquatic cave obligate; northern Central Basin; Davidson County; taxonomy poorly understood.	Aquatic
051302020102	Mill Creek Lower	Vascular Plant	Flowering Plant	Stellaria fontinalis	Water Stitchwort	G3	S3	--	S	Seeps And Limestone Creek Beds	Possible
051302020102	Mill Creek Lower	Animal Assemblage	-	Rookery	Heron Rookery	G5	SNR	--	Rare, Not State Listed	-	-
051302020102	Mill Creek Lower	Invertebrate Animal	Crustacean	Faxonius shoupi	Nashville Crayfish	G1G2	S1S2	LE	E	1st-order & larger streams, generally with bedrock bottom, under slabrock; endemic to Mill Creek watershed; Davidson & William. cos.	Aquatic
051302020102	Mill Creek Lower	Vascular Plant	Flowering Plant	Panax quinquefolius	American Ginseng	G3G4	S3S4	--	S-CE	Rich Woods	Possible

This list was populated using the TDEC Rare Species Dataviewer - http://environment-online.state.tn.us:8080/pls/enf_reports/f?p=9014:3

APPENDIX E

Stream and Wetland Assessments

Wood Environment & Infrastructure Solutions, Inc.
3800 Ezell Road, Suite 100
Nashville, Tennessee 37211
USA
T: 615-333-0630
www.woodplc.com

January 18, 2019

Ms. Caitlin Dillon
Metro Nashville Airport Authority
One Terminal Drive, Suite 501
Nashville, Tennessee 37214-4114

Subject: **Letter Report for Hydrological Determination**
BNA- Future Concourse A Expansion Site
Nashville, Davidson County, Tennessee
Wood Project No. 573320000.0047

Ms. Dillon:

Wood Environment & Infrastructure Solutions, Inc. (Wood) conducted a hydrologic determination at three locations along a channel located just northwest of Concourse A and west of Terminal Drive at the Nashville International Airport property (see Figures 1 and 2). This letter report summarizes the results of field activities performed as part of the preliminary evaluation of the proposed expansion of Concourse A in Nashville, Davidson County, Tennessee. This assessment was designed to determine the jurisdictional status of a single natural resource feature located on the property. The report includes a brief description of project background, methodology, results, and a report summary.

BACKGROUND

Wood was originally contacted by Ms. Caitlin Dillon from the Metro Nashville Airport Authority (MNAA) on January 9, 2019 requesting a jurisdictional determination for a natural resource feature on the subject property. Mr. Ken Whatley (MNAA) escorted Wood personnel to the area in question during our field survey.

METHODOLOGY

Before initiating field activities, Wood performed an in-house review of available information sources, specifically, the U.S. Geological Survey (USGS) 7.5-minute topographic map Nashville East, Tennessee quadrangle (Figure 1), the U.S. Department of Agriculture Soil Survey for Davidson County, National Wetlands Inventory map Nashville East, Tennessee quadrangle, and The National

Oceanic and Atmospheric Administration (NOAA) website location for Nashville, TN. In addition, Wood completed the Tennessee Department of Environment and Conservation (TDEC) Hydrologic Determination Field Data Sheet (attached) in accordance with the hydrologic determination guidance developed by TDEC.

State Waters

The objective of our field survey was to determine whether the Tennessee Department of Environment and Conservation (TDEC) regulates water resources located on-site as waters of the State. In order to make this determination, three important aquatic resource characteristics were assessed throughout the site: 1) the presence and condition of surface water, 2) the presence of aquatic fauna, 3) the presence and extent of wetlands. These data were used to determine the proper classification (i.e., wet weather conveyance or waters of the State) of any identified water resources. The following definitions were used for classification purposes:

• *Wet Weather Conveyance* – a man-made or natural watercourse, including natural watercourses that have been modified by channelization, that flow only in direct response to precipitation runoff in the immediate locality, and whose channels are above the groundwater table, and do not support fish or aquatic fauna, and are not suitable for drinking water supplies. [Rule 1200-4-3-.04(4) Tennessee Rules of TDEC]

• *Waters of the State* – include any and all waters, public or private, on or beneath the surface of the ground, that are contained within, flow through, or border upon Tennessee or any portion thereof, except those bodies of water confined to, and retained within the limits of private property in single ownership that do not combine or effect a junction with natural surface or underground waters. [Tennessee Code, Title 69-3-103(33)]

The presence and condition of surface water was determined by visually assessing the immediate watershed with each water resource identified. Specific conditions, including the presence or absence of water, pooled waters, the presence or absence of aquatic fauna, the presence of distinct watercourse channels, as well as channel width and depth, were noted in order to ascertain current surface water conditions.

RESULTS

The list below indicates the results of our in-house review of available literature resources and field survey.

• *USGS 7.5-minute topographic map Nashville East, Tennessee quadrangle* – Feature identified as an intermittent stream originating from a pond located within the boundary of the project area (Figure 1);

- *National Wetlands Inventory map Nashville East, Tennessee quadrangle* – Feature identified as a stream originating from a pond located within the boundary of the project area;

- *U.S. Department of Agriculture Soil Survey for Davidson County, Tennessee* – No natural resource features present within the boundary of the project area (hydric soils mapped in the project area);

- *Field Survey* – One stream was confirmed within the project boundaries (unnamed tributary to Sims Branch);

- *TDEC – Hydrologic Determination Field Data Sheet* – One stream was present within the project area (unnamed tributary to Sims Branch). Data sheets from three locations are attached to this report. Refer to Figure 2 for assessment locations. Field data sheets are attached to this report.

SUMMARY

Our field reconnaissance and determination was conducted on January 16, 2019. The review of background material and field visit indicates that the channel investigated is a stream, potentially intermittent in the upper reaches but well-defined and meeting TDEC's classification for regulated streams. The U.S. Army Corps of Engineers (USACE) would also consider the stream jurisdictional. This determination can only be considered official if the results are submitted and verified by the TDEC and USACE. However; we recognize that project plans may change based on the status of this feature. If needed, we can evaluate the TDEC and USACE permitting requirements with respect to your development plans.

In addition, the area previously shown as a pond may need additional review if the area is proposed for future development. While the area is no longer impounded it still is a depressional area exhibiting trees and other vegetation indicative of forested wetlands. It appears based on historical aerial photographs that the dam had been breached sometime prior to 1999.

We appreciate the opportunity to assist you with this project. If you have any questions or would like to discuss our findings in more detail, please contact Stan Rudzinski at (615) 577-7144.

Sincerely,

Wood Environment & Infrastructure Solutions, Inc.

F. Scott Glover , CPESC
Tech Prof 3-Environmental
QHP – No. 1016 – TN11

Stan B. Rudzinski, CE, CPESC
Associate Scientist-Environmental
QHP – No. 1031 – TN11

Attachments: Photographs (6)
Figure 1 – USGS Topographic Map
Figure 2 – Aerial Map
TDEC – Hydrologic Determination Field Data Sheet (3)

Photo Log

Photograph 1: View of stream channel at Location 1 facing west.

Photograph 2: View of stream channel midway between Location 1 and Location 2 facing east.

Photo Log

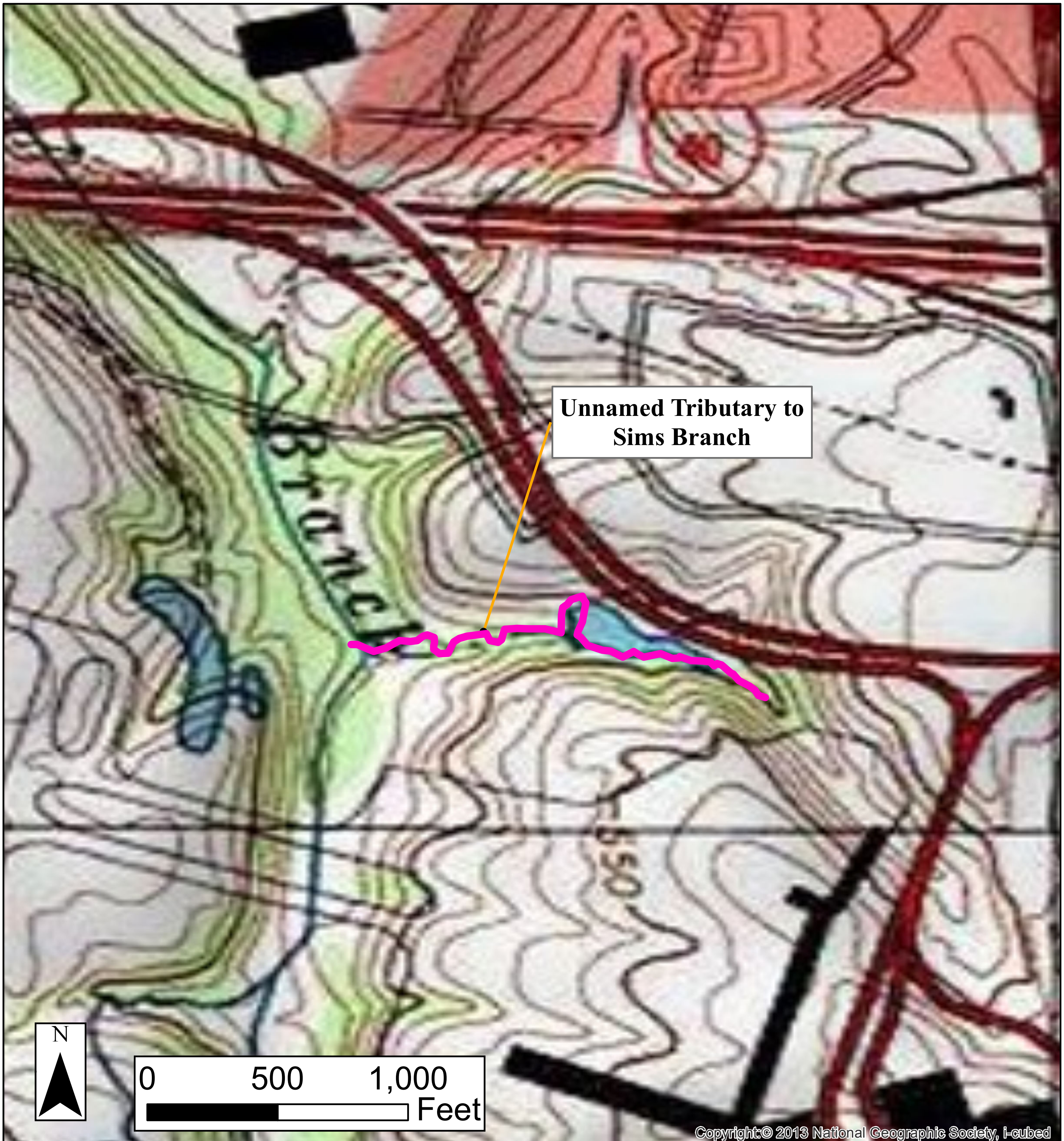
Photograph 3: View of stream channel near Location 2 facing north.

Photograph 4: View of stream channel near Location 2 facing south.

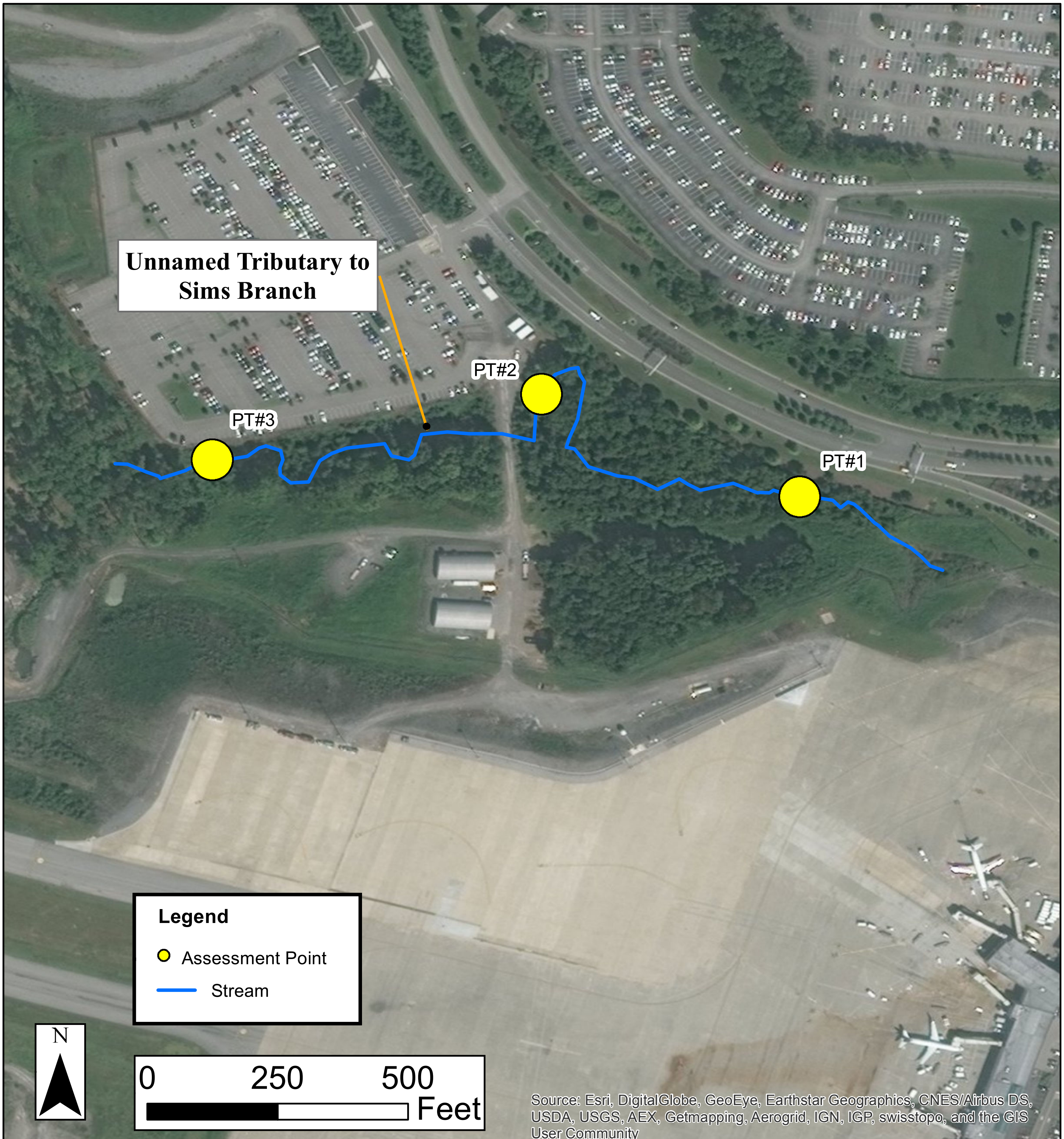
Photo Log

Photograph 5: View of stream channel at outlet culvert at road crossing facing east.

Photograph 6: View of stream channel near Location 3 facing southeast.



wood.	CLIENT: MNAA	Proposed Concourse A Expansion Site Hydrologic Determination		Figure No. 1
Wood Environment & Infrastructure Solutions, Inc. 3800 Ezell Road, Suite 100 Nashville, TN 37211	General Location Map	SCALE: as shown	DATE: 01/16/2019	PROJECT NO: 573320000.0047
		DRAWN BY: Glover	CHECKED BY: Rudzinski	
		SOURCE: ESRI IMAGERY		



wood.	CLIENT: MNAA	Proposed Concourse A Expansion Site Hydrologic Determination			Figure No. 2
Wood Environment & Infrastructure Solutions, Inc. 3800 Ezell Road, Suite 100 Nashville, TN 37211	Aerial Map	SCALE: as shown	DATE: 01/16/2019	PROJECT NO: 573320000.0047	
		DRAWN BY: Glover	CHECKED BY: Rudzinski		
		SOURCE: ESRI IMAGERY			

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: Davidson	Named Waterbody: UNT to Sims Br.	Date/Time: 1/16/19
Assessors/Affiliation: S. Rudzinski ; S. Glover (WOOD)		Project ID : Location 1
Site Name/Description: BNA - Terminal A		
Site Location: Unnamed Tributary to Sims Branch - Location 1		
USGS quad: Nashville East, TN	HUC (12 digit): 051302020102	Lat/Long: 36.136970 -86.670488
Previous Rainfall (7-days) : 0.41 inches		
Precipitation this Season vs. Normal : very wet wet average dry drought unknown Source of recent & seasonal precip data : NOAA		
Watershed Size : ~ 50 ac	Photos: Y or N (circle) Number :	
Soil Type(s) / Geology : Stiversville loam 12 to 25 % slopes, graded Source: NRCS		
Surrounding Land Use : Airport		
Degree of historical alteration to natural channel morphology & hydrology (circle one & describe fully in Notes) : Severe Moderate Slight Absent		

Primary Field Indicators Observed

Primary Indicators	NO	YES
1. Hydrologic feature exists solely due to a process discharge	✓	WWC
2. Defined bed and bank absent, dominated by upland vegetation / grass	✓	WWC
3. Watercourse dry anytime during February through April 15th, under normal precipitation / groundwater conditions	N/A	WWC
4. Daily flow and precipitation records showing feature only flows in direct response to rainfall	✓	WWC
5. Presence of multiple populations of obligate lotic organisms with ≥ 2 month aquatic phase	✓	Stream
6. Presence of fish (except *Gambusia*)	✓	Stream
7. Presence of naturally occurring ground water table connection	N/A	Stream
8. Flowing water in channel and 7 days since last precipitation in local watershed	N/A	Stream
9. Evidence watercourse has been used as a supply of drinking water	✓	Stream

NOTE : If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contradictory evidence, determination is complete.

In the absence of a primary indicator, or other definitive evidence, complete the secondary indicator table on page 2 of this sheet, and provide score below.

Guidance for the interpretation and scoring of both the primary & secondary indicators is provided in *TDEC-WPC Guidance For Making Hydrologic Determinations, Version 1.4*

Overall Hydrologic Determination = Stream

Secondary Indicator Score (if applicable) = 24.5

Justification / Notes :

Location 1

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal = 12.5)	Absent	Weak	Moderate	Strong
1. Continuous bed and bank	0	1	2	3
2. Sinuous channel	0	1	2	3
3. In-channel structure: riffle-pool sequences	0	1	2	3
4. Sorting of soil textures or other substrate	0	1 1.5	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	0.5	1	1.5
9. Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. At least second order channel on existing USGS or NRCS map	No = 0		Yes = 3	

B. Hydrology (Subtotal = 5.0)	Absent	Weak	Moderate	Strong
14. Subsurface flow/discharge into channel	0	1	2	3
15. Water in channel and >48 hours since sig. rain	0	1	2	3
16. Leaf litter in channel (January – September)	1.5	1	0.5	0
17. Sediment on plants or on debris	0	0.5	1	1.5
18. Organic debris lines or piles (wrack lines)	0	0.5	1	1.5
19. Hydric soils in stream bed or sides of channel	No = 0		Yes = 1.5	

C. Biology (Subtotal = 7.0)	Absent	Weak	Moderate	Strong
20. Fibrous roots in channel [1]	3	2	1	0
21. Rooted plants in channel [1]	3	2	1	0
22. Crayfish in stream (exclude in floodplain)	0	0.5	1	1.5
23. Bivalves/mussels	0	1	2	3
24. Amphibians	0	0.5	1	1.5
25. Macrobenthos (record type & abundance)	0	1	2	3
26. Filamentous algae; periphyton	0	1	2	3
27. Iron oxidizing bacteria/fungus	0	0.5	1	1.5
28. Wetland plants in channel [2]	0	0.5	1	2

[1] Focus is on the presence of upland plants. [2] Focus is on the presence of aquatic or wetland plants.

Total Points = 24.5

Under Normal Conditions, Watercourse is a Wet Weather Conveyance if Secondary Indicator Score < 19 points

Notes :

Benthic macroinvertebrates → caddisfly, amphipods, chironomids, water beetles

Hydrologic Determination Field Data Sheet
Tennessee Division of Water Pollution Control, Version 1.4

County: Davidson	Named Waterbody: UNT to Sims Br.	Date/Time: 1/16/19
Assessors/Affiliation: S. Rudzinski, S. Glover (WOOD)		Project ID : Location 2
Site Name/Description: BNA - Terminal A		
Site Location: Unnamed Tributary to Sims Branch - Location 2		
USGS quad: Nashville East, TN	HUC (12 digit): 051302020102	Lat/Long: 36.137471 -86.671697
Previous Rainfall (7-days) : 0.41 inches		
Precipitation this Season vs. Normal : very wet wet average dry drought unknown Source of recent & seasonal precip data : NOAA		
Watershed Size : ~ 65 ac	Photos: Y or N (circle) Number :	
Soil Type(s) / Geology : Stiverville loam 12 to 25% slopes, eroded		Source: NRCS
Surrounding Land Use : Airport		
Degree of historical alteration to natural channel morphology & hydrology (circle one & describe fully in Notes) : Severe Moderate Slight Absent		

Primary Field Indicators Observed

Primary Indicators	NO	YES
1. Hydrologic feature exists solely due to a process discharge	✓	WWC
2. Defined bed and bank absent, dominated by upland vegetation / grass	✓	WWC
3. Watercourse dry anytime during February through April 15th, under normal precipitation / groundwater conditions	N/A	WWC
4. Daily flow and precipitation records showing feature only flows in direct response to rainfall	✓	WWC
5. Presence of multiple populations of obligate lotic organisms with ≥ 2 month aquatic phase	✓	Stream
6. Presence of fish (except *Gambusia*)	✓	Stream
7. Presence of naturally occurring ground water table connection	N/A	Stream
8. Flowing water in channel and 7 days since last precipitation in local watershed	N/A	Stream
9. Evidence watercourse has been used as a supply of drinking water	✓	Stream

NOTE : If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contradictory evidence, determination is complete.

In the absence of a primary indicator, or other definitive evidence, complete the secondary indicator table on page 2 of this sheet, and provide score below.

Guidance for the interpretation and scoring of both the primary & secondary indicators is provided in *TDEC-WPC Guidance For Making Hydrologic Determinations, Version 1.4*

Overall Hydrologic Determination = Stream

Secondary Indicator Score (if applicable) = 28.5

Justification / Notes :

Location 2

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal = 13.0)	Absent	Weak	Moderate	Strong
1. Continuous bed and bank	0	1	2	3
2. Sinuous channel	0	1	2	3
3. In-channel structure: riffle-pool sequences	0	1	2	3
4. Sorting of soil textures or other substrate	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	0.5	1	1.5
9. Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. At least second order channel on existing USGS or NRCS map	No = 0		Yes = 3	

B. Hydrology (Subtotal = 6.0)	Absent	Weak	Moderate	Strong
14. Subsurface flow/discharge into channel	0	1	2	3
15. Water in channel and >48 hours since sig. rain	0	1	2	3
16. Leaf litter in channel (January – September)	1.5	1	0.5	0
17. Sediment on plants or on debris	0	0.5	1	1.5
18. Organic debris lines or piles (wrack lines)	0	0.5	1	1.5
19. Hydric soils in stream bed or sides of channel	No = 0		Yes = 1.5	

C. Biology (Subtotal = 9.5)	Absent	Weak	Moderate	Strong
20. Fibrous roots in channel [1]	3	2	1	0
21. Rooted plants in channel [1]	3	2	1	0
22. Crayfish in stream (exclude in floodplain)	0	0.5	1	1.5
23. Bivalves/mussels	0	1	2	3
24. Amphibians	0	0.5	1	1.5
25. Macrobenthos (record type & abundance)	0	1	2	3
26. Filamentous algae; periphyton	0	1	2	3
27. Iron oxidizing bacteria/fungus	0	0.5	1	1.5
28. Wetland plants in channel [2]	0	0.5	1	2

[1] Focus is on the presence of upland plants. [2] Focus is on the presence of aquatic or wetland plants.

Total Points = 28.5

Under Normal Conditions, Watercourse is a Wet Weather Conveyance if Secondary Indicator Score < 19 points

Notes : Benthic macroinvertebrates → caddisfly, chironomids, water beetles, tipulidae, amphipods

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: Davidson	Named Waterbody: UNT to Sims Br.	Date/Time: 1/16/19
Assessors/Affiliation: S. Rudzinski, S. Glover (WOOD)		Project ID : Location 3
Site Name/Description: BNA - Terminal A		
Site Location: Unnamed Tributary to Sims Branch - Location 3		
USGS quad: Nashville East, TN	HUC (12 digit): 051302020102	Lat/Long: 36.137097 -86.673409
Previous Rainfall (7-days) : 0.41 inches		
Precipitation this Season vs. Normal : very wet wet average dry drought unknown Source of recent & seasonal precip data : NOAA		
Watershed Size : ~ 90 ac	Photos: Y or N (circle) Number :	
Soil Type(s) / Geology : Lindell silt loam, 0 to 2 % slopes, occasionally flooded	Source: NRCS	
Surrounding Land Use : Airport		
Degree of historical alteration to natural channel morphology & hydrology (circle one & describe fully in Notes) : Severe Moderate Slight Absent		

Primary Field Indicators Observed

Primary Indicators	NO	YES
1. Hydrologic feature exists solely due to a process discharge	✓	WWC
2. Defined bed and bank absent, dominated by upland vegetation / grass	✓	WWC
3. Watercourse dry anytime during February through April 15th, under normal precipitation / groundwater conditions	N/A	WWC
4. Daily flow and precipitation records showing feature only flows in direct response to rainfall	✓	WWC
5. Presence of multiple populations of obligate lotic organisms with ≥ 2 month aquatic phase	✓	Stream
6. Presence of fish (except *Gambusia*)	✓	Stream
7. Presence of naturally occurring ground water table connection	N/A	Stream
8. Flowing water in channel and 7 days since last precipitation in local watershed	N/A	Stream
9. Evidence watercourse has been used as a supply of drinking water	✓	Stream

NOTE : If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contradictory evidence, determination is complete.

In the absence of a primary indicator, or other definitive evidence, complete the secondary indicator table on page 2 of this sheet, and provide score below.

Guidance for the interpretation and scoring of both the primary & secondary indicators is provided in *TDEC-WPC Guidance For Making Hydrologic Determinations, Version 1.4*

Overall Hydrologic Determination = Stream

Secondary Indicator Score (if applicable) = 31.0

Justification / Notes :

Location 3

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal = 13.5)	Absent	Weak	Moderate	Strong
1. Continuous bed and bank	0	1	2	3
2. Sinuous channel	0	1	2	3
3. In-channel structure: riffle-pool sequences	0	1	2	3
4. Sorting of soil textures or other substrate	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	0.5	1	1.5
9. Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. At least second order channel on existing USGS or NRCS map	No = 0		Yes = 3	

B. Hydrology (Subtotal = 7.5)	Absent	Weak	Moderate	Strong
14. Subsurface flow/discharge into channel	0	1	2	3
15. Water in channel and >48 hours since sig. rain	0	1	2	3
16. Leaf litter in channel (January – September)	1.5	1	0.5	0
17. Sediment on plants or on debris	0	0.5	1	1.5
18. Organic debris lines or piles (wrack lines)	0	0.5	1	1.5
19. Hydric soils in stream bed or sides of channel	No = 0		Yes = 1.5	

C. Biology (Subtotal = 10.0)	Absent	Weak	Moderate	Strong
20. Fibrous roots in channel [1]	3	2	1	0
21. Rooted plants in channel [1]	3	2	1	0
22. Crayfish in stream (exclude in floodplain)	0	0.5	1	1.5
23. Bivalves/mussels	0	1	2	3
24. Amphibians	0	0.5	1	1.5
25. Macrobenthos (record type & abundance)	0	1	2	3
26. Filamentous algae; periphyton	0	1	2	3
27. Iron oxidizing bacteria/fungus	0	0.5	1	1.5
28. Wetland plants in channel [2]	0	0.5	1	2

[1] Focus is on the presence of upland plants. [2] Focus is on the presence of aquatic or wetland plants.

Total Points = 31.0

Under Normal Conditions, Watercourse is a Wet Weather Conveyance if Secondary Indicator Score < 19 points

Notes : Benthic macroinvertebrates → amphipods, tipulidae, chironomids, Caddis fly, cray fish

Note: Crayfish (3) were Orconectes durelli.

Hydrologic Determination Certification
Metro Nashville Stormwater Division

Map & Parcel: BNA - Terminal A
Address:
Project Name: MNAA - Nashville International Airport
Owner/ Developer: MNAA

A hydrologic determination was performed on 1/16/19 by qualified staff for a conveyance located on the above parcel in accordance with the hydrologic determination guidance developed by TDEC and approved by MWS. Based on the observed geomorphology, hydrology, and biology, the conveyance is a wet weather conveyance (WWC) and not a community water as defined by Section 6.9 of Nashville's Stormwater Management Manual, Volume 1.

HD performed by:

Name & Firm: Stan Rudzinski

Signature: Stan Rudzinski

Signature and stamp of Professional Engineer designing the project.

Attach:
Hydrologic Determination Field Sheet
Map
Photos of beginning, middle, and end of WWC
GPS coordinates of beginning and end of WWC on property

****MWS reserves the right to verify any hydrologic determination, especially those performed during drier months.****
This document should be submitted with the Grading Permit application for all conveyances that will not be protected.

Hydrologic Determination Field Data Sheet
Tennessee Division of Water Pollution Control

Assessor : Stan Rudzinski (Wood) | Date / Time : 1/16/19

Waterbody : Unnamed Tributary to Sims Branch | HUC : 051302020102

Location / Site Name : BNA - Terminal A | Location 1

County : Davidson | Lat/Long 1 : 36.136970 | Lat/Long 2 : -86.670488

Previous Rainfall (7-day) : 0.41 inches | USGS Quad : Nashville East

Seasonal Precip vs. Norm : very wet | wet | average | dry | drought | unknown

Photos Taken ? / Number : | Others Present : Scott Glover (Wood)

FIELD INDICATORS OBSERVED

	Absent	Weak	Moderate	Strong	N/A
GEOMORPHOLOGY					
1) Channel has well-defined bed and bank				✓	
2) Channel is sinuous			✓		
3) Presence of hydraulic diversity (riffle - pool sequence)			✓		
4) Hydric soils present in streambed or sides of channel	✓				
5) Presence of floodplain or bankful bench	✓				
6) Channel is 2nd order or greater	✓				
7) Gravel / Cobble substrate in channel bed				✓	
8) Historic land uses have altered natural channel morphology (e.g. channelization / livestock access)		✓			
HYDROLOGY					
1) Non-storm flow present ?				✓	
2) Storm-related flow present ?		✓			
3) Obvious groundwater connections (seeps, springs, etc)	✓				
4) Subsurface / interstitial flow in substrate detected		✓			
5) Channel has associated / adjacent wetlands	✓				
6) Presence of last fall's leaf litter in channel	✓				
7) Historic land uses have altered natural hydrology (e.g. french drains / livestock activities)			✓		
BIOLOGY					
1) Presence of Fish	✓				
2) Presence of Crustaceans (crayfish, scuds, isopods)		✓			
3) Presence of EPT (mayflies, caddisflies, stoneflies)		✓			
4) Other Inverts (odonates, pennies, tipulids, midges, etc)		✓			
5) Presence of Mollusca (Snails, clams)	✓				
6) Indicators of aquatic inverts (caddis cases or nets, larval skins, midge tubes, etc)		✓			
7) Periphyton present on substrate		✓			
8) Filamentous algae present in channel	✓				
9) Instream root wads / oxidized root channels	✓				
10) Hydrophytic vegetation present in channel	✓				
11) Rooted, non-aquatic plants present in streambed	✓				

Overall Hydrologic Determination = Stream

Justification / Comments :

Location 1

Hydrologic Determination Guidance Key
Tennessee Division of Water Pollution Control

STEP		GO TO STEP
1.	Does the hydrologic feature exist solely due to a process discharge ?	Yes ... go to END1 No ... go to 2
2.	Is the hydrologic feature defined by a linear channel or channels?	Yes ... go to 6 No .... go to 3
3.	Does the hydrologic feature exhibit enough of the COE-defined wetland characteristics (e.g. hydric soils, hydrophytic vegetation, hydrology) to likely qualify as a jurisdictional wetland ?	Yes ... go to END2 No .... go to 4
4.	Is the hydrologic feature a "pond" (open water lentic habitat) ?	Yes ... go to 5 No .... go to 6
5.	Is there a well-defined watercourse leading into or out of the pond ?	Yes ... go to 6 No .... go to END3
6.	Does the watercourse presently have flow ?	Yes ... go to 8 No .... go to 7
7.	When watercourse has flow, does it flow continuously for more than 30 days during a normal hydrologic year ?	Yes ... go to END4 No .... go to END1 Uncertain ... go to 10
8.	Has there been precipitation runoff in the local watershed in the past 5 days ?	Yes ... go to 9 No .... go to END4 Uncertain ... go to 9
9.	Are aquatic biota indicative of extended periods of flow present ?	Yes ... go to END4 No .... go to 10
10.	Do observed field characteristics / features* indicate that it is more likely than not that the watercourse flows or supports fish & aquatic life for extended periods of time during a normal hydrologic year ? ***Document your observations & rationale***	Yes ... go to END4 No .... go to END1

* note - see *Hydrologic Field Data Sheet* for field indicators

Location 1

END1 : Watercourse is a **Wet Weather Conveyance**. Alterations are covered under the *General Aquatic Resource Alteration Permit (ARAP) for Wet Weather Conveyances*. In-channel water quality and quantity control structures are usually permissible.

END2 : Hydrologic feature may be a **Wetland**. The feature should be delineated by a qualified wetland expert using USCOE methodology. Alteration may require an individual or general ARAP, depending on size and connectivity of wetland.

END3 : Hydrologic feature is an **Isolated Pond**. If completely contained on private property, alterations do not require an ARAP. However, discharges resulting from alterations of ponds, including draining, may require NPDES permit coverage.

END4 : Watercourse is a jurisdictional **Stream.** Physical alteration requires either an individual or general ARAP, depending on the nature and scale of alteration. Buffer regulations in the *Construction Stormwater General Permit* may apply. In-channel water quality and quantity control structures are generally not permissible.

TDEC / WPC
December 12, 2006

Hydrologic Determination Field Data Sheet
Tennessee Division of Water Pollution Control

Assessor : Stan Rudzinski (Wood) | Date / Time : 1/16/19

Waterbody : Unnamed Tributary to Sims Branch | HUC : 051302020102

Location / Site Name : BNA - Terminal A Location 2

County : Davidson | Lat/Long 1 : 36.137471 | Lat/Long 2 : - 86.671697

Previous Rainfall (7-day) : 0.41 inches | USGS Quad : Nashville East

Seasonal Precip vs. Norm : very wet wet average dry drought unknown

Photos Taken ? / Number : | Others Present : Scott Glover (Wood)

FIELD INDICATORS OBSERVED

	Absent	Weak	Moderate	Strong	N/A
GEOMORPHOLOGY					
1) Channel has well-defined bed and bank				✓	
2) Channel is sinuous			✓		
3) Presence of hydraulic diversity (riffle - pool sequence)			✓		
4) Hydric soils present in streambed or sides of channel	✓				
5) Presence of floodplain or bankful bench	✓				
6) Channel is 2nd order or greater	✓				
7) Gravel / Cobble substrate in channel bed				✓	
8) Historic land uses have altered natural channel morphology (e.g. channelization / livestock access)			✓		
HYDROLOGY					
1) Non-storm flow present ?				✓	
2) Storm-related flow present ?		✓			
3) Obvious groundwater connections (seeps, springs, etc)	✓				
4) Subsurface / interstitial flow in substrate detected		✓			
5) Channel has associated / adjacent wetlands	✓				
6) Presence of last fall's leaf litter in channel	✓				
7) Historic land uses have altered natural hydrology (e.g. french drains / livestock activities)			✓		
BIOLOGY					
1) Presence of Fish	✓				
2) Presence of Crustaceans (crayfish, scuds, isopods)		✓			
3) Presence of EPT (mayflies, caddisflies, stoneflies)		✓			
4) Other Inverts (odonates, pennies, tipulids, midges, etc)		✓			
5) Presence of Mollusca (Snails, clams)	✓				
6) Indicators of aquatic inverts (caddis cases or nets, larval skins, midge tubes, etc)		✓			
7) Periphyton present on substrate		✓			
8) Filamentous algae present in channel	✓				
9) Instream root wads / oxidized root channels	✓				
10) Hydrophytic vegetation present in channel	✓				
11) Rooted, non-aquatic plants present in streambed	✓				

Overall Hydrologic Determination = Stream

Justification / Comments :

Location 2

Hydrologic Determination Guidance Key
Tennessee Division of Water Pollution Control

STEP		GO TO STEP
1.	Does the hydrologic feature exist solely due to a process discharge ?	Yes ... go to END1 No.... go to 2
2.	Is the hydrologic feature defined by a linear channel or channels?	Yes… go to 6 No …. go to 3
3.	Does the hydrologic feature exhibit enough of the COE-defined wetland characteristics (e.g. hydric soils, hydrophytic vegetation, hydrology) to likely qualify as a jurisdictional wetland ?	Yes ... go to END2 No .... go to 4
4.	Is the hydrologic feature a "pond" (open water lentic habitat) ?	Yes ... go to 5 No .... go to 6
5.	Is there a well-defined watercourse leading into or out of the pond ?	Yes ... go to 6 No .... go to END3
6.	Does the watercourse presently have flow ?	Yes ... go to 8 No .... go to 7
7.	When watercourse has flow, does it flow continuously for more than 30 days during a normal hydrologic year ?	Yes ... go to END4 No .... go to END1 Uncertain ... go to 10
8.	Has there been precipitation runoff in the local watershed in the past 5 days ?	Yes ... go to 9 No .... go to END4 Uncertain ... go to 9
9.	Are aquatic biota indicative of extended periods of flow present ?	Yes ... go to END4 No .... go to 10
10.	Do observed field characteristics / features* indicate that it is more likely than not that the watercourse flows or supports fish & aquatic life for extended periods of time during a normal hydrologic year ? ***Document your observations & rationale***	Yes ... go to END4 No .... go to END1

* note - see *Hydrologic Field Data Sheet* for field indicators

Location 2

END1 : Watercourse is a **Wet Weather Conveyance**. Alterations are covered under the *General Aquatic Resource Alteration Permit (ARAP) for Wet Weather Conveyances*. In-channel water quality and quantity control structures are usually permissible.

END2 : Hydrologic feature may be a **Wetland**. The feature should be delineated by a qualified wetland expert using USCOE methodology. Alteration may require an individual or general ARAP, depending on size and connectivity of wetland.

END3 : Hydrologic feature is an **Isolated Pond**. If completely contained on private property, alterations do not require an ARAP. However, discharges resulting from alterations of ponds, including draining, may require NPDES permit coverage.

END4 : Watercourse is a jurisdictional **Stream.** Physical alteration requires either an individual or general ARAP, depending on the nature and scale of alteration. Buffer regulations in the *Construction Stormwater General Permit* may apply. In-channel water quality and quantity control structures are generally not permissible.

TDEC / WPC
December 12, 2006

Hydrologic Determination Field Data Sheet
Tennessee Division of Water Pollution Control

Assessor : Stan Rudzinski (Wood) Date / Time : 1/16/19

Waterbody : Unnamed Tributary to Sims Branch HUC : 05130202 0102

Location / Site Name : BNA - Terminal A Location 3

County : Davidson Lat/Long 1 : 36.137097 Lat/Long 2 : -86.673409

Previous Rainfall (7-day) : 0.41 inches USGS Quad : Nashville East

Seasonal Precip vs. Norm : very wet wet average dry drought unknown

Photos Taken ? / Number : Others Present : Scott Glover (Wood)

FIELD INDICATORS OBSERVED

	Absent	Weak	Moderate	Strong	N/A
GEOMORPHOLOGY					
1) Channel has well-defined bed and bank				✓	
2) Channel is sinuous			✓		
3) Presence of hydraulic diversity (riffle - pool sequence)			✓		
4) Hydric soils present in streambed or sides of channel		✓			
5) Presence of floodplain or bankful bench		✓			
6) Channel is 2nd order or greater	✓				
7) Gravel / Cobble substrate in channel bed				✓	
8) Historic land uses have altered natural channel morphology (e.g. channelization / livestock access)			✓		
HYDROLOGY					
1) Non-storm flow present ?				✓	
2) Storm-related flow present ?		✓			
3) Obvious groundwater connections (seeps, springs, etc)	~~SOR~~	✓			
4) Subsurface / interstitial flow in substrate detected	✓				
5) Channel has associated / adjacent wetlands	✓				
6) Presence of last fall's leaf litter in channel	✓				
7) Historic land uses have altered natural hydrology (e.g. french drains / livestock activities)			✓		
BIOLOGY					
1) Presence of Fish	✓				
2) Presence of Crustaceans (crayfish, scuds, isopods)		✓			
3) Presence of EPT (mayflies, caddisflies, stoneflies)		✓			
4) Other Inverts (odonates, pennies, tipulids, midges, etc)		✓			
5) Presence of Mollusca (Snails, clams)	✓				
6) Indicators of aquatic inverts (caddis cases or nets, larval skins, midge tubes, etc)		✓			
7) Periphyton present on substrate		✓			
8) Filamentous algae present in channel	✓				
9) Instream root wads / oxidized root channels	✓				
10) Hydrophytic vegetation present in channel	✓				
11) Rooted, non-aquatic plants present in streambed	✓				

Overall Hydrologic Determination = Stream

Justification / Comments :

Location 3

Hydrologic Determination Guidance Key
Tennessee Division of Water Pollution Control

STEP		GO TO STEP
1.	Does the hydrologic feature exist solely due to a process discharge ?	Yes ... go to END1 No .... go to 2
2.	Is the hydrologic feature defined by a linear channel or channels?	Yes .... go to 6 No .... go to 3
3.	Does the hydrologic feature exhibit enough of the COE-defined wetland characteristics (e.g. hydric soils, hydrophytic vegetation, hydrology) to likely qualify as a jurisdictional wetland ?	Yes ... go to END2 No .... go to 4
4.	Is the hydrologic feature a "pond" (open water lentic habitat) ?	Yes ... go to 5 No .... go to 6
5.	Is there a well-defined watercourse leading into or out of the pond ?	Yes ... go to 6 No .... go to END3
6.	Does the watercourse presently have flow ?	Yes ... go to 8 No .... go to 7
7.	When watercourse has flow, does it flow continuously for more than 30 days during a normal hydrologic year ?	Yes ... go to END4 No .... go to END1 Uncertain ... go to 10
8.	Has there been precipitation runoff in the local watershed in the past 5 days ?	Yes ... go to 9 No .... go to END4 Uncertain ... go to 9
9.	Are aquatic biota indicative of extended periods of flow present ?	Yes ... go to END4 No .... go to 10
10.	Do observed field characteristics / features* indicate that it is more likely than not that the watercourse flows or supports fish & aquatic life for extended periods of time during a normal hydrologic year ? ***Document your observations & rationale***	Yes ... go to END4 No .... go to END1

* note - see *Hydrologic Field Data Sheet* for field indicators

Location 3

END1 : Watercourse is a **Wet Weather Conveyance**. Alterations are covered under the *General Aquatic Resource Alteration Permit (ARAP) for Wet Weather Conveyances*. In-channel water quality and quantity control structures are usually permissible.

END2 : Hydrologic feature may be a **Wetland**. The feature should be delineated by a qualified wetland expert using USCOE methodology. Alteration may require an individual or general ARAP, depending on size and connectivity of wetland.

END3 : Hydrologic feature is an **Isolated Pond**. If completely contained on private property, alterations do not require an ARAP. However, discharges resulting from alterations of ponds, including draining, may require NPDES permit coverage.

END4 : Watercourse is a jurisdictional **Stream.** Physical alteration requires either an individual or general ARAP, depending on the nature and scale of alteration. Buffer regulations in the *Construction Stormwater General Permit* may apply. In-channel water quality and quantity control structures are generally not permissible.

TDEC / WPC
December 12, 2006

* NOAA Nashville International Airport BNA - Terminal A

Calculation of Normal Weather Conditions

Std Dev		Month	Long-term rainfall records: Minus One Std. Dev. (DRY)	Normal (Mean inches)	Plus One Std. Dev. (WET)	Actual Rainfal l	Condition (dry, wet, normal)	Condition value	Month weight value	Product of previous two columns
2.68	1st prior month *	Dec	1.56	4.24	6.92	5.41	Normal	2	x 3	6
1.76	2nd prior month	Nov	2.55	4.31	6.07	4.53	Normal	2	x 2	4
1.53	3rd prior month *	Oct	1.51	3.04	4.57	2.89	Normal	2	x 1	2
									Sum =	12

Note:

If sum is:	
6-9	then prior period has been drier than normal
10-14	then prior period has been normal
15-18	Then prior period has been wetter than normal

Condition value:	
Dry =	1
Normal =	2
Wet =	3

Conclusions: 12 - Prior period has been normal

SBR 1/16/19

STREAM ASSESSMENT
FOR
CONCOURSE AND GATE EXPANSION- BNA

NASHVILLE, DAVIDSON COUNTY, TN

Prepared for:

Metro Nashville Airport Authority

Nashville, TN

Garver, LLC

Franklin, TN

Prepared by:

Wood Environment & Infrastructure Solutions, Inc.
3800 Ezell Road, Suite 100
Nashville, TN 37211

Wood Project Number: 7650-19-1222

February 2020

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

This document was prepared by Wood Environment & Infrastructure Solutions, Inc. in support of the Concourse and Gate Expansion Environmental Assessment at the Nashville International Airport being conducted by Garver, LLC for the Metro Nashville Airport Authority.

1.0 INTRODUCTION

Wood Environment & Infrastructure Solutions, Inc. (Wood) conducted a stream assessment within the proposed project area associated with the Concourse and Gate Expansion area located within the northcentral portion of the Nashville International Airport (BNA)(**Figure 1**). The Metro Nashville Airport Authority (MNAA) is evaluating the environmental constraints associated with the project, with the assistance of Garver, LLC. Garver is preparing the necessary environmental documents and associated Environmental Assessment (EA). Following preliminary evaluations and discussions with MNAA personnel, Garver decided that an assessment of the streams located in the project footprint was necessary to supplement the information in the EA.

In addition, the project area includes Sims Branch, which is located within the Mill Creek watershed; therefore, special conditions apply for environmental permits associated with the project. Since the project may affect Sims Branch, permit review is anticipated with the U.S. Fish and Wildlife Service (USFWS), Tennessee Department of Environment and Conservation (TDEC) and the U.S. Army Corps of Engineers (USACE). As a result, Garver requested that Wood assist with evaluating streams located within the project area.

Wood scientific staff conducted a desktop survey and field assessment on September 30, 2019. Survey methods followed USACE Nashville District guidance and TDEC guidance for evaluating jurisdictional streams.

2.0 METHODOLOGY

The Clean Water Act (CWA), 33 U.S.C. § 1341 et seq. defines "waters of the United States" or WOTUS for the purpose of authorization under Section 404 of the CWA and Section 10 of the RHA at 33 C.F.R. Parts 328 and 329 and associated guidance and manuals.

Tennessee has developed a stream determination tool, the Hydrologic Determination Field Data Sheets (*Guidance For Making Hydrologic Determinations*, Version 1.4 May 2011). The Hydrologic Determination Field Data Sheet was utilized to assess the jurisdictional classification of each channel within the project area. This method was utilized to document the existing channel characteristics located within the area. In accordance with this guidance, the stream channel assessments will include a qualitative review of channel characteristics for purposes of documenting wet weather conveyance versus intermittent and perennial stream channels.

Wood scientists conducted a field survey and provided hydrologic field data sheets for seven locations within the project boundaries (**Figure 2**). During our survey, our biologists prepared a qualitative list of aquatic organisms including benthic macroinvertebrates and fish that were encountered and listed them on each data sheet. Wood personnel provided a description of the aquatic habitat and a detailed description of the vegetation associated with the current riparian buffer. Wood documented adjacent conditions, channel characteristics, and took site photographs.

3.0 DESKTOP EVALUATION

A desktop evaluation was conducted to develop a preliminary understanding of the possible location of streams in advance of the field delineation, to better understand the historical use of the property, and to identify past site alterations in the project area. The desktop survey included a review of available online resources, including the USGS 7.5-minute topographic map, aerial imagery of the site, U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Soil Map, and U.S. Fish & Wildlife Service (USFWS) National Wetlands Inventory (NWI) map.

3.1 Topography and Streams

The project area is located within the Lower Mill Creek watershed (HUC 05130202102). The project area is located on USGS Nashville East, TN Topographic Quadrangle. The site elevation ranges from approximately 460 feet to 550 feet above mean sea level. The project area is located within the existing airport property and relatively rolling topography; however, fill associated with existing airport runways, access roads, and parking lots have changed the natural topography. Several drainages are located throughout the corridor. There were two streams shown on the USGS topographic map within the project area.

4.0 FIELD ASSESSMENT

The field assessment was conducted on September 30, 2019, by Stan Rudzinski (TN-QHP 1031-TN11) and Scott Glover (TN-QHP 1016-TN11) of Wood.

4.1 Weather Conditions

The weather conditions during the field assessment were generally mostly sunny with a high of ~95ºF and low near 70ºF with precipitation totaling 0.00". Rainfall totaling 0.01" was recorded in the previous 7 days (National Climatic Data Center 2019). Based on TDEC's formula for calculating "normal weather conditions" the previous three-month period was considered to have had normal precipitation conditions. These calculations are provided in **Appendix A**.

4.2 General Landscape

Current surrounding land use includes undeveloped mowed/maintained fields and forested lots, existing airport runways, parking lots, and airport access roads. The southern part of the project area is located just west of the BNA terminal. The stream channel in this area is generally surrounded by mowed fields and steep fill-slopes associated with the runways and surrounding airport facility. Further north, and downgradient, the project area becomes more wooded.

4.3 Results

Based on Wood's assessment, the project area contains two streams (Sims Branch and an unnamed tributary to Sims Branch). TDEC Hydrologic Determination Field Data Sheets were completed at seven locations throughout the project area. The data sheets are included in **Appendix A**.

Stream 1 is Sims Branch and would be considered a jurisdictional stream based on TDEC Hydrologic Determination Field Data Sheet scores of 22.5 to 29.0. These stream identification forms for Sims Branch are provided in **Appendix A**. Photographs 1, 2, 3, 4, 6, and 7 depict Stream 1.

Stream 2 is an unnamed tributary to Sims Branch that would be considered a jurisdictional stream based on a TDEC Hydrologic Determination Field Data Sheet score of 23.5. The stream identification form for the unnamed tributary to Sims Branch is provided in **Appendix A**. Photograph 5 depicts Stream 2.

A list of benthic macroinvertebrates and fish identified at each assessment location is provided in the notes section of each completed TDEC Hydrologic Determination Field Data Sheet.

A summary list of plants identified adjacent to each assessment location is provided in **Appendix B**.

5.0 CONCLUSIONS

Wood Environment & Infrastructure Solutions, Inc. (Wood) conducted a stream assessment within the proposed Concourse and Gate Expansion Area. The assessment identified two streams determined to be jurisdiction in accordance with the CWA, USACE, and TDEC regulations, guidance, and applicable manuals. The conditions of these two streams and adjacent landscape is documented in this report, the attached data sheets, and photographs.

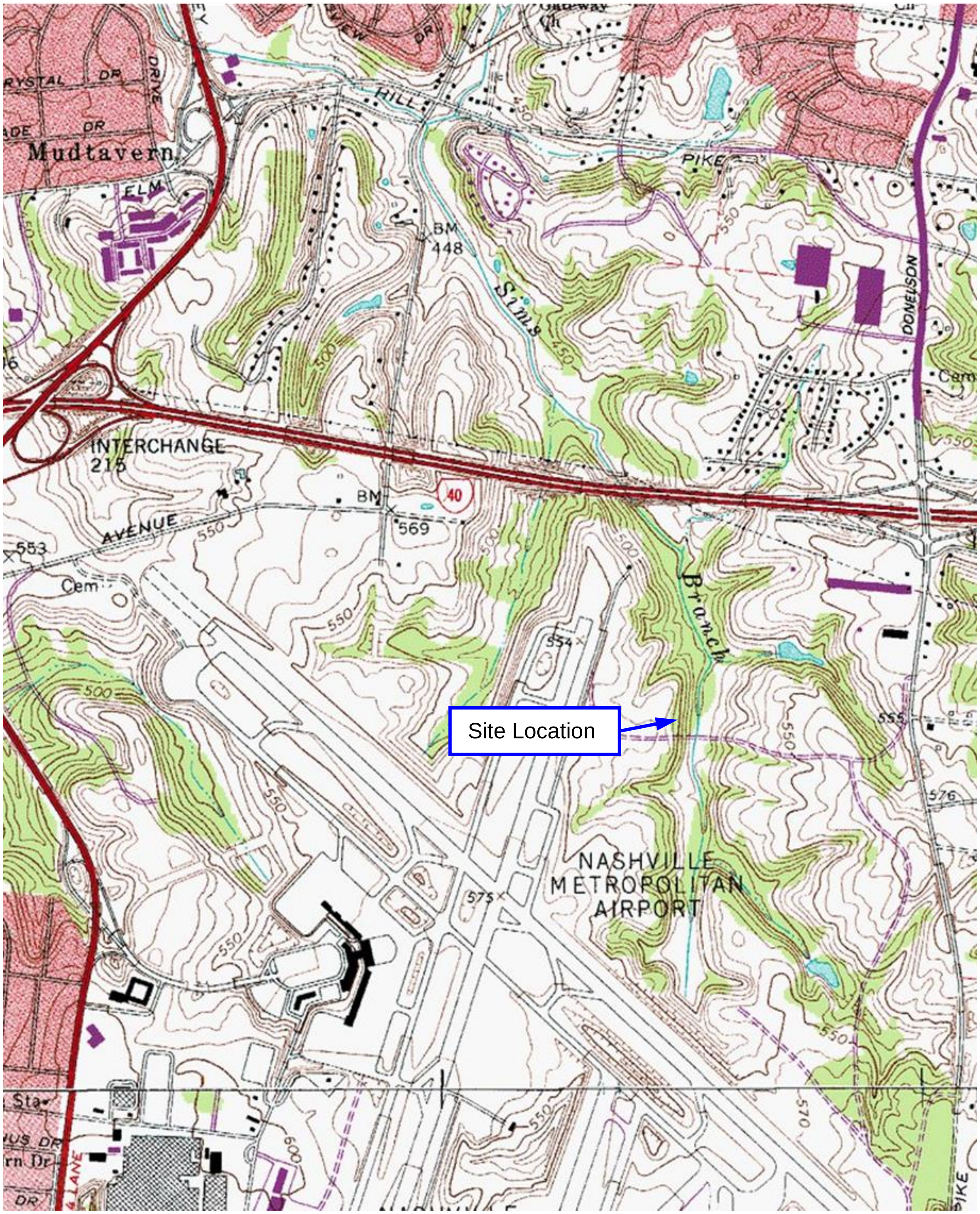


Figure 1. Approximate Site Location Project No. 7650-19-1222, Nashville International Airport, Davidson County, Tennessee

Figure 2. Approximate Assessment Locations Project No. 7650-19-1222, Nashville International Airport, Davidson County, Tennessee

Photo 1. Sims Branch, Location 1, facing upstream (south).

Photo 2. Sims Branch, Location 2, facing upstream (south).

Photo 3. Sims Branch, Location 3, facing downstream (north).

Photo 4. Sims Branch, Location 4, facing downstream (northeast).

Photo 5. Unnamed tributary to Sims Branch, Location 5, facing upstream (east).

Photo 6. Sims Branch, Location 6, facing upstream (south).

Photo 7. Sims Branch, Location 7, facing downstream (northwest).

APPENDIX A
Hydrologic Determination Field Data Sheets and Normal Weather Conditions Calculations

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: Davidson	Named Waterbody: Sims Branch	Date/Time: 9/30/2019
Assessors/Affiliation: Stan Rudzinski; Scott Glover (WOOD)		Project ID :
Site Name/Description: BNA – Concourse and Gate Expansion		**Location 1**
Site Location: Nashville International Airport		
USGS quad: Nashville East	HUC (12 digit): 051302020102	Lat/Long: 36.130986 -86.675212
Previous Rainfall (7-days) : 0.01 inches		
Precipitation this Season vs. Normal : very wet wet average dry drought unknown Source of recent & seasonal precip data :		
Watershed Size : ~430 acres	Photos: Y or N (circle) Number :	
Soil Type(s) / Geology :Stiversville silt loam, 12 to 25 percent slopes, eroded Source:NRCS WebSoilSurvey		
Surrounding Land Use : Airport runway, airport terminal, mowed/maintained grassed areas/small wood lots		
Degree of historical alteration to natural channel morphology & hydrology (circle one & describe fully in Notes) : Severe Moderate Slight Absent		

Primary Field Indicators Observed

Primary Indicators	NO	YES
1. Hydrologic feature exists solely due to a process discharge	✓	WWC
2. Defined bed and bank absent, dominated by upland vegetation / grass	✓	WWC
3. Watercourse dry anytime during February through April 15th, under normal precipitation / groundwater conditions	N/A	WWC
4. Daily flow and precipitation records showing feature only flows in direct response to rainfall	✓	WWC
5. Presence of multiple populations of obligate lotic organisms with ≥2 month aquatic phase	✓	Stream
6. Presence of fish (except *Gambusia*)	✓	Stream
7. Presence of naturally occurring ground water table connection	✓	Stream
8. Flowing water in channel and 7 days since last precipitation in local watershed	N/A	Stream
9. Evidence watercourse has been used as a supply of drinking water	✓	Stream

NOTE : If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contradictory evidence, determination is complete.

In the absence of a primary indicator, or other definitive evidence, complete the secondary indicator table on page 2 of this sheet, and provide score below.

Guidance for the interpretation and scoring of both the primary & secondary indicators is provided in *TDEC-WPC Guidance For Making Hydrologic Determinations, Version 1.4*

Overall Hydrologic Determination = Stream

Secondary Indicator Score (if applicable) = 24.0

Justification / Notes :

Location 1

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal = 11.0)	Absent	Weak	Moderate	Strong
1. Continuous bed and bank	0	1	2	3
2. Sinuous channel	0	1	2	3
3. In-channel structure: riffle-pool sequences	0	1	2	3
4. Sorting of soil textures or other substrate	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	0.5	1	1.5
9. Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. At least second order channel on existing USGS or NRCS map	No = 0		Yes = 3	

B. Hydrology (Subtotal = 6.0)	Absent	Weak	Moderate	Strong
14. Subsurface flow/discharge into channel	0	1	2	3
15. Water in channel and >48 hours since sig. rain	0	1	2	3
16. Leaf litter in channel (January – September)	1.5	1	0.5	0
17. Sediment on plants or on debris	0	0.5	1	1.5
18. Organic debris lines or piles (wrack lines)	0	0.5	1	1.5
19. Hydric soils in stream bed or sides of channel	No = 0		Yes = 1.5	

C. Biology (Subtotal = 7.0)	Absent	Weak	Moderate	Strong
20. Fibrous roots in channel [1]	3	2	1	0
21. Rooted plants in channel [1]	3	2	1	0
22. Crayfish in stream (exclude in floodplain)	0	0.5	1	1.5
23. Bivalves/mussels	0	1	2	3
24. Amphibians	0	0.5	1	1.5
25. Macrobenthos (record type & abundance)	0	1	2	3
26. Filamentous algae; periphyton	0	1	2	3
27. Iron oxidizing bacteria/fungus	0	0.5	1	1.5
28. Wetland plants in channel [2]	0	0.5	1	2

[1] Focus is on the presence of upland plants. [2] Focus is on the presence of aquatic or wetland plants.

Total Points = 24.0

Under Normal Conditions, Watercourse is a Wet Weather Conveyance if Secondary Indicator Score < 19 points

Notes : scuds, waterstrider, beetle, odonates, tipulidae, crayfish, red chironomid

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: Davidson	Named Waterbody: Sims Branch	Date/Time: 9/30/2019
Assessors/Affiliation: Stan Rudzinski; Scott Glover (WOOD)		Project ID : **Location 2**
Site Name/Description: BNA – Concourse and Gate Expansion		
Site Location: Nashville International Airport		
USGS quad: Nashville East	HUC (12 digit): 051302020102	Lat/Long: 36.133375 -86.674953
Previous Rainfall (7-days) : 0.01 inches		
Precipitation this Season vs. Normal : very wet wet average dry drought unknown Source of recent & seasonal precip data :		
Watershed Size : ~665 acres	Photos: Y or N (circle) Number :	
Soil Type(s) / Geology :Stiversville silt loam, 12 to 25 percent slopes, eroded Source:NRCS WebSoilSurvey		
Surrounding Land Use : Airport runway, airport terminal, mowed/maintained grassed areas/small wood lots		
Degree of historical alteration to natural channel morphology & hydrology (circle one & describe fully in Notes) : Severe Moderate Slight Absent		

Primary Field Indicators Observed

Primary Indicators	NO	YES
1. Hydrologic feature exists solely due to a process discharge	✓	WWC
2. Defined bed and bank absent, dominated by upland vegetation / grass	✓	WWC
3. Watercourse dry anytime during February through April 15th, under normal precipitation / groundwater conditions	N/A	WWC
4. Daily flow and precipitation records showing feature only flows in direct response to rainfall	✓	WWC
5. Presence of multiple populations of obligate lotic organisms with ≥2 month aquatic phase	✓	Stream
6. Presence of fish (except *Gambusia*)	✓	Stream
7. Presence of naturally occurring ground water table connection	✓	Stream
8. Flowing water in channel and 7 days since last precipitation in local watershed	N/A	Stream
9. Evidence watercourse has been used as a supply of drinking water	✓	Stream

NOTE : If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contradictory evidence, determination is complete.

In the absence of a primary indicator, or other definitive evidence, complete the secondary indicator table on page 2 of this sheet, and provide score below.

Guidance for the interpretation and scoring of both the primary & secondary indicators is provided in *TDEC-WPC Guidance For Making Hydrologic Determinations, Version 1.4*

Overall Hydrologic Determination = Stream

Secondary Indicator Score (if applicable) = 25.0

Justification / Notes :

Location 2

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal = 9.5)	Absent	Weak	Moderate	Strong
1. Continuous bed and bank	0	1	2	3
2. Sinuous channel	0	1	2	3
3. In-channel structure: riffle-pool sequences	0	1	2	3
4. Sorting of soil textures or other substrate	0	1	2	3
5. Active/relic floodplain	~~0~~ SOR	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	0.5	1	1.5
9. Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. At least second order channel on existing USGS or NRCS map	No = 0		Yes = 3	

B. Hydrology (Subtotal = 6.5)	Absent	Weak	Moderate	Strong
14. Subsurface flow/discharge into channel	0	1	2	3
15. Water in channel and >48 hours since sig. rain	0	1	2	3
16. Leaf litter in channel (January – September)	1.5	1	0.5	0
17. Sediment on plants or on debris	0	0.5	1	1.5
18. Organic debris lines or piles (wrack lines)	0	0.5	1	1.5
19. Hydric soils in stream bed or sides of channel	No = 0		Yes = 1.5	

C. Biology (Subtotal = 9.0)	Absent	Weak	Moderate	Strong
20. Fibrous roots in channel [1]	3	2	1	0
21. Rooted plants in channel [1]	3	2	1	0
22. Crayfish in stream (exclude in floodplain)	0	0.5	1	1.5
23. Bivalves/mussels	0	1	2	3
24. Amphibians	0	0.5	1	1.5
25. Macrobenthos (record type & abundance)	0	1	2	3
26. Filamentous algae; periphyton	0	1	2	3
27. Iron oxidizing bacteria/fungus	0	0.5	1	1.5
28. Wetland plants in channel [2]	0	0.5	1	2

[1] Focus is on the presence of upland plants. [2] Focus is on the presence of aquatic or wetland plants.

Total Points = 25.0

Under Normal Conditions, Watercourse is a Wet Weather Conveyance if Secondary Indicator Score < 19 points

Notes : frog, scuds, beetle, water boatmen, odonates, chironomid crayfish, water strider

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: Davidson	Named Waterbody: Sims Branch	Date/Time: 9/30/2019
Assessors/Affiliation: Stan Rudzinski; Scott Glover (WOOD)		Project ID : **Location 3**
Site Name/Description: BNA – Concourse and Gate Expansion		
Site Location: Nashville International Airport		
USGS quad: Nashville East	HUC (12 digit): 051302020102	Lat/Long: 36.136414 -86.674377
Previous Rainfall (7-days) : 0.01 inches		
Precipitation this Season vs. Normal : very wet wet average dry drought unknown Source of recent & seasonal precip data :		
Watershed Size : ~700 acres	Photos: Y or N (circle) Number :	
Soil Type(s) / Geology :Lindell silt loam, 0 to 2 percent slopes, occasionally flooded Source:NRCS WebSoilSurvey		
Surrounding Land Use : Airport runway, airport terminal, mowed/maintained grassed areas/small wood lots		
Degree of historical alteration to natural channel morphology & hydrology (circle one & describe fully in Notes) : Severe Moderate Slight Absent		

Primary Field Indicators Observed

Primary Indicators	NO	YES
1. Hydrologic feature exists solely due to a process discharge	✓	WWC
2. Defined bed and bank absent, dominated by upland vegetation / grass	✓	WWC
3. Watercourse dry anytime during February through April 15th, under normal precipitation / groundwater conditions	N/A	WWC
4. Daily flow and precipitation records showing feature only flows in direct response to rainfall	✓	WWC
5. Presence of multiple populations of obligate lotic organisms with ≥2 month aquatic phase	✓	Stream
6. Presence of fish (except *Gambusia*)	✓	Stream
7. Presence of naturally occurring ground water table connection	✓	Stream
8. Flowing water in channel and 7 days since last precipitation in local watershed	N/A	Stream
9. Evidence watercourse has been used as a supply of drinking water	✓	Stream

NOTE : If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contradictory evidence, determination is complete.

In the absence of a primary indicator, or other definitive evidence, complete the secondary indicator table on page 2 of this sheet, and provide score below.

Guidance for the interpretation and scoring of both the primary & secondary indicators is provided in *TDEC-WPC Guidance For Making Hydrologic Determinations, Version 1.4*

Overall Hydrologic Determination =	Stream
Secondary Indicator Score (if applicable) =	22.5

Justification / Notes :

Location 3

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal = 11.0)	Absent	Weak	Moderate	Strong
1. Continuous bed and bank	0	1	2	3
2. Sinuous channel	0	1	2	3
3. In-channel structure: riffle-pool sequences	0	1	2	3
4. Sorting of soil textures or other substrate	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	0.5	1	1.5
9. Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. At least second order channel on existing USGS or NRCS map	No = 0		Yes = 3	

B. Hydrology (Subtotal = 5.0)	Absent	Weak	Moderate	Strong
14. Subsurface flow/discharge into channel	0	1	2	3
15. Water in channel and >48 hours since sig. rain	0	1	2	3
16. Leaf litter in channel (January – September)	1.5	1	0.5	0
17. Sediment on plants or on debris	0	0.5	1	1.5
18. Organic debris lines or piles (wrack lines)	0	0.5	1	1.5
19. Hydric soils in stream bed or sides of channel	No = 0		Yes = 1.5	

C. Biology (Subtotal = 6.5)	Absent	Weak	Moderate	Strong
20. Fibrous roots in channel [1]	3	2	1	0
21. Rooted plants in channel [1]	3	2	1	0
22. Crayfish in stream (exclude in floodplain)	0	0.5	1	1.5
23. Bivalves/mussels	0	1	2	3
24. Amphibians	0	0.5	1	1.5
25. Macrobenthos (record type & abundance)	0	1	2	3
26. Filamentous algae; periphyton	0	1	2	3
27. Iron oxidizing bacteria/fungus	0	0.5	1	1.5
28. Wetland plants in channel [2]	0	0.5	1	2

[1] Focus is on the presence of upland plants. [2] Focus is on the presence of aquatic or wetland plants.

Total Points = 22.5

Under Normal Conditions, Watercourse is a Wet Weather Conveyance if Secondary Indicator Score < 19 points

Notes : water strider, beetle, odonates, tipulidae, crayfish, chironomid

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: Davidson	Named Waterbody: Sims Branch	Date/Time: 9/30/2019
Assessors/Affiliation: Stan Rudzinski; Scott Glover (WOOD)		Project ID : **Location 4**
Site Name/Description: BNA – Concourse and Gate Expansion		
Site Location: Nashville International Airport		
USGS quad: Nashville East	HUC (12 digit): 051302020102	Lat/Long: 36.137262 -86.674045
Previous Rainfall (7-days) : 0.01 inches		
Precipitation this Season vs. Normal : very wet wet average dry drought unknown Source of recent & seasonal precip data :		
Watershed Size : ~790 acres	Photos: Y or N (circle) Number :	
Soil Type(s) / Geology :Lindell silt loam, 0 to 2 percent slopes, occasionally flooded Source:NRCS WebSoilSurvey		
Surrounding Land Use : Airport runway, airport terminal, mowed/maintained grassed areas/small wood lots		
Degree of historical alteration to natural channel morphology & hydrology (circle one & describe fully in Notes) : Severe Moderate Slight Absent		

Primary Field Indicators Observed

Primary Indicators	NO	YES
1. Hydrologic feature exists solely due to a process discharge	✓	WWC
2. Defined bed and bank absent, dominated by upland vegetation / grass	✓	WWC
3. Watercourse dry anytime during February through April 15th, under normal precipitation / groundwater conditions	N/A	WWC
4. Daily flow and precipitation records showing feature only flows in direct response to rainfall	✓	WWC
5. Presence of multiple populations of obligate lotic organisms with ≥2 month aquatic phase	✓	Stream
6. Presence of fish (except *Gambusia*)		Stream
7. Presence of naturally occurring ground water table connection	✓	Stream
8. Flowing water in channel and 7 days since last precipitation in local watershed	N/A	Stream
9. Evidence watercourse has been used as a supply of drinking water	✓	Stream

NOTE : If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contradictory evidence, determination is complete.

In the absence of a primary indicator, or other definitive evidence, complete the secondary indicator table on page 2 of this sheet, and provide score below.

Guidance for the interpretation and scoring of both the primary & secondary indicators is provided in *TDEC-WPC Guidance For Making Hydrologic Determinations, Version 1.4*

Overall Hydrologic Determination = Stream

Secondary Indicator Score (if applicable) = 28.5

Justification / Notes :

Secondary Field Indicator Evaluation

Location 4

A. Geomorphology (Subtotal = 14.0)	Absent	Weak	Moderate	Strong
1. Continuous bed and bank	0	1	2	3
2. Sinuous channel	0	1	2	3
3. In-channel structure: riffle-pool sequences	0	1	2	3
4. Sorting of soil textures or other substrate	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	0.5	1	1.5
9. Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. At least second order channel on existing USGS or NRCS map	No = 0		Yes = 3	

B. Hydrology (Subtotal = 5.0)	Absent	Weak	Moderate	Strong
14. Subsurface flow/discharge into channel	0	1	2	3
15. Water in channel and >48 hours since sig. rain	0	1	2	3
16. Leaf litter in channel (January – September)	1.5	1	0.5	0
17. Sediment on plants or on debris	0	0.5	1	1.5
18. Organic debris lines or piles (wrack lines)	0	0.5	1	1.5
19. Hydric soils in stream bed or sides of channel	No = 0		Yes = 1.5	

C. Biology (Subtotal = 9.5)	Absent	Weak	Moderate	Strong
20. Fibrous roots in channel [1]	3	2	1	0
21. Rooted plants in channel [1]	3	2	1	0
22. Crayfish in stream (exclude in floodplain)	0	0.5	1	1.5
23. Bivalves/mussels	0	1	2	3
24. Amphibians	0	0.5	1	1.5
25. Macrobenthos (record type & abundance)	0	1	2	3
26. Filamentous algae; periphyton	0	1	2	3
27. Iron oxidizing bacteria/fungus	0	0.5	1	1.5
28. Wetland plants in channel [2]	0	0.5	1	2

[1] Focus is on the presence of upland plants. [2] Focus is on the presence of aquatic or wetland plants.

Total Points = 28.5

Under Normal Conditions, Watercourse is a Wet Weather Conveyance if Secondary Indicator Score < 19 points

Notes : mayfly, scud, odonate, water beetle, water strider, chironomid, crayfish

Fish: stoneroller; darter

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: Davidson	Named Waterbody: UNT to Sims Br	Date/Time: 9/30/2019
Assessors/Affiliation: Stan Rudzinski; Scott Glover (WOOD)		Project ID : **Location 5**
Site Name/Description: BNA – Concourse and Gate Expansion		
Site Location: Nashville International Airport		
USGS quad: Nashville East	HUC (12 digit): 051302020102	Lat/Long: 36.137116 -86.673360
Previous Rainfall (7-days) : 0.01 inches		
Precipitation this Season vs. Normal : very wet wet average dry drought unknown Source of recent & seasonal precip data :		
Watershed Size : ~80 acres	Photos: Y or N (circle) Number :	
Soil Type(s) / Geology :Lindell silt loam, 0 to 2 percent slopes, occasionally flooded Source:NRCS WebSoilSurvey		
Surrounding Land Use : Airport runway, airport terminal, mowed/maintained grassed areas/small wood lots		
Degree of historical alteration to natural channel morphology & hydrology (circle one & describe fully in Notes) : Severe Moderate Slight Absent		

Primary Field Indicators Observed

Primary Indicators	NO	YES
1. Hydrologic feature exists solely due to a process discharge	✓	WWC
2. Defined bed and bank absent, dominated by upland vegetation / grass	✓	WWC
3. Watercourse dry anytime during February through April 15th, under normal precipitation / groundwater conditions	N/A	WWC
4. Daily flow and precipitation records showing feature only flows in direct response to rainfall	✓	WWC
5. Presence of multiple populations of obligate lotic organisms with ≥2 month aquatic phase	✓	Stream
6. Presence of fish (except *Gambusia*)		Stream
7. Presence of naturally occurring ground water table connection	✓	Stream
8. Flowing water in channel and 7 days since last precipitation in local watershed	N/A	Stream
9. Evidence watercourse has been used as a supply of drinking water	✓	Stream

NOTE : If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contradictory evidence, determination is complete.

In the absence of a primary indicator, or other definitive evidence, complete the secondary indicator table on page 2 of this sheet, and provide score below.

Guidance for the interpretation and scoring of both the primary & secondary indicators is provided in *TDEC-WPC Guidance For Making Hydrologic Determinations, Version 1.4*

Overall Hydrologic Determination = Stream

Secondary Indicator Score (if applicable) = 23.5

Justification / Notes : Flow at very lower end near Sims Branch; pools above

Secondary Field Indicator Evaluation

Location 5

A. Geomorphology (Subtotal = 13.0)	Absent	Weak	Moderate	Strong
1. Continuous bed and bank	0	1	2	3
2. Sinuous channel	0	1	2	3
3. In-channel structure: riffle-pool sequences	0	1	2	3
4. Sorting of soil textures or other substrate	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	0.5	1	1.5
9. Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. At least second order channel on existing USGS or NRCS map	No = 0		Yes = 3	

B. Hydrology (Subtotal = 4.0)	Absent	Weak	Moderate	Strong
14. Subsurface flow/discharge into channel	0	1	2	3
15. Water in channel and >48 hours since sig. rain	0	1	2	3
16. Leaf litter in channel (January – September)	1.5	1	0.5	0
17. Sediment on plants or on debris	0	0.5	1	1.5
18. Organic debris lines or piles (wrack lines)	0	0.5	1	1.5
19. Hydric soils in stream bed or sides of channel	No = 0		Yes = 1.5	

C. Biology (Subtotal = 6.5)	Absent	Weak	Moderate	Strong
20. Fibrous roots in channel [1]	3	2	1	0
21. Rooted plants in channel [1]	3	2	1	0
22. Crayfish in stream (exclude in floodplain)	0	0.5	1	1.5
23. Bivalves/mussels	0	1	2	3
24. Amphibians	0	0.5	1	1.5
25. Macrobenthos (record type & abundance)	0	1	2	3
26. Filamentous algae; periphyton	0	1	2	3
27. Iron oxidizing bacteria/fungus	0	0.5	1	1.5
28. Wetland plants in channel [2]	0	0.5	1	2

[1] Focus is on the presence of upland plants. [2] Focus is on the presence of aquatic or wetland plants.

Total Points = 23.5

Under Normal Conditions, Watercourse is a Wet Weather Conveyance if Secondary Indicator Score < 19 points

Notes : mayfly, scud, chironomidae, odonate, water strider

Fish : Stoneroller

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: Davidson	Named Waterbody: Sims Branch	Date/Time: 9/30/2019
Assessors/Affiliation: Stan Rudzinski; Scott Glover (WOOD)		Project ID : Location 6
Site Name/Description: BNA – Concourse and Gate Expansion		
Site Location: Nashville International Airport		
USGS quad: Nashville East	HUC (12 digit): 051302020102	Lat/Long: 36.139059 -86.674779
Previous Rainfall (7-days) : 0.01 inches		
Precipitation this Season vs. Normal : very wet wet average dry drought unknown Source of recent & seasonal precip data :		
Watershed Size : ~850 acres	Photos: Y or N (circle) Number :	
Soil Type(s) / Geology :Lindell silt loam, 0 to 2 percent slopes, occasionally flooded Source:NRCS WebSoilSurvey		
Surrounding Land Use : Airport runway, airport terminal, mowed/maintained grassed areas/small wood lots		
Degree of historical alteration to natural channel morphology & hydrology (circle one & describe fully in Notes) : Severe Moderate Slight Absent		

Primary Field Indicators Observed

Primary Indicators	NO	YES
1. Hydrologic feature exists solely due to a process discharge	✓	WWC
2. Defined bed and bank absent, dominated by upland vegetation / grass	✓	WWC
3. Watercourse dry anytime during February through April 15th, under normal precipitation / groundwater conditions	N/A	WWC
4. Daily flow and precipitation records showing feature only flows in direct response to rainfall	✓	WWC
5. Presence of multiple populations of obligate lotic organisms with ≥2 month aquatic phase	✓	Stream
6. Presence of fish (except *Gambusia*)		Stream
7. Presence of naturally occurring ground water table connection	✓	Stream
8. Flowing water in channel and 7 days since last precipitation in local watershed	N/A	Stream
9. Evidence watercourse has been used as a supply of drinking water	✓	Stream

NOTE : If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contradictory evidence, determination is complete.

In the absence of a primary indicator, or other definitive evidence, complete the secondary indicator table on page 2 of this sheet, and provide score below.

Guidance for the interpretation and scoring of both the primary & secondary indicators is provided in *TDEC-WPC Guidance For Making Hydrologic Determinations, Version 1.4*

Overall Hydrologic Determination = Stream

Secondary Indicator Score (if applicable) = 29.0

Justification / Notes :

Secondary Field Indicator Evaluation

Location 6

A. Geomorphology (Subtotal = 14.0)	Absent	Weak	Moderate	Strong
1. Continuous bed and bank	0	1	2	3
2. Sinuous channel	0	1	2	3
3. In-channel structure: riffle-pool sequences	0	1	2	3
4. Sorting of soil textures or other substrate	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	0.5	1	1.5
9. Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. At least second order channel on existing USGS or NRCS map	No = 0		Yes = 3	

B. Hydrology (Subtotal = 5.5)	Absent	Weak	Moderate	Strong
14. Subsurface flow/discharge into channel	0	1	2	3
15. Water in channel and >48 hours since sig. rain	0	1	2	3
16. Leaf litter in channel (January – September)	1.5	1	0.5	0
17. Sediment on plants or on debris	0	0.5	1	1.5
18. Organic debris lines or piles (wrack lines)	0	0.5	1	1.5
19. Hydric soils in stream bed or sides of channel	No = 0		Yes = 1.5	

C. Biology (Subtotal = 9.5)	Absent	Weak	Moderate	Strong
20. Fibrous roots in channel [1]	3	2	1	0
21. Rooted plants in channel [1]	3	2	1	0
22. Crayfish in stream (exclude in floodplain)	0	0.5	1	1.5
23. Bivalves/mussels	0	1	2	3
24. Amphibians	0	0.5	1	1.5
25. Macrobenthos (record type & abundance)	0	1	2	3
26. Filamentous algae; periphyton	0	1	2	3
27. Iron oxidizing bacteria/fungus	0	0.5	1	1.5
28. Wetland plants in channel [2]	0	0.5	1	2

[1] Focus is on the presence of upland plants. [2] Focus is on the presence of aquatic or wetland plants.

Total Points = 29.0

Under Normal Conditions, Watercourse is a Wet Weather Conveyance if Secondary Indicator Score < 19 points

Notes : may fly, chironomid, scuds, odonates, water strider, caddisfly, snail

Fish: Stone roller; creek chub

Hydrologic Determination Field Data Sheet
Tennessee Division of Water Pollution Control, Version 1.4

County: Davidson	Named Waterbody: Sims Branch	Date/Time: 9/30/2019
Assessors/Affiliation: Stan Rudzinski; Scott Glover (WOOD)		Project ID : **Location 7**
Site Name/Description: BNA – Concourse and Gate Expansion		
Site Location: Nashville International Airport		
USGS quad: Nashville East	HUC (12 digit): 051302020102	Lat/Long: 36.140395 -86.675300
Previous Rainfall (7-days) : 0.01 inches		
Precipitation this Season vs. Normal : very wet wet average dry drought unknown Source of recent & seasonal precip data :		
Watershed Size : ~1,000 acres	Photos: Y or N (circle) Number :	
Soil Type(s) / Geology :Lindell silt loam, 0 to 2 percent slopes, occasionally flooded Source:NRCS WebSoilSurvey		
Surrounding Land Use : Airport runway, airport terminal, mowed/maintained grassed areas/small wood lots		
Degree of historical alteration to natural channel morphology & hydrology (circle one & describe fully in Notes) : Severe Moderate Slight Absent		

Primary Field Indicators Observed

Primary Indicators	NO	YES
1. Hydrologic feature exists solely due to a process discharge	✓	WWC
2. Defined bed and bank absent, dominated by upland vegetation / grass	✓	WWC
3. Watercourse dry anytime during February through April 15th, under normal precipitation / groundwater conditions	N/A	WWC
4. Daily flow and precipitation records showing feature only flows in direct response to rainfall	✓	WWC
5. Presence of multiple populations of obligate lotic organisms with ≥2 month aquatic phase	✓	Stream
6. Presence of fish (except *Gambusia*)		Stream
7. Presence of naturally occurring ground water table connection	✓	Stream
8. Flowing water in channel and 7 days since last precipitation in local watershed	N/A	Stream
9. Evidence watercourse has been used as a supply of drinking water	✓	Stream

NOTE : If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contradictory evidence, determination is complete.

In the absence of a primary indicator, or other definitive evidence, complete the secondary indicator table on page 2 of this sheet, and provide score below.

Guidance for the interpretation and scoring of both the primary & secondary indicators is provided in *TDEC-WPC Guidance For Making Hydrologic Determinations, Version 1.4*

Overall Hydrologic Determination = Stream

Secondary Indicator Score (if applicable) = 30.0

Justification / Notes :

Location 7

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal = 13.0)	Absent	Weak	Moderate	Strong
1. Continuous bed and bank	0	1	2	3
2. Sinuous channel	0	1	2	3
3. In-channel structure: riffle-pool sequences	0	1	2	3
4. Sorting of soil textures or other substrate	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	0.5	1	1.5
9. Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. At least second order channel on existing USGS or NRCS map	No = 0		Yes = 3	

B. Hydrology (Subtotal = 7.0)	Absent	Weak	Moderate	Strong
14. Subsurface flow/discharge into channel	0	1	2	3
15. Water in channel and >48 hours since sig. rain	0	1	2	3
16. Leaf litter in channel (January – September)	1.5	1	0.5	0
17. Sediment on plants or on debris	0	0.5	1	1.5
18. Organic debris lines or piles (wrack lines)	0	0.5	1	1.5
19. Hydric soils in stream bed or sides of channel	No = 0		Yes = 1.5	

C. Biology (Subtotal = 10.0)	Absent	Weak	Moderate	Strong
20. Fibrous roots in channel [1]	3	2	1	0
21. Rooted plants in channel [1]	3	2	1	0
22. Crayfish in stream (exclude in floodplain)	0	0.5	1	1.5
23. Bivalves/mussels	0	1	2	3
24. Amphibians	0	0.5	1	1.5
25. Macrobenthos (record type & abundance)	0	1	2	3
26. Filamentous algae; periphyton	0	1	2	3
27. Iron oxidizing bacteria/fungus	0	0.5	1	1.5
28. Wetland plants in channel [2]	0	0.5	1	2

[1] Focus is on the presence of upland plants. [2] Focus is on the presence of aquatic or wetland plants.

Total Points = 30.0

Under Normal Conditions, Watercourse is a Wet Weather Conveyance if Secondary Indicator Score < 19 points

Notes : caddisflies (2), scud, mayfly, chironomid, water strider, snail, odonate

Fish: stoneroller; creek chub

Fieldwork completed on
September 30, 2019 @ BNA

NOAA - BNA

Table 1. Calculation of Normal Weather Conditions

Std Dev		Month	Long-term rainfall records: Minus One Std. Dev. (DRY)	Long-term rainfall records: Normal (Mean inches)	Long-term rainfall records: Plus One Std. Dev. (WET)	Actual Rainfall	Condition (dry, wet, normal)	Condition value	Month weight value	Product of previous two columns
1.61	1st prior month *	Aug 2019	1.56	3.17	4.78	4.78	Normal	2	x 3	6
1.77	2nd prior month *	July 2019	1.87	3.64	5.41	4.81	Normal	2	x 2	4
2.44	3rd prior month *	June 2019	1.70	4.14	6.58	8.34	Wet	3	x 1	3
									Sum =	13

Note:

If sum is:	
6-9	then prior period has been drier than normal
10-14	then prior period has been normal
15-18	Then prior period has been wetter than normal

Condition value:	
Dry =	1
Normal =	2
Wet =	3

Conclusions: Prior period has been normal

```
1 234.004130436248
2 197.344497294059
3 236.736550379772
4 190.62398183067
5 210.181907607944
6 244.40697408133    2.44
7 177.665546830589   1.77
8 161.851457471702   1.61
9 209.156599860741
10 153.817840848405
11 176.804118522535
12 268.616960426127
13 234.004130436248
14 197.344497294059
15 236.736550379772
16 190.62398183067
17 210.181907607944
18 244.40697408133
19 177.665546830589
20 161.851457471702
21 209.156599860741
22 153.817840848405
23 176.804118522535
24 268.616960426127
```

National Centers for Environmental Information

Data Tools: 1981-2010 Normals

The 1981-2010 Climate Normals are NCDC's latest three-decade averages of climatological variables, including temperature and precipitation. This new product replaces the 1971-2000 Climate Normals (http://hurricane.ncdc.noaa.gov/cgi-bin/climatenormals/climatenormals.pl?directive=prod_select&subrnum=) product, which remains available as historical data.

The tool below provides temperature and precipitation Climate Normals for over 9,800 stations across the United States. Begin by selecting the desired dataset tab to view monthly, daily, annual/seasonal, or hourly Normals. Then select the desired location and a corresponding station.

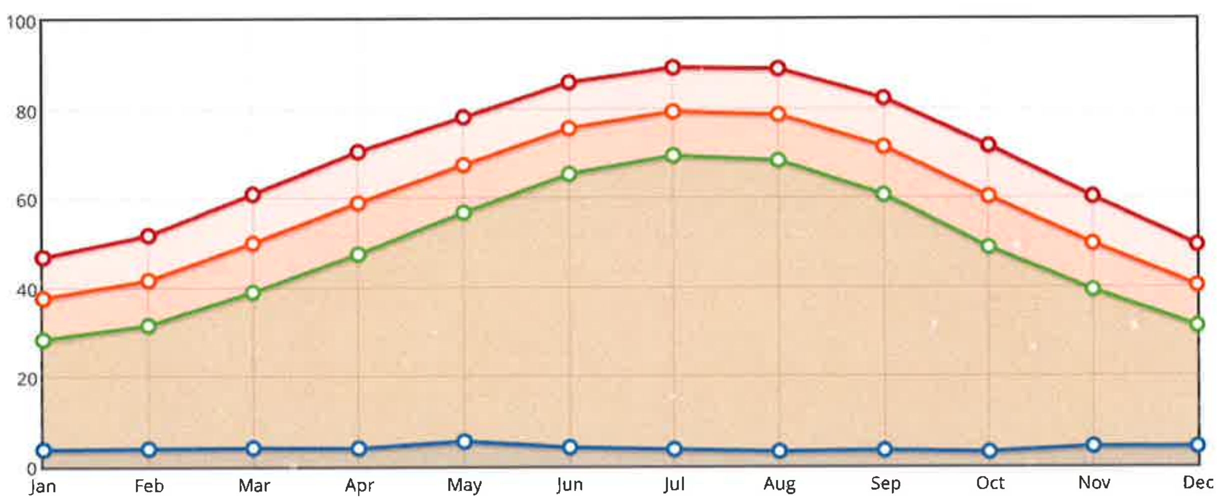
Monthly Normals | Daily Normals | Annual/Seasonal Normals | Hourly Normals

Use the form below to select the geographic region in the first pane, then select the station name in the next pane as the name list is populated.

TEXAS	NEAPOLIS EXPERIMENTAL STATION, TN US
UTAH	NEWCOMB, TN US
VERMONT	NEWPORT 1 NW, TN US
VIRGINIA	NORRIS, TN US
WASHINGTON	OAK RIDGE ASOS, TN US
WEST VIRGINIA	OAK RIDGE ATDD, TN US
WISCONSIN	OLD HICKORY DAM, TN US

NASHVILLE INTERNATIONAL AIRPORT, TN US

View Station Details (https://www.ncdc.noaa.gov/cdo-web/datasets/normal_mly/stations/GHCND:USW00013897/detail) | View Station Report



MONTH	PRECIP (IN)	MIN TMP (°F)	AVG TMP (°F)	MAX TMP (°F)
01	3.75	28.4	37.7	46.9
02	3.94	31.6	41.7	51.8
03	4.11	39.0	50.0	61.0
04	4.00	47.5	59.0	70.5
05	5.50	56.8	67.5	78.2

MONTH	PRECIP (IN)	MIN TMP (°F)	AVG TMP (°F)	MAX TMP (°F)
06	4.14	65.4	75.7	86.0
07	3.64	69.5	79.4	89.3
08	3.17	68.4	78.7	89.0
09	3.41	60.7	71.5	82.4
10	3.04	48.9	60.3	71.7
11	4.31	39.4	49.8	60.3
12	4.24	31.3	40.4	49.5

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Current Location: Elev: 600 ft. Lat: 36.1189° N Lon: -86.6892° W
Station: **NASHVILLE INTERNATIONAL AIRPORT, TN US USW00013897**

Record of Climatological Observations

These data are quality controlled and may not be identical to the original observations.

Generated on 10/10/2019

Sept 2019

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Observation Time Temperature: Unknown Observation Time Precipitation: 2400

Year	Month	Day	Temperature (F) 24 Hrs. Ending at Observation Time Max.	Temperature (F) 24 Hrs. Ending at Observation Time Min.	Temperature (F) At Observation	Precipitation 24 Hour Amounts Ending at Observation Time Rain, Melted Snow, Etc. (in)	Flag	Precipitation 24 Hour Amounts Ending at Observation Time Snow, Ice Pellets, Hail (in)	Flag	Precipitation At Obs. Time Snow, Ice Pellets, Hail, Ice on Ground (in)	Evaporation 24 Hour Wind Movement (mi)	Evaporation Amount of Evap. (in)	Soil Temperature (F) 4 in. Depth Ground Cover (see *)	4 in. Depth Max.	4 in. Depth Min.	Soil Temperature (F) 8 in. Depth Ground Cover (see *)	8 in. Depth Max.	8 in. Depth Min.
2019	09	01	91	67		0.00		0.0		0.0								
2019	09	02	93	71		0.00		0.0		0.0								
2019	09	03	94	68		0.00		0.0		0.0								
2019	09	04	97	68		0.00		0.0		0.0								
2019	09	05	87	66		0.00		0.0		0.0								
2019	09	06	93	63		0.00		0.0		0.0								
2019	09	07	88	66		0.00		0.0		0.0								
2019	09	08	89	63		0.00		0.0		0.0								
2019	09	09	95	67		0.00		0.0		0.0								
2019	09	10	99	70		0.01		0.0		0.0								
2019	09	11	98	70		0.00		0.0		0.0								
2019	09	12	97	71		0.00		0.0		0.0								
2019	09	13	99	73		T		0.0		0.0								
2019	09	14	94	71		0.00		0.0		0.0								
2019	09	15	97	65		0.00		0.0		0.0								
2019	09	16	99	71		0.00		0.0		0.0								
2019	09	17	96	72		0.00		0.0		0.0								
2019	09	18	95	68		0.00		0.0		0.0								
2019	09	19	91	70		0.00		0.0		0.0								
2019	09	20	89	68		0.00		0.0		0.0								
2019	09	21	92	66		0.00		0.0		0.0								
2019	09	22	92	64		0.00		0.0		0.0								
2019	09	23	89	69		0.01		0.0		0.0								
2019	09	24	85	60		0.00		0.0		0.0								
2019	09	25	92	57		T		0.0		0.0								
2019	09	26	82	68		T		0.0		0.0								
2019	09	27	95	68		0.00		0.0		0.0								
2019	09	28	94	71		0.00		0.0		0.0								
2019	09	29	97	68		0.00		0.0		0.0								
2019	09	30	98	70		0.00		0.0		0.0								
		Summary	93	68		0.02		0.0										

Empty, or blank, cells indicate that a data observation was not reported.

*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

"s" This data value failed one of NCDC's quality control tests.

"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.

"A" values in the Precipitation Flag or the Snow Flag column indicate a multiday total, accumulated since last measurement, is being used.

Data value inconsistency may be present due to rounding calculations during the conversion process from SI metric units to standard imperial units.

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Record of Climatological Observations

These data are quality controlled and may not be identical to the original observations.

Generated on 10/10/2019

Aug 2019

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 600 ft. Lat: 36.1189° N Lon: -86.6892° W
Station: **NASHVILLE INTERNATIONAL AIRPORT, TN US USW00013897**

Observation Time Temperature: Unknown Observation Time Precipitation: 2400

			Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time			24 Hour Amounts Ending at Observation Time				At Obs. Time			4 in. Depth			8 in. Depth		
Year	Month	Day	Max.	Min.	At Observation	Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)	24 Hour Wind Movement (mi)	Amount of Evap. (in)	Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2019	08	01	92	71		0.00		0.0		0.0								
2019	08	02	92	70		0.86		0.0		0.0								
2019	08	03	92	70		0.07		0.0		0.0								
2019	08	04	87	69		0.56		0.0		0.0								
2019	08	05	91	68		0.00		0.0		0.0								
2019	08	06	92	68		0.60		0.0		0.0								
2019	08	07	91	67		0.00		0.0		0.0								
2019	08	08	90	73		0.00		0.0		0.0								
2019	08	09	92	77		T		0.0		0.0								
2019	08	10	93	74		T		0.0		0.0								
2019	08	11	94	69		0.00		0.0		0.0								
2019	08	12	95	69		0.00		0.0		0.0								
2019	08	13	97	74		1.47		0.0		0.0								
2019	08	14	92	72		0.00		0.0		0.0								
2019	08	15	91	68		0.00		0.0		0.0								
2019	08	16	91	64		0.00		0.0		0.0								
2019	08	17	93	70		0.00		0.0		0.0								
2019	08	18	96	70		0.00		0.0		0.0								
2019	08	19	96	74		0.00		0.0		0.0								
2019	08	20	96	73		0.02		0.0		0.0								
2019	08	21	96	72		0.00		0.0		0.0								
2019	08	22	90	73		0.16		0.0		0.0								
2019	08	23	90	72		T		0.0		0.0								
2019	08	24	86	70		0.00		0.0		0.0								
2019	08	25	85	71		0.76		0.0		0.0								
2019	08	26	77	70		0.28		0.0		0.0								
2019	08	27	88	72		T		0.0		0.0								
2019	08	28	88	64		0.00		0.0		0.0								
2019	08	29	86	58		0.00		0.0		0.0								
2019	08	30	92	62		0.00		0.0		0.0								
2019	08	31	92	64		0.00		0.0		0.0								
		Summary	91	70		4.78		0.0										

Empty, or blank, cells indicate that a data observation was not reported.

*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

"s" This data value failed one of NCDC's quality control tests.

"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.

"A" values in the Precipitation Flag or the Snow Flag column indicate a multiday total, accumulated since last measurement, is being used.

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Current Location: Elev: 600 ft. Lat: 36.1189° N Lon: -86.6892° W
Station: **NASHVILLE INTERNATIONAL AIRPORT, TN US USW00013897**

Record of Climatological Observations

These data are quality controlled and may not be identical to the original observations.

Generated on 10/10/2019

July 2019

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Observation Time Temperature: Unknown Observation Time Precipitation: 2400

			Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Observation	24 Hour Amounts Ending at Observation Time				At Obs. Time			4 in. Depth			8 in. Depth		
Year	Month	Day	Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)	24 Hour Wind Movement (mi)	Amount of Evap. (in)	Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2019	07	01	93	72		0.00		0.0		0.0								
2019	07	02	93	73		T		0.0		0.0								
2019	07	03	92	73		0.23		0.0		0.0								
2019	07	04	91	71		0.26		0.0		0.0								
2019	07	05	91	72		T		0.0		0.0								
2019	07	06	93	71		0.09		0.0		0.0								
2019	07	07	93	75		0.38		0.0		0.0								
2019	07	08	94	74		0.00		0.0		0.0								
2019	07	09	96	74		0.00		0.0		0.0								
2019	07	10	93	74		0.01		0.0		0.0								
2019	07	11	95	75		0.00		0.0		0.0								
2019	07	12	93	75		0.00		0.0		0.0								
2019	07	13	95	76		T		0.0		0.0								
2019	07	14	87	73		T		0.0		0.0								
2019	07	15	86	73		0.03		0.0		0.0								
2019	07	16	92	74		0.01		0.0		0.0								
2019	07	17	90	76		0.01		0.0		0.0								
2019	07	18	91	74		0.04		0.0		0.0								
2019	07	19	96	73		0.00		0.0		0.0								
2019	07	20	97	77		0.39		0.0		0.0								
2019	07	21	90	72		0.06		0.0		0.0								
2019	07	22	90	70		2.63		0.0		0.0								
2019	07	23	83	68		0.01		0.0		0.0								
2019	07	24	85	61		0.00		0.0		0.0								
2019	07	25	86	60		0.00		0.0		0.0								
2019	07	26	90	64		0.00		0.0		0.0								
2019	07	27	91	66		0.00		0.0		0.0								
2019	07	28	93	66		0.00		0.0		0.0								
2019	07	29	92	69		0.00		0.0		0.0								
2019	07	30	91	72		0.66		0.0		0.0								
2019	07	31	91	70		0.00		0.0		0.0								
		Summary	91	71		4.81		0.0										

Empty, or blank, cells indicate that a data observation was not reported.

*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

"s" This data value failed one of NCDC's quality control tests.

"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.

"A" values in the Precipitation Flag or the Snow Flag column indicate a multiday total, accumulated since last measurement, is being used.

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Current Location: Elev: 600 ft. Lat: 36.1189° N Lon: -86.6892° W
Station: **NASHVILLE INTERNATIONAL AIRPORT, TN US USW00013897**

Record of Climatological Observations

These data are quality controlled and may not be identical to the original observations.

Generated on 10/10/2019

June 2019

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Observation Time Temperature: Unknown Observation Time Precipitation: 2400

			Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time			24 Hour Amounts Ending at Observation Time				At Obs. Time			4 in. Depth			8 in. Depth		
Year	Month	Day	Max.	Min.	At Observation	Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)	24 Hour Wind Movement (mi)	Amount of Evap. (in)	Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2019	06	01	88	63		0.00		0.0		0.0								
2019	06	02	91	67		0.00		0.0		0.0								
2019	06	03	85	65		0.00		0.0		0.0								
2019	06	04	87	60		0.00		0.0		0.0								
2019	06	05	94	73		0.00		0.0		0.0								
2019	06	06	79	72		0.21		0.0		0.0								
2019	06	07	80	70		1.92		0.0		0.0								
2019	06	08	84	71		0.05		0.0		0.0								
2019	06	09	87	72		0.95		0.0		0.0								
2019	06	10	84	61		0.00		0.0		0.0								
2019	06	11	77	56		0.00		0.0		0.0								
2019	06	12	81	59		0.00		0.0		0.0								
2019	06	13	78	57		0.00		0.0		0.0								
2019	06	14	82	52		0.00		0.0		0.0								
2019	06	15	89	68		0.00		0.0		0.0								
2019	06	16	92	72		0.43		0.0		0.0								
2019	06	17	90	71		0.28		0.0		0.0								
2019	06	18	86	70		1.01		0.0		0.0								
2019	06	19	89	70		0.88		0.0		0.0								
2019	06	20	85	68		0.03		0.0		0.0								
2019	06	21	91	66		0.06		0.0		0.0								
2019	06	22	91	67		0.15		0.0		0.0								
2019	06	23	93	67		0.14		0.0		0.0								
2019	06	24	85	70		0.49		0.0		0.0								
2019	06	25	90	69		0.00		0.0		0.0								
2019	06	26	91	70		1.28		T		0.0								
2019	06	27	89	67		0.46		0.0		0.0								
2019	06	28	91	67		0.00		0.0		0.0								
2019	06	29	92	72		0.00		0.0		0.0								
2019	06	30	94	73		0.00		0.0		0.0								
		Summary	87	67		8.34		0.0										

Empty, or blank, cells indicate that a data observation was not reported.

*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

"s" This data value failed one of NCDC's quality control tests.

"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.

"A" values in the Precipitation Flag or the Snow Flag column indicate a multiday total, accumulated since last measurement, is being used.

Data value inconsistency may be present due to rounding calculations during the conversion process from SI metric units to standard imperial units.

APPENDIX B
Summary of Existing Vegetation

Summary of Existing Adjacent Vegetation Observed within the stream corridors at BNA.

Scientific Name	Common Name	Areas Surveyed						
		1	2	3	4	5	6	7
Trees and Shrubs								
Acer negundo	boxelder				X	X	X	X
Acer saccharum	sugar maple							X
Acer rubrum	red maple				X	%		
Albizia julibrissin	mimosa			X	X			
Alnus serrulata	smooth alder	X	X		X			
Carya ovata	shagbark hickory					X		
Carya tomentosa	mockernut hickory							X
Celtis occidentalis	hackberry						X	X
Cornus florida	flowering dogwood				X			
Franxinus pennsylvanica	green ash				X		X	
Juglans nigra	black walnut				X	X		X
Juniperus virginana	eastern redcedar				X	X		
Ligustrum sinense	Chinese privet				X	X	X	
Liquidambar styracifua	sweet gum							
Liriodendron tulipifera	yellow poplar				X	X		X
Lonicera maackii	Amur honeysuckle		X	X	X	X	X	X
Oxydendrum arboreum	sourwood				X			
Platanus occidentalis	sycamore			X	X	X	X	X
Populus deltoides	eastern cottonwood	X	X	X				
Prunus serotina	black cherry				X			
Rosa multiflora	multiflora rose				X			
Quercus muehlenbergii	chinkapin oak				X			
Quercus rubra	northern red oak				X	X		X
Quercus velutina	black oak							X
Rhus typhina	staghorn sumac		X					
Salix nigra	black willow		X		X		X	X

Summary of Existing Adjacent Vegetation Observed within the stream corridors at BNA.

Scientific Name	Common Name	Areas Surveyed						
		1	2	3	4	5	6	7
Sassafras albidum	sassafras							X
Herbaceaous Plants								
Ambrosia trifida	giant ragweed			X			X	
Arundinaria gigantea	giant cane						X	
Campsis radicans	trumpet creeper					X	X	
Carex lurida	shallow sedge					X		
Commelina erecta	whitemouth dayflower					X		
Conoclinium coelestinum.	blue mist flower	X				X	X	
Cynodon dactylon	Bermudagrass						X	
Cyperus esculentus	yellow nutsedge	X	X					X
Euphorbia maculata	spotted spurge			X				
Festuca sp.	fescue	X	X				X	
Ipomoea sp.	morning-glory			X				
Lespedeza cuneata	sericea lespedeza		X	X		X	X	
Juncus effusus	common rush					X		
Microstegium vimineum	Japanese stiltgrass						X	
Nasturtium officinale	watercress		X					
Parthenocissus quinquefolia	Virginia creeper				X			
Perilla frutescens	beefsteakplant							X
Plantago sp.	plantain						X	
Polygonum pensylvanicum	Pennsylvania smartweed	X		X		X		X
Polygonum punctatum	spotted smartweed	X		X				
Ranunculus bulbosus	St. Anthony's turnip		X					X
Rubus sp.	blackberry			X				
Rumex sp.	dock	X		X				
Seteria glauca	yellow foxtail		X	X			X	
Smilax rotundifolia	roundleaf greenbrier					X		

Summary of Existing Adjacent Vegetation Observed within the stream corridors at BNA.

Scientific Name	Common Name	Areas Surveyed						
		1	2	3	4	5	6	7
Solidago sp.	goldenrod	X	X	X	X	X	X	
Sorghum halepense	Johnsongrass			X			X	
Toxicodendron radicans	poison ivy					X		
Verbesina virginica	white crownbeard		X				X	

Ecological Services for Proposed BNA Improvements Nashville, Tennessee

Project Location: Nashville International Airport (BNA)
Davidson County, Tennessee

Prepared For:

Garver
2049 East Joyce Boulevard
Fayetteville, AR 727037

Prepared By:

KSWA
[KS WARE & ASSOCIATES]

KSWA Project No. 100-19-0075

Prepared: April 5, 2020

Approval:

KSWA Senior Project Manager

Linda D. Main

Signature

Linda Main, PG April 5, 2020
Printed Name/Date

KSWA Environmental Scientist

Kelly Jordan

Signature

Kelly Jordan April 5, 2020
Printed Name/Date

Project Description

The Metro Nashville Airport Authority (MNAA) and their representative, Garver, have identified an area at BNA (Nashville International Airport) that is to be improved. The current project area is indicated in **Figure 1** that was provided by Garver in an email to KSWA on December 23, 2019. The area is bound to the north by the valet lot and Terminal Drive; to the east by Concourses A, B, C, and D; and to the south and west by taxiways, runways and stormwater management features.

Introduction

The legal definition of wetlands in the United States is "those areas that are inundated or saturated by surface 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." For an area to be identified as a wetland, it must have, under normal circumstances, a hydrophytic vegetation community, the presence of undrained hydric soil, and indicators of wetland hydrology.

Hydrophytic vegetation is present when the plant community is dominated by species that require, or can tolerate, prolonged inundation or soil saturation during the growing season. Vegetation determinations are based on the wetland indicator status of species that make up the plant community. Species are rated according to the probability of occurring in a wetland area, with Obligate (OBL) plant species having the highest probability (99%) and continuing through species in the Facultative categories (FACW, FAC, and FACU) which are recognized as occurring in both wetlands and uplands to varying degrees.

A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part of the soil profile. Depleted Matrix is the most common indicator of a hydric soil in this area.

The presence of wetland hydrology is determined through observations of primary and/or secondary hydrologic indicators. Hydrology is confirmed by the presence of one primary indicator or two secondary indicators of wetland hydrology. Hydrologic indicators include surface water, soil saturation, high water table, drainage patterns, stunted or stressed plants, crayfish burrows, and others.

The following sources were used for the wetland assessment desktop review and field investigation to determine the potential presence and locations of wetlands on the project site:

- 7.5-minute USGS topographic quadrangle map, East Nashville, TN – U.S. Geological Survey Map Locator & Downloader - https://store.usgs.gov/
- Soil mapping - Natural Resources Conservation Service (NRCS) Web Soil Survey - https://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

- National Wetland Inventory data – U. S. Fish and Wildlife Service Wetlands Mapper - https://www.fws.gov/wetlands/data/Mapper.html

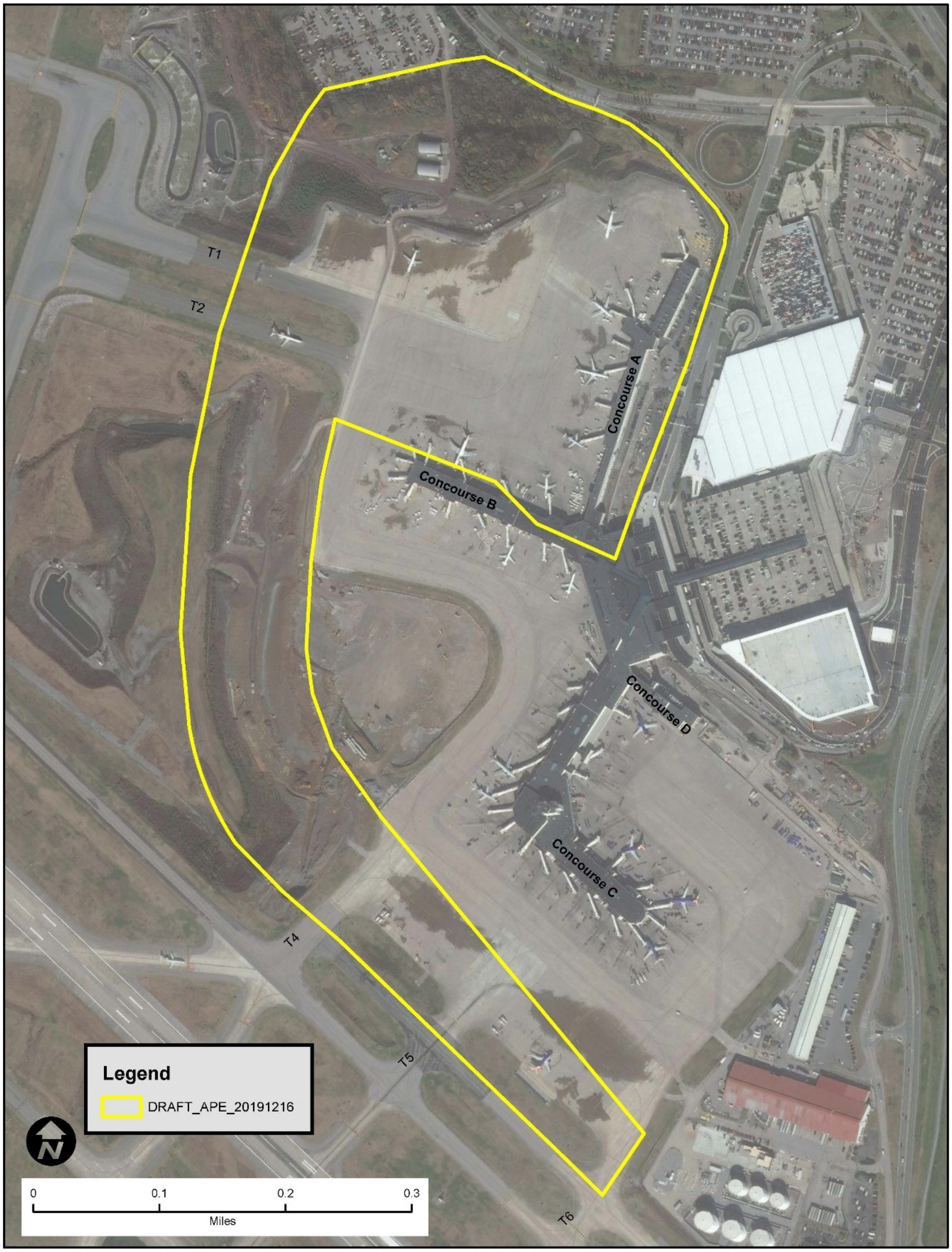


Figure 1: BNA Project Area – Nashville, TN

- 1987 U. S. Army Corps of Engineers Wetland Delineation Manual
- 2012 U.S. Army Corps of Engineers Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountain and Piedmont Region (Version 2.0). ERDC-EL TR-12-9. U.S. Army Corps of Engineers Research and Development Center, Environmental Laboratory, Vicksburg, MS - http://www.usace.army.mil/Portals/2/docs/civilworks/regulatory/reg_supp/EMP_Piedmont_v2b.pdf
- Watershed Assessment - Division of Water Resources Water Quality Assessment and Permits - https://www.tn.gov/environment/program-areas/wr-water-resources/water-quality/water-resources-data-map-viewers.html

Desktop Review

The project area consists of approximately 100 acres located on the northern side of the airport property south of Interstate 40 (See **Figures 2** and **3**). Much of the project area is covered with impervious surfaces from historic alterations of the site's natural geology and hydrology. The project area drains to Sims Branch (HUC 051302020102) in the Lower Mill Creek Watershed. The Sims Branch drainage area is approximately 992 acres at the most downstream point of the project area (See **Appendix A**). Sims Branch drains south to north within the project area. Most of the project area drains west to Sims Branch. One tributary to Sims Branch is located on the northeastern side of the project area just south of Terminal Drive. Sims Branch is assessed as "not supporting" by the Tennessee Department of Environment and Conservation (TDEC) for propylene glycol, dissolved oxygen and anthropogenic substrate alterations (See **Appendix B**).

The soils map from the NRCS in **Appendix C** indicates the project area contains moderately well drained and well drained soils on the site with the Stiversville loam series comprising 81 percent of the project area, Lindell silt loam comprising 17.5 percent and water comprising 1.2 percent. Stiversville loam is well-drained and has no hydric components. The Lindell silt loam is occasionally flooded and has a minor hydric component (Norene series 4 percent). The area that is mapped for Lindell soils is located under a fill slope. Water is indicated in a forested area near Terminal Drive. The soil map may not be accurate due to historic fill placement for airport infrastructure.

The National Wetlands Inventory Mapper from the U.S. Fish and Wildlife Service indicated six small wetland areas of similar types within the project limits totaling 8 acres. Five of those were along Sims Branch and one was in the wooded area near Terminal Drive where the NRCS soil map indicates water. These areas are shown in **Figure 4.**

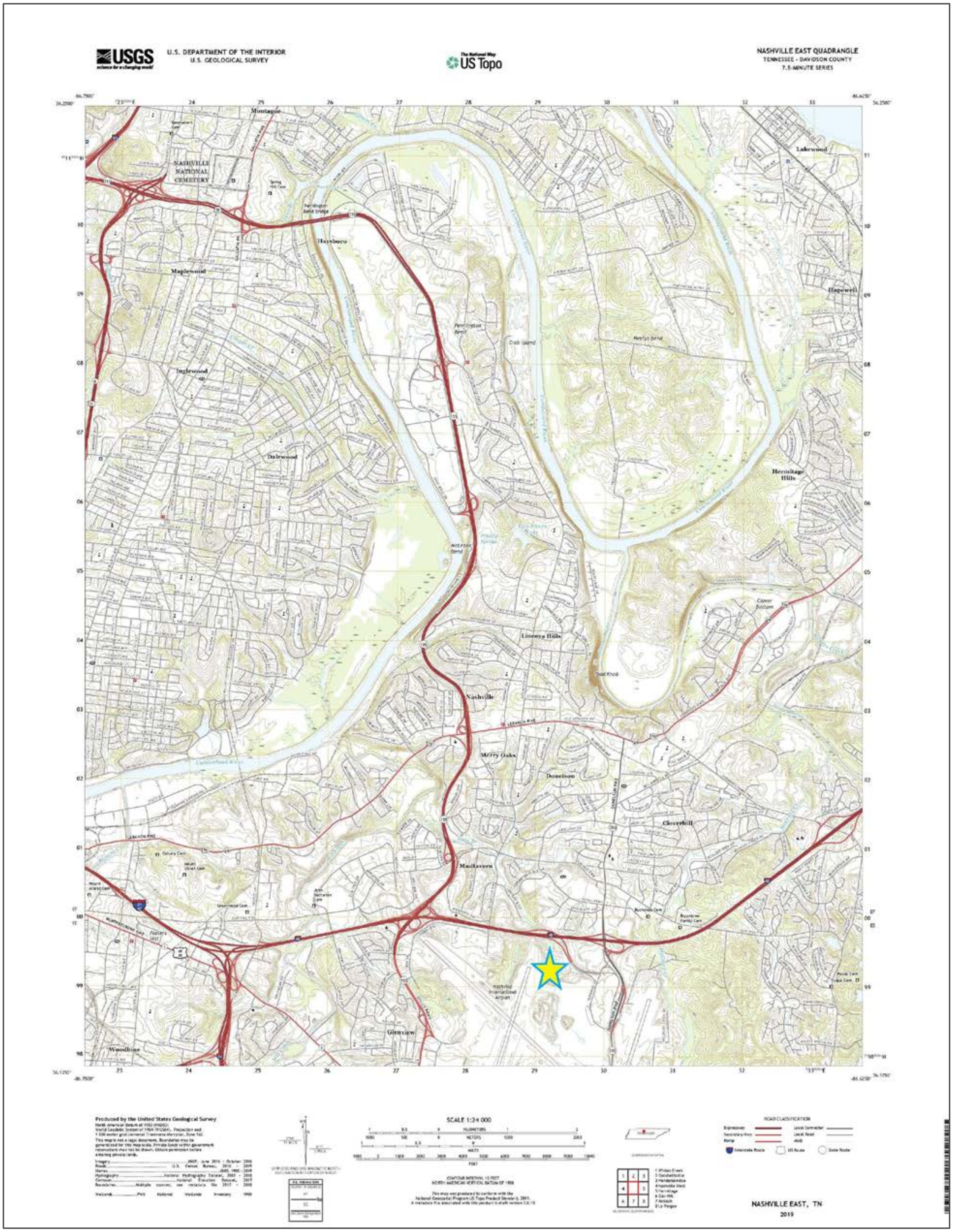


Figure 2: Location Topographic Map

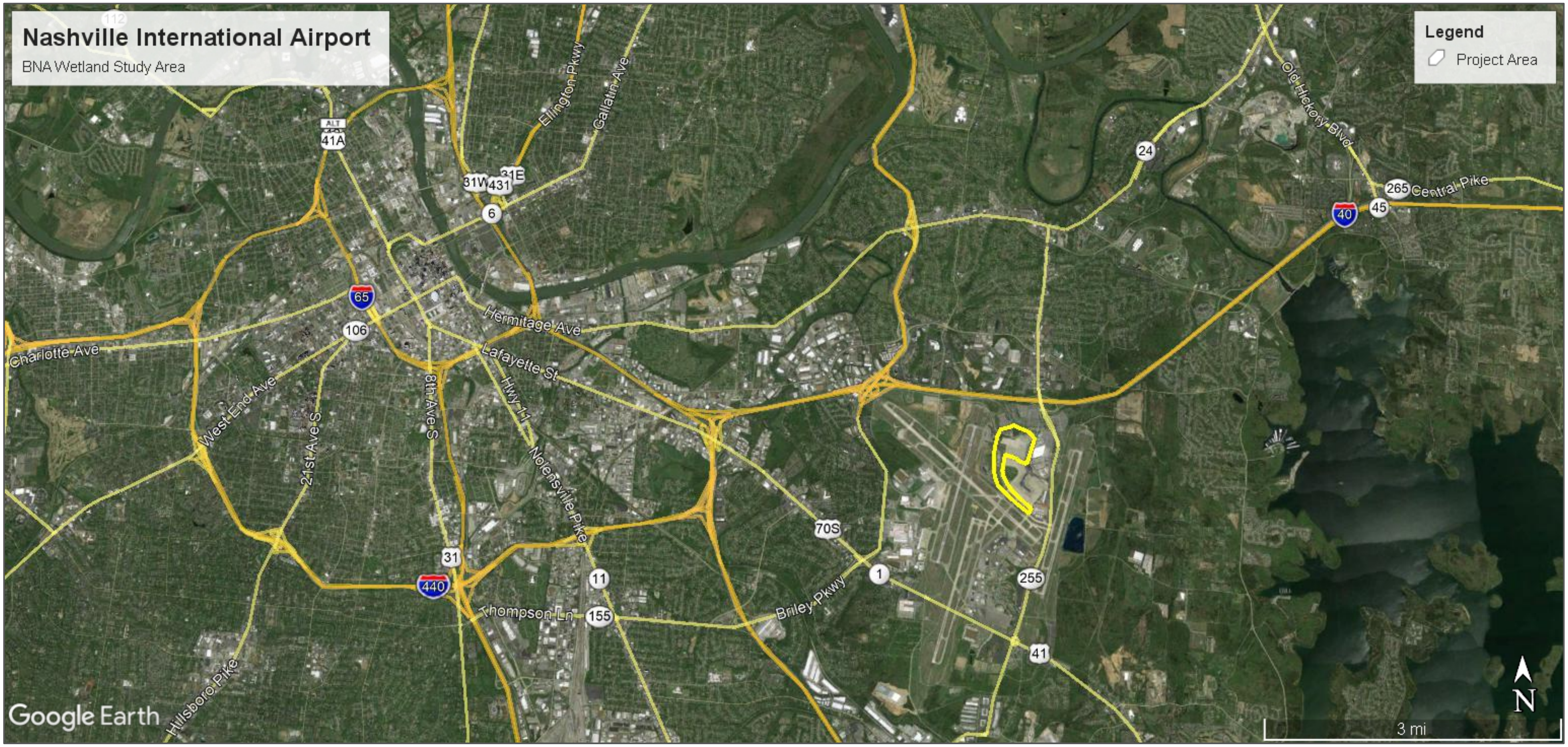
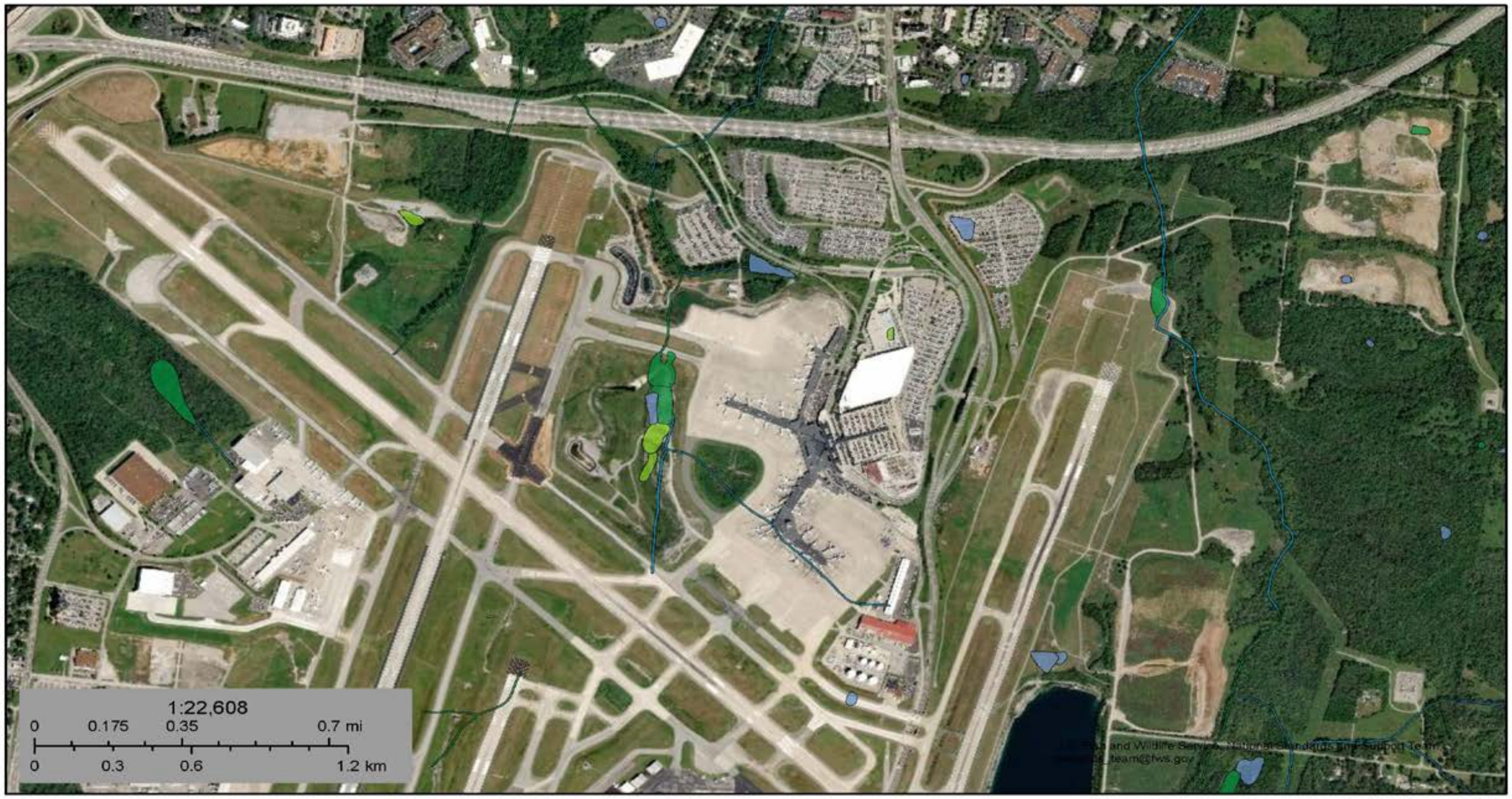


Figure 3: Location Aerial Map

U.S. Fish and Wildlife Service

National Wetlands Inventory

BNA Improvements Wetland Assessment



February 11, 2020

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

Figure 4: National Wetlands Inventory Map

The Normal Weather Calculation specified in TDEC's Guidance for Making Hydrologic Determinations Version 1.4 (May 2011) was used to determine if weather conditions had been normal over the three month period prior to the field investigation. Weather conditions could have an effect on visible indicators of hydrology such as surface water, saturation, etc. Over the 3 month period prior to the January 10, 2020 site visit, precipitation amounts have been within the normal range (± 1 standard deviation from normal). This calculation and supporting documentation are found in **Appendix D**.

Field Assessment

KSWA conducted the initial site visit on January 10, 2020 accompanied by Garver's on-site representative, Mr. Matt Koss. The second (January 16, 2020) and third (February 10, 2020) site visits were coordinated with Garver prior to entering the project site. **Table 1** shows recorded precipitation amounts. Daily data can be viewed in **Appendix D**.

Table 1: Precipitation Amounts Prior to Site Visits

Date	Within previous 48 hours	Within past 7 days
January 10, 2020	0.00	0.50
January 16, 2020	0.66	2.24
February 10, 2020	1.2	3.09

KSWA began the investigation at the southern end of the project area near Concourse C. **Figure 5** is a map showing photo locations between Concourses B and C. Most of this portion of the project area is covered in concrete. However, there are 2 vegetated sections between points B and D. These two sections are located between taxiways and used to convey stormwater to localized area drains. There was no ponding at the time of the visit and no hydric vegetation was observed. These areas are not wetlands. See **Figures 6-9**.

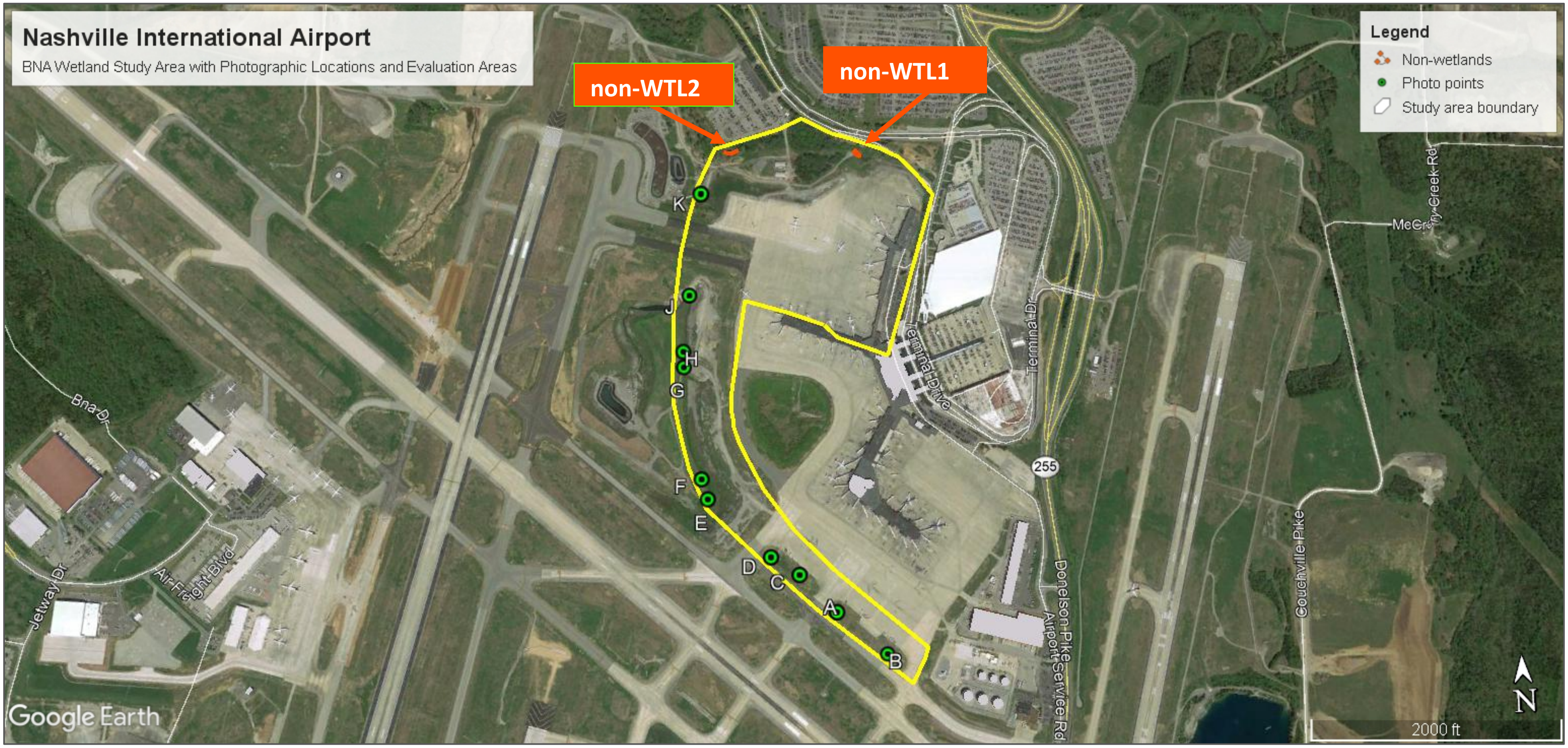


Figure 5: Photo Location Map

***There is no Point I**

Figure 6: Looking from point B to the southeast toward the tank farm from the drainage basin in the most southerly vegetated section of the project area

Figure 7: Looking southeast from point A toward point B

Figure 8: Looking from point C to the northwest at the glycol containment underground storage tank and toward point D

Figure 9: Looking southeast toward point C

The area between Point E and Point J (See **Figure 5**) is along Sims Branch. Sims Branch flows from south to north through a valley between man-made fill slopes. The stream enters the area from a culvert and has likely been relocated in the past. The channel is predominantly straight but with small bars and benches forming as it begins to return to a more natural geomorphology. Hydric plants were observed on some of the bars and benches but the flow regime is that of a stream, not a wetland. See **Figures 10-15**.

Figure 10: Looking south from point E toward a culvert as Sims Branch enters the project area

Figure 11: Looking downstream (North) from point F along Sims Branch noting depositional features

Figure 12: Looking southeast (upstream) from point G at a newly encapsulated unnamed watercourse and Sims Branch

Figure 13: Looking downstream from point H at a stream riffle

Figure 14: Looking downstream from point J at the confluence of an unnamed watercourse and Sims Branch prior to entering a culvert to be conveyed to point K

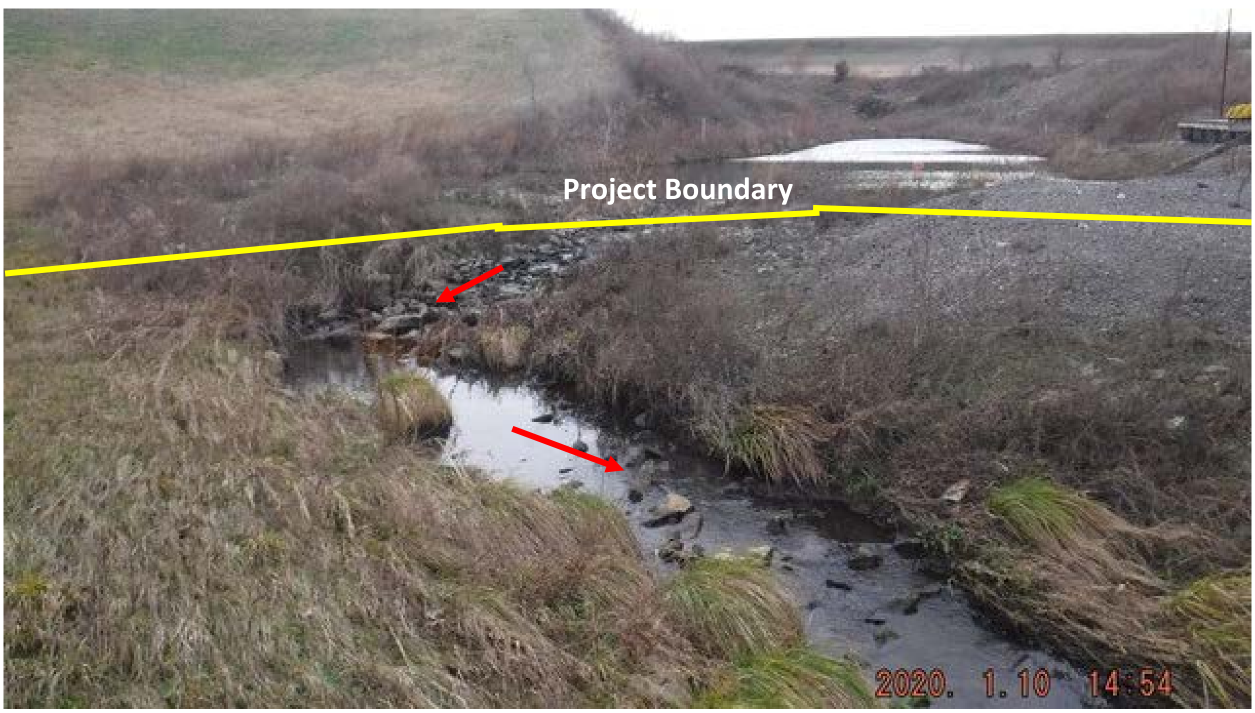


Figure 15: Looking southwest from point J – Upstream of the unnamed watercourse in Figure 14 is a small pond that is outside the project area. Red arrows are flow direction

Sims Branch exits the culvert at point K and flows between some internal roads and under a span bridge (**Figure 16**) then converges with an unnamed tributary before leaving the project area (**Figure 17**).

Figure 16: Looking upstream from point L at a span bridge. See Figure 18 for map location of point L

Figure 17: Looking north from point L at confluence of Sims Branch and an unnamed tributary prior to leaving the project area

Figure 18 is a photo location map of a smaller section within the project area showing smaller details of non-WTL2.

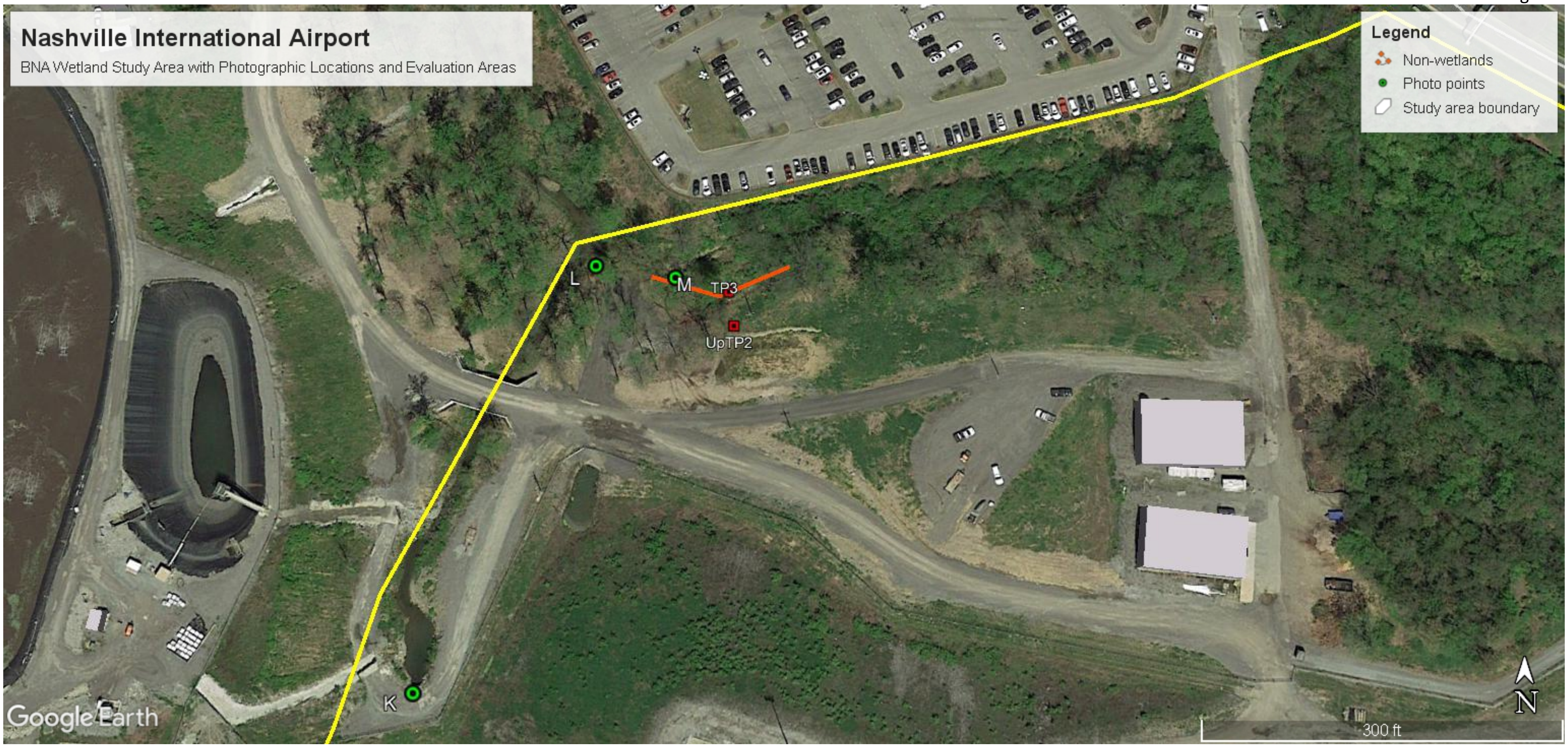


Figure 18: Map with detail of non-WTL2

A small linear channel feature, non-wetland (non-WTL2) converges with the unnamed tributary at point M upstream of the confluence with Sims Branch (**Figure 19**). This non-wetland is approximately 130 feet long and averages 4 feet wide (0.01 acres). The linear non-wetland lies within a well-defined channel that is poorly vegetated with *Juncus effuses, Carex frankii*, *Salix nigra*, *Quercus palustris*, *Lonicera maackii*, *Smilax rotundifolia,* and *Rosa multiflora*. Some areas of the wetland were void of vegetation where water ponds and water-stained leaves were in heavy packs. KSWA observed wetland hydrology in the form of saturated soils, water-stained leaves, hydrogen sulfide odor, sparsely vegetated concave surface, and geomorphic position. However, soils were not hydric as evidenced by a matrix of 2.5Y 2.5/1 with no redoximorphic features. No flow was observed in the channel on January 10, 2020, but soils were saturated with small ponded areas. The pictures are from February 10, 2020 during a short break in a rain event on top of already wet conditions and some flow was present (**Figures 20** and **21**). The January 10, 2020 visit was conducted under more typical conditions when flow was not likely affected by precipitation. The non-WTL2 soil test pit locations are shown on **Figure 18**. The soil test pit in the non-wetland was taken at the midpoint of the channel at TP3 to a depth of 12 inches. The upland test pit is located at UpTP2. Data forms for TP3 and UpTP2 are in **Appendix E**.

Figure 19: Looking east and upstream of point L at the unnamed tributary toward the confluence with non-WTL2 at point M. Red arrow indicates flow direction

Figure 20: Linear non-WTL2 looking up-gradient from point M in Figure 18

Figure 21: Looking from the eastern boundary of non-WTL2 to the west toward point M

The unnamed tributary shown in **Figure 17** continues upstream through two forested areas and through non-WTL1 to its origination from a pipe near the eastern boundary of the project area. **Figure 22** is a map detail of non-WTL1 with data points and photo locations.

Non-WTL1 is a depression (0.04 acres) that is located along the floodplain of the unnamed tributary between fill slopes for roads where the channel loses a bit of definition. It has two distinct plant communities, one that is located in a lightly forested area and one that is mainly herbaceous.

The western boundary is located in the lightly forested area (**Figure 23**) and is bound along the left descending bank by a fill slope for an access road, to the west where the tributary has cut down within the soil profile and stream characteristics dominate the regime, and to the north by the fill slope for Terminal Drive. This portion of the non-wetland contains young and mature *Salix nigra*, *Lonicera maackii*, and *Ligustrum sinense* as the most dominant species. The unnamed tributary has shallow banks and appears to escape into the floodplain as vegetation is bent and scour has occurred underneath shrubs. KSWA observed a high water table, saturation, water-stained leaves, drainage patterns, geomorphic position, and microtopographic relief as indicators of wetland hydrology. However, the soils were not hydric as evidenced by a matrix of 2.5Y 2.5/1 with no redoximorphic features. See **Appendix E** for non-WTL1/TP1 data form.

The eastern portion of non-WTL1 is dominated by herbaceous vegetation consisting of grasses and sedges with a mix of hydric and non-hydric vegetation (**Figure 24**). The channel definition fades in this area allowing the water in the channel to easily spread over its floodplain. The area contained notable amounts of rock the size of a small fist and smaller, similar to what was in the stream channel. KSWA observed a high water table, saturation, drift deposits, drainage patterns and geomorphic position as hydrologic indicators. However, the soils were not hydric, evidenced by a matrix of 2.5Y 2.5/1 with no redoximorphic features. See **Appendix E** for non-WTL1/TP2 data form.

Figure 22: Map detail of non-WTL1

Figure 23: Looking east from the western wetland boundary

Figure 24: Looking west from near the eastern boundary of non-WTL1 at Q

Summary and Conclusions

Garver requested that KSWA assess approximately 100 acres of project area for proposed improvements at the Nashville International Airport (BNA). KSWA representatives evaluated the site on January 10 and 16, 2020 and returned again on February 10, 2020. KSWA observed 2 small areas located on the property totaling 0.05 acres that appeared to have some wetland characteristics. However, neither area had hydric soils. Non-WTL1 is near the northeastern project area boundary and non-WTL2 is located near the northwestern project area boundary. There were no wetlands identified within the project area.

Permitting from TDEC and USACE is not required for non-jurisdictional features. However, streams are jurisdictional, but were not evaluated as part of this study. The jurisdictional status of other watercourses within the project area are outside the scope of this study.

Qualification of Conclusions

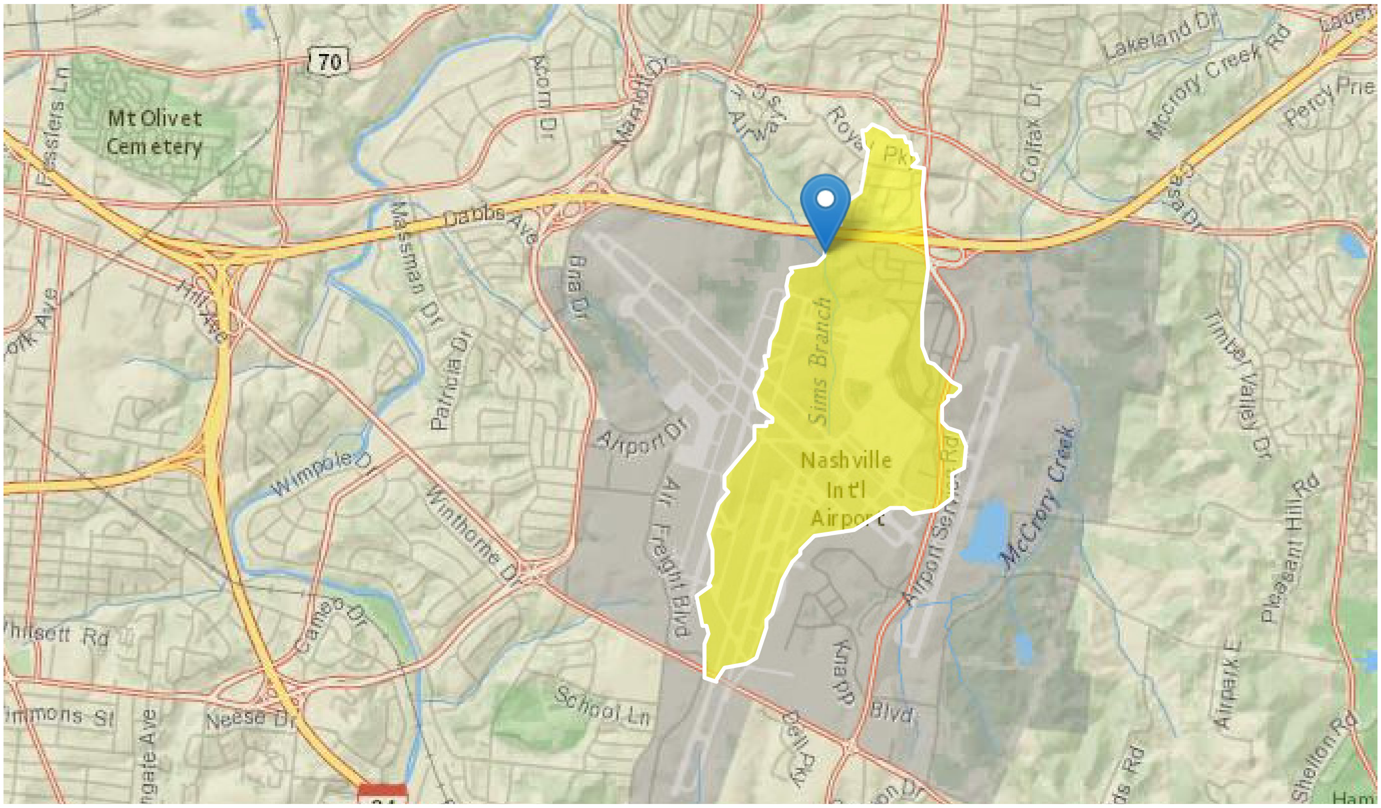
The conclusions contained in this report were based on the existing conditions at the time of the site visits, and the project information provided. Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally accepted environmental practices. KSWA is not responsible for the conclusions, opinions, or recommendations made by others based upon the data included herein.

Appendix A

Drainage Area

StreamStats Report

Region ID: TN
Workspace ID: TN20200211192642506000
Clicked Point (Latitude, Longitude): 36.14034, -86.67526
Time: 2020-02-11 13:26:42 -0600



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	1.55	square miles

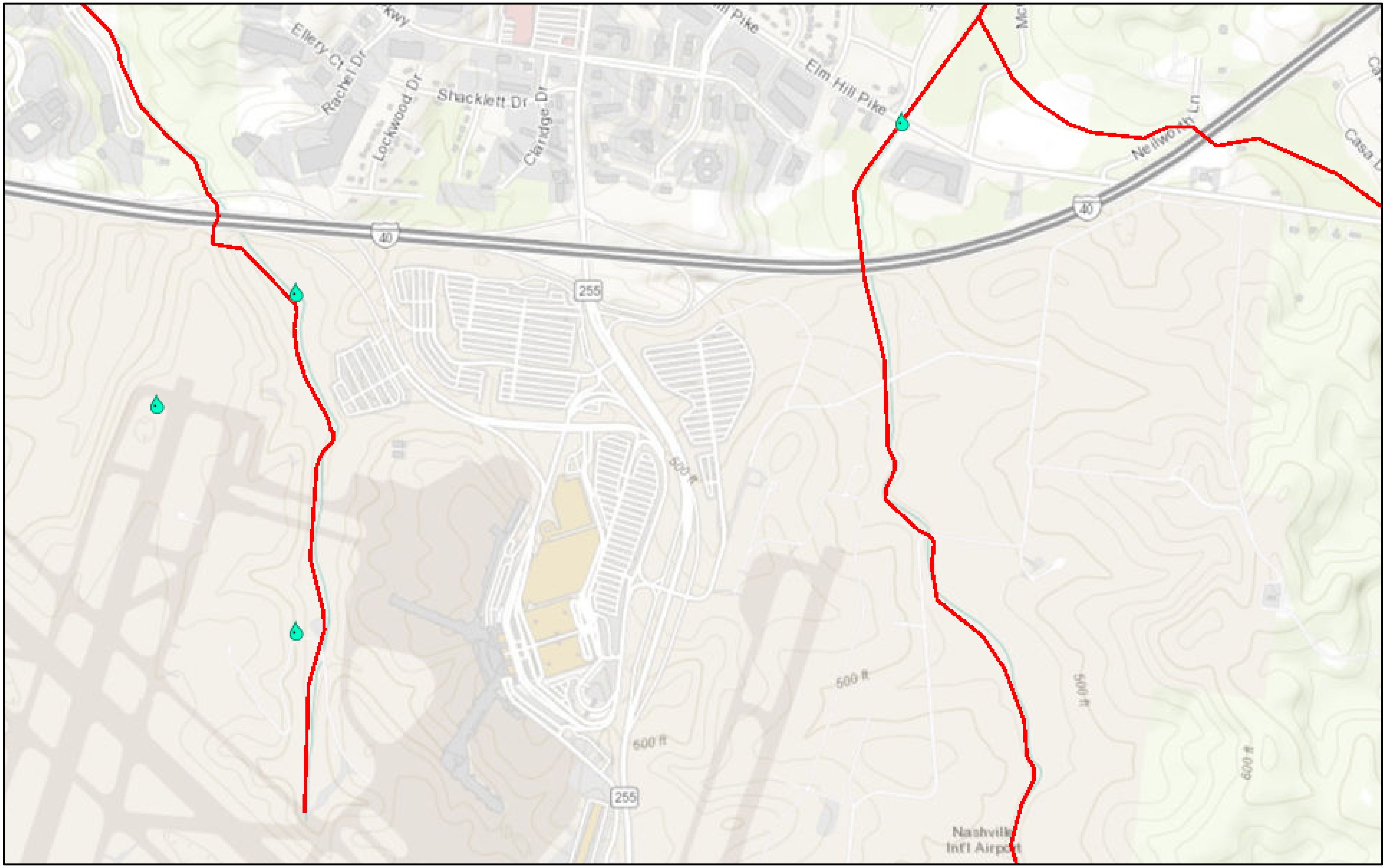
USGS Data Disclaimer: Unless otherwise stated, all data, metadata and related materials are considered to satisfy the quality standards relative to the purpose for which the data were collected. Although these data and associated metadata have been reviewed for accuracy and completeness and approved for release by the U.S. Geological Survey (USGS), no warranty expressed or implied is made regarding the display or utility of the data for other purposes, nor on all computer systems, nor shall the act of distribution constitute any such warranty.

Application Version: 4.3.11

Appendix B

Water Quality Assessment

ArcGIS Web Map



2/11/2020, 2:37:47 PM

Monitoring Sites
Counties

Water Quality Assessment Waterbodies
Fully Supporting
Not Assessed
Not Supporting

Water Quality Assessment
Fully Supporting
Fully Supporting (evaluated)
Not Assessed
Not Supporting

1:18,056

0 0.13 0.25 0.5 mi

0 0.2 0.4 0.8 km

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS,

Web AppBuilder for ArcGIS

Nashville-Davidson Metro Governm, Tennessee STS GIS, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, EPA, USDA |

Options Filter by map extent Zoom to Clear selection Refresh

ASSESSMENT_UNIT_ID	ASSESSMENT_UNIT_NAME	WATER_TYPE	WATER_SIZE	PARAM_NAME	SOURCE_NAME
TN05130202007_0150	Sims Branch	RIVER	1.40	PROPYLENE GLYCOL	INDUSTRIAL/COMMERCIAL STORMWATER DISCHARGE (PERMITTED)
TN05130202007_0150	Sims Branch	RIVER	1.40	OTHER ANTHROPOGENIC SUBSTRATE ALTERATIONS	MUNICIPAL (URBANIZED H DENSITY AREA)
TN05130202007_0150	Sims Branch	RIVER	1.40	OTHER ANTHROPOGENIC SUBSTRATE ALTERATIONS	INDUSTRIAL/COMMERCIAL STORMWATER DISCHARGE (PERMITTED)
TN05130202007_0150	Sims Branch	RIVER	1.40	DISSOLVED OXYGEN	INDUSTRIAL/COMMERCIAL

Appendix C

NRCS Soil Report

United States Department of Agriculture

NRCS

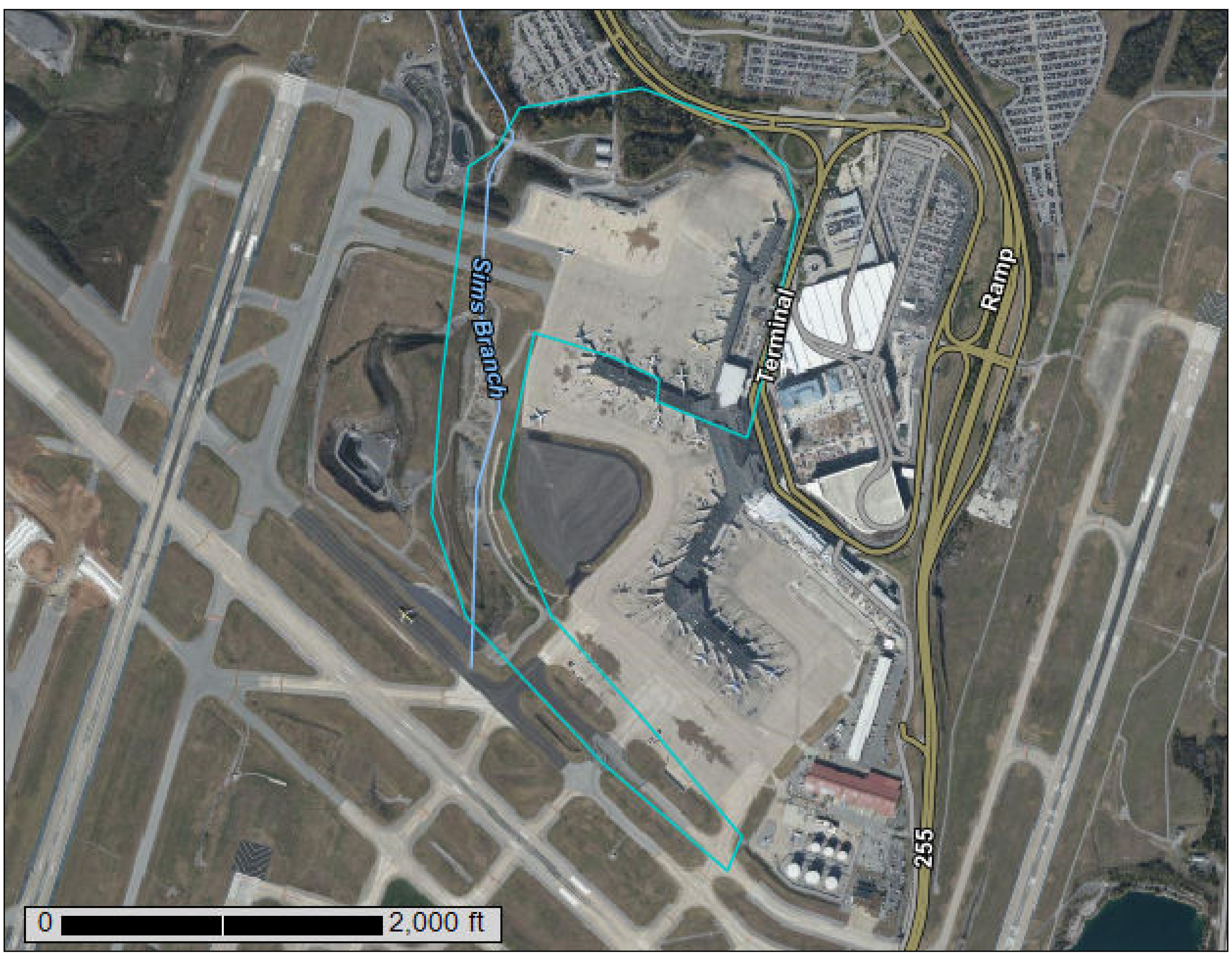
Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Davidson County, Tennessee

BNA Improvements



February 11, 2020

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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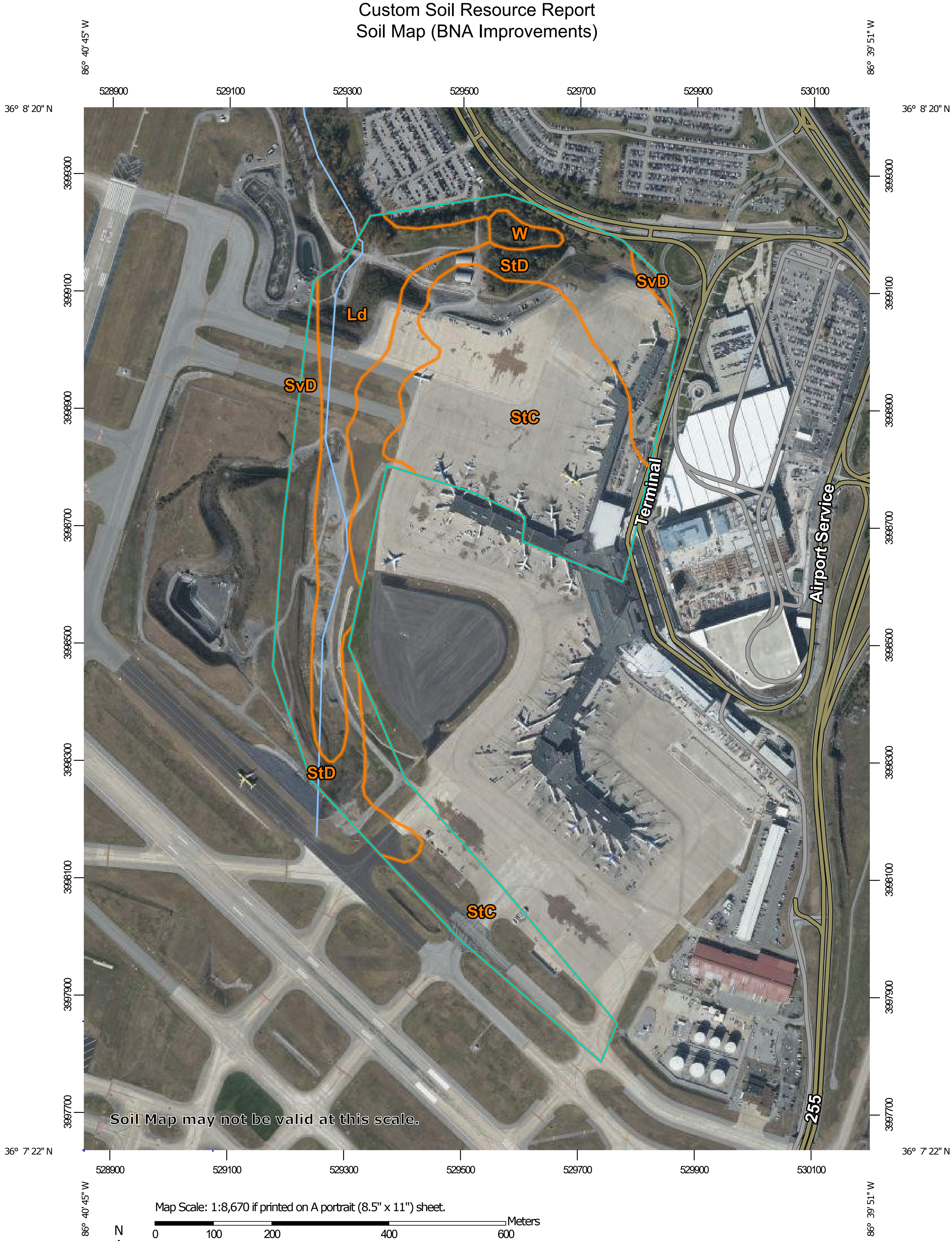
Contents

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map (BNA Improvements)



Map Scale: 1:8,670 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 100, 200, 400, 600

Feet: 0, 400, 800, 1600, 2400

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Davidson County, Tennessee
Survey Area Data: Version 17, Sep 16, 2019

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Nov 2, 2019—Nov 16, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend (BNA Improvements)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ld	Lindell silt loam, 0 to 2 percent slopes, occasionally flooded	19.1	17.5%
StC	Stiversville loam, 5 to 12 percent slopes, eroded	51.8	47.3%
StD	Stiversville loam, 12 to 25 percent slopes, eroded	36.5	33.4%
SvD	Stiversville-Urban land complex, 3 to 25 percent slopes	0.6	0.6%
W	Water	1.3	1.2%
Totals for Area of Interest		**109.4**	**100.0%**

Map Unit Descriptions (BNA Improvements)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Davidson County, Tennessee

Ld—Lindell silt loam, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 2td2y
Elevation: 500 to 850 feet
Mean annual precipitation: 48 to 58 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 190 to 230 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Lindell and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lindell

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Fine-loamy alluvium derived from limestone and siltstone

Typical profile

Ap - 0 to 7 inches: silt loam
Bw - 7 to 15 inches: silt loam
Bg - 15 to 52 inches: silt loam
Cg - 52 to 79 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 12 to 16 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 11.2 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Hydric soil rating: No

Minor Components

Norene

Percent of map unit: 4 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Arrington

Percent of map unit: 4 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Armour

Percent of map unit: 2 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

StC—Stiversville loam, 5 to 12 percent slopes, eroded

Map Unit Setting

National map unit symbol: 2v5br
Elevation: 420 to 1,030 feet
Mean annual precipitation: 39 to 61 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 180 to 233 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Stiversville and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Stiversville

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope

Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy residuum weathered from limestone, sandstone, and shale

Typical profile

Ap - 0 to 8 inches: loam
Bt - 8 to 53 inches: clay loam
Cr - 53 to 63 inches: bedrock

Properties and qualities

Slope: 5 to 12 percent
Depth to restrictive feature: 39 to 59 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 10.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Hampshire

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Marsh

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (three-dimensional): Side slope
Hydric soil rating: No

StD—Stiversville loam, 12 to 25 percent slopes, eroded

Map Unit Setting

National map unit symbol: 2v5bq
Elevation: 410 to 1,040 feet

Mean annual precipitation: 39 to 61 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 180 to 233 days
Farmland classification: Not prime farmland

Map Unit Composition

Stiversville and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Stiversville

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loamy residuum weathered from limestone, sandstone, and shale

Typical profile

Ap - 0 to 8 inches: loam
Bt - 8 to 53 inches: clay loam
Cr - 53 to 63 inches: bedrock

Properties and qualities

Slope: 12 to 25 percent
Depth to restrictive feature: 39 to 59 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 10.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Hampshire

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Marsh

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (three-dimensional): Side slope
Hydric soil rating: No

SvD—Stiversville-Urban land complex, 3 to 25 percent slopes

Map Unit Setting

National map unit symbol: kkp7
Mean annual precipitation: 39 to 57 inches
Mean annual air temperature: 48 to 70 degrees F
Frost-free period: 190 to 205 days
Farmland classification: Not prime farmland

Map Unit Composition

Stiversville and similar soils: 60 percent
Urban land: 35 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Stiversville

Setting

Landform: Ridges
Landform position (three-dimensional): Crest
Parent material: Loamy residuum weathered from limestone, sandstone, and shale

Typical profile

H1 - 0 to 8 inches: loam
H2 - 8 to 53 inches: clay loam
Cr - 53 to 63 inches: bedrock

Properties and qualities

Slope: 3 to 25 percent
Depth to restrictive feature: 39 to 59 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Hydric soil rating: No

Description of Urban Land

Typical profile
H1 - 0 to 6 inches: material

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Minor Components

Minor components
Percent of map unit: 5 percent
Hydric soil rating: No

W—Water

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Appendix D

Normal Weather Calculation

BNA Proposed Improvements

		Long Term Rainfall Records						
	Month	Minus 1 Std. Dev (dry)	Normal (Mean)	Plus 1 Std. Dev (Wet)	Actual Rain	Condition	Month Weight value	Product of previous 2 columns
1st prior month	December	1.41	4.24	7.07	5	2	3	6
2nd prior month	November	2.15	4.31	6.47	5.38	2	2	4
3rd prior month	October	1.34	3.04	4.74	6.46	3	1	3
							Sum=	13

Note:

If sum is:	
6-9	Then prior period has been drier than normal
10-14	Then prior period has been normal
15-18	Then prior period has been wetter than normal

Condition Value:	
Dry=	1
Normal=	2
Wet=	3

	1 Std. Deviation	Normal
jan	2.21	3.75
feb	1.83	3.94
mar	2.78	4.11
apr	2.03	4
may	2.18	5.5
june	2.03	4.14
july	1.64	3.64
aug	1.27	3.17
sep	2.15	3.41
oct	1.7	3.04
nov	2.16	4.31
dec	2.83	4.24

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Asheville, North Carolina 28801

Current Location: Elev: 600 ft. Lat: 36.1189° N Lon: -86.6892° W

Station: **NASHVILLE INTERNATIONAL AIRPORT, TN US USW00013897**

Observation Time Temperature: Unknown Observation Time Precipitation: 2400

Year	Month	Day	Temperature (F) 24 Hrs. Ending at Observation Time Max.	Min.	At Observation	Precipitation 24 Hour Amounts Ending at Observation Time Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	At Obs. Time Snow, Ice Pellets, Hail, Ice on Ground (in)	Evaporation 24 Hour Wind Movement (mi)	Amount of Evap. (in)	Soil Temperature (F) 4 in. Depth Ground Cover (see *)	Max.	Min.	8 in. Depth Ground Cover (see *)	Max.	Min.
2019	10	01	98	70		0.00		0.0		0.0								
2019	10	02	99	68		0.00		0.0		0.0								
2019	10	03	99	65		0.00		0.0		0.0								
2019	10	04	85	65		0.00		0.0		0.0								
2019	10	05	95	58		0.00		0.0		0.0								
2019	10	06	82	66		0.95		0.0		0.0								
2019	10	07	68	55		1.24		0.0		0.0								
2019	10	08	77	55		0.00		0.0		0.0								
2019	10	09	83	53		0.00		0.0		0.0								
2019	10	10	83	62		0.00		0.0		0.0								
2019	10	11	86	48		0.30		0.0		0.0								
2019	10	12	64	42		T		0.0		0.0								
2019	10	13	72	38		0.00		0.0		0.0								
2019	10	14	76	44		0.00		0.0		0.0								
2019	10	15	79	52		T		0.0		0.0								
2019	10	16	68	45		0.35		0.0		0.0								
2019	10	17	63	41		0.00		0.0		0.0								
2019	10	18	72	40		0.00		0.0		0.0								
2019	10	19	68	45		0.01		0.0		0.0								
2019	10	20	78	60		T		0.0		0.0								
2019	10	21	74	60		0.33		0.0		0.0								
2019	10	22	67	48		0.00		0.0		0.0								
2019	10	23	70	40		0.00		0.0		0.0								
2019	10	24	73	42		0.00		0.0		0.0								
2019	10	25	61	48		1.00		0.0		0.0								
2019	10	26	76	58		0.65		0.0		0.0								
2019	10	27	63	49		0.02		0.0		0.0								
2019	10	28	65	46		0.00		0.0		0.0								
2019	10	29	62	50		0.00		0.0		0.0								
2019	10	30	72	57		0.66		0.0		0.0								
2019	10	31	69	33		0.95		0.0		0.0								
		Summary	76	52		6.46		0.0										

Empty, or blank, cells indicate that a data observation was not reported.

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2019	11	01	53	30		0.00		0.0		0.0								
2019	11	02	58	28		0.00		0.0		0.0								
2019	11	03	60	31		0.00		0.0		0.0								
2019	11	04	65	33		0.00		0.0		0.0								
2019	11	05	64	41		0.00		0.0		0.0								
2019	11	06	74	37		T		0.0		0.0								
2019	11	07	59	39		0.73		0.0		0.0								
2019	11	08	44	28		0.00		0.0		0.0								
2019	11	09	57	24		0.00		0.0		0.0								
2019	11	10	69	38		0.00		0.0		0.0								
2019	11	11	64	29		0.34		0.4		0.0								
2019	11	12	29	18		0.02		T		0.0								
2019	11	13	44	17		0.00		0.0		0.0								
2019	11	14	55	28		0.00		0.0		0.0								
2019	11	15	50	32		0.00		0.0		0.0								
2019	11	16	57	28		0.00		0.0		0.0								
2019	11	17	57	28		0.00		0.0		0.0								
2019	11	18	53	37		0.00		0.0		0.0								
2019	11	19	65	40		T		0.0		0.0								
2019	11	20	60	33		0.00		0.0		0.0								
2019	11	21	64	43		T		0.0		0.0								
2019	11	22	61	48		1.12		0.0		0.0								
2019	11	23	51	41		0.37		0.0		0.0								
2019	11	24	55	34		0.00		0.0		0.0								
2019	11	25	65	33		0.00		0.0		0.0								
2019	11	26	64	42		0.89		0.0		0.0								
2019	11	27	67	41		0.45		0.0		0.0								
2019	11	28	50	35		T		0.0		0.0								
2019	11	29	54	44		0.00		0.0		0.0								
2019	11	30	65	50		1.47		0.0		0.0								
		Summary	58	34		5.39		0.4										

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Year	Month	Day	Temperature (F) 24 Hrs. Ending at Observation Time Max.	Min.	At Observation	Precipitation 24 Hour Amounts Ending at Observation Time Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	At Obs. Time Snow, Ice Pellets, Hail, Ice on Ground (in)	Evaporation 24 Hour Wind Movement (mi)	Amount of Evap. (in)	Soil Temperature (F) 4 in. Depth Ground Cover (see *)	Max.	Min.	8 in. Depth Ground Cover (see *)	Max.	Min.
2019	12	01	65	42		0.00		0.0		0.0								
2019	12	02	42	35		0.02		0.0		0.0								
2019	12	03	47	34		0.00		0.0		0.0								
2019	12	04	61	38		0.00		0.0		0.0								
2019	12	05	64	33		T		0.0		0.0								
2019	12	06	58	49		0.03		0.0		0.0								
2019	12	07	58	39		0.00		0.0		0.0								
2019	12	08	63	36		0.00		0.0		0.0								
2019	12	09	68	57		0.50		0.0		0.0								
2019	12	10	63	31		0.30		T		0.0								
2019	12	11	49	24		0.00		0.0		0.0								
2019	12	12	56	25		0.00		0.0		0.0								
2019	12	13	50	45		0.04		0.0		0.0								
2019	12	14	53	44		0.01		0.0		0.0								
2019	12	15	61	40		T		0.0		0.0								
2019	12	16	64	45		1.41		0.0		0.0								
2019	12	17	45	31		0.02		T		0.0								
2019	12	18	37	25		0.00		0.0		0.0								
2019	12	19	49	23		0.00		0.0		0.0								
2019	12	20	53	26		0.00		0.0		0.0								
2019	12	21	55	38		0.00		0.0		0.0								
2019	12	22	51	42		0.09		0.0		0.0								
2019	12	23	69	46		T		0.0		0.0								
2019	12	24	70	39		0.00		0.0		0.0								
2019	12	25	69	38		0.00		0.0		0.0								
2019	12	26	64	47		T		0.0		0.0								
2019	12	27	65	49		0.01		0.0		0.0								
2019	12	28	73	49		0.04		0.0		0.0								
2019	12	29	67	54		2.53		0.0		0.0								
2019	12	30	54	43		0.00		0.0		0.0								
2019	12	31	51	38		0.00		0.0		0.0								
		Summary	58	39		5.00		0.0										

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Observation Time Temperature: Unknown Observation Time Precipitation: 2400

Year	Month	Day	Temperature (F): 24 Hrs. Ending at Observation Time: Max.	Min.	At Observation	Precipitation: 24 Hour Amounts Ending at Observation Time: Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	At Obs. Time: Snow, Ice Pellets, Hail, Ice on Ground (in)	Evaporation: 24 Hour Wind Movement (mi)	Amount of Evap. (in)	Soil Temperature (F): 4 in. Depth: Ground Cover (see *)	Max.	Min.	8 in. Depth: Ground Cover (see *)	Max.	Min.
2020	01	01	52	33		0.00		0.0		0.0								
2020	01	02	54	46		1.23		0.0		0.0								
2020	01	03	59	52		0.39		0.0		0.0								
2020	01	04	55	35		0.03		0.0		0.0								
2020	01	05	56	29		0.00		0.0		0.0								
2020	01	06	55	32		0.08		0.0		0.0								
2020	01	07	54	36		0.00		0.0		0.0								
2020	01	08	60	34		0.00		0.0		0.0								
2020	01	09	62	37		0.00		0.0		0.0								
2020	01	10	68	59		0.07		0.0		0.0								
2020	01	11	71	46		1.51		0.0		0.0								
2020	01	12	53	38		0.00		0.0		0.0								
2020	01	13	57	37		T		0.0		0.0								
2020	01	14	63	52		0.63		0.0		0.0								
2020	01	15	70	55		0.03		0.0		0.0								
2020	01	16	55	35		0.00		0.0		0.0								
2020	01	17	53	34		0.00		0.0		0.0								
2020	01	18	57	39		0.22		0.0		0.0								
2020	01	19	40	23		0.00		0.0		0.0								
2020	01	20	25	20		T		0.2		0.0								
2020	01	21	37	24		0.00		0.0		0.0								
2020	01	22	47	20		0.00		0.0		0.0								
2020	01	23	49	37		0.71		0.0		0.0								
2020	01	24	53	40		0.09		0.0		0.0								
2020	01	25	40	31		T		0.0		0.0								
2020	01	26	50	30		0.02		0.0		0.0								
2020	01	27	59	37		0.05		0.0		0.0								
2020	01	28	47	33		0.00		0.0		0.0								
2020	01	29	48	38		T		0.0		0.0								
2020	01	30	50	40		0.00		0.0		0.0								
2020	01	31	50	42		0.02		0.0		0.0								
		Summary	53	37		5.08		0.2										

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Observation Time Temperature: Unknown Observation Time Precipitation: 2400

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Observation	24 Hour Amounts Ending at Observation Time				At Obs. Time	24 Hour Wind Movement (mi)	Amount of Evap. (in)	4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)			Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2020	02	01	49	36		0.11		0.0		0.0								
2020	02	02	71	34		0.00		0.0		0.0								
2020	02	03	72	50		0.00		0.0		0.0								
2020	02	04	65	57		0.81		0.0		0.0								
2020	02	05	59	46		0.84		0.0		0.0								
2020	02	06	47	33		0.20		0.6		1.0								
2020	02	07	36	29		0.04		0.5		0.0								
2020	02	08	52	30		0.00		0.0		0.0								
2020	02	09	65	30		0.06		0.0		0.0								
2020	02	10	57	49		1.14		0.0		0.0								
2020	02	11																
2020	02	12																
2020	02	13																
2020	02	14																
2020	02	15																
2020	02	16																
2020	02	17																
2020	02	18																
2020	02	19																
2020	02	20																
2020	02	21																
2020	02	22																
2020	02	23																
2020	02	24																
2020	02	25																
2020	02	26																
2020	02	27																
2020	02	28																
2020	02	29																
		Summary	57	39		3.20		1.1										

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Appendix E

Wetland Data Sheets

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Proposed BNA Improvements City/County: Nashville/Davidson Sampling Date: 2020-01-16

Applicant/Owner: MNAA (through Garver) State: TN Sampling Point: non-WTL1/TP1

Investigator(s): K.Jordan & M. Finch Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 1

Subregion (LRR or MLRA): LRR N 123 Lat: 36.136823 Long: -86.669926 Datum: WGS84

Soil Map Unit Name: StD Stiversville Loam 12 to 25% slope eroded NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation No, Soil No, or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___
Hydric Soil Present?	Yes ___	No X
Wetland Hydrology Present?	Yes X	No ___

Is the Sampled Area within a Wetland? **Yes** ___ **No** X

Remarks:

Non-wetland is located at bottom of a fill slope for an internal roadway turn-around and at base of slope between the apron and Terminal Drive. Stream enters area from a pipe. Fist size rock and smaller in much of the area below the surface of the vegetation. Two plant communities - one more herbaceous, second more tree. This point is within the tree dominated community.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes X	No ___	Depth (inches): 11
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 10

Wetland Hydrology Present? Yes X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

N/A

Remarks:

Area is small and located on the stream banks where the banks become shallow.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: non-WTL1/TP1

Tree Stratum (Plot size: 20)

	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix nigra	40	yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
= Total Cover	40		

50% of total cover: 20 20% of total cover: 8

Sapling/Shrub Stratum (Plot size: 15)

	Absolute % Cover	Dominant Species?	Indicator Status
1. Ligustrum sinense	20	Yes	FACU
2. Lonicera maackii	15	Yes	----
3. Salix nigra	25	Yes	OBL
4.			
5.			
6.			
7.			
8.			
9.			
= Total Cover	60		

50% of total cover: 30 20% of total cover: 12

Herb Stratum (Plot size: 5)

	Absolute % Cover	Dominant Species?	Indicator Status
1. Ludwigia palustris	5	Yes	OBL
2. Glechoma hederacea	5	Yes	FACU
3. Carex frankii	5	Yes	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	15		

50% of total cover: 7.5 20% of total cover: 3

Woody Vine Stratum (Plot size:)

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
= Total Cover			

50% of total cover: 20% of total cover:

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 57 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	75	x 1 = 75
FACW species	0	x 2 = 0
FAC species	0	x 3 = 0
FACU species	25	x 4 = 100
UPL species	0	x 5 = 0
Column Totals:	100 (A)	175 (B)

Prevalence Index = B/A = 1.75

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

_X_ 2 - Dominance Test is >50%

_X_ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL Sampling Point: non-WTL1/TP1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-16	2.5Y 2.5/1	100	---------	---			SCL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 136, 122)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ **No** X

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Proposed BNA Improvements City/County: Nashville/Davidson Sampling Date: 2020-01-16

Applicant/Owner: MNAA (through Garver) State: TN Sampling Point: non-WTL1/TP2

Investigator(s): K. Jordan, M.Finch Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 1

Subregion (LRR or MLRA): LRR N 123 Lat: 36.136756 Long: -86.669784 Datum: WGS84

Soil Map Unit Name: StD Stiversville Loam, 12% to 25% slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation No, Soil No, or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___	**Is the Sampled Area within a Wetland?** **Yes** ___ **No** X
Hydric Soil Present?	Yes ___	No X	
Wetland Hydrology Present?	Yes X	No ___	

Remarks:

Non-wetland is located at bottom of a fill slope for an internal roadway turn-around and at the base of a slope between the apron and Terminal Drive. Stream enters area from a pipe. Fist size rock and smaller in much of the area below the surface of the vegetation. Two plant communities - one more herbaceous, second more tree. This point is within the herbaceous dominated community.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- X Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes X	No ___	Depth (inches): 11
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 10

Wetland Hydrology Present? Yes X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

N/A

Remarks:

Area is small and located on the stream banks where the banks become shallow.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: non-WTL1/TP2

Tree Stratum (Plot size: ______)

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
= Total Cover			

50% of total cover: ______ 20% of total cover: ______

Sapling/Shrub Stratum (Plot size: ______)

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
= Total Cover			

50% of total cover: ______ 20% of total cover: ______

Herb Stratum (Plot size: 10)

	Absolute % Cover	Dominant Species?	Indicator Status
1. Cyperus esculentus	20	Yes	FACW
2. Schedonorus arundinaceus	20	Yes	FACU
3. Andropogon virginicus.	20	Yes	FACU
4. Poa annua	20	Yes	FACU
5. Carex frankii	20	Yes	OBL
6. Poa autumnalis	20	Yes	FAC
7.			
8.			
9.			
10.			
11.			
= Total Cover	120		

50% of total cover: 60 20% of total cover: 24

Woody Vine Stratum (Plot size: ______)

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
= Total Cover			

50% of total cover: ______ 20% of total cover: ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	20	x 1 =	20
FACW species	20	x 2 =	40
FAC species	20	x 3 =	60
FACU species	60	x 4 =	240
UPL species		x 5 =	
Column Totals:	120 (A)		360 (B)

Prevalence Index = B/A = 3

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ______

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: non-WTL1/TP2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-16	2.5Y 2.5/1	100					SCL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 136, 122)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):
Type: rock
Depth (inches): 16

Hydric Soil Present? **Yes** ______ **No** X

Remarks:
rock at 16 inches. Numerous fist size rocks and gravel in area.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Proposed BNA Improvements City/County: Nashville/Davidson Sampling Date: 2020-01-16

Applicant/Owner: MNAA (through Garver) State: TN Sampling Point: UpTp1

Investigator(s): K.Jordan, M.Finch Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none Slope (%): 20%

Subregion (LRR or MLRA): LRR N 123 Lat: 36.136662 Long: -86.669948 Datum: WGS84

Soil Map Unit Name: StD, Stiversville Loam 12% to 25% slope NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No, Soil No, or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** **Yes** ____ **No** X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:

Upland sampling point taken on fill slope above non-WTL1. There was no recent disturbance.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? Yes ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

N/A

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: UpTP-1

Tree Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
50% of total cover: ______ 20% of total cover: ______			

Sapling/Shrub Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	= Total Cover		
50% of total cover: ______ 20% of total cover: ______			

Herb Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1. Schedonorus arundinceus	70	Yes	FACU
2. Poa annua	25	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	95 = Total Cover		
50% of total cover: 47.5 20% of total cover: 19			

Woody Vine Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
50% of total cover: ______ 20% of total cover: ______			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	95	x 4 =	380
UPL species	0	x 5 =	0
Column Totals:	95 (A)		380 (B)

Prevalence Index = B/A = 4

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ______ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: UpTP1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 4/4	100					SCL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 136, 122)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: rock

Depth (inches): 12

Hydric Soil Present? Yes ______ No X

Remarks:

Soils riddled with gravel and rock (typical of a fill slope).

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Proposed BNA Improvements City/County: Nashville/Davidson Sampling Date: 2020-02-10

Applicant/Owner: MNAA (through Garver) State: TN Sampling Point: non-WTL2/TP3

Investigator(s): K. Jordan Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): channel Local relief (concave, convex, none): concave Slope (%): 1.5

Subregion (LRR or MLRA): LRR N 123 Lat: 36.137028 Long: -86.673476 Datum: WGS84

Soil Map Unit Name: Ld - Lindell silt loam, 0 to 2 percent slopes, occasionally flooded NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation No, Soil No, or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___	**Is the Sampled Area within a Wetland?** **Yes** ___ **No** X
Hydric Soil Present?	Yes ___	No ___	
Wetland Hydrology Present?	Yes X	No ___	

Remarks:

Non-wetland with defined channel

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- X Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches): 1
Water Table Present?	Yes X	No ___	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 0

Wetland Hydrology Present? Yes X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

N/A

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

SAMPLING POINT: non-WTL2/TP3

Tree Stratum (Plot size: ________)

	Absolute % Cover	Dominant Species?	Indicator Status
1. Quercus palustris	40	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
= Total Cover	40		

50% of total cover: 20 20% of total cover: 8

Sapling/Shrub Stratum (Plot size: ________)

	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix nigra	20	Yes	OBL
2. Lonicera maackii	20	Yes	--------
3. Rosa multiflora	10	Yes	FACU
4.			
5.			
6.			
7.			
8.			
9.			
= Total Cover	50		

50% of total cover: 25 20% of total cover: 10

Herb Stratum (Plot size: 5)

	Absolute % Cover	Dominant Species?	Indicator Status
1. Juncus effusus	10	Yes	FACW
2. Carex frankii	10	Yes	OBL
3. Smilax rotundifolia	5	Yes	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	25		

50% of total cover: 12.5 20% of total cover: 5

Woody Vine Stratum (Plot size: ________)

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
= Total Cover			

50% of total cover: ________ 20% of total cover: ________

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 71 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	30	x 1 = 60
FACW species	50	x 2 = 100
FAC species	10	x 3 = 30
FACU species	10	x 4 = 40
UPL species		x 5 =
Column Totals:	100 (A)	230 (B)

Prevalence Index = B/A = 2.3

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ______

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL Sampling Point: non-WTL2/TP3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	2.5Y 2.5/1	100					SCL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 136, 122)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No X

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Proposed BNA Improvements City/County: Nashville/Davidson Sampling Date: 2020-02-10

Applicant/Owner: MNAA (through Garver) State: TN Sampling Point: UpTP2

Investigator(s): K.Jordan Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none Slope (%): 10%

Subregion (LRR or MLRA): LRR N 123 Lat: 36.136937 Long: -86.673459 Datum: WGS84

Soil Map Unit Name: StD, Stiversville Loam 12% to 25% slope NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation No, Soil No, or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___	No X	**Is the Sampled Area within a Wetland?**	**Yes** ___	**No** X
Hydric Soil Present?	Yes ___	No X			
Wetland Hydrology Present?	Yes ___	No X			

Remarks:

Upland sampling point taken on fill slope above non-WTL-2. There was no recent disturbance.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes ___	No X	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): ___

Wetland Hydrology Present? Yes ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

N/A

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: UpTP2

Tree Stratum (Plot size:)

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
= Total Cover			

50% of total cover: 20% of total cover:

Sapling/Shrub Stratum (Plot size:)

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
= Total Cover			

50% of total cover: 20% of total cover:

Herb Stratum (Plot size: 5)

	Absolute % Cover	Dominant Species?	Indicator Status
1. Schedonorus arundinceus	65	Yes	FACU
2. Poa annua	25	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	90		

50% of total cover: 45 20% of total cover: 18

Woody Vine Stratum (Plot size:)

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
= Total Cover			

50% of total cover: 20% of total cover:

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	0	x 2 = 0
FAC species	0	x 3 = 0
FACU species	90	x 4 = 360
UPL species	0	x 5 = 0
Column Totals:	90 (A)	360 (B)

Prevalence Index = B/A = 4

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL Sampling Point: UpTP2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-12	10YR 4/6	100					SCL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 136, 122)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):
Type: rock
Depth (inches): 12

Hydric Soil Present? Yes ______ No X

Remarks:

January 4, 2021

Mr. Ryan Mountain, PWS
Senior Environmental Scientist/Specialist
Garver
2049 East Joyce Boulevard
Fayetteville, AR 72703

Subject: ADDENDUM Wetland Delineation Report - Proposed BNA Improvements Nashville, Tennessee

Dear Mr. Mountain:

K. S. Ware and Associates, L.L.C. (KSWA) is pleased to submit this report addendum, which details the results of our ecological services (wetland delineation) for the additional area of the referenced project. Our services were provided in general accordance with S*cope of Services for Wetland Delineation Addendum – Proposed BNA Improvements* proposal, dated November 20, 2020.

The attached report reviews the project information provided to us, describes the site and conditions encountered, and details our ecological findings for the additional project area.

We appreciate the opportunity to work with you on this project. Please contact us if you have any questions about the attached report. We look forward to working with you on the remainder of the project and on future projects.

Sincerely,

K. S. Ware and Associates, L.L.C.

Linda D. Main

Linda Main, PG
Senior Project Manager

Kelly Jordan

Kelly Jordan, TN-QHP
Environmental Scientist

52 Lindsley Ave., Suite 101 | Nashville, TN 37210
615.255.9702 phone | 615.256.5873 fax | info@kswarellc.com

Wetland Delineation Addendum

Proposed Nashville International Airport (BNA) Improvements

Nashville, Tennessee

Prepared For:

Garver
2049 Easts Joyce Boulevard
Fayetteville, AR 727037

Prepared By:

KSWA
[KS WARE & ASSOCIATES]

KSWA Project No. 100-19-0075

Prepared January 4, 2021

Approval:

KSWA Senior Project Manager

Linda D. Main
Signature

Linda Main, PG December 30, 2020
Printed Name/Date

KSWA Environmental Specialist

Kelly Jordan
Signature

Kelly Jordan, QHP December 31, 2020
Printed Name/Date

Contents

1.0 **Project Description**

The Metro Nashville Airport Authority (MNAA) and their representative, Garver, identified an additional area, northwest of the initial project area, at Nashville International Airport (BNA) to be evaluated for potential wetlands. This entire additional area falls within a designated stormwater detention basin. The additional project area is indicated in **Figure 1.** This aerial photograph with highlighted area was provided by Garver in an email to KSWA on October 31, 2020. The area is bound to the north by greenspace adjacent to Terminal Drive; to the east by the valet lot; to the south-southeast by the initial project area; and to the west by a service road.

2.0 **Desktop Review**

The additional project area consists of approximately 9.65 acres, located on the northern side of the airport property south of Interstate 40 (**Figure 2**) and northwest of the initial project area (**Figure 1**). The topographic surface of the additional area is mainly flat and exists along Sims Branch that runs from south to north across the additional project area. Parking areas, service roads, and other airport-related infrastructure are on fill slopes along the perimeter of the additional project area. Sims Branch (HUC 051302020102) is in the Lower Mill Creek Watershed. The Sims Branch drainage area is approximately 851 acres at the most downstream point of the additional project area (**Appendix A**). Sims Branch is assessed as “not supporting” by the Tennessee Department of Environment and Conservation (TDEC) for propylene glycol, dissolved oxygen, and anthropogenic substrate alterations (**Appendix B**). Federal Emergency Management Agency (FEMA) floodplain maps indicate the additional project area is in an area of minimal flood hazard (Zone X). See **Appendix C** for the FEMA floodplain map.

The soils map obtained from the National Resources Conservation Services (NRCS) database, included in **Appendix D,** indicates the additional project area contains moderately well drained and well drained soils. On the additional project area, Lindell silt loam series comprises 86.5 percent of the soil and Stiversville loam comprises 13.5 percent. The Lindell silt loam is occasionally flooded and has a minor hydric component (Norene series, 4 percent). Stiversville loam is mainly located on the slope areas within the additional project area.

The National Wetlands Inventory (NWI) Mapper from the U.S. Fish and Wildlife Service indicates 1.62 acres of PFO1A (**P**alustrine, **FO**rested, 1=broadleaf deciduous, A=temporary flooded) wetlands along the Sims Branch corridor. These areas are shown in **Figure 3.**

The Normal Weather Calculation, as specified in TDEC, Division of Water Resources (DWR) *Guidance for Making Hydrologic Determinations, Version 1.5* (April 2020), was used to determine if weather conditions had been normal over the three-month period prior to the field investigation. Weather conditions could affect visible indicators of hydrology such as surface water, saturation, etc. Over the three-month period prior to the December 21 and 29, 2020, site visits, precipitation amounts were slightly dry. However, precipitation in December 2020 is within normal range. **Table 1** shows recorded precipitation amounts for the 48-hour and 7-day periods prior to the site visits. This calculation and supporting documentation are found in **Appendix E**.

Figure 1: BNA Additional Project Area – Nashville, TN

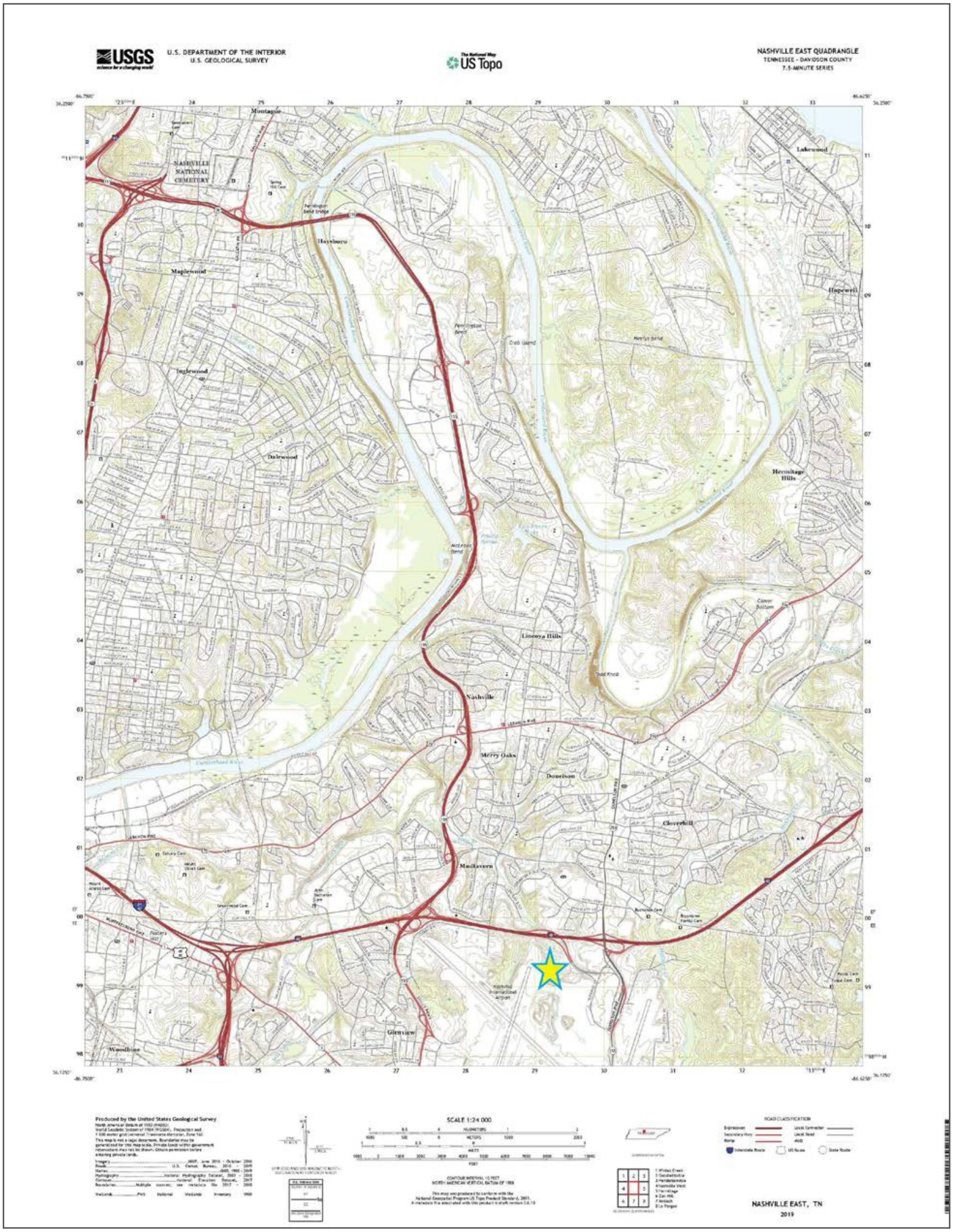


Figure 2: Location Topographic Map

U.S. Fish and Wildlife Service
National Wetlands Inventory

BNA Additional Wetlands

December 30, 2020

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

Figure 3: National Wetlands Inventory Map

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

Table 1: Precipitation Amounts Prior to Site Visits

Date	Within previous 48 hours (inches)	Within past 7 days (inches)
December 21, 2020	0.38	1.24
December 29, 2020	0.00	0.78

3.0 Field Assessment

KSWA began the wetland evaluation on December 21, 2020, by walking the site, observing plant communities, drainage patterns, and hydrologic inputs within the additional project area. Sims Branch enters the additional project area at the southern project boundary and drains approximately 450 feet north, where a tributary joins the watercourse, and then flows another 850 feet to exit the additional project area via a culvert. The additional project area consists of mostly flat topography along Sims Branch, flanked by fill slopes to accommodate adjacent parking areas, service roads, and infrastructure. Localized, small depressions create microtopographic relief and drainage patterns, resulting in areas of ponding water. Several flowing stormwater drainages cut across the additional project area from the west and discharge into Sims Branch along the left descending bank (LDB). Stormwater drainages discharging from the east, along the right descending bank (RDB) of Sims Branch, are located on the northern portion of the additional project area. The northern-most stormwater drainage was discharging a small amount of water at the time of the site visits. A flowing tributary also discharged to the RDB of Sims Branch near the northern additional project area boundary. KSWA began collecting hydrologic data near the intersection of two service roads on the west side of Sims Branch near the northern boundary of the additional project area.

- KSWA observed surface water draining southward from the road intersection toward a defined channel that drained to Sims Branch. This flow-path contained little vegetation, water-stained leaves, indications of iron-oxidizing bacteria, and algae. As the grade flattened, the water fanned out, some collecting in wheel ruts, before reaching a defined channel that appeared man-made and drained east to Sims Branch. Outside the more concentrated flow, the vegetation was dominated by *Cyperus species*, likely with fac-wet (FACW) or obligate (OBL) wetland indicator status. Indicators of wetland hydrology included saturation at 6 inches depth and a highwater table within 7 inches of the surface. While wetland hydrology and vegetation were observed, the soil did not have hydric soil characteristics. KSWA evaluated the soil profile from the surface to a depth of 16 inches, where bedrock was encountered. The soil matrix at all depths had a hue of 10YR and values of 4. However, depth requirements for the two most closely relevant wetland indicators, depleted matrix and redox depressions, were not met. **Figure 4** depicts test pit locations and areas determined as wetlands. Data was collected at Test Pit 152. Additional soil samples in the immediate area with similar vegetation and hydrology (as depicted by smaller, un-numbered orange dots in **Figure 4**) displayed similar, non-hydric soil characteristics. This area on the northwest side of the additional project area is not a wetland. See **Photos 1 - 3** in **Appendix F**. The Wetland Data Form for Test Pit 152 is in **Appendix G**.

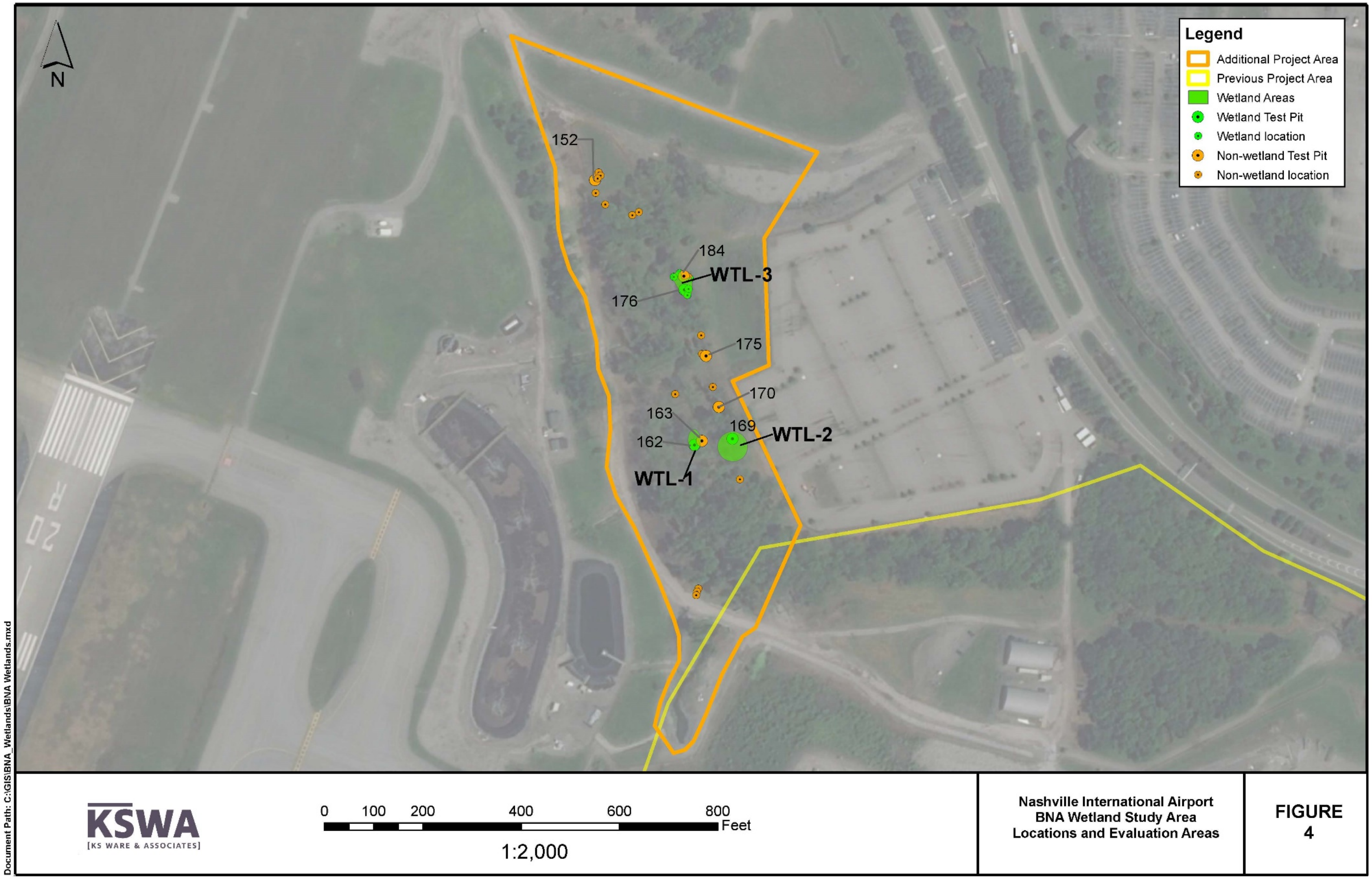


Figure 4*: Additional Study Area – Wetlands and Test Pit Locations*

- KSWA continued the wetlands survey to the south on the west side of Sims Branch. In the area of Test Pits 162 and 163, KSWA observed a sewer manhole on the low side of a small depression, with a defined channel beginning just down-gradient of the manhole. WTL-1 is located on the high side of the depression above the sewer manhole. Wetland WTL-1 is small and measures approximately 22 feet long and 21 feet wide, with an area of 363 square-feet (0.008 acres). *Cyperus species* (FACW) and *Packera glabella* (OBL) were dominant vegetative species. KSWA observed a high-water table at 8 inches below the ground surface (bgs), soil saturation at 3 inches bgs, and oxidized rhizospheres on living roots as primary indicators of wetland hydrology. KSWA also observed drainage patterns and microtopographic relief that are secondary indicators of wetland hydrology. KSWA observed the hydric soil indicator of depleted matrix, with a thickness of 14 inches in the soil profile. This area is a wetland because it meets all criteria for wetland hydrology, hydrophytic vegetation, and hydric soil. It is identified as WTL-1. See **Photos 4 - 6** in **Appendix F**. The Wetland Data Form for Test Pit 162 (WTL) and its upgradient counterpart, Test Pit 163 (UPL), are provided in **Appendix G**.

- KSWA crossed Sims Branch to begin the evaluation of the east side of the stream. KSWA observed a small depression with standing water, approximately 3 inches deep, with a predominance of *Cyperus species,* likely a FACW or OBL wetland indicator status. Through Test Pit 169, KSWA also observed a high-water table at 8 inches bgs and saturation at 3 inches bgs, primary indicators of wetland hydrology. KSWA also observed microtopographic relief as a secondary indicator of wetland hydrology. KSWA observed a depleted matrix in the soil profile between 3 and 10 inches bgs, which is an indicator of hydric soils. This area is a wetland because it meets all criteria for wetland hydrology, hydrophytic vegetation, and hydric soil and is identified as WTL-2. WTL-2 measures approximately 707 square feet (0.02 acres). See **Photos 7 - 9** in **Appendix F**. The Wetland Data Form for Test Pit 169 (WTL) and its upgradient counterpart, Test Pit 170 (UPL), are provided in **Appendix G**.

- KSWA paused the field assessment on December 21, 2020, due to low light conditions and concern for accurate comparisons of soil hue, value, and chroma to the Munsell Soil Color Charts and returned to the site December 29, 2020. Continuing northward on the east side of Sims Branch, KSWA observed an area at the toe of a fill slope where microtopographic relief and drainage patterns indicated a subtle swale. Data was collected at Test Pit 175. KSWA also observed oxidized rhizospheres on living roots as a primary indicator of wetland hydrology. *Cyperus species* (with a likely indicator status of FACW or OBL) dominated the vegetation with an absolute cover estimated at 60 percent, confirming the presence of wetland vegetation. KSWA evaluated the soil profile from the surface to a depth of 20 inches. Redox concentrations in the pore linings were not of sufficient concentration for the required depth and location of those concentrations to meet the F8 Indicator of Redox Depressions. In addition, the soil did not exhibit a chroma of 1 or 2 until 11 inches bgs, disqualifying Indicator F3 of Depleted Matrix. Redox Depressions and Depleted Matrix are the two most closely relevant hydric soil indicators. This area is not a wetland. See **Photos 10 and 11** in **Appendix F**. The Wetland Data Form for Test Pit 175 is in **Appendix G**.

- As KSWA continued the assessment northward along the east side of Sims Branch, KSWA observed a watercourse flowing to the northwest to Sims Branch that originated from under a tree. KSWA observed standing water between the watercourse and the slope from the adjacent parking lot and noted algae, *Cyperus*, *Juncus* and *Ranunculus species* in the area. Plant vegetation was also stunted, likely by prolonged wet conditions and/or accumulation of dead leaf material in a concave micro-depression. Test Pit 176 (WTL) showed other indicators of wetland hydrology, including saturation at the ground surface and crayfish burrows. Upon excavation of the soil, KSWA observed a hydrogen sulfide odor that dissipated quickly. Hydrogen sulfide odor is an indicator of both wetland hydrology and hydric soils. KSWA also documented the presence of a depleted matrix in the soil profile between 4 and 15 inches bgs. This area exhibits hydrology, vegetation, and soil characteristic of a wetland and is identified as WTL-3. WTL-3 measures approximately 631 square feet (0.01 acres). See **Photos 12 - 16** in **Appendix F**. The Wetland Data Form for Test Pits 176 (WTL) and 184 (UPL) are in **Appendix G**.

4.0 **Summary and Conclusions**

Garver requested that KSWA assess 9.65 acres of additional project area on the northern side of the airport property, south of Interstate 40 and northwest of the initial project area. KSWA representatives evaluated the site on December 21 and 29, 2020. KSWA observed 3 small wetland areas within the additional project area limits, totaling 1701 square feet (0.04 acres).

Alterations to these wetlands would require authorization from TDEC and United States Army Corp of Engineers (USACE). TDEC's General Permit for Minor Alterations to Wetlands could be used for up to 0.1 acres of wetlands representing moderate resource value. The resource value of these wetlands is low based on size, limited riparian area, connection to a natural environment, and poor vegetative species diversity. However, an individual permit could be required if alterations to these wetlands was in conjunction with other impacts.

5.0 **Qualification of Conclusions**

The conclusions contained in this report are based on the existing conditions at the time of the site visits, and the project information provided. Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally accepted environmental practices. KSWA is not responsible for the conclusions, opinions, or recommendations made by others based upon the data included herein.

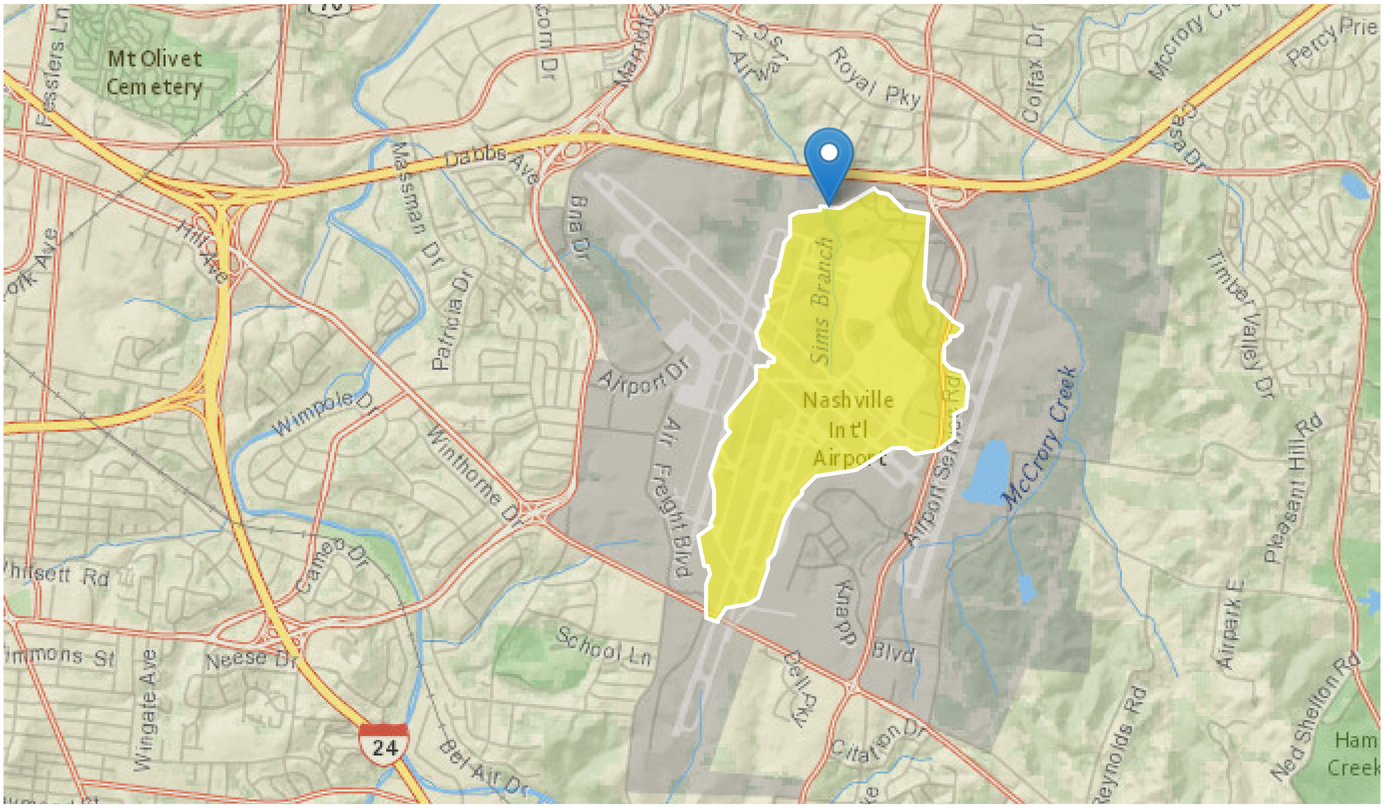
Appendix A

Drainage

Area

StreamStats Report - Sims Branch @ BNA

Region ID: TN
Workspace ID: TN20201230205307684000
Clicked Point (Latitude, Longitude): 36.13945, -86.67503
Time: 2020-12-30 14:53:16 -0600



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	1.33	square miles

USGS Data Disclaimer: Unless otherwise stated, all data, metadata and related materials are considered to satisfy the quality standards relative to the purpose for which the data were collected. Although these data and associated metadata have been reviewed for accuracy and completeness and approved for release by the U.S. Geological Survey (USGS), no warranty expressed or implied is made regarding the display or utility of the data for other purposes, nor on all computer systems, nor shall the act of distribution constitute any such warranty.

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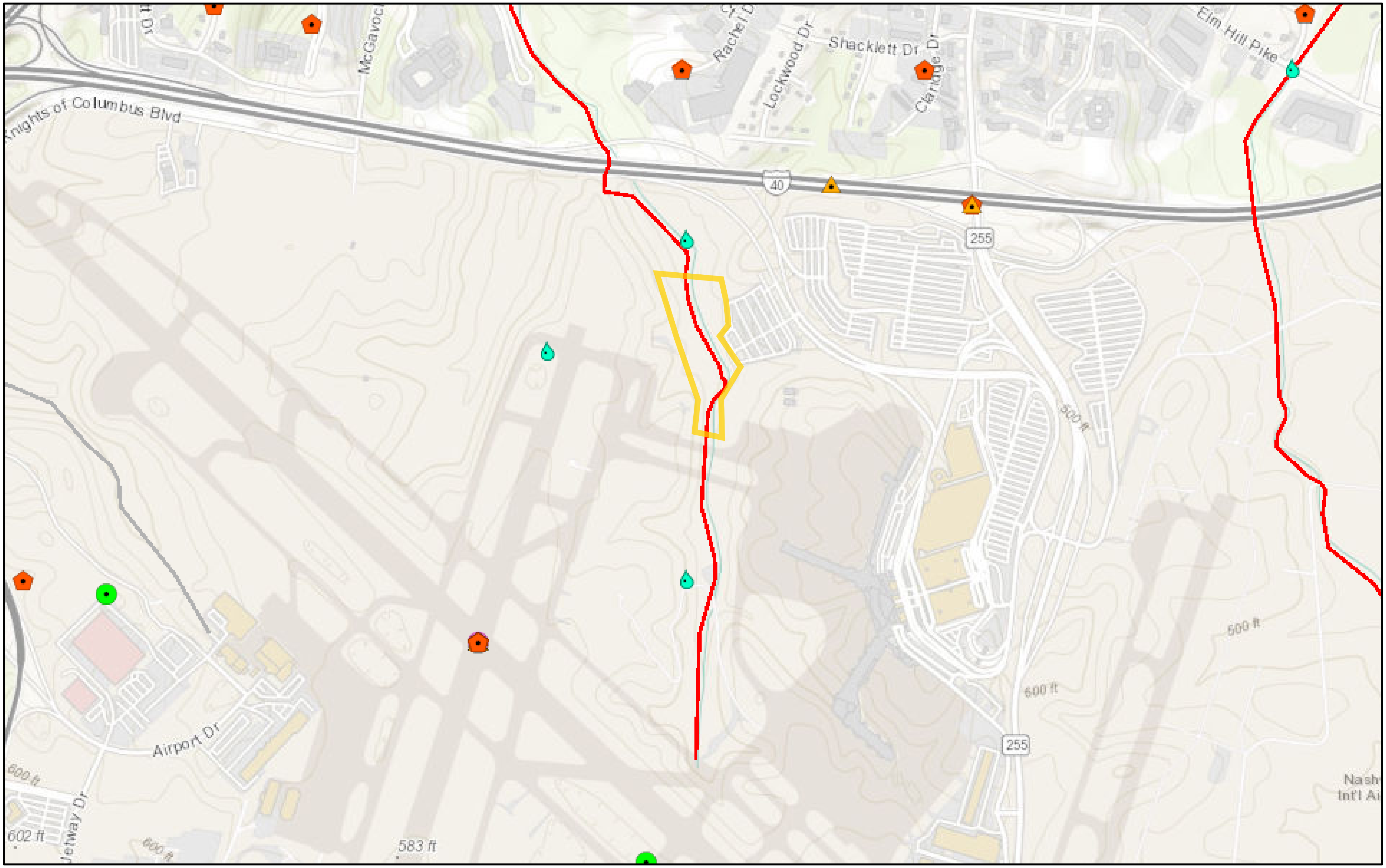
USGS Product Names Disclaimer: Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Application Version: 4.4.0

Appendix B

Water Quality Assessment

ArcGIS Web Map



1/3/2021, 10:55:56 AM

Counties

Water Quality Assessment Waterbodies

Fully Supporting

Not Assessed

Not Supporting

Water Quality Assessment

Fully Supporting

Fully Supporting (evaluated)

Not Assessed

Not Supporting

Not Supporting (evaluated)

1:18,056

0 0.13 0.25 0.5 mi

0 0.2 0.4 0.8 km

Nashville-Davidson Metro Governm, Tennessee STS GIS, Esri, HERE,

Web AppBuilder for ArcGIS

Nashville-Davidson Metro Governm, Tennessee STS GIS, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, EPA, USDA |

ArcGIS Web Map

1/3/2021, 10:57:59 AM

Counties

Water Quality Assessment Waterbodies

Fully Supporting

Not Assessed

Not Supporting

Water Quality Assessment

Fully Supporting

Fully Supporting (evaluated)

Not Assessed

Not Supporting

Not Supporting (evaluated)

1:9,028

0 0.05 0.1 0.2 mi

0 0.1 0.2 0.4 km

USDA FSA, GeoEye, Maxar, Esri, HERE, Garmin, iPC

Web AppBuilder for ArcGIS

USDA FSA, Maxar | Esri, HERE, Garmin, iPC |

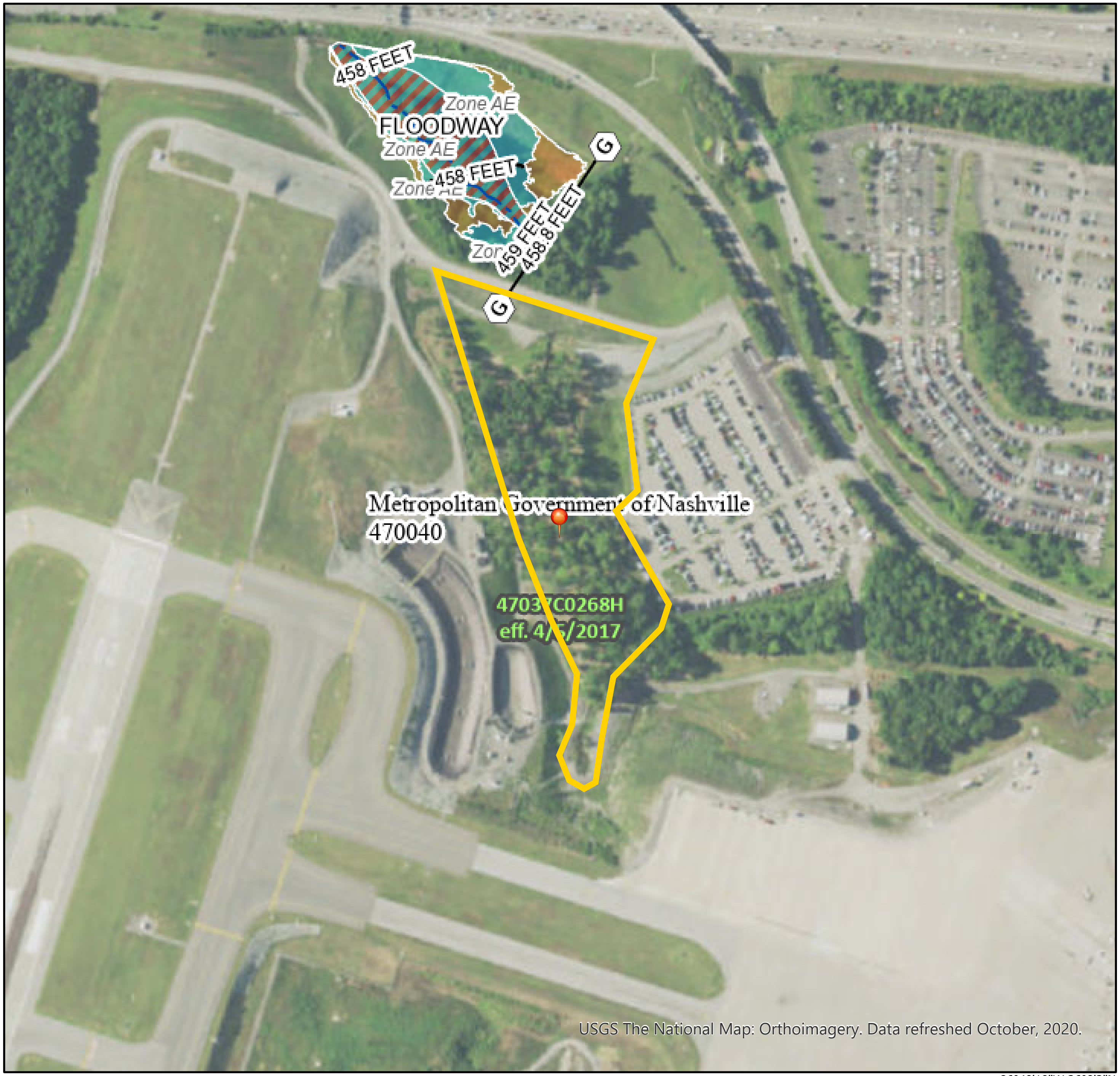
Appendix C

FEMA Floodplain Map

National Flood Hazard Layer FIRMette

FEMA

86°40'48"W 36°8'31"N



Feet 1:6,000

0 250 500 1,000 1,500 2,000

86°40'10"W 36°8'2"N

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) *Zone A, V, A99*
	With BFE or Depth *Zone AE, AO, AH, VE, AR*
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
	Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN Area of Minimal Flood Hazard *Zone X*
	Effective LOMRs
	Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer
	Levee, Dike, or Floodwall
OTHER FEATURES	20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
	Coastal Transect
	513 Base Flood Elevation Line (BFE)
	Limit of Study
	Jurisdiction Boundary
	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
MAP PANELS	Digital Data Available
	No Digital Data Available
	Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 1/2/2021 at 1:10 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Appendix D

NRCS Soil Report

United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Davidson County, Tennessee

December 29, 2020

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

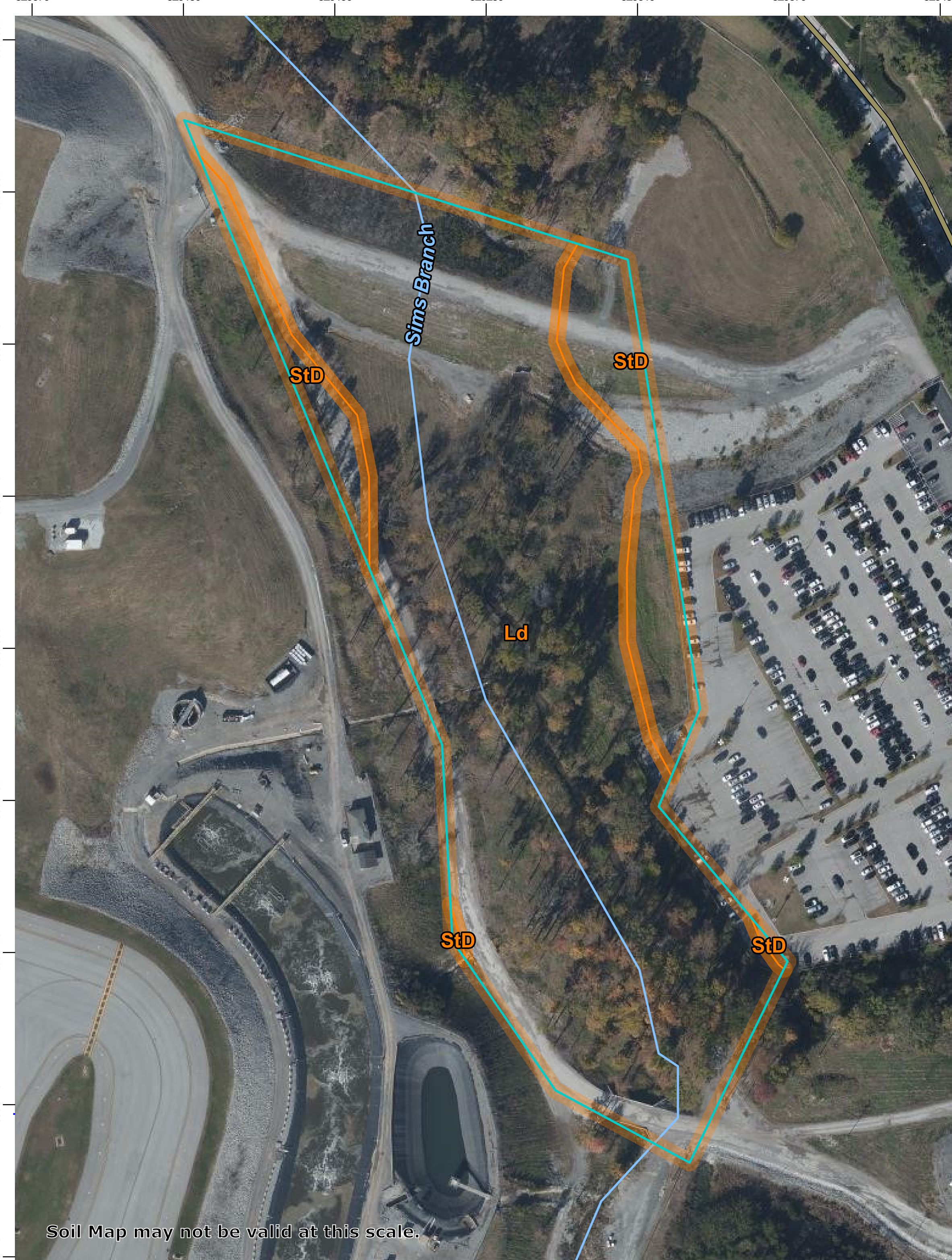
The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map (BNA Improvements Dec 2020)



Map Scale: 1:2,410 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0, 35, 70, 140, 210

Feet: 0, 100, 200, 400, 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Davidson County, Tennessee
Survey Area Data: Version 18, May 29, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Nov 2, 2019—Nov 16, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend (BNA Improvements Dec 2020)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ld	Lindell silt loam, 0 to 2 percent slopes, occasionally flooded	9.3	86.5%
StD	Stiversville loam, 12 to 25 percent slopes, eroded	1.5	13.5%
Totals for Area of Interest		**10.8**	**100.0%**

Map Unit Descriptions (BNA Improvements Dec 2020)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Davidson County, Tennessee

Ld—Lindell silt loam, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 2td2y
Elevation: 500 to 850 feet
Mean annual precipitation: 48 to 58 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 190 to 230 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Lindell and similar soils: 90 percent
Minor components: 4 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lindell

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Fine-loamy alluvium derived from limestone and siltstone

Typical profile

Ap - 0 to 7 inches: silt loam
Bw - 7 to 15 inches: silt loam
Bg - 15 to 52 inches: silt loam
Cg - 52 to 79 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 12 to 16 inches
Frequency of flooding: NoneOccasional
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: High (about 11.2 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Hydric soil rating: No

Minor Components

Norene

Percent of map unit: 4 percent

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

StD—Stiversville loam, 12 to 25 percent slopes, eroded

Map Unit Setting

National map unit symbol: 2v5bq
Elevation: 410 to 1,040 feet
Mean annual precipitation: 39 to 61 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 180 to 233 days
Farmland classification: Not prime farmland

Map Unit Composition

Stiversville and similar soils: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Stiversville

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loamy residuum weathered from limestone, sandstone, and shale

Typical profile

Ap - 0 to 8 inches: loam
Bt - 8 to 53 inches: clay loam
Cr - 53 to 63 inches: bedrock

Properties and qualities

Slope: 12 to 25 percent
Depth to restrictive feature: 39 to 59 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: High (about 10.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: A
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Appendix E

Normal Weather Calculation

	Month	Long Term Rainfall Records Minus 1 Std. Dev (dry)	Normal (Mean)	Plus 1 Std. Dev (Wet)	Actual Rain	Condition	Month Weight value	Product of previous 2 columns
1st prior month	November	1.99	3.76	5.53	1.2	1	3	3
2nd prior month	October	0.89	2.43	3.97	3.51	2	2	4
3rd prior month	September	1.25	3.34	5.43	3.8	2	1	2
							Sum=	9

Note:

If sum is:	
6-9	Then prior period has been drier than normal
10-14	Then prior period has been normal
15-18	Then prior period has been wetter than normal

Condition Value:	
Dry=	1
Normal=	2
Wet=	3

	1 Std. Deviation	Normal
jan	2.34	4.05
feb	1.97	3.8
mar	2.37	4.79
apr	1.91	3.88
may	2.1	4.33
june	2.44	3.82
july	1.78	3.58
aug	1.62	3.07
sep	2.09	3.34
oct	1.54	2.43
nov	1.77	3.76
dec	2.69	4.25

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Record of Climatological Observations

These data are quality controlled and may not be identical to the original observations.

Generated on 12/30/2020

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 600 ft. Lat: 36.1189° N Lon: -86.6892° W

Station: **NASHVILLE INTERNATIONAL AIRPORT, TN US USW00013897**

Observation Time Temperature: Unknown Observation Time Precipitation: 2400

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Obs.	24 Hour Amounts Ending at Observation Time				At Obs. Time	24 Hour Wind Movement (mi)	Amount of Evap. (in)	4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)			Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2020	09	01	88	71		0.10		0.0		0.0								
2020	09	02	90	75		0.01		0.0		0.0								
2020	09	03	89	76		0.07		0.0		0.0								
2020	09	04	87	63		0.00		0.0		0.0								
2020	09	05	87	59		0.00		0.0		0.0								
2020	09	06	88	60		0.00		0.0		0.0								
2020	09	07	90	62		0.00		0.0		0.0								
2020	09	08	90	64		0.00		0.0		0.0								
2020	09	09	91	66		0.00		0.0		0.0								
2020	09	10	92	68		0.00		0.0		0.0								
2020	09	11	92	71		0.00		0.0		0.0								
2020	09	12	91	73		0.20		0.0		0.0								
2020	09	13	76	71		3.27		0.0		0.0								
2020	09	14	84	68		0.00		0.0		0.0								
2020	09	15	85	65		T		0.0		0.0								
2020	09	16	86	67		0.00		0.0		0.0								
2020	09	17	86	67		0.00		0.0		0.0								
2020	09	18	77	58		0.00		0.0		0.0								
2020	09	19	77	54		0.00		0.0		0.0								
2020	09	20	80	57		0.00		0.0		0.0								
2020	09	21	77	55		0.00		0.0		0.0								
2020	09	22	75	52		0.00		0.0		0.0								
2020	09	23	69	61		0.02		0.0		0.0								
2020	09	24	67	61		0.03		0.0		0.0								
2020	09	25	76	64		T		0.0		0.0								
2020	09	26	80	61		0.00		0.0		0.0								
2020	09	27	83	60		0.00		0.0		0.0								
2020	09	28	73	53		0.10		0.0		0.0								
2020	09	29	70	50		0.00		0.0		0.0								
2020	09	30	79	48		0.00		0.0		0.0								
		Summary	83	63		3.80		0.0										

Empty, or blank, cells indicate that a data observation was not reported.

*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

"s" This data value failed one of NCDC's quality control tests. "At Obs." = Temperature at time of observation

"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.

"A" values in the Precipitation Flag or the Snow Flag column indicate a multiday total, accumulated since last measurement, is being used.

Data value inconsistency may be present due to rounding calculations during the conversion process from SI metric units to standard imperial units.

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Record of Climatological Observations

These data are quality controlled and may not be identical to the original observations.

Generated on 12/30/2020

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 600 ft. Lat: 36.1189° N Lon: -86.6892° W

Station: **NASHVILLE INTERNATIONAL AIRPORT, TN US USW00013897**

Observation Time Temperature: Unknown Observation Time Precipitation: 2400

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time			24 Hour Amounts Ending at Observation Time				At Obs. Time			4 in. Depth			8 in. Depth		
			Max.	Min.	At Obs.	Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)	24 Hour Wind Movement (mi)	Amount of Evap. (in)	Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2020	10	01	75	51		0.00		0.0		0.0								
2020	10	02	68	44		0.00		0.0		0.0								
2020	10	03	71	42		0.00		0.0		0.0								
2020	10	04	75	50		0.00		0.0		0.0								
2020	10	05	70	45		0.00		0.0		0.0								
2020	10	06	80	44		0.00		0.0		0.0								
2020	10	07	84	50		0.00		0.0		0.0								
2020	10	08	80	53		0.00		0.0		0.0								
2020	10	09	73	63		0.11		0.0		0.0								
2020	10	10	71	64		1.15		0.0		0.0								
2020	10	11	76	67		0.44		0.0		0.0								
2020	10	12	83	59		0.17		0.0		0.0								
2020	10	13	74	50		0.00		0.0		0.0								
2020	10	14	83	46		0.00		0.0		0.0								
2020	10	15	76	52		0.09		0.0		0.0								
2020	10	16	63	41		T		0.0		0.0								
2020	10	17	67	38		0.00		0.0		0.0								
2020	10	18	67	50		0.01		0.0		0.0								
2020	10	19	79	63		0.00		0.0		0.0								
2020	10	20	81	61		0.00		0.0		0.0								
2020	10	21	85	59		0.00		0.0		0.0								
2020	10	22	86	61		0.00		0.0		0.0								
2020	10	23	85	54		0.64		0.0		0.0								
2020	10	24	54	49		0.02		0.0		0.0								
2020	10	25	64	52		0.00		0.0		0.0								
2020	10	26	59	55		0.01		0.0		0.0								
2020	10	27	67	55		T		0.0		0.0								
2020	10	28	66	58		0.76		0.0		0.0								
2020	10	29	75	49		0.11		0.0		0.0								
2020	10	30	57	42		0.00		0.0		0.0								
2020	10	31	68	39		0.00		0.0		0.0								
		Summary	73	52		3.51		0.0										

Empty, or blank, cells indicate that a data observation was not reported.

*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

"s" This data value failed one of NCDC's quality control tests. "At Obs." = Temperature at time of observation

"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.

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U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Record of Climatological Observations

These data are quality controlled and may not be identical to the original observations.

Generated on 12/30/2020

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 600 ft. Lat: 36.1189° N Lon: -86.6892° W

Station: **NASHVILLE INTERNATIONAL AIRPORT, TN US USW00013897**

Observation Time Temperature: Unknown Observation Time Precipitation: 2400

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Obs.	24 Hour Amounts Ending at Observation Time				At Obs. Time	24 Hour Wind Movement (mi)	Amount of Evap. (in)	4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)			Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2020	11	01	63	40		0.00		0.0		0.0								
2020	11	02	56	34		0.00		0.0		0.0								
2020	11	03	69	35		0.00		0.0		0.0								
2020	11	04	73	40		0.00		0.0		0.0								
2020	11	05	71	43		0.00		0.0		0.0								
2020	11	06	74	42		0.00		0.0		0.0								
2020	11	07	80	46		0.00		0.0		0.0								
2020	11	08	81	55		0.00		0.0		0.0								
2020	11	09	83	58		0.00		0.0		0.0								
2020	11	10	79	59		T		0.0		0.0								
2020	11	11	70	50		0.09		0.0		0.0								
2020	11	12	66	42		0.00		0.0		0.0								
2020	11	13	66	42		0.00		0.0		0.0								
2020	11	14	73	39		0.00		0.0		0.0								
2020	11	15	69	44		0.15		0.0		0.0								
2020	11	16	63	34		0.00		0.0		0.0								
2020	11	17	56	38		0.00		0.0		0.0								
2020	11	18	59	32		0.00		0.0		0.0								
2020	11	19	68	41		0.00		0.0		0.0								
2020	11	20	71	45		0.00		0.0		0.0								
2020	11	21	74	45		0.00		0.0		0.0								
2020	11	22	67	41		0.07		0.0		0.0								
2020	11	23	54	33		0.00		0.0		0.0								
2020	11	24	64	34		0.00		0.0		0.0								
2020	11	25	67	54		0.04		0.0		0.0								
2020	11	26	59	40		0.00		0.0		0.0								
2020	11	27	62	38		0.00		0.0		0.0								
2020	11	28	57	37		0.00		0.0		0.0								
2020	11	29	52	34		0.37		0.0		0.0								
2020	11	30	43	32		0.48		0.2		0.0								
		Summary	66	42		1.20		0.2										

Empty, or blank, cells indicate that a data observation was not reported.

*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

"s" This data value failed one of NCDC's quality control tests. "At Obs." = Temperature at time of observation

"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.

"A" values in the Precipitation Flag or the Snow Flag column indicate a multiday total, accumulated since last measurement, is being used.

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Record of Climatological Observations

These data are quality controlled and may not be identical to the original observations.

Generated on 12/30/2020

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 600 ft. Lat: 36.1189° N Lon: -86.6892° W

Station: **NASHVILLE INTERNATIONAL AIRPORT, TN US USW00013897**

Observation Time Temperature: Unknown Observation Time Precipitation: 2400

Year	Month	Day	Temperature (F) 24 Hrs. Ending at Observation Time Max.	Temperature (F) 24 Hrs. Ending at Observation Time Min.	Temperature (F) At Obs.	Precipitation 24 Hour Amounts Ending at Observation Time Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	At Obs. Time Snow, Ice Pellets, Hail, Ice on Ground (in)	Evaporation 24 Hour Wind Movement (mi)	Amount of Evap. (in)	Soil Temperature (F) 4 in. Depth Ground Cover (see *)	4 in. Max.	4 in. Min.	8 in. Depth Ground Cover (see *)	8 in. Max.	8 in. Min.
2020	12	01	42	26		0.00		0.0		0.0								
2020	12	02	49	20		0.00		0.0		0.0								
2020	12	03	58	26		0.17		0.0		0.0								
2020	12	04	47	36		0.61		0.0		0.0								
2020	12	05	56	32		0.00		0.0		0.0								
2020	12	06	58	30		0.00		0.0		0.0								
2020	12	07	42	31		0.00		0.0		0.0								
2020	12	08	45	30		0.00		0.0		0.0								
2020	12	09	66	29		0.00		0.0		0.0								
2020	12	10	71	36		0.00		0.0		0.0								
2020	12	11	66	39		0.01		0.0		0.0								
2020	12	12	68	44		0.10		0.0		0.0								
2020	12	13	53	33		0.49		0.0		0.0								
2020	12	14	41	32		0.70		0.0		0.0								
2020	12	15	46	30		T		0.0		0.0								
2020	12	16	44	34		0.16		0.0		0.0								
2020	12	17	41	27		0.00		0.0		0.0								
2020	12	18	45	24		0.00		0.0		0.0								
2020	12	19	52	30		0.32		0.0		0.0								
2020	12	20	51	33		0.06		0.0		0.0								
2020	12	21	60	32		0.00		0.0		0.0								
2020	12	22	56	36		0.00		0.0		0.0								
2020	12	23	61	36		0.46		0.0		0.0								
2020	12	24	51	24		0.32		T		0.0								
2020	12	25	27	17		T		T		0.0								
2020	12	26	51	17		0.00												
2020	12	27																
2020	12	28																
2020	12	29																
2020	12	30																
2020	12	31																
		Summary	52	30		3.40		0.0										

Empty, or blank, cells indicate that a data observation was not reported.

*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

"s" This data value failed one of NCDC's quality control tests. "At Obs." = Temperature at time of observation

"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.

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Appendix F

Photographs

Photo #1 Looking south at surface water near test pit 152. Photo shows surface water spreading out with accumulation in a tire rut before it is collected in (likely) man-made drainage feature that discharges to Sims Branch to the east.	
Photo #2 View of surface water near test pit 152 showing algae and evidence of iron oxidizing bacteria. Note the sparse vegetation.	
Photo #3 Photo of the soil from test pit 152. High water table is observable within 7 inches of the surface and saturation within 6 inches of the surface. Rock was encountered at a depth of 16 inches.	

Photo #4 Looking north from the southern boundary of **WTL-1** (green area). The area was dominated by *Cyperus sp.* and *Packera glabella*. The depression drains toward the manhole (orange arrow).	
Photo #5 Looking south toward **WTL-1** (green circle) Water around the sewer manhole drains in a defined channel and discharges to Sims Branch to the east.	
Photo #6 Soil profile from the test pit at Point 62 in **WTL-1**.	

Photo #7 Looking north at WTL-2 that has roughly 30’ diameter. Surface water in the ponded area was about 3 inches deep. At the test pit location (point 169, pink arrow), soils were saturated at 3 inches from the surface and a high-water table was observed at 8 inches below the surface.	
Photo #8 View of the soil profile from the test pit (169).	
Photo #9 Looking north from point 170. This location serves as the UPL point for 169. Hydrophytic vegetation and indicators of wetland hydrology were present, but the soils were not hydric.	

Photo #10 Looking south at test pit 175. KSWA observed an area at the toe of a fill slope where microtopographic relief and drainage patterns indicated a subtle swale. This location had wetland hydrology and plants, but the soils were not hydric, so it is not a wetland.	
Photo #11 Soil profile from point 175.	
Photo #12 Looking south at a portion of **WTL-3**. KSWA observed a flowing watercourse (blue arrow) that began from under a tree. KSWA then observed standing water between the watercourse and the slope from the adjacent parking lot. KSWA noted algae, wetland vegetation and a hydrogen sulfide odor, an indicator of wetland hydrology and hydric soils. KSWA also documented the presence of a depleted matrix between 4 and 15 inches of the soil profile.	

Photo #13 Looking northwest (downstream) along the drainage feature. **WTL-3** extends to the right descending bank of that feature. The pink arrow shows the location of the test pit.	
Photo #14 Soil profile at test point 176 in **WTL-3.**	
Photo #15 Looking north at UPL test pit location 184 as a contrast to WTL test pit location 176.	

Photo #16 Soil profile at UPL point 184. KSWA observed oxidized rhizospheres along living root channels at 15 inches of the soil profile. This does not meet the criteria for a depleted matrix or redox depressions.	

Appendix G

Wetland Data Sheets

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Proposed BNA Improvements City/County: Nashville/Davidson Sampling Date: 2020-12-21

Applicant/Owner: MNAA (through Garver) State: TN Sampling Point: 152

Investigator(s): K.Jordan & T.Hess Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 1

Subregion (LRR or MLRA): LRR N 123 Lat: 36.139154° Long: -86.675247° Datum: WGS84

Soil Map Unit Name: Ld - Lindell silt loam, 0 to 2 percent slopes, occasionally flooded NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation No, Soil No, or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___
Hydric Soil Present?	Yes ___	No X
Wetland Hydrology Present?	Yes X	No ___

Is the Sampled Area within a Wetland? **Yes** ___ **No** X

Remarks:

Located on low slope

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes X	No ___	Depth (inches): 7
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 6

Wetland Hydrology Present? Yes X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

N/A

Remarks:

Surface water flowing across ground within just a few feet of test pit.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: 152

Tree Stratum (Plot size: 20)

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
= Total Cover			

50% of total cover: ____ 20% of total cover: ____

Sapling/Shrub Stratum (Plot size: ____)

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
= Total Cover			

50% of total cover: ____ 20% of total cover: ____

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Juncus sp.	5	No	FACW
2. Cyperus sp.	40	Yes	FACW*
3. Setaria parviflora	5	No	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	50		

50% of total cover: 25 20% of total cover: 10

Woody Vine Stratum (Plot size: ____)

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
= Total Cover			

50% of total cover: ____ 20% of total cover: ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ____ (A)

Total Number of Dominant Species Across All Strata: ____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ____ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

X 1 - Rapid Test for Hydrophytic Vegetation
__ 2 - Dominance Test is >50%
__ 3 - Prevalence Index is ≤3.0[1]
__ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: (Include photo numbers here or on a separate sheet.)

Juncus unable to identify to species because there was no florescence. Most of the juncus species in this region are either OBL or FACW. Cyperus, similar.

SOIL

Sampling Point: 152

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-5	10 YR 4/2	100					CL	
5-10	10 YR 4/1	75	5 YR 3/4	5	C	PL	CL	
	10 YR 4/6	20					CL	
10-16	10 YR 4/3	90						
	10 YR 4/1	10						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: rock

Depth (inches): 16

Hydric Soil Present? Yes ______ No X

Remarks:

Point taken where vegetation was hydric and flowing surface water was observed first as mostly sheet flow then as a more concentrated flow that eventually formed a channel. Area was not a closed depression.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Proposed BNA Improvements City/County: Nashville/Davidson Sampling Date: 2020-12-21

Applicant/Owner: MNAA (through Garver) State: TN Sampling Point: 162

Investigator(s): K.Jordan & T.Hess Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 1

Subregion (LRR or MLRA): LRR N 123 Lat: 36.137713° Long: -86.674458° Datum: WGS84

Soil Map Unit Name: Ld - Lindell silt loam, 0 to 2 percent slopes, occasionally flooded NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	**Is the Sampled Area within a Wetland?** **Yes** X **No** ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks:

Area is a depression near a sewer manhole. Test point is 22 feet from sewer manhole. The area is wetter closer to the manhole. There was no leakage from the man hole on the surface, but leakage subsurface is unknown. Wetland is 22 feet long, 21 feet wide oval.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)	___ True Aquatic Plants (B14)
X High Water Table (A2)	___ Hydrogen Sulfide Odor (C1)
X Saturation (A3)	X Oxidized Rhizospheres on Living Roots (C3)
___ Water Marks (B1)	___ Presence of Reduced Iron (C4)
___ Sediment Deposits (B2)	___ Recent Iron Reduction in Tilled Soils (C6)
___ Drift Deposits (B3)	___ Thin Muck Surface (C7)
___ Algal Mat or Crust (B4)	___ Other (Explain in Remarks)
___ Iron Deposits (B5)	
___ Inundation Visible on Aerial Imagery (B7)	
___ Water-Stained Leaves (B9)	
___ Aquatic Fauna (B13)	

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes X	No ___	Depth (inches): 8
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 3

Wetland Hydrology Present? Yes X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

N/A

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: 162

Tree Stratum (Plot size: 20)

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
= Total Cover			

50% of total cover: ____ 20% of total cover: ____

Sapling/Shrub Stratum (Plot size: ____)

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
= Total Cover			

50% of total cover: ____ 20% of total cover: ____

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Cyperus sp.	30	Yes	FACW
2. Packera glabella	20	Yes	OBL
3. Rumex crispus	5	No	FAC
4. Solidago sp.	1	No	
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	55		

50% of total cover: 28 20% of total cover: 11

Woody Vine Stratum (Plot size: ____)

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
= Total Cover			

50% of total cover: ____ 20% of total cover: ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
_X_ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL Sampling Point: 162

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-2	2.5 Y 3/2	100					CL	
2-6	10 YR 4/2	98	7.5 YR 4/6	2	C	PL	CL	Prominent
6-9	2.5 Y 4/1	95	5 YR 4/6	5	C	PL	CL	Prominent
9-16	2.5 Y 4/2	98	10 YR 3/6	2	C	PL	CL	Prominent

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- _X_ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes Y **No** ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Proposed BNA Improvements City/County: Nashville/Davidson Sampling Date: 2020-12-21

Applicant/Owner: MNAA (through Garver) State: TN Sampling Point: 163

Investigator(s): K.Jordan & T.Hess Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 1

Subregion (LRR or MLRA): LRR N 123 Lat: 36.137739 Long: -86.674409° Datum: WGS84

Soil Map Unit Name: Ld - Lindell silt loam, 0 to 2 percent slopes, occasionally flooded NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation No, Soil No, or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?		X
Wetland Hydrology Present?	X	

Is the Sampled Area within a Wetland? **Yes** ___ **No** X

Remarks:

Upland test pit for WTL-1 (pt. 162)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		X	
Water Table Present?		X	
Saturation Present? (includes capillary fringe)	X		11

Wetland Hydrology Present? Yes X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

N/A

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: 163

Tree Stratum (Plot size: 20)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
50% of total cover:		20% of total cover:	

Sapling/Shrub Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	= Total Cover		
50% of total cover:		20% of total cover:	

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Cyperus sp.	10	Yes	FACW
2. Glechoma hederacea	5	No	FACU
3. Rumex crispus	5	No	FAC
4. Poa sp.	10	Yes	FAC*
5. Lamium sp.	5	No	---------
6.			
7.			
8.			
9.			
10.			
11.			
	35 = Total Cover		
50% of total cover: 18		20% of total cover: 7	

Woody Vine Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

Vegetation was minimal with decomposing leaves covering most of the ground.
*likely FAC or wetter.

SOIL

Sampling Point: 163

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-5	2.5 Y 4/3	100					CL	
5-8	2.5 Y 4/3	98	7.5 YR 4/6	2	C	PL	CL	
8-11	2.5 Y 4/3	98	5 YR 4/6	2	C	PL	CL	
11-16	2.5 Y 4/2	98	10 YR 3/6	2	C	PL	CL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 136, 122)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No X

Remarks:
Test point not within closed depression

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Proposed BNA Improvements City/County: Nashville/Davidson Sampling Date: 2020-12-21

Applicant/Owner: MNAA (through Garver) State: TN Sampling Point: 169

Investigator(s): K.Jordan & T.Hess Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 1

Subregion (LRR or MLRA): LRR N 123 Lat: 36.137760° Long: -86.674201° Datum: WGS84

Soil Map Unit Name: Ld - Lindell silt loam, 0 to 2 percent slopes, occasionally flooded NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation No, Soil No, or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	**Is the Sampled Area within a Wetland?**	**Yes** X **No** ___
Hydric Soil Present?	Yes X No ___		
Wetland Hydrology Present?	Yes X No ___		

Remarks:

30'diameter

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 3

Water Table Present? Yes X No ___ Depth (inches): 8

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 3

Wetland Hydrology Present? Yes X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

N/A

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: 169

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Quercus palustris	85	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
= Total Cover			
50% of total cover:	20% of total cover:		

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
= Total Cover			
50% of total cover:	20% of total cover:		

Herb Stratum (Plot size: 5')			
1. Cyperus sp.	40	Yes	FACW
2. Rumex crispus	25	Yes	FAC
3. Packera glabella	5	No	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	70 = Total Cover		
50% of total cover: 35	20% of total cover: 14		

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

X 1 - Rapid Test for Hydrophytic Vegetation

__ 2 - Dominance Test is >50%

__ 3 - Prevalence Index is ≤3.0[1]

__ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: 169

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-3	10 YR 5/2	100					CL	
3-5	10 YR 5/2	98	7.5 YR 5/8	2	C	PL	CL	Prominent
5-7	10 YR 6/2	100			D	M	CL	Prominent
7-10	10 YR 5/2	98	7.5 YR 5/6	2	C	PL	CL	Prominent
10-14	10 YR 5/3	95	10 YR 5/6	5	C	M	CL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Gleyed Matrix (F2)
_X__ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 136, 122)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** Y **No** ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Proposed BNA Improvements City/County: Nashville/Davidson Sampling Date: 2020-12-21

Applicant/Owner: MNAA (through Garver) State: TN Sampling Point: 170

Investigator(s): K.Jordan & T.Hess Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 1

Subregion (LRR or MLRA): LRR N 123 Lat: 36.137932° Long: -86.674306° Datum: WGS84

Soil Map Unit Name: Ld - Lindell silt loam, 0 to 2 percent slopes, occasionally flooded NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation No, Soil No, or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___
Hydric Soil Present?	Yes ___	No X
Wetland Hydrology Present?	Yes X	No ___

Is the Sampled Area within a Wetland? **Yes** ___ **No** X

Remarks:

Upland test pit for point 169

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes ___	No X	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 11

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

N/A

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: 170

Tree Stratum (Plot size: 20)

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		

50% of total cover: ______ 20% of total cover: ______

Sapling/Shrub Stratum (Plot size: ______)

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	= Total Cover		

50% of total cover: ______ 20% of total cover: ______

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Cyperus sp.	50	Yes	FACW
2. Rumex crispus	5	No	FAC
3. Packera glabella	5	No	OBL
4. Poa sp.	10	No	FAC*
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	70 = Total Cover		

50% of total cover: 35 20% of total cover: 14

Woody Vine Stratum (Plot size: ______)

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: ______ 20% of total cover: ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (Include photo numbers here or on a separate sheet.)

*Likely FAC or wetter

SOIL

Sampling Point: 170

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-3	10 YR 5/3	100					CL	
3-7	10 YR 5/3	98	7.5 YR 5/6	1	C	PL	CL	
7-10	10 YR 5/2	100			D	M	CL	
10-14	10 YR 4/2	98	7.5 YR 5/6	2	C	PL	CL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- _ __Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No X

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Proposed BNA Improvements City/County: Nashville/Davidson Sampling Date: 2020-12-29

Applicant/Owner: MNAA (through Garver) State: TN Sampling Point: 175

Investigator(s): K.Jordan Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 1

Subregion (LRR or MLRA): LRR N 123 Lat: 36.138213° Long: -86.674415° Datum: WGS84

Soil Map Unit Name: Ld - Lindell silt loam, 0 to 2 percent slopes, occasionally flooded NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation No, Soil No, or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___	**Is the Sampled Area within a Wetland?** **Yes** ___ **No** X
Hydric Soil Present?	Yes ___	No X	
Wetland Hydrology Present?	Yes X	No ___	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes ___	No X	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): ___

Wetland Hydrology Present? Yes X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:
N/A

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: 175

Tree Stratum (Plot size: 25)

	Absolute % Cover	Dominant Species?	Indicator Status
1. Liriodendron tulipifera	25	yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			

= Total Cover

50% of total cover: ______ 20% of total cover: ______

Sapling/Shrub Stratum (Plot size: ______)

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			

= Total Cover

50% of total cover: ______ 20% of total cover: ______

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Cyperus sp.	60	Yes	FACW
2. Rumex crispus	5	No	FAC
3. Packera glabella	10	No	OBL
4. Lonicera japonica	5	No	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			

80 = Total Cover

50% of total cover: 40 20% of total cover: 16

Woody Vine Stratum (Plot size: ______)

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			

= Total Cover

50% of total cover: ______ 20% of total cover: ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	10	x 1 =	10
FACW species	60	x 2 =	120
FAC species	5	x 3 =	15
FACU species	30	x 4 =	120
UPL species		x 5 =	
Column Totals:	105 (A)		265 (B)

Prevalence Index = B/A = 2.52

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ______

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: 175

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
1-6	10 YR 5/3	98	5 YR 4/6	2	C	PL	CL	
6-9	10 YR 5/3	98	5 YR 4/6	2	C	PL	CL	
9-11	10 YR 5/3	95	5 YR 4/6	5	C	PL	CL	
11-14	10 YR 5/1	25						
	10 YR 5/3	25	5 YR 4/6	5	C	M	CL	
	10 YR 4/2	40	5 YR 4/6	5	C	PL	CL	
14-20	10 YR 4/2	95	7.5 YR 4/6	5	C	PL	CL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No X

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Proposed BNA Improvements City/County: Nashville/Davidson Sampling Date: 2020-12-29

Applicant/Owner: MNAA (through Garver) State: TN Sampling Point: 176

Investigator(s): K.Jordan & T.Hess Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 1

Subregion (LRR or MLRA): LRR N 123 Lat: 36.138573° Long: -86.674590° Datum: WGS84

Soil Map Unit Name: Ld - Lindell silt loam, 0 to 2 percent slopes, occasionally flooded NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation No, Soil No, or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___
Hydric Soil Present?	Yes X	No ___
Wetland Hydrology Present?	Yes X	No ___

Is the Sampled Area within a Wetland? **Yes** X **No** ___

Remarks:

points 177-182 are perimeter=0.02 acres

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- X Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- X Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- X Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- X Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches): 1
Water Table Present?	Yes ___	No X	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 0

Wetland Hydrology Present? Yes X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

N/A

Remarks:

located between flowing drainage and slope to adjacent parking lot.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: 176

Tree Stratum (Plot size: 25)

	Absolute % Cover	Dominant Species?	Indicator Status
1. Quercus rubra	20	Yes	FACU
2. Celtis laevigata	20	Yes	FACW
3.			
4.			
5.			
6.			
7.			
	= Total Cover		

50% of total cover: 40 20% of total cover: 8

Sapling/Shrub Stratum (Plot size:)

	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix nigra	1	Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	1 = Total Cover		

50% of total cover: - 20% of total cover: -

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Cyperus sp.	30	Yes	FACW
2. Juncus	5	No	FAC
3. Packera glabella	5	No	OBL
4. Ranunculus hispidus	10	Yes	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	50 = Total Cover		

50% of total cover: 25 20% of total cover: 10

Woody Vine Stratum (Plot size:)

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: 20% of total cover:

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: 176

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-2	10 YR 4/3	100						
2-4	10 YR 4/2	100						
4-6	10 YR 4/2	98	5 YR 4/6	2	C	PL	CL	
6-10	10 YR 4/1	98	5 YR 4/6	2	C	PL	CL	
10-12	10 YR 5/2	98	5 YR 4/6	2	C	M	CL	
12-15	10 YR 4/2	98	5 YR 4/6	2	C	PL	CL	
15-18	10 YR 4/3	99	5 YR 4/6	5	C	PL	CL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Gleyed Matrix (F2)
_X__ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 136, 122)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes X **No** ______

Remarks:

Organics such as sticks and leaf remnants were visible throughout the profile

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Proposed BNA Improvements City/County: Nashville/Davidson Sampling Date: 2020-12-29

Applicant/Owner: MNAA (through Garver) State: TN Sampling Point: 184

Investigator(s): K.Jordan Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 1

Subregion (LRR or MLRA): LRR N 123 Lat: 36.138648° Long: -86.674600° Datum: WGS84

Soil Map Unit Name: Ld - Lindell silt loam, 0 to 2 percent slopes, occasionally flooded NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No, Soil No, or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X
Hydric Soil Present?	Yes ____	No X
Wetland Hydrology Present?	Yes X	No ____

Is the Sampled Area within a Wetland? **Yes** ____ **No** X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): 0
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

N/A

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: 184

Tree Stratum (Plot size: 25)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Sapling/Shrub Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	= Total Cover		
50% of total cover: -	20% of total cover: -		

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Cyperus sp.	25	Yes	FACW
2. Lamium sp.	30	Yes	--------
3. Packera glabella	5	No	OBL
4. Glechoma hederacea *	30	Yes	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	90 = Total Cover		
50% of total cover: 45	20% of total cover: 18		

Woody Vine Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	5	x 1 = 5
FACW species	25	x 2 = 50
FAC species	0	x 3 = 0
FACU species	30	x 4 = 120
UPL species	30	x 5 = 150
Column Totals:	90 (A)	325 (B)

Prevalence Index = B/A = 3.6

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: 184

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-1	organics							
1-15	10 YR 4/3	100						
15-16	10 YR 4/3	98	5 YR 4/6	2	C	PL	CL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 136, 122)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? Yes ______ No X

Remarks:

APPENDIX F

Energy/Natural Resources Technical Memorandum

December 20, 2020

Mr. Ryan Mountain
Garver
Nashville, TN

Dear Mr. Mountain:

Slade/SL King needs to know the overall existing infrastructure to be able to assess and recommend any improvement for future expansion including resiliency for on-site systems. Also, Slade/SLK has provided the scope of work and some analysis based on no utility data. In depth utility data was not available or needed for this type of review.

Available data included projected total electricity demand for Vision 1.0, Vision 2.0, and Future load provided by MNAA and presented below:

The following may be required for a detailed analysis of the energy consumption related to the Proposed Action; however it is not anticipated for this project:

- **Utility bills for the past three fiscal years**

- **Existing Equipment type including HVAC, Lighting and Water system.**
  For instance, if the facilities are mainly equipped with DX Systems or Central Heating and Cooling plants to meet the Heating and Cooling demand. This helps us to have a better understanding if the equipment has passed their useful life or not to function as efficient as possible and potentially some necessary retrofit.

- **Any renovation and retrofit project which has been done for the past 10 years throughout the whole facilities including any upgrades related to HVAC, Lighting and Water systems.**

If you need additional information, please call me at 205-413-4685.

Sincerely,

L'Tryce Slade, MRP, JD

Slade

To: Ryan Mountain

From: L'Tryce Slade

Date: December 21, 2020

Existing facility loads are 6,058 kW vs Vision 1.0 loads: 13,550.81 kW, Vision 2.0: 11,042.4 kW and Future loads: 1,020 kW which results in total connected loads of 30,651.87 kW. It should be noted that the provided loads are based on a combination of historical data and concluding calculated loads, as well as an extrapolation of calculated loads from Vision 1.0 for the purpose of estimated load for Vision 2.0 and future loads.

The concourse A expansion is included in designated projects in Vision 2.0 which will add 351,200 SF to the existing facility also will result in demolishing 110,000 SF of existing concourse A. A comparison of anticipated loads for Vision 2.0, the breakdown of loads associated with each area would require more detailed analysis. For instance, to assess the future load for concourse A and see how realistic the load is, we need to know the existing load for concourse A. No other available data to analyze and compare the existing load for concourse A is available at this time. The Satellite concourse's future load and square footage (89,390 SF) data was reviewed.

Per EO 13123, Greening the Government Through Efficient Energy Management and accordance with FAA guidelines, MNAA is willing to implement principles of environmental design and sustainability including greenhouse gas mitigation and resource conservation into planning process for new projects. BNA has already indicated some sustainability efforts through implementation plan of the existing 250 ft deep lake to install geo-cooling system for the airport which could tremendously reduce the electricity usage. This reduction is anticipated to be 6,000 kW of peak demand, saving 1.3 million kWh and 30 million gallons of potable water which will result in utility savings more than 430,000 USD per year.

1. Utility Bill Analysis

Energy Use Intensity (EUI) is a comprehensive and realistic measure to study building energy performance which measure the energy consumption levels relative to the building gross area. To accomplish utility and energy analysis, three years of utility bills including electricity, natural gas, water/sewage, and other sources must be available to have a proper and realistic understanding of the building performance.

Airport terminal buildings are not included in The Commercial Building Energy Consumption Survey (CBECS) in 2018 report by US Energy Administration Information (USEAI); therefore, there is no EUI baseline due to lack of information. Energy consumption patterns of airport terminals are not simple due to the variety of space types such as office, retail, food service, mall, public assembly and so on. Based on the studies that have been done in 2015, the EUI of airport terminal in North America varies between 130 kBtu/sf-yr to 320 kBtu/sf-yr. There are many factors that cause this variety including building location, area, age, number of stories, lighting, number of occupants, equipment, Heating Design Days (HDD) and Cooling Design Days (CDD). But 200 kBtu/sf-yr could be considered as the US. National average site EUI for energy efficient air terminal buildings. Also, these numbers can be beneficial for any future expansion to predict the future Energy consumption. The following methodology and some candidate Energy Conservation Measures (ECMs) should be considered to achieve the best possible EUI.

2. Energy Analysis and Potential Energy Efficiency and Sustainability Measure

To study and assess any Building energy performance, all the bill data need to be compared with energy simulation and normalized baseline (taking into account all the explanatory variables such as location, age, HDD, CDD, equipment and so on). As it is mentioned, there are many factors and pieces which should be considered and gathered to analyze energy consumption of any facility or building and even one missing item would remarkably affect the entire analysis.

It is vital to note that 60% of a typical air terminal Building consists of offices, concessions, retails, baggage handling, screening and public assembly which indicates a great potential for energy reduction and implementing ECMs. The followings are candidate ECMs including HVAC, Electrical Power and Lighting and Water Systems which are applicable to commercial and Air Terminal Buildings:

2.1. Candidate Energy Conservation Measures:

- **Chilled Water System Optimization and Renovation:**
  This ECM potentially could cover any optimizations and replacement in chilled water systems including Chillers, Pumps, VFDs and Cooling Towers.
- **Hot Water System Optimization and Renovation:**
  This ECM potentially could cover any optimizations and replacement in Hot water systems including Boilers, Pumps and VFDs.
- **Optimized Air Distribution Systems:**
  Including replacement and optimization of Terminal Units, Air handling Units, Fans and VFDs.
- **Controls Optimization and Retro-Commissioning of HVAC Systems:**
  This ECM could cover a variety range of optimization including:

Scheduling / Optimum Start Stop, Chilled Water and Hot Water Reset, Supply Air Temperature Reset, Static Pressure Reset, Demand Control Ventilation, Adjust Minimum Terminal Unit Minimum Settings, Retro-Cx/Tuning/ Test and Balance etc.

- **Lighting System Improvements including LEDs and Controls Upgrades:**
  Including LED Fixture Replacement, LED Luminaire Conversion, LED lamp and adding and Retro-Commissioning Occupancy sensors.
- **Transformer Upgrades**
- **Water Conservation including Fixture Upgrades and Sensor Controls**
  Installation of low flow shower heads, faucet restrictors, low flush toilets, low flush valves for urinal
- **Irrigation Sewer Credit:**
  Eliminate sewer charges or possibly installation of a separate water meter for irrigation system.
- **Rainwater Management**
  Rainwater harvesting throughout the facility can highly reduce water consumption for landscape irrigation which already MNAA has designed the new parking garage to include 20,000 gallons of rainwater harvesting.

3. Potential for Resiliency for on-site Systems

The following on-site systems could potentially avoid and minimize BNA from any unpredicted energy disruption and to ensure energy availability and reliability.

1. **Solar Photovoltaic Systems**
2. **Wind Tower Systems**
3. **On-site Back-up Generation Opportunities for Resiliency**
   - Potentially replacing existing generators
   - Peak Shaving with Battery Storage
   - Peak Shaving with Existing Generation
   - Peak Shaving with Chilled Water System Thermal Storage

3.1. Environmental impact

In 2018, The U.S total electricity generation by electric power industry of 4.17 trillion kWh from all the energy resources caused the total emission of 1.87 billion metric tons of Carbon Dioxide (CO_2) which results in 0.99 pound of CO_2 emissions per kWh. It should be noted that the amount of emissions caused by electricity production varies by two main factors:

1- Type of energy source which could be Coal, Oil, Natural Gas and Renewables
2- Type and efficiency of Power Plants

Also, 63% of total US electricity generation produced by power plants which used coal, natural gas and petroleum as energy source which caused 99% of total emissions. According to Energy Information Administration (EIA) implementing renewable energies such as Biomass, Hydro, Solar and Wind are carbon neutral which can remarkably result in Carbon Dioxide mitigation.

According to EIA data base, coal power plants account for 25% of electricity production in 2018 in Tennessee which is 20,996,713 MWh and resulted in emissions of more than 10,580 metric tons of Carbon Dioxide. As it mentioned before, by considering a best possible EUI for BNA as an average energy efficient Airport Terminal Building, there is a remarkable potential to mitigate CO_2 emissions by electricity generation via renewable energies. Also, by knowing the type and energy source of power plants feeding BNA through Nashville Electric Service, will highly help to understand and evaluate more precisely the environmental impact of implementing any energy conservation measures and renewable energies.

Estimated Overall Facility Loads

	Connected (kW)	Demand (kW)	Schedule
Existing Facility Demand (Includes CUP)	6,058.00	6,058.00	Open
Vision Loads			
Concourse D (Designed)	2,714.24	2,006.18	2020 Q3
Project 1 Terminal (Designed)	2,158.05	1,446.48	2020 Q3
IAF (Estimate)	5,024.26	3,801.50	2023 Q3
Parking Garages B & C	3,460.49	2,886.96	Garage C Open Garage B - Est 2023 Q3
Future Loads			
Concourse A Expansion	3,697.83	2,773.37	2024 Q4
Satellite Concourse	2,668.23	2,001.17	2022 Q1
Concourse D Expansion	1,019.34	764.50	No Schedule
Hotel	2,907.00	2,180.25	Est 20223 Q3
CONRAC Expansion	1,020.00	1,020.00	2025 Q4
Total	30,727.44	24,938.41	

APPENDIX G

Socioeconomic Studies

Nashville International Airport
Concourse and Gate Expansion

Socioeconomic Analysis Memorandum
December 2020

Prepared by:

GARVER

INTRODUCTION

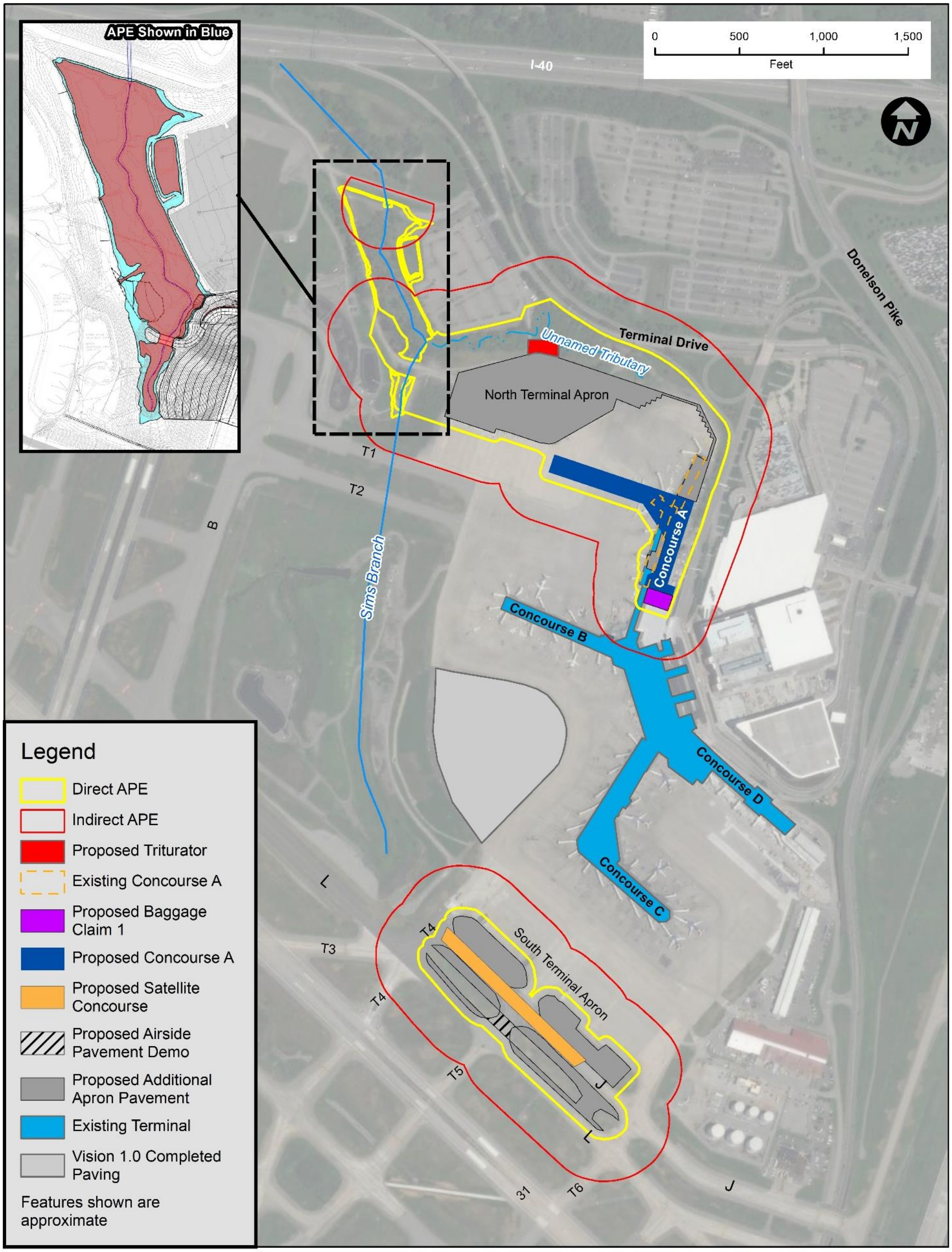
The Nashville International Airport (BNA or Airport) is a public use airport owned and operated by the Metropolitan Nashville Airport Authority (MNAA) and serves private and major commercial airlines. The Airport consists of four primary use concrete runways, full parallel taxiways, ground support equipment, and four active concourses (A, B, C and D) with concourses T approved and currently under construction. The total number of gates at BNA (post Vision Environmental Assessment [EA]) is 48 gates. The Airport's concourses include amenities such as restaurants, ATMs, restrooms, hold rooms, entertainment, and concessions.

The MNAA developed a long-term plan for addressing necessary airport improvements through 2041. This plan was called the BNA Vision (Vision 1.0 EA, 2018). As documented in the Vision 1.0 EA and Finding of No Significant Impact (FONSI) issued March 2018, the greater Nashville area has experienced unprecedented growth over the past decade. The Vision 1.0 EA was identified as a "comprehensive plan designed to enable BNA to meet the needs of projected increased growth in the region and accommodate rapidly increasing numbers of passengers flying into and out of BNA" and the Vision 1.0 EA thoroughly documented growth patterns regarding increased enplanements and regional population growth. Research conducted during compilation of the Vision 1.0 EA is considered recent; therefore, much of the reported information remains applicable and this socioeconomic memorandum supplements that document with updated information applicable for the proposed project. This memorandum addresses baseline information, while providing concise discussions on updated information obtained between the completion of the Vision EA and present day. The geographic areas evaluated for this socioeconomic analysis are Davidson County and the Nashville-Davidson-Murfreesboro-Franklin, Tennessee (TN) Metropolitan Statistical Area (MSA). The BNA is located within these geographical areas and these areas encompass the communities most affected by proposed improvements to the BNA.

PROPOSED IMPROVEMENTS

BNA proposes to expand its gate capacity to support the documented increase in regional growth by expanding Concourse A, constructing a new satellite concourse, and constructing other related improvements as part of the Proposed Action. Terminal apron ramps are also proposed for expansion to safely accommodate maneuvering aircraft around the expanded Concourse A. The Proposed Action is being pursued to increase capacity in response to projected enplanement forecasts commensurate with the economic growth of the greater Nashville area. The proposed improvement areas are shown in **Figure 1**.

Figure 1: Proposed Improvement



POPULATION DEMOGRAPHICS

The Nashville-Davidson-Murfreesboro-Franklin, TN MSA, also known as the greater Nashville area, is located in the Tennessee Valley within the state of Tennessee. The Nashville-Davidson-Murfreesboro-Franklin MSA, referred henceforth as the Nashville MSA, covers 10 counties, and consists of a population of more than 1.8 million. The Nashville MSA has experienced job growth of 26 percent over the past decade, making the region the second fastest growing metro economy in the country.

Data was gathered using the U.S. Census Bureau's latest American Community Survey (ACS) 5-year estimates. For this report, the 2018 ACS demographic data is used to characterize the existing population for the immediate and surrounding area in which BNA is located. Data tables include information for Davidson County and Nashville MSA. State data is also included for comparison purposes. Data described in this and following subsections include age, gender, race/ethnicity, median household income, educational attainment, and other economic demographics.

Environmental Justice Populations

As stated above, the U.S. Census Bureau (USCB) 5-year ACS estimates were gathered, and this data was used to determine the presence and extent of the environmental justice (EJ) populations. The EJ population includes minority populations and/or low-income populations. Minority populations are characterized as a group of individuals within minority race groups that include Hispanic or Latino, Black or African American, American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, Other Race or Two or More Races. Low income populations are determined by the median household income below the U.S. Department of Health and Human Services (DHHS) 2020 poverty guideline of $26,200 for a family of four. Minority population and median household income data for Davidson County and Nashville MSA are included in **Table 1** and **2**, respectively. The state data is also included for comparison purposes.

Table 1: Minority Population Demographics

Geographic Area	Total Population	Hispanic or Latino	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Some Other Race	Two or More Races	Percent Minority Population
Tennessee	6,651,089	5.3%	16.6%	0.2%	1.7%	0.0%	0.1%	1.9%	25.9%
Davidson County	684,017	10.2%	27.2%	0.2%	3.5%	0.06%	0.3%	2.3%	43.8%
Nashville MSA	1,864,138	7.1%	15.1%	0.2%	2.6%	0.04%	0.2%	2.1%	27.4%

Source: USCB, 2018 American Community Survey 5-Year Estimates, Table DP05.

Table 2: Median Household Income

Geographic Area	Number of Households	Median Household Income	Percent of Families and People Whose Income is Below Poverty Level
Tennessee	2,567,061	$50,972	16.1
Davidson County	277,903	$81,577	16.4
Nashville MSA	704,111	$86,319	12.4

Source: USCB, 2018 American Community Survey 5-Year Estimates, Table DP03.

As shown in **Table 1**, the highest minority group is the Black or African American population followed by the Hispanic or Latino population. Overall, Davidson County and Nashville MSA are not considered to be high minority populated areas because the total minority percentage is below 50 percent of the total population; however, the minority population percentages for Davidson County and the Nashville MSA are higher than the percentage for the state of Tennessee. Therefore, the geographic areas of Davidson County and the greater Nashville area have minority populations more than generally found in the rest of the state.

The median household income for all geographic areas listed in **Table 2** are well above the 2020 DHHS poverty guideline of $26,200[1]. These geographic areas are not considered to be low-income areas; however, there are approximately 12 to 16 percent of families in the Nashville MSA and Davidson County respectively, whose incomes are below the poverty level as determined by the USCB 5-year estimates data.

Gender and Age Demographics

To evaluate potential underrepresented and vulnerable groups, age and gender demographic data were gathered for Davidson County, Nashville MSA and the state, which are included in **Table 3**.

Table 3: Gender and Age Demographics

Geographic Area	Total Population	Male	Female	Under 18 years	65 years and over
Tennessee	6,651,089	49%	51%	23%	16%
Davidson County	684,017	48%	52%	21%	12%
Nashville MSA	1,864,138	49%	51%	24%	13%

Source: USCB, 2018 American Community Survey 5-Year Estimates, Table DP05.

As shown above, the total population is generally divided equally between males and females, but the female population is 1 to 2 percent higher than their counterpart for the areas listed. On the other hand, age groups younger than 18 years old and 65 years and older generally consist of approximately 30 to 35 percent of the population in Davidson County and in Nashville MSA. This is slightly less compared to the percentage for the entire state, which is approximately 39 percent for these age groups. The remaining age groups, between 18 to 64 years of age, make up a majority of the total population (65 to 70 percent) and includes the general labor force available in these geographic areas. These age and gender demographics for Davidson County and the Nashville MSA are generally consistent with the entire state of Tennessee.

ECONOMIC CONDITIONS

The greater Nashville area is one of the strongest growth areas in the country. Nashville experienced faster growth than the U.S. as a whole in employment, total income, and per capita personal income from 2002 through 2015. During this timeframe, greater Nashville area employment grew by over 26 percent and increased its share of the country's total employment from 0.057 percent to 0.063 percent.

[1] The 2018 DHHS poverty guideline for a family of four is $25,100; however, the most currently published DHHS poverty level, which is 2020 at the time of this report, is included to be a more conservative comparison in evaluating median household income.

Educational Attainment

Educational attainment data is gathered to help evaluate the overall economic outlook of the communities within Davidson County and Nashville MSA. Educational attainment is included in **Table 4**.

Table 4: Educational Attainment

Geographic Area	Total Population - 25 to 64 years old	Less than High School Graduate	High School Graduate or Equivalent	Some college or Associate's Degree	Bachelor's Degree or Higher
Tennessee	3,485,493	11%	32%	29%	28%
Davidson County	390,052	11%	22%	26%	42%
Nashville MSA	1,015,324	9%	26%	28%	37%

Source: USCB, 2018 American Community Survey 5-Year Estimates, Table S2301.

More highly skilled workers can contribute to a more prosperous economic outlook for the area and provides a look at the available potential employment pool for the airport and supporting businesses in the area. The data, shown in the **Table 4**, shows that there is an available population of individuals with college degrees and higher. This represents the availability of a highly skilled workforce for employers in these geographic areas.

Employment Characteristics

The USCB 5-year ACS estimates were used to gather the latest employment data for the Nashville MSA and Davidson County to determine the economic condition of the communities within these two geographic areas. Employment status for Davidson County and the Nashville MSA are included in **Table 5**.

Table 5: Employment

Geographic Area	Total Population - 16 years and older	Percent in Labor Force	Unemployment Rate
Tennessee	5,321,857	61%	5.9
Davidson County	552,221	71%	4.6
Nashville MSA	1,474,707	68%	4.5

Source: USCB, 2018 American Community Survey 5-Year Estimates, Table DP03.

As shown in **Table 5**, the employment rate for Davidson County and the Nashville MSA are lower than the state of Tennessee. The labor force available in these geographic areas are also higher than the state of Tennessee, consisting of over 65 percent of the total population in both of these geographic areas. A large labor force can provide positive benefits for employers and businesses in these areas and can help support a strong economy.

The employment forecast indicates that Nashville will continue to exhibit strong growth and that the greater Nashville area will have approximately 0.75 percent of the U.S. employment by 2041 (Lynch, 2017). Employment continues to be strong in the region with approximately 75,000 new jobs created in the last five years (Lynch, 2017).

Airport Statistics

MNAA employs approximately 300 people according to the latest economic study (Martin Associates, 2019). In addition, BNA has more than 100 tenants and lessees operating independent businesses at BNA, which employ approximately 5,000 people (Vision 1.0 EA, 2018).

The impact of airports and associated aviation activity is a crucial component of diverse economies. The Bureau of Transportation Statistics (BTS) ranked BNA as 29th among 783 U.S. airports for the number of passengers within a 12-month period ending in July 2020. In July 2020, 27 scheduled carriers are reported, one less than the 28 carriers reported in the prior year of 2019. The dominant carrier at BNA is Southwest Airlines which holds over half the carrier shares for the airport at approximately 53 percent. Other top airline carriers include Delta, American, United and SkyWest.

From 2016 to 2019, there has been a steady increase in total passengers according to BTS data. Total passengers increased approximately 40 percent, from 12.5 million to 17.5 million total passengers. The total passenger reported for July 2020 is 12.2 million. This substantial decrease in total passengers in 2020 is largely due to the travel impacts resulting from the COVID-19 pandemic.

BNA supports 67,000 total jobs in 2018 which includes approximately 33,000 direct jobs and over 33,000 indirect and induced jobs from related industries (MNAA, 2019). BNA generates approximately $6 billion in business revenue.

ENVIRONMENTAL CONSEQUENCES

The proposed improvements are evaluated for potential impacts to the population. These potential effects are discussed in the following sections.

Direct Effects

Short-term effects

Impacts during the construction phase of the project would result in short-term effects to businesses, employees, visitors and travelers using the BNA. Construction related impacts are typically temporary in duration and include access and economic impacts related to construction disturbances. Temporary restrictions to access specific locations and longer wait times due to disruption of typical routes would be impacted. Indirect effects to businesses resulting from hindrances due to construction may also occur. Advance planning would minimize frustration for customers. Advance notice of potential construction areas would enable users of the BNA to avoid these areas and find alternative access routes to minimize delays and concerns. Temporary reduction in customers and foot traffic may result from alternative routes and the use of alternate businesses and services during construction.

Construction, regardless of the amount of disruption that may occur, is unlikely to reduce the passenger rate of the airport. Most travelers using BNA are unlikely to use an alternate airport to visit Nashville or surrounding areas for convenience purposes.

Long-term effects

The proposed improvements include expansion of Concourse A. The airlines utilizing Concourse A are United, Spirit, Cape Air, Boutique Air, Air Canada, British Airways and other international charters. The proposed expansion would help grow the carrier capabilities and maneuvering of their aircraft.

Concourse A currently has one tenant, the Arts District Market. Two other tenants have recently closed, La Hacienda and Hudson News and Gifts. The small increase in leasable space would result in additional opportunities for businesses and employment at BNA. The proposed expansion of Concourse A includes additional tenant spaces and is anticipated to bring in the following businesses, in addition to the Arts District Market, upon completion of the expansion in 2023: Fugitives Public House, Kijiji Coffee House, Arrington Vineyards, and vending spaces for Best Buy, Fuel Rod and SouveNear with Arts & Shirts. These additional businesses would draw in the economic benefits to these areas and increase the number of employment opportunities for the labor force that currently exists in the Nashville MSA and Davidson County. It will also help growth of the local economy from these extra businesses and employment to be drawn back into the local economy.

Other direct impacts that might affect surrounding communities are potential noise effects. A noise analysis was performed on the proposed improvements and reported in a December 2020 technical memorandum. The analysis determined noise affected contour areas for the same out year from no-action compared to the proposed action. Although the proposed action would result in larger area of effects, the expanded areas are not substantial. In addition, there are three areas of residential land use, but are within both the no-action and the proposed action affected areas. Furthermore, noise impacts would be addressed through mitigation measures. These noise abatement measures would reduce noise effects to the surrounding areas and include sound insulation, residential property sales assistance programs and acquisitions. Detailed information on the analysis and mitigation measures are found in the noise analysis technical memorandum (HMMH, 2020).

Secondary Effects

Potential effects that would indirectly result from the proposed improvements are evaluated to determine any secondary impacts from the proposed project. These impacts could indirectly result from direct economic jobs and employment that trigger any trickle effects for other industries that support or rely on the airport business. Other employment industries and businesses such as hotels, restaurant and retail companies that rely on travel and tourism are considered indirect or secondary impacted industries.

The Proposed Action is expected to result in an increase of permanent jobs at BNA; these jobs would result from increased terminal services, businesses and amenities. As the population of the labor force in Davidson County is currently estimated to be over 391,000 (USCB, 2018), the permanent jobs generated by the Proposed Action are relatively minor in comparison to the overall county-wide labor force; therefore, there would be no significant impacts to the labor force as a result of the Proposed Action.

The Proposed Action would not directly change the land use of surrounding areas. Indirect impacts to land use may result from future development; however, significant development is unlikely to occur based on development trends in this area. Aerial imagery over the last 20 years show no significant changes in development in the immediate areas surrounding the airport. The amount of available land in the immediate area surrounding the airport would primarily be limited to infill and areas to the south and east of the airport. Future development is also constrained due to floodplain, waters and wetland resources that are less desirable areas for development. Furthermore, future development would be evaluated separately under projects conducted by others and would be required to follow applicable local, state and federal guidelines including avoidance, minimization and mitigation measures to address any potential impacts from such projects.

CONCLUSION

No adverse impacts related to socioeconomics in nearby communities, Davidson County, or the greater Nashville area are expected to occur as a result of implementing the Proposed Action. In addition, no permanent displacements or relocations are anticipated from the Proposed Action and all improvements would occur within airport-owned land. Based on the analysis, vulnerable and EJ populations would not be adversely impacted by the Proposed Action. Economic effects in the form of increased potential for employment would result for the communities adjacent to and surrounding the BNA. Temporary impacts would occur from the construction phase of the project. General mitigation measures and best management practices will be implemented to reduce potential impacts to businesses and communities within and nearby the airport area during construction. Noise impacts would also be mitigated in accordance with regulatory standards and guidelines. During construction, MNAA will require contractors to develop a management plan to minimize potential impacts to BNA customers.

LITERATURE CITED

HMMH. 2020. Updated Technical Memorandum: Noise and Air Quality Analysis for BNA CAGE Environmental Assessment. 58 pages.

Lynch, Mary. 2017. Nashville International Airport Enplanements Forecast. Nashville: TransSolutions, LLC. 15 pages.

Martin Associates. 2019. The Economic Impact of Nashville International and John C. Tune Airports. 57 pages.

Metropolitan Nashville Airport Authority (MNAA). 2018. BNA Vision, Final Environmental Assessment. 260 pages.

Metropolitan Nashville Airport Authority (MNAA). 2019. Nashville International Airport PFC Public Notification. 11 pages.

U.S. Census Bureau. 2018. American Community Survey 5-Year Estimates, Tables DP03, DP05, and S2301.

NASHVILLE INTERNATIONAL AIRPORT SOCIO-ECONOMIC STUDY

PREPARED BY
SLADE

SLADE
ENVIRONMENTAL SERVICES
GENERAL CONTRACTING

FOR GARVER
September 15, 2020

SLADE
ENVIRONMENTAL SERVICES
GENERAL CONTRACTING

NASHVILLE INTERNATIONAL AIRPORT SOCIO-ECONOMICS

Nashville is located in the Tennessee Valley. The Metropolitan Statistical Areas economic market covers 10 counties and consists of a population of more than 1.9 million. As one of the largest metro areas, Nashville is the headquarters for Nissan, North America, Bridgestone Americas, Dollar General, HCA Health care, Alliance Bernstein, and Amazon. The Nashville Metropolitan Statistical Areas MSA has experienced job growth of 26 percent over the past decade, making the region the second fastest growing metro economy in the country since the Great Recession.

Cultural diversity, unique neighborhoods, a variety of industries and a thriving creative community make Nashville a diverse economy, low cost of living and doing business, and a well-educated population. These characteristics make Nashville's economic market among the nation's best locations for relocating, expanding and establishing a business.

The impact of airports and associated aviation activity is a crucial component of diverse economies. BNA currently employs 300 people and has more than 1000 tenants. The total number of people employed is approximately 5000. The small increase in leasable space may result in additional opportunities for businesses and employment at BNA.

BNA has a Master Plan that has three phases:

- Vision 1.0
- Vision 2.0
- Future

This memorandum addresses baseline information, while providing concise discussions on updated information obtained between the completion of the Vision EA and present day. The Nashville Chamber of Commerce data was used for demographic, economy, international, livability, location, distribution and trade, and talent and workforce. Citations with Nashville MSA (Source: U.S. Census Bureau were obtained from The Nashville Chamber of Commerce. Another source for information is the Nashville International Airport Enplanement Forecast, prepared by Mary A. Lynch Analysis is in the Final Environmental Assessment BNA Vision Plan. Since the Airport receives federal funds it is important to consider the community. The EPA has developed a new environmental justice EJ mapping and screening tool called EJ Screen was used for demographic research. These data sources were used in the analysis for the BNA Socioeconomic Report.

PRIMARY SOCIO-ECONOMIC IMPACT

Primary socio-economic impact consists of economic variables that are a direct function of the activities at the airport. To evaluate the magnitude of this type of impact, a thorough and detailed collection of data from all business entities, both public and private, especially those located at the airport, is necessary. Surveys and interviews should be conducted with the airline representatives, concessionaires, car rental firms, airport administration, fixed based operators, and government agencies involved in the operation of the airport. Some of the examples of primary impact are the number of employees; the gross payroll; expenditures for local goods and services, including advertisement, local tax payments, including state sales tax; capital investment expenditures; and annual revenues.

Enplanement

According to the Nashville International Airport Enplanement in the Final Environmental Assessment BNA Vision Plan, the forecast is for incremental international passengers at BNA.

Table 1 BNA Enplanements	
2011	4,806,092
2012	4,923,323
2013	5,178,915
2014	5,521,701
2015	5,8331,513
2016	6,489,739
Forecast	
2017	7,091,433
2021	7,716,463
2026	8,618,358
2031	9,424,887
2041	11,176,900

Source: Nashville International Airport Enplanement in the Final Environmental Assessment BNA Vision Plan, Mary A. Lynch.

The forecast expects that enplanement will increase through the years. A 2016 study identified potential international markets and expectations for enplanements at BNA. The international enplanement is the growth embodied in the forecast presented above. The international forecast was developed through 2021. The forecasts were through 2041 using regional growth rates in the FAA's 2017 Aerospace Forecast.

The Table below shows the domestic/international split included in the forecast.

Table 2 Domestic/International Enplanements International Enplanements						
	2016	2017	2021	2026	2031	2041
YYZ	49,218	66,219	66,219	78,647	93,408	131,762
CUN	8,472	11,947	17,599	21,309	25,802	37,827
LHR			29,395	33,257	37,628	48,166
SJU		3,295	6,590	7,979	9,661	14,163
PUJ			5,109	6,186	7,490	10,982
MBJ			875	1,060	1,283	1,882
SJO			875	1,060	1,283	1,882
FPO	1,058		1210	1,430	1,690	2,361
MEX			14,638	17,724	21,461	31,463

KEF			23,986	28,350	33,509	46,812
Total	58,749	81,461	166,496	197,003	233,215	327,300
	Domestic Enplanement					
	2016 6,430,990	2017 7,009,972	2021 7,549,967	2026 8,421,355	2031 9,191,673	2041 10,849,601
	Total Enplanement					
	2016 6,489,739	2017 7,091,433	2021 7,716,463	2026 8,618,3358	2031 9,424,887	2041 11,176,900

Source: Airport management provided data for 2016-2021; Mary A. Lynch Analyses provided data for 2021-2041

Statistical Data

BNA has statistical data such as Aviation Statistical Summary, Deplaned Passengers, Enplaned Passengers, and Total Passengers. Tourist and travelers are attracted to the vibrant industry and population growth, and strong income factors in Nashville. These elements influence continuous growth of enplanements at BNA and for the continuing growth in air travel.

Table 3
Aviation Statistical Summary
Month of April 2020
Fiscal Year: 2020

	Month-to-Date			**Year-to-Date**		
	FY '20	**FY '19**	**Change**	**FY'20**	**FY'19**	**Change**
Aircraft Operations	6310	19,601	-67.8	180,481	185,322	-2.6
Gross Landing Wgts (1,000 pounds)	297,112	854,990	-65.2	8,270,976	8,128,941	1.7
Total passengers Air Mail	62,533	1,501,291	-95.8	13,067,472	13,831,655	-5.5
Air Mail	1	74	-98.2	684	622	9.9
Air Freight	624	785	-20.4	8,185	6,825	19.9
Air Cargo-Domestic	2,575	3,653	-29.5	30,823	35,279	-12.6
Air Cargo-International	1	239	-99.6	2,251	2,363	-4.7
Cargo Total	3,202	4,751	-32.6	41,943	45,090	-7.0
General Aviation Fuel John C. Tune	149,706	734,336	-79.6	6,373,061	6,744,104	-5.5
Auto Rental	22,458	170,254	-86.8	1,442,012	1,562,117	-7.7
Long Term Tickets ISS	6,426	82,225	-92.2	660,853	742,989	-11.1
Short Term Tickets ISS	1,407	59,073	-97.6	464,468	569,908	-18.5

Grand Trans Departures	11,695	62,899	-81.4	589,975	692,292	-14.8
Airport Traffic	7,128	174,216	-95.9	1,456,112	1,477,709	-1.5
Calculated Load Factors	118,737	611,679	-80.6	7,913,827	6,993,137	13.2
Enplaned Passengers	31,510	747,058	-95.8	6,514,459	6,910,694	-5.7
Airline Seats	318,844	945,146	-66.3	9,271,010	8,688,447	6.7
Load Factors	9.9	79	-69.2	70.7	79.5	-9.3
Deplaned Passengers	31,023	754,233	-95.9	6,553,013	6,920,961	-5.3
Airline Seats	318,844	945,146	-66.3	9,271,010	8,688,447	6.7
Load Factors	9.7	79.8	-70.1	70.7	79.7	-9.0
Total Passengers	62,533	1,501,291	-95.8	13,067,472	13,831,655	-5.5
Airline Seats	637,688	1,890,292	-66.3	18,542,020	17,376,894	6.7
Load Factors	9.8	79.4	-69.6	70.5	79.6	-9.1

When we compare the "Month to Month" and "Year to Date" there is a steady decrease for Aircraft Operations; Total Passengers; Air Cargo-Domestic; Air Cargo-International; Cargo Total; General Aviation Fuel John C. Tune; Auto Rental; Long Term Tickets ISS; Grand Trans Departures; Airport Traffic;

Under the **Calculated Load Factors** the Airline Seats Enplaned Passengers; and Airline Seats current month had an increase. The year to date had a decrease.

The Gross Landings; Air Mail; and Air Freight current month had an increase. However, the year to date is a decrease.

Under the **Calculated Load Factors** the Airline Seats; Deplaned Passengers; and Airline Seats current month had an increase. However, the year to date is a decrease.

SLADE
ENVIRONMENTAL SERVICES
GENERAL CONTRACTING

Table 4
Metropolitan Nashville Airport Authority
Deplaned Passengers
Nashville International Airport
All Customers
Fiscal Year

Deplaned Passengers
The monthly and yearly percentage shows the ridership compared to the fiscal year ridership.

	FY 2015	Month%	Year%	FY 2016	Month%	Year%	FY 2017	Month%	Year%
July	509,957	6.9	6.9	557,709	9.4	9.4	597,989	7.2	7.2
August	472,500	8.9	7.9	512,520	8.5	8.9	560,341	9.3	8.2
September	456,673	11.4	9.0	495,639	8.5	8.8	564,887	14.0	10.0
October	510,594	8.6	8.9	561,189	9.9	9.1	608,851	8.5	9.6
November	438,185	5.8	8.3	486,639	11.1	9.5	560,931	15.3	10.7
December	444,599	4.9	7.7	465,462	4.7	8.7	519,962	11.7	10.8
January	388,260	0.8	6.9	421,952	8.7	8.7	475,397	12.7	11.1
February	345,935	-4.8	5.6	416,434	20.4	9.8	452,907	8.8	10.8
March	492,327	2.2	5.2	526,261	6.9	9.5	586,672	11.5	10.9
April	493,711	7.2	5.4	533,075	8.0	9.3	581,536	9.1	10.7
May	508,998	4.7	5.3	574,379	12.8	9.7	610,856	6.4	10.3
June	533,731	4.9	5.3	605,002	13.4	10.0	656,19	8.4	10.1
Total	5,595,470			6,156,261			6,776,438		
YTD% Change			5.3			10.0			10.1
	FY 2018	Month %	Year %	FY 2019	Month%	Year%	FY 2020	Month%	Year%
July	654,968	9.5	9.5	728,098	11.2	11.2	849,635	16.7	16.7
August	617,344	10.2	9.8	710,070	15.02	13	801,063	12.8	14.8
September	574,222	1.7	7.2	679,699	18.37	14.7	764,614	12.5	14.0
October	655,673	7.7	7.3	767,033	16.98	15.3	875,069	14.1	14.1
November	615,924	9.8	7.8	707,874	14.93	15.2	763,127	7.8	12.8
December	576,469	10.9	8.3	639,159	10.87	14.5	74,141	16.4	13.4
January	511,789	7.7	8.2	591,640	15.60	14.7	674,109	13.9	13.4
February	505,981	11.7	8.5	586,814	15.98	14.8	667,865	13.8	13.5
March	653,602	11.4	8.9	756,341	15.72	14.9	382,367	-49.4	5.8
April	661,770	13.8	9.4	754,233	13.97	14.8	31,023	-95.9	-5.3
May	695,050	13.8	9.8	819,197	17.86	15.1	99,331	-87.9	-14.1
June	729,020	11.1	10.0	835,216	14.57	15.1	0	-100.0	0.0
Total	7,451,812			8,575,374			6,652,344		
YTD% Change		10.0				15.1			-14.1

There was a steady increase of Deplaned Passenger from 2015 to 2020. The Deplaned passenger decreased March 2020 due to the Coronavirus flying was discouraged. As a result, ridership decreased.

Enplaned Passenger
Table 5
Enplanement Trends and Forecast
Metropolitan Nashville Airport Authority
Nashville International Airport
All Customers

Fiscal Year

	FY 2015	Month %	Year %	FY2016	Month %	Year %	FY 2017	Month %	Year %
July	503,370	9.1	9.1	543,685	8.0	8.0	586,474	7.9	7.9
August	469,703	9.1	9.1	504,576	7.4	7.7	556,225	10.2	9.0
September	453,172	11.4	9.8	494,402	9.1	8.2	563,977	14.1	10.6
October	509,866	8.7	9.5	557,367	9.3	8.5	608,322	9.1	10.2
November	440,935	5.5	8.7	482,788	9.5	8.7	561,613	16.3	11.4
December	457,350	4.3	8.0	478,943	4.7	8.0	534,097	11.5	11.4
January	379,636	1.4	7.2	411,430	8.4	8.1	468,454	13.9	11.7
February	347,544	-4.8	5.9	419,612	20.7	9.4	455,030	8.4	11.3
March	487,417	1.1	5.3	520,969	6.9	9.0	586,932	12.7	11.5
April	487,603	7.9	5.5	525,080	7.7	8.9	573,720	9.3	11.3
May	530,258	5.2	5.5	597,730	12.7	9.3	637,295	6.6	10.8
June	537,294	5.4	5.5	604,510	12.5	9.6	657,960	8.8	10.6
	5,604,148			6,141,092			6,790,099		

	FY 2018	Mo %	Year%	FY2019	Mo%	Year%	FY 2020	Mo%	Year%
July	646,817	10.3	10.3	718,855	11.11	11.1	828,530	15.3	15.3
August	612,464	10.1	10.2	700,457	14.37	12.7	790,318	12.8	14.1
September	571,939	1.4	7.3	676,187	18.23	14.4	762,322	12.7	13.6
October	654,334	7.6	7.4	771,444	17.90	15.3	875,797	13.5	13.6
November	618,454	10.1	7.9	702,094	13.52	15.0	751,439	7.0	12.3
December	592,972	11.0	8.4	668,960	12.81	14.6	765,328	14.4	12.6
January	505,103	7.8	8.3	585,863	15.99	14.8	657,466	12.2	12.6
February	508,395	11.7	8.7	584,876	15.04	14.8	668,237	14.3	12.8
March	653,938	11.4	9.0	755,200	15.48	14.9	383,512	-49.2	5.2
April	647,145	12.8	9.4	747,058	15.44	15.0	31,510	-95.8	-5.7
May	723,266	13.5	9.8	844,443	16.75	15.1	102,325	-87.9	-14.7
June	731,505	11.2	10.0	841,170	14.99	15.1	0	-100.0	0.0
	7,466,322			8,596,307			6,616,784		

This data shows the ridership in months and year. The purpose of this table is to show ridership is dependent on the economic climate and socioeconomic issues. For instance, there was a steady increase of Enplaned Passengers from 2015 to 2020.There was a steady rise in Enplaned Passenger ridership up until March 2020 due to the Coronavirus flying is discouraged. As a result, ridership decreased.

Total Passengers
Table 6
Metropolitan Nashville Airport Authority Total Passenger
Nashville International Airport All Customers

Fiscal Year
The monthly and yearly percentage shows the ridership compared to the fiscal year ridership.

	FY 2015	Month %	Year %	FY2016	Month %	Year %	FY 2017	Month %	Year%
July	1,013,327	8.0	8.0	1,101,394	8.7	8.7	1,184,463	7.5	7.5
August	942,023	9.0	8.5	1,017,096	7.9	8.3	1,116,566	9.8	8.6
September	909,845	11.4	9.4	990,041	8.8	8.5	1,128,864	14.0	10.3
October	1,020,460	8.6	9.2	1,118,556	9.6	8.8	1,217,173	8.8	9.9
November	879,120	5.7	8.5	969,427	10.3	9.1	1,122,544	15.8	11.0
December	901,949	4.6	7.9	944,405	4.7	8.4	1,054,059	11.6	11.1
January	767,896	1.1	7.0	833,382	8.5	8.4	943,851	13.3	11.4
February	693,479	-4.8	5.7	836,046	20.6	9.6	907,937	8.6	11.1
March	979,744	1.7	5.2	1,047,230	6.9	9.2	1,173,604	12.1	11.2
April	981,314	7.5	5.5	1,058,155	7.8	9.1	1,155,256	9.2	11.0
May	1,039,256	4.9	5.4	1,172,109	12.8	9.5	1.248.151	6.5	10.5
June	1,071,025	5.2	5.4	1,209,512	12.9	9.8	1,314,069	8.6	10.3
	11,199,618			12,297,353			13,566,537		

	FY 2018	Mo %	Year%	FY2019	Mo %	Year%	FY 2020	Mo %	Year%
July	1,301,785	9.9	9.9	1,446,653	11.1	11.1	1,678,165	16	16.0
August	1,229,808	10.1	10.0	1,410,527	14.69	12.9	1,591,381	12.8	14.4
September	1,146,161	1.5	7.2	1,355,886	18.30	14.6	1,526,936	12.6	13.8
October	1,310,007	7.6	7.3	1,538,477	17.44	15.3	1,750,866	13.8	13.8
November	1,234,378	10.0	7.8	1,409,968	14.22	15.1	1,514,566	7.4	12.6
December	1,169,441	10.9	8.3	1,308,119	11.86	14.6	1,509,469	15.4	13.0
January	1,016,892	7.7	8.3	1,177,503	15.79	14.7	1,331,575	13.1	13.0
February	1,014,376	11.7	8.6	1,171,690	15.51	14.8	1,336,102	14.0	13.1
March	1,307,540	11.4	8.9	1,511,541	15.60	14.9	765,879	-49.3	5.5
April	1,308,915	13.3	9.4	1,501,291	14.70	14.9	62,533	-95.8	-5.5
May	1,418,316	13.6	9.8	1,663,640	17.30	15.1	201,656	-87.9	-14.4
June	1,460,525	11.1	10.0	1,676,386	14.78	15.1	0	-100.0	0
	14,918,144			17,171,681			13,269,128		

This data shows the ridership in months and year. The purpose of this table is to show ridership is dependent on the economic climate and socioeconomic issues. For instance, there was a steady increase of Passengers from 2015 to 2020. There was a steady rise in Passenger ridership up until March 2020 due to the Coronavirus social distancing was encouraged. As a result, ridership decreased.

Future Planning

The main component of future planning is the expansion of the CONRAC; Garages, A, B, and C hotel; and administrative offices. A new loop would be constructed to allow transportation network companies (staged in the economy parking lot) access to a new ground transportation center in Garage A (refer to Figure 1.3-2). With the potential future realignment of the Donelson Pike (to be undertaken by the Tennessee Department of Transportation [TDOT]), additional roadway modifications may be necessary. Due to the uncertain timeline and footprint, no specific planning to accommodate the CONRAC is included as part of this BNA Vision Concept, with the exception of an estimated electrical load for planning by NES. While a specific route to feed the CONRAC expansion is not fully realized, the proposed footprint that has been outlined by BNA does pose complications for existing utility routing in this general area.

As part of this BNA Vision Concept, the approximate footprint of this facility is shown above, as well as impacts on the existing routes and planned route modifications as part of the TARI project. It is the intention of this Master Plan to provide guidance for preferred routes of the electrical utility routing that can be incorporated into the TARI project in order to avoid potential conflicts in the future once the scope of the ConRAC expansion is fully realized.

According to the 2010 Census Population there are 6,346,105 people in Tennessee. The land area in Tennessee is 41,234.9 square miles. The Tennessee density is 153.9 persons per square mile.[1]

[1] https://www2.census.gov/geo/pdfs/reference/guidestloc/tn_gslcg.pdf

An airports personality is based on demographics, population, age, per capita income, etc. This is what makes BNA airport unique.

Unemployment

The unprecedented growth: Unemployment Rate (2018) in Nashville is MSA 2.7%. Tennessee has 3.6% unemployment, which is similar to the United States unemployment rate of 3.9%. The data below shows the populations in 3 miles.[2] Three miles was utilized due to the close proximity of the workers to the airport.

The State wide unemployment is 3.3 percent in 2018, which was the sixth lowest in the United States. The national unemployment rate was 4.1 percent in 2018.[3]

Per Capita Income

In 2017, the per capita income is $55,944 in the Nashville MSA. The Key Economic Indicators population growth is 14%. The Gross Domestic Product (GDP) Growth is 41%. GDP is the monetary value of all finished goods and services made within a country during a specific period. GDP provides an economic snapshot of a country, used to estimate the size of an economy and growth rate. GDP can be calculated in three ways, using expenditures, production, or incomes.

The job growth is 33%, which one can connect a direct impact on enplanement travel in and outside of BNA. (Sources: Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2018; 2018 Population Estimates; BEA, Real GDP in Chained Dollars; BEA Current Employment Statistics; C2ER ACCRA Cost of Living Index; TN & Nashville MSA Economy at a Glance BLS; 2019 Forbes.)

Population for the City of Nashville

The City of Nashville has a rapid influx of residents and was a top metropolitan area with population growth for the past six years. Since 2010, the population increased to 19.6%. According

2 https://www.google.com/search?sxsrf=ALeKk01ryZZ3OauwXDaThUXA_8AHRrYN3g%3A1599355555354&ei=ozpUX_GNFdD2swWk5ZroBQ&q=what+is+the+unemployment+rate+in+nashville+tn+in+2018&oq=what+is+the+unemployment+rate+in+nashville+tn+in+2018&gs_lcp=CgZwc3ktYWIQAzIFCCEQqwI6BAgAEEc6BggAEBYQHjoFCCEQoAE6CAghEBYQHRAeUOBlWN9uYNdxaABwAXgAgAF6iAHiBZIBAzYuMpgBAKABAaoBB2d3cy13aXrAAQE&sclient=psy-ab&ved=0ahUKEwix6_vdr9PrAhVQ-6wKHaSyBl0Q4dUDCA0&uact=5

3 https://www.google.com/search?rlz=1C5CHFA_enUS833US833&sxsrf=ALeKk01NHz7gAiJP5NhGZU8DPZSLFSgpYQ%3A1599354398147&ei=HjZUX6XOCKTb5gLlu5eAAw&q=what+is+the+unemployment+rate+for+TN++in+2018&oq=what+is+the+unemployment+rate+for+TN++in+2018&gs_lcp=CgZwc3ktYWIQAzIFCAAQzQIyBQgAEM0COgQIABBHUNOkAVjxyAFg8tMBaAFwAXgAgAFQiAHyBpIBAjEzmAEAoAEBqgEHZ3dzLXdpesABAQ&sclient=psy-ab&ved=0ahUKEwil1ZW2q9PrAhWkrVkKHeXdBTAQ4dUDCA0&uact=5

to 2017 Census, 1,905,898 people live in Nashville. [4]The prediction is that in 2040 2,526,822 people will live in Nashville. The Nashville Region gained 83 net new people per day on average in 2017. 312,848 residents were added from 2010-2018. According to the Nashville Chamber, the Census 2017 Data is referenced at www.nashvillechamber.com/economic-development/data-reports/regional-stats.

Table 7 Population in Nashville, TN	
1,905,898	2017
2,526,822	2040 projection

Between 2010 and 2016, the population of the Greater Nashville Area grew by nearly 20%, from approximately 1.6 million to 1.9 million, and BNA annual enplanements increased by more than 55%, from approximately 4.5 million to 7 million in the same period. By 2035, the population of the Greater Nashville Area is expected to surpass 2.5 million people, and BNA enplanements are expected to grow from approximately 7 million today to more than 10 million, a further increase of approximately 43% (Lynch, 2017).

Table 8 Population										
Geography	**2000**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Nashville MSA	1,311,789	1,675,972	1,698,475	1,727,473	1,759,034	1,793,910	1,830,345	1,865,298	1,903,045	1,930,961
Nashville Economic Market	1,435,577	1,761,44	1,787,629	1,825,379	1,856,224	1,895,545	1,935,107	1,971,542	2,010,349	2,042,187
Davidson County	569,927	628,131	635,799	649,318	659,428	669,094	678,889	684,410	691,243	692,587

NASHVILLE MSA (SOURCE : U.S. CENSUS BUREAU, Annual Estimates of Resident Population , 2019)
www.nashvillechamber.com/economic-development/data-reports/regional-stats.

Age

The age of the people in the Nashville MSA is diverse from ages 0-75. Enplanements are continuously on the rise, due to the music lovers of different ages visiting the City of Nashville. For instance:

Table 9 Age group	**Percent of total population**
0-19	25.8%
20-34	21.7%
35-54	27.0%
55-74	20.5%
75+	5.1%[1]

[4]www.nashvillechamber.com/economic-development/data-reports/regional-stats.

NASHVILLE MSA (SOURCE: U.S. CENSUS BUREAU, American Community Survey, 2018 1- Year Estimates) www.nashvillechamber.com/economic-development/data-reports/regional-stats.

Race and Ethnicity

The race and ethnicity for the City of Nashville has changed through the years, therefore diversifying the tourist attraction interest. The diversity in race and ethnicity influences enplanement at BNA, as it relates to the economic impact to tourist attractions in Nashville, TN. Race or ethnicity is the following in **Table 10**:

Table 10 Race or Ethnicity	Percent of Total Population
White	79.3%
Black or African American	16.6%
American Indian/Alaska Native	0.8%
Asian	3.5%
Native Hawaiian and Other Pacific Islander	0.2%
Other or Two or More Races	2.7%
Hispanic or Latino (of any race)	7.4%

NASHVILLE MSA (SOURCE: U.S. CENSUS BUREAU, AMERICAN COMMUNITY SURVEY, 2018 1-YEAR ESTIMATES)

According to Executive Order 12898, Environmental Justice is based on race and income. The Census Block reveals the area has Environmental Justice concerns.

Table 11	
Census Block Group EJ Indexes (percentile)	
Particulate Matter (PM 2.5)	58.5
Ozone NATA Diesel PM	58.5
NATA Air Toxics Cancer Risk	
NATA Respiratory Hazard Index (HI)	
Traffic Proximity	59.2
Lead Paint Indicator	62.6
Superfund Proximity	58.3
Risk Management Plan (RMP) Proximity	58.3
Hazardous Waste Proximity	58.3
Wastewater Discharge Proximity	74.8

Migration

The growth of the migrant population has a direct effect on the BNA airport enplanement to relocate from out of the United States and other countries. The economic driver is a key driver of business activity in Tennessee and the southeast region. The area benefits from a diverse economy that has a balance of health care, corporate operations manufacturing and supply chain management. The diverse economy has a direct effect on the enplanements increase through the years. For instance, prominent health care facilities growth is influenced by the size of the airport. Patients from across the regions come to Nashville for the excellent health care. Corporate operations manufacturing locates near the airport to import and export products globally. Supply chain management takes into consideration the airport's ability to serve a supply chain serving a global market. Nashville is one of the country's most attractive growth centers. Nashville has ranked within the top 10 large metros for the job growth and population growth for the past six year. The increase in job growth require employees to travel in and outside the City of Nashville, which increases enplanement.

Table 12	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Net migration	12,338	22,198	21,438	23,922	26,062	25,358	24,218	21,317

NASHVILLE MSA (SOURCE : U.S. CENSUS BUREAU, Estimates of the Components of Resident Population Change, 2019)

SECONDARY SOCIO-ECONOMIC IMPACTS

Secondary socio-economic impacts are those traceable to airport related businesses such as restaurants, hotels, motels, travel agencies, and their related construction activities which are airport generated. Benefit This level of socio-economic growth impact is of significance in tourist locations where there are a considerable number of transit air enplanements.. People are visiting Nashville to attend conventions, experience the night life. Restaurants, travel agencies, and their respective construction activities.

Conventions &Tourism
The airport's BNA Vision Dynamic Growth and Expansion Plan is a positive indicator that the growth in convention, tourism, and business activity in Nashville will expand. $10 Billion is spent in the music industry. People fly in to experience the music attractions. People fly in to visit downtown restaurants, bars, and nightlife entertainment options.

People use BNA to travel to visit festivals, museums, and attend over forty four events held in Nashville annually. Tourist companies assist a steady flow of visitors. The top eight attractions are:

- Grand Ole Opry
- Ryman Auditorium

- Country Music Hall of Fame and Museum
- Belle Meade Plantation
- Andrew Jackson's Heritage
- Downtown Nashville
- The Johnny Cash Museum
- RCA Studio B

TERTIARY SOCIO-ECONOMIC IMPACTS

Economic impacts that result from the primary and secondary levels provide the stimulus to propagate economic waves which affect the entire market area. Referred to as the tertiary level of economic impacts, these impacts typically consists of stimuli to employment and payroll.

Each employee in a primary impact level (airlines, concessions, government agencies, and airport specific contracting firms) and in the secondary impact level (restaurants, travel agencies, and their respective construction activities) cause tertiary or induced employment in wholesale and retail trade, government, banking and finance, and others. This induced employment is known as the employment multiplier effect, which is a well-known phenomenon and principle of economics. [5]These industries are related to the airport improvement to provide travel accommodations for the tourist to reach the restaurants.

Economic Drivers Tourism and Hospitality:

In the secondary impact level, tourism and hospitality, cause tertiary or induced employment in wholesale and retail trade, government, banking and finance. Hotels close to Tertiary Airports will suffer longer on ridership during the Coronavirus, due to some major airlines reducing their number of flights. If flights are not full, airlines are not providing direct flights. Tourist enplane at the airport to fly in and out of the City. There are 259,170 jobs in tourism and hospitality. There is $20.5 Billion Annual Economic Impact.[6] If there are fewer flights, then there are fewer people flying as tourist and staying in hotels.

Manufacturing

Air cargo at Nashville International Airport (BNA) increased enplanement by supporting 15 major carriers. Rates for freight transport are among the most competitive in the nation. There are 236,613 jobs and $69.7 Billion in the Annual Economic Impact in Nashville. There are 86,425 direct manufacturing jobs in the Nashville Region.[7] The manufacturing industry has parts that are delivered via the airport. There are three interstate highways that converge in Nashville, providing ideal access to market for the manufacturing community. Airports connect easily to main highways for freight options like FedEx. Also, tourist like to get on the highway easily to reach their next destination. Another option for delivering cargo is the railroad. Nashville is a hub in the CSX rail system, connecting 20 states, 140 freight carriers, and 150 truck terminals.

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[5] Eaton, Alfred. F. Jr., "The Socio-economic Impact of the Airport Upon the Community." Master's Thesis, University of Tennessee, 1977. https://trace.tennessee.edu/utk_gradthes/3068.

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Music & Entertainment

According to the Nashville Chamber of Commerce, there are 110,656 jobs in music and entertainment, which means that national performers enplane on a regular basis to fly in and out of Nashville.[8] The music and entertainment results in $15.9 Billion for annual economic impact.
[9]

Health Care Management

Based on research from the Nashville Chamber of Commerce, there are 362,560 jobs, 126,996 Direct Jobs that result into $67 billion annual economic impact.[10] One example is health care management professionals, that enplane in and out of BNA to provide professional services outside of the City.

The Economic Drivers like the aforementioned above requires enplanement travel in and outside of the City. There are 50,473 business establishments in the Nashville MSA. A breakdown of the businesses includes:

- Professional, Scientific and Technical Services 6,671
- Retail trade (6,129)
- Other Service except Public Administration 4,946
- Wholesale Trade 3,970
- Construction 3,964
- Administrative Support, Waste Management, and Remediation Services 3,296
- Finance and insurance (3,191)
- Real Estate, rental and leasing (2,106)
- Manufacturing 1,871
- Information 1,611
- Health care and social assistance (4,294)
- Accommodation and food services (4,188)
- Transportation, warehousing and wholesale trade (1,308)
- Construction (3,964)
- Education Services 657
- Arts, entertainment and recreation (1,496)
- Manufacturing (1,871)
- Management of Companies and Enterprises 528
- Agriculture, Forestry, Fishing and Hunting 128
- Utilities 45
- Unclassified 38
- Mining, Quarrying, and Oil and Gas Extraction 36

Sources: 2020_Regional_ECD_Guide_FINAL_HEALTHCARE-MANAGEMENT (1), 2020_Regional_ECD_Guide_FINAL_Reduced_ECONOMY;

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[8]

[9] 2020_Regional_ECD_Guide_FINAL_MUSIC-AND-ENTERTAINMENT

[10]

[11] BLS 2 CEW 2018

2020_Regional_ECD_Guide_FINAL_MUSIC-AND-ENTERTAINMENT Nashville Area Chamber of Commerce Music Industry Study; Bureau of Labor Statistics 2CEW 2018A.

Nashville Tech Workforce Study

There is a projected increase in enplanement due to a strong technology workforce in Nashville, as well as the tech sector workers traveling for work related activities. The growth of the tech sector, and the growth of technology jobs across industries, is part of the Nashville area's success story. In fact, job growth in the region grew 25 percent from 2009 to 2018 while tech job growth was 47 percent. This has a direct impact on the increase of the use of the airport. In 2018, the Nashville MSA was estimated to have technology workers, with an average 2,173 tech job postings per month – indicating that demand outpaces the supply of tech workers. By 2028, the region projects overall job growth of 16 percent, while tech jobs are anticipated to grow by 22 percent. The upward trend in tech workforce growth is projected to continue, demonstrating the need to address the technology worker supply gap.[12]

Nashville MSA Per Capita and Household Income

The average household size within the Nashville MSA is 2.60 people. The median household income is $63,939.

Table 12 conveys the Per Capita and Household Income. The data represents wealth in households. This pertains to the increase in enplanements as part of this project. People travel more as a household on family vacations when there is a median income with disposable income.

NASHVILLE MSA (SOURCE: U.S. BUREAU OF ECONOMIC ANALYSIS), CAINC1, 2018, U. S. Census Bureau, American Community Survey

Table 13	2010	2011	2012	2013	2014	2015	2016	2017	2018
Per Capita Income	$41,205	$43,037	$45,792	$45,825	$47,392	50,635	$52,450	55,382	$57,953
Median Household Income	$50,760	$49,992	$51,500	$51,996	$52,640	$57,985	$60,030	63, 939	$65,919
Average Househol d Income	$69,537	$69,801	$70,559	$71,471	$74,288	$79,665	$82,049	$87,562	$89, 756

12 . https://www.nashvillechamber.com/research/recent-studies

Nashville's socioeconomic indicators supports the idea that growth in demand for air travel at BNA might exceed the growth rates for US enplanements. The per capita income is higher in Nashville than in other Cities.

Employed Workforce by Industry

Nashville is known for talent especially creative talent which drives more people to use the airport. Young graduates and the types of workers that have vibrancy, artistic and musical essence, and competitive edge in technology and innovation. Most of the talent comes from the education system with its 20 accredited four-year, two-year, tech schools and post graduate institutions. More than 124,00 students are enrolled in higher education in the Nashville region, **with 60 percent choosing to remain in the area to work.[14]** Many of these students are not from Tennessee or Nashville, which requires them to fly home. **A few of the student's institutions include Vanderbilt, Middle Tennessee State, Fisk, Tennessee State, Belmont, and Lipscomb University. Vanderbilt, Belmont and Lipscomb Universities offer top ranked MBA programs.** The Nashville region retains 60 percent of these graduates each year. Thirty three percent of Nashville citizens are over 25 years of age. They have a bachelor's degree or higher, and 167,291 residents have graduate or professional degrees. The total population is 1,905,898. The total labor force is 1,04,993. The labor participation rate is 68.9%. [15]

NASHVILLE MSA (SOURCE: TN DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT)

Table 14[16]

Industry Sector Jobs and Wage Rates	**Nashville jobs**	**Nashville Median Salary**	**US Jobs**	**US Median Salary**
Accommodation and food services	105,793	$25,424	14,593,936	24,466
Administrative support, waste management services	89,915	$41,582	11,198,483	42,699
Agriculture, forestry, fishing and hunting	11,671	$23,891	2,905,834	34,581
Arts, entertainment and recreation	38,040	$51,804	4,019,300	33,393

[13] https://www.nashvillechamber.com/economic-development/data-reports/regional-stats
[14] Talent+&+Workforce+section+ECD+Guide+2019+-+reduced

Construction	58,791	$60,912	8,986,639	63,838
Educational services	27,329	$55,549	3,661,361	50,922
Finance and insurance	67,810	$92,299	10,136,675	96,131
Government	111,825	$72,504	21,548,140	82,006
Health care and social assistance	132,422	$70,663	21,440,540	58,804
Information	25,813	$82,244	3,273,322	116,348
Management of companies and enterprises	24,699	$140,004	2,755,821	129,944
Manufacturing	86,849	$76,036	13,245,386	82,741
Other services (except public administration)	49,831	$33,397	7,560,406	33,632
Professional, scientific, and technical services	86,450	$84,943	12,646,294	88,815
Real estate and rental and leasing	58,529	$47,185	8,849,042	37,759
Regional trade	120,506	$37,470	18,469,343	35,300
Transportation and warehousing	63,451	$47,854	7,390,736	51,0941
Utilities	1,513	$106,699	667,609	128,999
Wholesale trade	41,204	$87,353	6,275,964	86,911

[16] Talent+&+Workforce+section+ECD+Guide+2019+-+reduced

The data in this table represents Industry Sector Jobs and Wages. There is a direct correlation that higher wages relate to higher disposable income that leads to vacations that require enplanement. High net worth individuals tend to travel more personally and business. The wages correlate to the need to travel to generate wealth for corporations.

Table15 Employed Workforce (in thousands) by Industry Nashville MSA (Source: TN Department of Labor and Workforce Development, Labor Force and Non-Farm Employment Annual Averages 2015-2019

Industry	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total-Non-agriculture employment						914.6	949.9	983.0	1014.7	1047.9
Manufacturing	60.4	62.7	67.3	71.1	77.9	79.2	82.3	84.5	84.3	84.8
Trade, Transportation, Utilities	147.8	152.4	158.6	160.3	172.9	176.1	181.5	187.2	194.0	202.1
Information	19.3	19.3	20.2	20.4	20.7	21.6	22.8	23.4	23.4	24.7

Industry	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Financial Activities	46.2	47.4	48.3	50.9	56.2	59.6	62.8	66.2	68.4	71.4
Professional & Business Services	98.6	106.6	114.5	121.5	134.4	146.9	155.3	161.2	168.9	176.4
Education & Health Services	118.5	121.5	125.0	127.2	135.8	140.8	145.6	149.2	152.5	154.9
Leisure & Hospitality	76.9	79.0	83.7	88.0	95.0	100.4	105.5	110.8	116.5	121.8
Government	106.0	105.1	104.4	103.5	111.3	113.4	114.8	116.7	118.5	119.7

The employment numbers associated with these jobs have increased through the years. As a result, these professions correlate to workers and visiting workers enplaning at BNA to travel.

Davidson County Economic Diversity

The data below represents the industries that have workers that are part of the increase in enplanements. Industries tend to locate close to large airports, like BNA, that can send the products as well as their employees in and out.

Table 16

Industry	2018 Establishments	2018 Employment
Total	19,981	457,334
Forestry, fishing, hunting, and agriculture support	7	17
Mining	8	137
Utilities	11	255
Construction	1,235	22,262
Manufacturing	568	20,170
Wholesale Trade	1,065	21,522
Retail Trade	2,586	36,946
Transportation & Warehousing	520	23,071
Information	680	14,129
Finance & Insurance	1,289	27,444
Real estate & rental & leasing	1,095	9,004
Professional, scientific & technical services	2,135	27,625
Management of companies & enterprises	243	23,621

Industry	2018 Establishments	2018 Employment
Admin, support, waste mgt, remediation services	1,135	37,961
Educational services		26,019
Health care and social assistance	2,040	79,628
Arts, entertainment & recreation	901	11,554
Accommodation & food services	2,175	55,788
Other services (except public administration)	1,984	20,528
Unclassified establishments	22	13

(SOURCE: U.S. CENSUS BUREAU, 2018 BUSINESS PATTERNS) https://www.nashvillechamber.com/economic-development/data-reports/regional-stats

Nashville MSA Economic Diversity

The major impacts that the aviation airport serves are other categories outside of the primary, secondary, or tertiary level. The most significant contribution an airport can make to the community is the attraction of industry. American businesses in Nashville own or operate more than 45,000 aircraft. This has a direct effect on increasing enplanement. Businesses that operate an aircraft would likely locate its facilities near airports. There are other businesses that consider the airport size before determining their location. Local airports are a valuable asset to the local industries maintenance programs. A few examples are **Table 17** below:

(SOURCE: U.S. CENSUS BUREAU, 2015 BUSINESS PATTERNS)

INDUSTRY	2020 ESTABLISHMENTS	2 020 EMPLOYMENT
Total	50,435	1,020,808
Total	50,435	1,020,808
Forestry, fishing, hunting, and agriculture support	128	5,935
Mining	36	846
Utilities	45	3,990
Construction	3,964	57,290
Manufacturing	1,871	85,547

INDUSTRY	2 020 ESTABLISHMENTS	2 0 20 EMPLOYMENT
Wholesale trade	3,970	40,018
Retail trade	6,129	104,198
Transportation & warehousing	1,308	61,396
Information	1,611	22,686
Finance & insurance	3,191	46,909
Real estate & rental & leasing	2,106	20,347
Professional, scientific & technical services	6,671	71,932
Management of companies & enterprises	528	23,964
Admin, support, waste mgt, remediation services	3,296	88,371
Educational services	657	69,957
Health care and social assistance	4,294	138,871
Arts, entertainment & recreation	1,496	22,324
Accommodation & food services	4,188	104,886
Other services (except public administration)	4,946	51,341

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Construction
The peak construction time for the project: 2019 A-Concourse and Gateway Expansion Environmental Assessment. There are two peaks. The first would be March 2022-March 2023 to finish out the far end of the new Concourse A. The second would be March 2026-March 2027, to build the new Concourse A between the terminal and the far new end.

The anticipated average construction workforce was not provided by BNA. The number of workers per workday on site is not readily available. The current number peaks at 400/day once interior work begins. Currently, there are 200 workers/day on average. The number of construction equipment (estimate) that could be on site during peak construction is not readily available. The Peak equipment is 100 pieces/day. The temporary construction jobs (estimate) would result from the proposed action for the current projects is unknown. There are approximately 3000 temporary jobs. The construction establishment is 3,964. The construction employment is 57,290.

Project Affects Emergency Services Such as Ambulance, Fire, and Rescue

The Ambulance, Fire, and Rescue ensures the safety and security of BNA. The department has stations and meets the FAA requirements of an Index D Airport, responding three ARFF vehicles to the center of the farthest runway, with the first applying water within three minutes of the alarm call and the other two within four minutes.

The Airport Emergency Exercise, required by the Federal Aviation Administration is to take place once every three years, evaluates airport operations plans in the event of an emergency. During the exercise, critical functions such as incident command and control, rescue methods and procedures, and triage of injured victims are assessed.

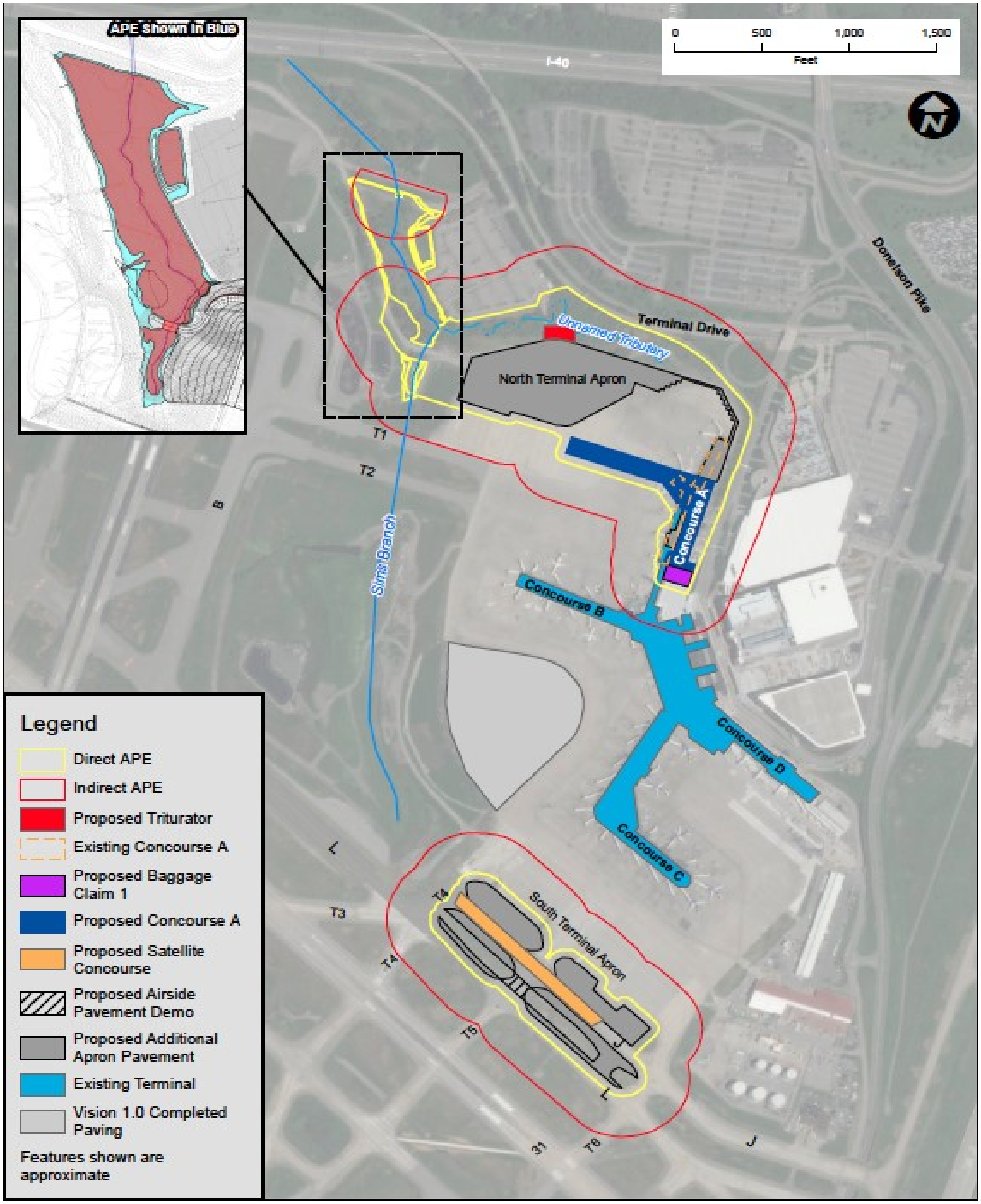
Firefighters hold minimum certifications as Firefighter II, EMT or Paramedic, ARFF and CPAT. The department hires already certified firefighters and takes applications. AEDs are throughout the airport if needed. CPR Information is available in the AEDs.

Transportation

People travel to the airport via highway 1-40, 1-65, and I-24. Another mode of transportation is, traveling via CSX to Nashville to catch a flight. Water is another channel for access on the Cumberland River to reach Nashville. Finally, transit is a cheaper route to the airport.

75% of the U.S. Market is within a 2-hour flight. This 2-hour flight was done intentionally. The current project that Garver is working on will have increased enplanements. There are 12 million people that live within a 2.5 Hour Drive. There is a 2-day trucking distance. There are three major interstates that converge in Nashville. The Nashville region is centrally located within the United States, providing a competitive advantage to businesses that locate here. Nashville’s location and transportation options allow manufacturing and logistics to reach the US and international locations with ease and affordability. Tennessee is bordered by eight states and is connected to the southeast region.

The accessibility and transportation in Nashville have expansive modes of transportation that allows manufacturing and logistics companies to reach U.S. and international locations with ease and affordability. Tennessee is connected to 8 different states, providing connectivity to the southeast region and beyond.



Air

Nashville International Airport (BNA) is located only eight miles from downtown. BNA has a strong record of increase in enplanements. For instance, the airport averages 576 daily flights and provides service to nearly 16 million passengers annually. 15 carriers, averages 460 daily flights to more than 65 nonstop markets and provides service to approximately 18.5 million passengers annually. BNA is the 4th fastest growing airport among the top 50 airports in North America .[17]

Road

Nashville is one of only six U.S. cities at the convergence of three major interstate highways – I-40, I-65 and I-24. The 440 Parkway downtown loop and Briley Parkway link the urbanized areas; Route 840 connects four counties in an outer loop. In the Nashville Region there are140 freight carriers and 150 truck terminals.[18] The multiple road access gives trucks the ability to carry freight to the airport, which increases enplanements.

Rail

CSX Transportation has two major rail yards in Nashville, as well as an intermodal terminal, TDSI automatic distribution terminal and TRANSFLO terminal. Nashville is CSX's division headquarters. Goods can travel on rail to Memphis, then to Canada or from Nashville directly to the Port of Savannah. Rail is another mode of transportation that connects with airports. The rail mode of transporting goods is another factor industry consider when they locate in major Cities.

Water

Port of Nashville on the Cumberland River; nine-foot navigation channel accessible to Ohio River, Mississippi River and Gulf of Mexico. Water is another mode of transporting goods. Manufacturers and industries consider port access as well as enplanement access before locating in major cities.

Transit

Transit connects to BNA, which is important for all types of riders to have access to the airport. The transit option can save money for riders who do not own a car, or who do not want to park overnight. The transit and airport marketing, fare structure, network structure, and passenger information system can offer lower income riders who seek affordability options and modes to get to the airport. Ultimately, by providing a cheaper mode to reach the airport it helps increases enplanements. The following are transit options:

- WeGo intercity bus system
- Music City Star suburban rail
- Nashville B-cycle bike-share system
- Rideshare services[19]

[17] Accessibility and Transportation, https://www.nashvillechamber.com/economic-development/data-reports/resources-brochures
[18] Accessibility and Transportation, https://www.nashvillechamber.com/economic-development/data-reports/resources-brochures
[19] Accessibility and Transportation, https://www.nashvillechamber.com/economic-development/data-reports/resources-brochures

Economic Drivers

The Nashville region's economy is a key driver of business activity in Tennessee and the southeast region. The area benefits from a diverse economy. With a balance of health care, corporate operations manufacturing and supply chain management, Nashville is one of the country's most attractive growth centers. Nashville has ranked within the top 10 large metros for the job growth and population growth for the past eight years. They are the number 1 metro for economic strength, as well as the Number 1 fastest growing Large Metro economy.[20]

Corporate Services

Since Nashville is one of the most desirable headquarters and corporate office locations in America, and the airport has corporations flying in and out of the airport. The region's talent uses the airport on a consistent basis. Nashville attracts metropolitan areas in the country for in-migration. Nashville has 83 people per day entering the City's labor forces, which adds to the region's employers continuous supply of available workforce. The airport is the door to the home to 13 Fortune 1000 companies including 7 Fortune 500 companies[21]

Corporations, financial services, technology, and entrepreneurs all have a direct impact on the increase in enplanements for BNA. Corporate headquarter include Dollar General, Amazon, Tractor Supply Company, Genesco, and Kirkland's). Corporate Health Care includes Community Health Systems, LifePoint, and HCA. Manufacturing includes Nissan, Hankook Tire, and Bridgestone. The financial services include Alliance Bernstein. Technology Companies include Eventbrite, Smile Direct Club, Lyft, Houzz, Postmates, and Keep Trucking are the operations hubs. Entrepreneurs also use the airport for business.[22]

OTHER SOCIO-ECONOMIC IMPACTS

There are socio-economic impacts that tend to be obscure because they are difficult to quantify and evaluate in a statistically meaningful way. Some of the important subtle factors are impacts from broadened markets. BNA benefits from the ability to export local goods and services; impacts on land values; and air visitor enplanement expenditures.

International Business

The international business company relies heavily on easy access to airport enplanement for international trade. The Nashville economic market is one of America's most vibrant centers for business growth, with expanding global links and opportunities. With international businesses and headquarters spanning all business sectors, including corporate services, health care, advanced manufacturing, supply chain management, it is easy to see the diversity present in every aspect of Nashville. No City of similar size offers as great a setting and potential for international trade and investment.

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[20] Economic Drivers.https://www.nashvillechamber.com/economic-development/data-reports/resources-brochures

[21] Corporate Services, https://www.nashvillechamber.com/economic-development/data-reports/resources-brochures

[22]Corporate Service, https://www.nashvillechamber.com/economic-development/data-reports/resources-brochures

45% of the Nashville Region's New Job Commitments in 2018 were created through foreign direct investment. 10,000 people move via enplanement to Nashville from abroad every year accounting for 11.5% of all inbound migration. The consulate general of Japan moved to Nashville from New Orleans in 2008 to better service the growing population of Japanese Nationals in the Midsouth. This has a direct impact to the need for growth of the airport.

Over 330 foreign owned Company locations employ more than 52,000, people in the Nashville region. In 2018, population gains from abroad accounted for 23% of all net migration. Rising to #1 in 2013 and 2015, Tennessee ranked in the Top 10 National for new FDI Job commitments since 2013. SME's account for 81% of Nashville's Good and Exporters in 2017.[23] SME's account for 81% of Nashville Goods exporters.[24] Since exports come from overseas through BNA airport, it increases enplanement from international business to the Nashville.

Table 18			
Foreign Direct Investment in the Nashville Region	**Locations**	**Employees**	**% of Employees**
Japan	75	19,493	35.8%
United Kingdom	40	3,735	7.2%
Germany	25	3,630	7.4%
France	33	5,815	5.2%
Canada	23	3,070	6.0%
Switzerland	18	2,706	5.5%
Ireland	9	1,561	3.2%
All others	111	14,801	30.0%

Table 19	
Nashville MSA Export Products	**Exports**
Transportation Equipment Manufacturing	$3,537,041,949
Computer and Electronic Product Manufacturing	$1,474,263,464
Electrical Equipment, appliance and Component Manufacturing	$637,378,179
Chemical Manufacturing	$428,296,821
All Others	$2,264,673,780
Total	$8,723,667,061

[23] IBM Global location trends report, 2017, https://s3.amazonaws.com/nashvillechamber.com/2020_Regional_ECD_Guide_FINAL_INTERNATIONAL-BUSINESS.pdf

[24] (ITA), https://s3.amazonaws.com/nashvillechamber.com/2020_Regional_ECD_Guide_FINAL_INTERNATIONAL-BUSINESS.pdf

Table 20	
Trading Partners	**Exports**
Canada	$4,251,747,000
Mexico	$1,486,943,000
Japan	$590,577,000
China	$539,214,000
Hong Kong	$336,878,000
All Other	$2,958,914,000
Total	$10,164,273,000

Distribution and Trading
Since Nashville's region is located and offers expansive modes of transportation, it allows businesses to reach US and international locations with ease and affordability. Fifty percent of the US population lives 650 miles from Nashville, and 24 states are located within a 650-mile radius. Tennessee touches 8 states. Therefore, these locations mean one—and two-day truck delivery times to more than 75 percent of all U.S. markets.[25]

Nashville is one of six U.S. cities with 3 major intersecting interstate highways. Highway systems are one of the nation's best, offering connections for freight and commuting. Middle TN is within 250 miles of one-third of car and truck assembly in the US, which is an ideal location for shipment. The access to North American market delivers bottom-line advantage in freight cost. There are 82,000 distribution and trade jobs in the Nashville Region.[26]

According to the Book of List 2018-2019, and Dun and Bradstreet 2018, the charts convey the distribution or trade employer's data that represents the number of local employees. The Trade employees increase in enplanements as part of this project because businesses are located in Nashville. As a result, this requires enplanement for leading distribution/trade employees.

Table 21	
Leading Distribution/Trade Employees	**Local Employees**
Nissan North America	12,000
Bridgestone Americas	3,335
Electrolux Home Products	3,400
Amazon	3,692
A.O. Smith Corp.	2,254
Ingram Content Group	1,957
Lifeway Christian Resources	1,168
General Mills	1,773
CEVA Logistics	845
GAP	815

[25] Distribution and Trade, https://s3.amazonaws.com/nashvillechamber.com/2020_Regional_ECD_Guide_
[26] Distribution and Trade
https://s3.amazonaws.com/nashvillechamber.com/2020_Regional_ECD_Guide_FINAL_INTERNATIONAL-BUSINESS.pdf

Under Armour	500
Western Express	370

One socioeconomic benefit is the jobs for the people who work at BNA. A few of the jobs and hourly rates are in the chart. The money that the workers make at the BNA benefit the Nashville economy, because worker's shop, live, and work in the City. The jobs will increase due to the expansion project. BNA should make the projections on the number of jobs.

Table 22		
Distribution and Trade Occupation	**Jobs in Nashville MSA**	**Median Hourly Earnings**
Air traffic controllers	79	$56.44
Airfield operations specialists	60	$15.89
Cargo and freight agents	300	$20.21
Commercial pilots	175	$28.22
Conveyor operators and tenders	30	$19.38
Gas Compressor and Gas Pumping Station Operators	50	21.16
Heavy and tractor trailer truck drivers	18.840	$23.19
Light truck and delivery service drivers	6,430	$17.29
Motor vehicle operators	540	$15.08
Tank car, truck, and ship loaders	57	$21.82
Transportation security screeners	300	$18.35
Transportation workers, all other	225	$17.74

Source: *BLS, Occupational Employment Statistics, May 2019 Release, Chmura Analytics 2019*

Environmental Justice Populations

Federal agencies must consider environmental justice in their activities under the National Environmental Policy Act (NEPA). The Environmental Justice Interagency Working Group (EJ IWG) recently developed the report Promising Practices for EJ Methodology in NEPA Reviews, which is a compilation of methodologies gleaned from current agency practices. These practices were identified concerning the interface of environmental justice considerations through NEPA processes. Additionally, this page provides more resources to enhance environmental justice considerations in the NEPA review process.

The Community Guide to Environmental Justice and NEPA Methods provide information for communities who want to assure that their environmental justice (EJ) issues are adequately considered when there is a federal agency action that may involve environmental impacts on minority populations, low-income populations, and/or Indian tribes and indigenous communities.

EJ Screen and EJ Indexes (Version 2019) FRS ID: 110000820498
For Block Group 470379801001 at Tennessee, EPA Region 4, there is an approximate population 0 or an Input Area (sq. miles) 6.10. The study area was based on the address One Terminal Drive, Nashville, TN, which contains 1 block group(s) with zero population. See Table 23

September 16, 2020

Table 23 conveys the Census Block Group EJ Indexes and it is important to consider Environmental Justice. As the airport grows, the airport should be aware of the surrounding community and its effect to the built environment. The Table conveys the Environmental Justice variables. It provides the information in percentile in the State, Region, and USA. The healthier the area, the more BNA can grow the airport to increase enplanement development.[27]

SLADE
ENVIRONMENTAL SERVICES
GENERAL CONTRACTING

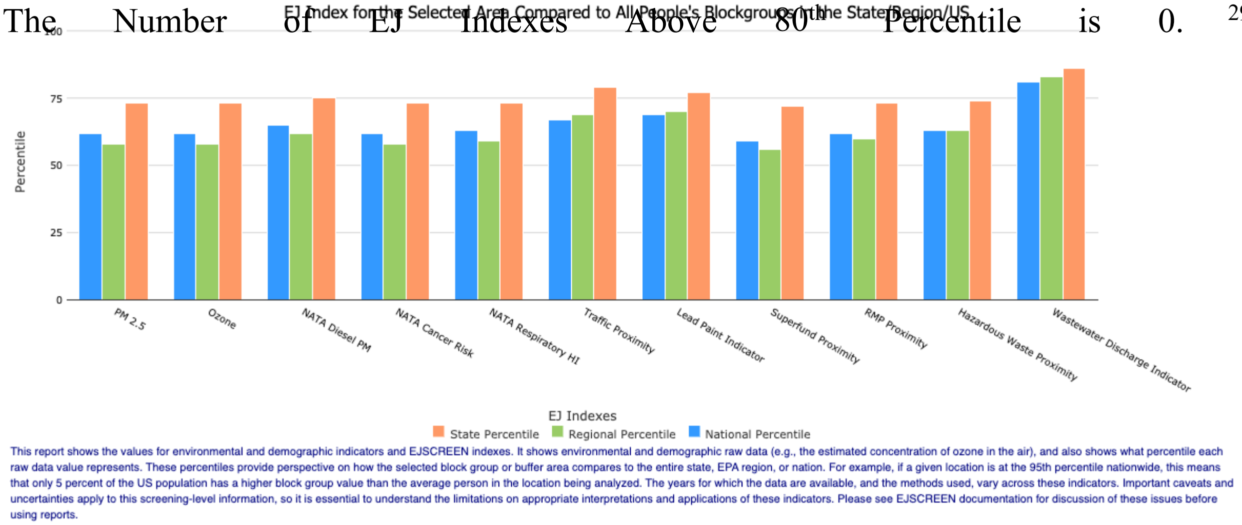
Table 23

EJSCREEN Report (Version 2019)
1 miles Ring Centered at 36.131225,-86.669626
TENNESSEE, EPA Region 4
Approximate Population: 1
Input Area (sq. miles): 3.14
(The study area contains 1 block group(s) with zero population.)

Census Block Group EJ Indexes (percentile) One	Percentile in EPA Region	Percentile in State	Percentile in USA
Terminal Drive, Nashville, TN			
EJ Index Particulate Matter (PM 2.5)	N/A	N/A	N/A
EJ Index for Ozone	N/A	N/A	N/A
EJ Index NATA Diesel PM	N/A	N/A	N/A
EJ Index for NATA Air Toxics Cancer Risk	N/A	N/A	N/A
EJ index for NATA Respiratory Hazard Index	N/A	N/A	N/A
EJ Index for Traffic Proximity and Volume	N/A	N/A	N/A
EJ Index for Lead Paint Indicator	N/A	N/A	N/A
EJ Index Superfund Proximity	N/A	N/A	N/A
EJ Index for RMP Proximity	N/A	N/A	N/A
EJ Index for Hazardous Waste Proximity	N/A	N/A	N/A
EJ Index for Wastewater Discharge Indicator	N/A	N/A	N/A

Source: https://ejscreen.epa.gov/mapper/ejscreen_SOE.aspx

The Number of EJ Indexes Above 80^{th} Percentile is 0.[29]



This report shows the values for environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each rawdata value represents. These percentile provides perspective on how the selected block group or buffer area compares to the entire state, EPA region, or nation. For example, if a given location is at the 95^{th} percentile nationwide, this means thy only 5 percent of the US population has a higher block group value than the average person being analyzed. The years that data are available, and the method used varies across these indicators. Important caveats and uncertainties apply to this screening level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EPA documentation for discussion of these issues.[30]

Table 24 conveys the Site Reporting to EPA for a 3-mile radius. It provides the information for Superfund NPL and Hazardous Waste Treatment.

Table 24	
Sites Reporting to EPA	
Superfund NPL	0
Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	0

Source: https://ejscreen.epa.gov/mapper/ejscreen_SOE.aspx

[29] https://ejscreen.epa.gov/mapper/ejscreen_SOE.aspx
[30] https://ejscreen.epa.gov/mapper/ejscreen_SOE.aspx

Air Quality
Often times in Environmental Justice areas the air quality is a threat to the public health. However, BNA must have good air quality in order to enplane. The Table is The National Scale Air Toxics Assessment (NATA), which is EPA's ongoing, comprehensive evaluation of air toxics in the United States. EPA developed the NATA to prioritize air toxics, emission sources, and locations of interest for further study in a 3-mile radius of the airport. The emission sources to the airport are dependent on proximity to the airport. It is important to remember that NATA provides broad estimates of health risks over geographic areas of the Country, not definite risks to specific individuals or locations. More information on the NATA analysis can be found at Https://www.epa.gov/natil-air-toxic-assessment.[32]

Table 25 The National Scale Air Toxics Assessment (NATA)

Selected Variable		**State**		**EPA Region**		**USA**	
	Value	Avg.	%tile	Avg.	%tile	Avg.	%tile
Particulate Matter (PM 2.5 in ug/m3)	9.49	9.04	75	8.59	75	8.3	80
Ozone (ppb)	44.9	44.4	63	40	78	43	62
NATA Diesel PM (ug/m3)	.804	.396	94	0.417	90-95th	.479	80-90th
NATA Air Toxics Cancer Risk (risk per MM)	40	35	90	36	70-80th	32	80-90th
NATA Respiratory Hazard Index	.59	.48	89	.52	80-90th	.44	80-90th
Traffic Proximity and Volume (daily traffic count/distance to road)	770	260	92	350	88	750	77
Lead Paint Indicator (% pre 1960s housing)	.28	.2	77	.15	82	.28	60
Superfund Proximity (site count/km distance)	0.15	0.071	22	0.083	21	.13	11

32 Https://www.epa.gov/natil-air-toxic-assessment

RMP Proximity (facility count/km distance)	1.3	.53	88	.6	86	.74	82
Hazardous Waste Proximity (facility count/km distance)	1.3	.61	86	.52	89	4	69
Wastewater Discharge Indicator (toxicity weighted concentration distance)	00.021	0.018	79	.45	80	14	70

Demographic Profile of Surrounding Area (3 Miles)

This section provides demographic information regarding the community surrounding the facility. ECHO compliance data is an environmental database, which is not sufficient to determine whether violations at a particular facility had negative impacts on public health or the environment. However, it does have 38% percent minority and 17,774percent below the poverty line to show if environmental justice concerns. Statistics are based upon the 2010 U. S. Census is accurate to the extent that the facility latitude and longitude listed below are correct. EPA's spatial processing methodology considers the overlap between the selected radii and the census blocks (for U.S. Census demographics) and census block groups for (ACS demographic) in determining the demographics surrounding the facility.

Table 26	
General Statistics	
Total Persons	37,311
Population Density	1,354/sq.mi
Percent Minority	38%
Households in Area	16,301
Housing Units in Area	17,899
Households on Public Assistance	278
Persons Below Poverty Level	17,774

*This information is not available in percentages.

Demographics in Nashville MSA

According to Demographics in the Nashville MSA, the Geography is 283,486 residents were added from 2010-2019. It is predicted that more than 2,526,822 million people will live in the Nashville area by 2040. The Census 2019 has 1,934,317 residents. There is a rapid influx of residents, Nashville has been a Top 10 Metro for population growth for the past six years. There was a 14.0% population increase since 2010.[33]

Table 27	
Geography	
Radius of Selected Area	3mi.
Center Latitude	36.13448
Center Longitude	-86.66813
Land Area	97%
Water Area	3%

Sources: US Census, ACS 2017 1 year estimates, annual estimates of residents population April 1, 2010 to July1, 2018. [34]

37% of the population is above $50,000. 24.6% of people make between 0- $34,999. 33.6% of the people make $35,000-$74,999. 29.3% make $75,000-$149,9999. 12.5% make $150,000 for the household income, and they have disposable income to enplane at BNA. Table 28 displays the Income Breakdown of Households and the Age Breakdown-Persons (%).

Table 28	
Income Breakdown-Households (%)	
Less than $15,000	1,954 (12.11%)
$15,000-$25,000	2,373 (14.7%)
$25,000-$50,000	5,670 (35.13%)
$50,000-$75,000	3,222 (19.9%)
Greater than $75,000	2,919 (18.09%)
Age-Breakdown -Persons (%)	
Children 5 years and younger	2,852 (8%)
Minors 17 years and younger	7,851 (21%)
Adults 18 years and older	29,461 (79%)
Seniors 65 years and older	3,285 (9%)

The Race Breakdown-Persons in Table 29 offers additional information in percentages of race in 2017. [35]

[33] https://s3.amazonaws.com/nashvillechamber.com/2020_Regional_ECD_Guide_FINAL_DEMOGRAPHICS.pdf
[34] Boyd Center for Business and Economic Research, University of Tennessee, Knoxville-September 2017, https://haslam.utk.edu/boyd-center
[35] https://s3.amazonaws.com/nashvillechamber.com/2020_Regional_ECD_Guide_FINAL_DEMOGRAPHICS.pdf

Table 29 2018	
Race Breakdown-Persons (%)	
White	(79.3%)
African American	(16.6%)
Hispanic Origin	(7.4%)
Asian/Pacific Islander	(3.5%)
American Indian	(.8%)
Other/Multiracial	(2.7%)

[36] 2018

Table 30	
Education Level (Persons 25 & Older)-Persons (%)	
Less than 9th Grade	(5%)
9th through 12th Grade	(6.7%)
High School Diploma	(26.9%)
Some College/ 2-year	(20.3%)
Associate's degree	8.6%
Bachelor's degree	(20.0%)
Graduate or professional degree	12.6%
Total Population 25 years and over	

[37]2018

List of NAICS Codes and Descriptions

Table 31	
NAICS Code	**NAICS Description**
48111	Scheduled Air Transportation

List of Facility Contacts for Air Service

Table 32						
Name	**Street**	**City**	**State**	**Zip Code**	**Phone**	**Type of Contact**
Mike Ayers	One Terminal Drive, Suite 401	Nashville	TN	37214	615-275-3521	Public

No Handler Information or Process Information is available.

BNA Air Service

Nashville has legacy and low fare scheduled carriers and their regional partners in Red. The airlines in green have Air Carrier Shares of BNA Enplanements:

[36] Nashville MSA Source US Census Bureau, America Community Survey, 2018-1sr year estimates.
[37] https://www.nashvillechamber.com/economic-development/data-reports/regional-stats

- Southwest-55.6% of the shares for enplanements
- Air Canada
- Alaska
- American -20.2% of the shares for enplanement
- Delta-15.8% of the shares for enplanement
- Contour
- Boutique
- Jet Blue
- United-6.2% of the shares for enplanement
- Frontier-1.5% of the shares for enplanement
- Other 0.7% of the shares for enplanement
  Source: Mary A. Lynch analysis

CONCLUSION

Before we discuss where Nashville is going, we must assess the present. Currently, the demographics overall is 37,311. The population density is 1,354/square mile. The percent minority is 38%.The households in the area is approximately 16,301. The households receiving public assistance is 278. The people below the poverty line is 17,774.

Nashville has a strong socioeconomic environment, that has a direct impact on industries such as tourist, conventions, health care, business expansion, and air service base supports growth in enplanements. The economy would benefit as a direct result in job growth with headquarters developing in Nashville. As we assess the impacts of growth of the music, tourist, health care, and corporate industry it will have a direct effect on the present and future expansion of the airport. As the airport continues to develop it must consider socioeconomic issues in the built environment around them as well as the environmental justice community. Socioeconomic issues include impacts to employment. As you know, the airport is a major driver of employment in the area. The future construction projects will lead to more workforce to complete the construction and once construction is complete the use of the building will have employees who operate the business.

BNA serves as a catalyst and nucleus for commercial, industrial, and residential expansion in the surrounding area. The MSA of Nashville should consider providing more resources to BNA as a source for community development programs. As the airport continues to be a part of the socioeconomic fabric of the City, the development of the airport can provide meeting resources so the facility can contribute more to the community economy. While at the same time, airports can continue to grow their masterplan area. Future business and industrial concentrations can locate within a few minutes drive to the airport. People locate near an airport as a convenient way to access imports and exports . BNA’s expansion is in alignment with future growth for the Nashville economy.

APPENDIX H

Public Involvement, Comments and Responses

NOTICE OF PUBLIC HEARING
CONCOURSE AND GATE EXPANSION DRAFT ENVIRONMENTAL ASSESSMENT
NASHVILLE INTERNATIONAL AIRPORT, NASHVILLE, TENNESSEE

On June 18, 2021, between 8:00 and 9:00 AM, a public hearing will be held at the Joint Information Center, 815 Hangar Lane, Nashville, Tennessee 37127. The purpose of the hearing is to afford an opportunity for public input on the social, economic and environmental effects of the proposed expansion of Concourse A and the addition of a new Satellite Concourse at the airport (Proposed Action). A Draft Environmental Assessment (Draft EA) for the Proposed Action has been prepared and is now available for public review. The Draft EA reviews the purpose and need for the proposed action, alternatives to those actions, the environmental impacts, and the mitigation that may be incorporated into the project. The hearing will provide information on the Proposed Action and allow public comment on airport development as consistent with the BNA Vision program goals and objectives.

A brief presentation shall be made beginning at 8:00 AM after which the questions and comments may be made until 9:00 AM. Persons in attendance will be afforded the opportunity to present written or oral comments. Public Hearing information will also be available virtually, by RSVP only, by contacting caitlin.dillon@flynashville.com. The meeting will be recorded. In addition, anyone wishing to provide statements is invited to contact:

Aaron Braswell
Federal Aviation Administration Memphis Airports District Office
2600 Thousand Oaks Boulevard, Suite 2250
Memphis, Tennessee 38118
(901) 322-8192

Ryan Mountain or Matt Koss
Garver LLC,
361 Mallory Station Road, Suite 102,
Franklin, Tennessee 37067

Caitlin Dillon
Metropolitan Nashville Airport Authority
140 BNA Park Drive, Suite 520,
Nashville, Tennessee 37214

Written statements shall be received and incorporated into the official record up to 15 days after the public hearing. All statements will be made a part of the record of the public hearing. Persons wishing to review the draft Environmental Assessment prepared by the Consultant may do so for the thirty (30) days preceding the Public Hearing during normal business hours at: 1370 Murfreesboro Pike, Building #3, Nashville, Tennessee 37127, or at the BNA website, http://www.flynashville.com and the FAA Southern Region Airports Division website, https://www.faa.gov/airports/southern/. Comments on the Draft EA are encouraged and requested by **Thursday, July 2, 2021**.

Text of Ad: 05/14/2021

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NOTICE OF PUBLIC HEARING
CONCOURSE AND GATE EXPANSION DRAFT ENVIRONMENTAL ASSESSMENT
NASHVILLE INTERNATIONAL AIRPORT, NASHVILLE, TENNESSEE

On June 18, 2021, between 8:00 and 9:00 AM, a public hearing will be held at the Joint Information Center, 815 Hangar Lane, Nashville, Tennessee 37217. The purpose of the hearing is to afford an opportunity for public input on the effects of the proposed expansion of Concourse A and the addition of a new Satellite Concourse at the airport (Proposed Action). Public Hearing information will also be available virtually, by RSVP only, by contacting caitlin.dillon@flynashville.com. Anyone wishing to provide statements is also invited to contact:

Aaron Braswell
Federal Aviation Administration Memphis Airports District Office
2600 Thousand Oaks Boulevard, Suite 2250
Memphis, Tennessee 38118
(901) 322-8192

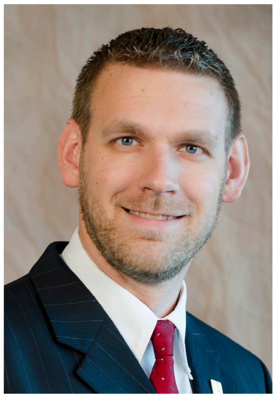
Ryan Mountain or Matt Koss
Garver LLC,
361 Mallory Station Road, Suite 102,
Franklin, Tennessee 37067

Caitlin Dillon
Metropolitan Nashville Airport Authority
140 BNA Park Drive, Suite 520,
Nashville, Tennessee 37214

Persons wishing to review the draft Environmental Assessment prepared by Garver may do so preceding the Public Hearing during normal business hours at: 1370 Murfreesboro Pike, Building #3, Nashville, Tennessee 37127, or at the BNA website, http://www.flynashville.com and the FAA Southern Region Airports Division website, https://www.faa.gov/airports/southern/. Comments on the Draft EA are encouraged and requested by Thursday, July 2, 2021.

APPENDIX I

Preparer Resumes



MATT KOSS, PE

Senior Project Manager

EDUCATION
Bachelor of Science in Civil Engineering

REGISTRATION
Professional Engineer, TN, 116633

OFFICE LOCATION
Franklin, TN

EXPERIENCE
13 years (firm)

18 years (total)

Matt Koss is a senior project manager and Aviation Team leader with 18 years of engineering and construction experience. Matt's responsibilities include design, project coordination, and construction management of various airfield projects. His primary design experience includes airfield pavement and drainage design, hangar development, and site improvements at general, commercial, and military aviation facilities. Matt's other responsibilities include project planning, client coordination, funding agency coordination, project administration, and construction observation. Matt's recent experience includes design and construction support on the Runway 13-31 West Reconstruction at Nashville International Airport, design of Taxiways Lima and Juliet at Nashville International Airport, and design and client coordination on the SOF Rotary Wing Hangar project at Fort Campbell, Kentucky. Matt previously served as a lead military engineer and managed a team in charge of reconstruction efforts in Afghanistan.

EXPERIENCE

NASHVILLE INTERNATIONAL AIRPORT TERMINAL AND LANDSIDE PROGRAMMING AND INITIAL DESIGN

Nashville, TN

Project manager responsible for site verification, conceptual design and project coordination for expansion of the terminal and concourses including adding six new gates to Concourse D, construction of a new International Arrivals Building, and improvements to Concourse A. Project elements also include expansion of the terminal apron and the required safety and phasing, regulatory and environmental coordination for stream encapsulation and wetland mitigation, and stormwater drainage design.

NASHVILLE INTERNATIONAL AIRPORT RECONSTRUCTION OF TAXIWAY LIMA WEST BETWEEN RUNWAY 2L AND TAXIWAY L-2

Nashville, TN

Project manager responsible for the total reconstruction area was approximately 420,000 square feet, so Garver's design had to address construction safety and phasing and demolition as well as conform to relevant FAA ACs, Metropolitan Government of Nashville and Davidson County Codes, and all other applicable agency requirements.

NASHVILLE INTERNATIONAL AIRPORT MAINTENANCE-REPAIR-OVERHAUL HANGAR AND SITE DEVELOPMENT

Nashville, TN

Project leader responsible for leading the airside conceptual design, design development, and final design phases as well as coordinating the design disciplines and providing construction phase services for a new Maintenance-Repair-Operations (MRO) hangar – 55,000-square-foot maintenance hangar with another 25,000 square feet of office/administrative space at BNA. The project also involved adding a new taxiway, two 100,000-square-foot aprons, plus multiple landside access roads, and extensive parking lot upgrades and additions.

ZAC SIMPSON, PE

Senior Project Manager

Zac Simpson is a senior project manager on Garver's Aviation Team with 20 years of civil engineering experience. Zac has led large airfield modernization programs at commercial service and general aviation airports throughout Tennessee, Kentucky, Alabama, Kansas, Oklahoma, and Texas. With an emphasis on maintaining schedules and budgets, he has added innovation to his projects and provided ancillary benefits to his clients. His project experience includes RSA improvements, road relocations, aircraft hangars, fuel systems, airfield lighting, and unique approaches to pavement rehabilitation. Zac works closely with the FAA Memphis ADO and is well versed in Part 139 requirements and how to meet them with limited budgets.

EDUCATION

Bachelor of Science in Civil Engineering

REGISTRATION

Professional Engineer, KY, 33108

Professional Engineer, TN, 120790

Professional Engineer, AL, 34423

Professional Engineer, OK, 28735

Professional Engineer, MS, 27245

AFFILIATIONS

OFFICE LOCATION

Huntsville, AL

EXPERIENCE

15 years (firm)

21 years (total)

EXPERIENCE

NASHVILLE INTERNATIONAL AIRPORT TERMINAL AIRPORT AND TAXILANE EXPANSION

Nashville, TN

Civil engineer responsible for design of proposed stormwater drainage improvements, pavement design, and permittee-responsible onsite mitigation design. Also responsible for coordination with geotechnical engineers for baseline evaluation of the proposed project site and the development of the design with respect to the existing site conditions. In addition, coordinated all structural project needs with remote structural design teams to facilitate incorporation of the structural design of specialty drainage structures required for drainage improvements of this magnitude. Led the mitigation design effort of all structural and civil design improvements for the project and provided oversight to incorporate the required landscape design provided by design subcontractors to complete the permittee-responsible onsite mitigation plans.

MUHLENBERG COUNTY AIRPORT LAND SWAP COORDINATION

Greenville, KY

Project manager responsible for assisting the Airport with Environmental Assessment (EA) for obstruction removal to both runway ends, including the composition of a short-form EA for the Runway 6 approach end to expedite environmental clearance for obstruction removal to maintain night-time approaches. This EA included Wildlife Hazard Site Assessments, Archaeological, and Endangered Species Surveys.

HENDERSON CITY-COUNTY AIRPORT RUNWAY EXTENSION AND ROAD RELOCATION ENVIRONMENTAL ASSESSMENT

Henderson, KY

Project manager responsible for assisting the Airport in land acquisition negotiations, road relocation design, 69kV transmission line relocation, and all grant administration associated with this multi-phase, multi-year project to result in a 1,600-foot runway extension.

CASSIE SCHMIDT

Environmental Scientist/Environmental Specialist

Cassie Schmidt is an environmental scientist on our Transportation Team with eight years of environmental data collection and assessment experience. She has knowledge of local, state, and federal environmental regulations and guidelines. Her experience includes conducting Phase I and II Environmental Site Assessments; completing alternative analyses and functions and services assessments to satisfy Section 404 permitting requirements; and designing and drafting wetland and stream mitigation plans. Her responsibilities include co-authoring NEPA documents (including Environmental Assessments); conducting wetland and stream delineations and other environmental field investigations; preparing Section 404 permitting applications for Nationwide and Individual Permits, performing Initial Site Assessments; preparing biological evaluations for threatened and endangered species and for jurisdictional waters and wetlands; and assisting in preparing spill prevention control and countermeasure plans, stormwater pollution prevention plans, and sediment control plans. Additional responsibilities include collecting reconnaissance level environmental data in support of large-scale impact analyses; assisting with preliminary engineering studies and public involvement meetings; and coordinating with various federal, state, and local environmental agencies.

EDUCATION

Master of Science, Biology

Bachelor of Science, Zoology

REGISTRATION

Federal Fish & Wildlife Permit, AR, TE78650B-1

Federal Fish & Wildlife Permit, KS, TE78650B-1

Federal Fish & Wildlife Permit, MO, TE78650B-1

Federal Fish & Wildlife Permit, OK, TE78650B-1

AFFILIATIONS

Society of Wetland Scientists

OFFICE LOCATION

Fayetteville, AR

EXPERIENCE

6 years (firm)

9 years (total)

EXPERIENCE

MUHLENBERG COUNTY AIRPORT RUNWAY 06-24 ENVIRONMENTAL ASSESSMENT

Greenville, KY

Environmental scientist responsible for preparing a Wildlife Hazard Site Visit report for the Muhlenberg county Airport, including exhibits. Conducted a wetland delineation for an additional study area within the west end of the runway approach and compiled the wetland delineation report including exhibits. Prepared a Short Form Environmental Assessment (appropriate NEPA documentation), which included a threatened and endangered species habitat assessment and effects determination, public notice advertisements, coordination of cultural and historic resource clearance with the State Historic Preservation Office, other agency coordination, and addressing Federal Aviation Administration comments. Prepared an Environmental Due Diligence Audit (EDDA) for land acquisition required for the proposed improvements.

HENDERSON CITY–COUNTY AIRPORT RUNWAY EXTENSION AND ROAD RELOCATION ENVIRONMENTAL ASSESSMENT

Henderson, KY

Prepared Section 404 permit application and obtained an Individual Permit from USACE. Also coordinated wetland mitigation for unavoidable impacts.

COLBY MARSHALL

Environmental Specialist

Colby Marshall is an environmental specialist at Garver responsible for performing wetland delineations, jurisdictional water evaluations, water quality sampling, industrial and construction stormwater permitting, and other data collection and analysis such as habitat assessments wildlife surveys, macro-invertebrate sorting, and fish identifications. He has completed the USACE Stream Investigation, Stabilization, and Design Workshop and has an EPA Watershed Management Training Certificate. His experience includes Trimble GPS and ArcGIS.

EDUCATION
Bachelor of Science, Biology

OFFICE LOCATION
Fayetteville, AR

EXPERIENCE
2 years (firm)

11 years (total)

EXPERIENCE

NORTHWEST ARKANSAS NATIONAL AIRPORT ACCESS - NEPA

Fayetteville, AR

Environmental scientist responsible for delineating wetlands along a proposed roadway extension alignment. Responsibilities included assessing federally threatened and endangered species habitat, as well as drafting a wetland memo and assisting in drafting an environmental assessment.

CENTRE-PIEDMONT-CHEROKEE COUNTY REGIONAL AIRPORT PARALLEL TAXIWAY

Centre, AL

Environmental scientist responsible for delineating wetlands along a proposed taxiway project. Responsibilities included assessing federally threatened and endangered species habitat, as well as drafting a wetland report and preliminary jurisdictional determination application.

ROGERS EXECUTIVE AIRPORT CONSTRUCT TAXIWAY

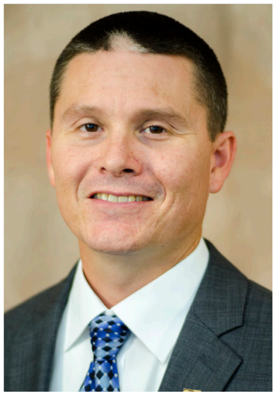
Rogers, AR

Environmental scientist responsible for delineating wetlands along a proposed taxiway project. Responsibilities included drafting a wetland report.

FAYETTEVILLE-DRAKE FIELD ON-CALL SERVICES

Fayetteville, AR

Environmental scientist responsible for drafting and submitting an industrial stormwater pollution prevention plan.



RYAN MOUNTAIN, PWS

Senior Environmental Scientist/Specialist

Ryan Mountain is our environmental special studies manager and senior environmental scientist with 20 years of environmental and project management experience. Ryan is a Professional Wetland Scientist (PWS) and Tennessee Department of Environment and Conservation (TDEC) Qualified Hydrologic Professional In-training (QHP-IT). He has completed US Army Corps of Engineers wetland delineation training and the Federal Highway Administration's Section 4(f) overview course, covering the important statute that protects parklands, recreation areas, wildlife and waterfowl refuges, and significant historic sites. He has also completed TNM 2.5 Noise Modeling and Noise Fundamentals courses AEDT airport noise training, TDEC qualified hydrologic professional training, and wildlife hazard management training required by the Federal Aviation Administration for conducting wildlife hazard assessments at Airports. Additionally, he has received NEPA documents training and air/industrial stormwater permitting training.

EDUCATION
Bachelor of Science, Fisheries & Wildlife Management

REGISTRATION
Professional Wetland Scientist, 2745

MDOT Storm Water Pollution Prevention, MS, 12420

TDEC Qualified Hydrologic Professional in Training, TN

AFFILIATIONS
Society of Wetland Scientists

OFFICE LOCATION
Rogers, AR

EXPERIENCE
15 years (firm)

21 years (total)

EXPERIENCE

MUHLENBERG COUNTY AIRPORT RUNWAY 06-24 ENVIRONMENTAL ASSESSMENT

Greenville, KY

Senior environmental scientist and co-author of a focused environmental assessment (EA) and full EA for two runway obstruction removal projects that also includes a state road relocation, terrain removal, property acquisition and a wildlife/perimeter security fence project. Responsibilities included coordination with the airport director; local, state and federal agencies; and consultant coordination for threatened and endangered species bat surveys, cultural historic properties and archaeological surveys. Additionally, served as the primary field biologist for completion of a wildlife hazard site visit (WHSV) and wetland delineation required by the FAA.

NASHVILLE INTERNATIONAL AIRPORT TERMINAL APRON AND TAXILANE EXPANSION

Nashville, TN

Senior environmental scientist responsible for completion of aquatic resource permitting services for the Nashville International Airport. Permitting services completed for this project included performing a wetland delineation, agency coordination, permitting application packages, and stream and wetland mitigation coordination. Additionally, Ryan coordinated with a specialized subconsultant for the completion of Nashville Crayfish surveys, assisted in the development of and coordinated completion of detailed stream mitigation design and construction drawings, wetland mitigation banking coordination, issuance of a Section 404 Individual Permit and Individual Aquatic Resource Alteration Permit (ARAP) from the Tennessee Department of Conservation.

MICHELE LOPEZ

Senior Environmental Planner

Michele Lopez is a senior environmental planner on our Transportation Team with 21 years of experience. Michele has provided environmental oversight and has performed technical tasks for various schematic, feasibility, and corridor study projects. Her responsibilities include reviewing technical documents, assisting in data collection, overseeing public involvement and outreach tasks, writing study reports, managing all environmental deliverables, and coordinating with subconsultants for all reports and overall environmental assessments. Michele is familiar with NEPA guidelines and requirements and has experience performing specific analyses in indirect impacts, cumulative impacts, and socioeconomic impacts including environmental justice and community impact assessments.

EDUCATION
Bachelor of Science, Biology

OFFICE LOCATION
Frisco, TX

EXPERIENCE
2 years (firm)

22 years (total)

EXPERIENCE

BASTROP CORRIDOR, INNOVATIVE I-SECTION FEASIBILITY STUDIES

Bastrop, TX

Environmental task leader responsible for overseeing public involvement activities. Responsibilities include developing and implementing a Public Involvement Plan which includes a public meeting and several stakeholder open house meetings. Also responsible for preparing the purpose and need statements for each of the four corridors included in the study and ultimately a feasible study report documenting findings and recommendations for each of the study corridors.

FM 1378 SE, FEASIBILITY STUDY

Lucas, TX

Environmental task leader responsible for overseeing environmental documentation, including data collection, constraints mapping, and technical reports. Responsibilities include overseeing the implementation of the Public Involvement Plan and associated outreach activities. Also responsible for preparing and reviewing the Environmental Assessment and associated technical reports for the Schematic/Environmental portion of the project.

ADDITIONAL EXPERIENCE

- Nashville International Airport Concourse Gate Expansion Environmental Assessment
  Nashville, TN
- Dallas Fort Worth International Airport EastWest Connector Roadway
  Dallas, TX
- Northwest Arkansas National Airport Access - NEPA
  Fayetteville, AR
- TxDOT US Highway 80 SCH/ENV DAL
  Kaufman, TX