MVP Southgate Project

Docket No. PF18-4-000

Draft

Resource Report 9 – Air and Noise Quality

August 2018

MVP Southgate Project
Draft Resource Report 9 – Air and Noise Quality

Resource Report 9 – Filing Requirements	
Information	**Location in Resource Report**
Minimum Filing Requirements	
1. Describe existing air quality in the vicinity of the project. (§ 380.12(k)(1)) • Identify criteria pollutants that may be emitted above EPA-identified significance levels.	Section 9.2.1
2. Quantify the existing noise levels (day-night sound level (Ldn) and other applicable noise parameters) at noise sensitive areas and at other areas covered by relevant state and local noise ordinances. (§ 380.12(k)(2)) • If new compressor station sites are proposed, measure or estimate the existing ambient sound environment based on current land uses and activities. • For existing compressor stations (operated at full load), include the results of a sound level survey at the site property line and nearby noise-sensitive areas. • Include a plot plan that identifies the locations and duration of noise measurements. • All surveys must identify the time of day, weather conditions, wind speed and direction, engine load, and other noise sources present during each measurement.	Section 9.3.3
3. Quantify existing and proposed emissions of compressor equipment, plus construction emissions, including nitrogen oxides (NOx) and carbon monoxide (CO), and the basis for these calculations. Summarize anticipated air quality impacts for the project. (§ 380.12(k)(3)) • Provide the emission rate of NOx from existing and proposed facilities, expressed in pounds per hour and tons per year for maximum operating conditions, include supporting calculations, emission factors, fuel consumption rate, and annual hours of operation.	Section 9.2.2, Appendix 9-A, Appendix 9-B, Appendix 9-E, Appendix 9-F
4. Describe the existing compressor units at each station where new, additional, or modified compressor units are proposed, including the manufacturer, model number, and horsepower of the compressor units. For proposed new, additional, or modified compressor units include the horsepower, type, and energy source. (§ 380.12(k)(4))	There are no existing compressor units
5. Identify any nearby noise-sensitive area by distance and direction from the proposed compressor unit building/enclosure. (§ 380.12(k)(4))	Section 9.3.3
6. Identify any applicable state or local noise regulations. (§ 380.12(k)(4)) • Specify how the facility will meet the regulations.	Section 9.3.2
7. Calculate the noise impact at noise-sensitive areas of the proposed compressor unit modifications or additions, specifying how the impact was calculated, including manufacturer's data and proposed noise control equipment. (§ 380.12(k)(4))	Section 9.3.5
Additional Information Often Missing and Resulting in Data Requests	
8. Include climate information as part of the air quality information provided for the project area.	Section 9.2.1.1
9. Identify potentially applicable federal and state air quality regulations.	Section 9.2.4
10. Provide construction emissions (criteria pollutants, hazardous air pollutants, greenhouse gases) for proposed pipelines and aboveground facilities.	Section 9.2.5, Appendix 9-A
11. Provide copies of state and federal applications for air permits.	Appendix 9-C, Appendix 9-D

Resource Report 9 – Filing Requirements	
Information	**Location in Resource Report**
12. Provide operation and fugitive emissions (criteria pollutants, hazardous air pollutants, greenhouse gases) for pipelines and aboveground facilities.	Section 9.2.5.2, Appendix 9-B
13. Provide air quality modeling for entire compressor stations.	Appendix 9-E, Appendix 9-F
14. Identify temporary and permanent emissions sources that may have cumulative air quality effects in addition to those resulting from the project.	Section 9.2.6, Table 9.2-11
Noise and Vibration (see further discussion below)	
15. Describe the existing noise environment and ambient noise surveys for compressor stations, liquefied natural gas facilities, meter and regulation facilities, and drilling locations.	Section 9.3.3
16. Identify any state or local noise regulations applicable to construction and operation of the project.	Section 9.3.2
17. Indicate whether construction activities would occur over 24-hour periods.	Section 9.3.4
18. Discuss construction noise impacts and quantify construction noise impacts from drilling, pile driving, dredging, etc.	Section 9.3.4.3
19. Quantify operation noise from aboveground facilities, including blowdowns.	Section 9.3.5
20. Describe the potential for the operation of the proposed facilities to result in an increase in perceptible vibration and how this would be prevented.	Section 9.3.5.4
21. Identify temporary and permanent noise sources that may have cumulative noise effects in addition to those resulting from the project.	Section 9.3.7

DRAFT RESOURCE REPORT 9
AIR AND NOISE QUALITY

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LIST OF ACRONYMS AND ABBREVIATIONS

AQCR	air quality control region
BACT	Best Available Control Technology
Btu	British thermal unit
CAA	Clean Air Act
Certificate	Certificate of Public Convenience and Necessity
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2e	carbon dioxide equivalent
CSR	Virginia Code of State Rules
dB	decibels
dBA	A-weighted decibels
ESD	emergency shutdown
FERC or Commission	Federal Energy Regulatory Commission
GHG	greenhouse gas
HAP	hazardous air pollutant
HDD	horizontal directional drill
hp	horsepower
Hz	Hertz
L_{dn}	day-night sound level
L_{eq}	equivalent sound level
L_P	sound pressure level
L_W	sound power level
MACT	Maximum Available Control Technology
MMBtu/hr	million British thermal units per hour
Mountain Valley	Mountain Valley Pipeline, LLC
MRR	Greenhouse Gas Mandatory Reporting Rule
NAAQS	National Ambient Air Quality Standards
NCAC	North Carolina Administrative Code
NCDC	National Climatic Data Center's
NESHAP	National Emission Standards for Hazardous Air Pollutants
NNSR	Nonattainment NSR
NO_2	nitrogen dioxide
NO_X	nitrogen oxide
NSAs	noise sensitive areas
NSPS	New Source Performance Standards
NSR	New Source Review
O_3	ozone
OGI	optical gas imaging

Pb	lead
PM_{10}	particulate matter with an aerodynamic diameter of 10 microns or less
$PM_{2.5}$	particulate matter with an aerodynamic diameter of 2.5 microns or less
Project	MVP Southgate Project
PSD	Prevention of Significant Deterioration
SO_2	sulfur dioxide
SOP	State operating permits
Title V	Federal Title V operating permit program
tpy	tons per year
Transco	Transcontinental Gas Pipe Line Company, LLC
U.S.	United States
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compounds

DRAFT RESOURCE REPORT 9
AIR AND NOISE QUALITY

9.1 INTRODUCTION

Mountain Valley Pipeline, LLC ("Mountain Valley") is seeking a Certificate of Public Convenience and Necessity ("Certificate") from the Federal Energy Regulatory Commission ("FERC" or "Commission") pursuant to Section 7(c) of the Natural Gas Act to construct and operate the MVP Southgate Project ("Project"). The Project will be located in Pittsylvania County, Virginia and Rockingham and Alamance counties, North Carolina. The Project proposes to construct approximately 72 miles of 24-inch-diameter natural gas pipeline (known as the H-650 pipeline) to provide timely, cost-effective access to new natural gas supplies to meet the growing needs of natural gas users in the southeastern United States ("U.S."), including for the Project's anchor shipper, a local distribution company serving customers in North Carolina. See Resource Report 1 (General Project Description) for additional Project information.

9.1.1 Environmental Resource Report Organization

Resource Report 9 includes discussion of Air Quality and Noise in the Project area as well as potential Project-related impacts. Resource Report 9 is prepared and organized according to the FERC *Guidance Manual for Environmental Report Preparation* issued February 2017. Air quality resources and potential air impacts associated with the Project are discussed in Section 9.2. A summary of the regional climate and existing air quality is provided in Section 9.2.1, and a discussion of Project-related emissions is located in Section 9.2.2. An overview of the air permitting requirements are discussed in Section 9.2.3, a discussion of applicable regulatory requirements in Section 9.2.4, an analysis of General Conformity in Section 9.2.5, and a summary of air quality mitigation measures in Section 9.2.6. Noise quality resources and potential impacts from the Project are discussed in Section 9.3. Section 9.3.1 provides background information on noise, Section 9.3.2 provides a description of the applicable regulatory requirements applicable to noise, Section 9.3.3 identifies the existing in-air acoustic conditions and presents noise modeling results, Section 9.3.4 discusses construction noise, Section 9.3.5 discusses Project operation noise, Section 9.3.6 discusses post-construction sound survey, and Section 9.3.7 discusses cumulative effects.

9.2 AIR QUALITY

Potential short-term and temporary air quality impacts may result from construction activities necessary to install the pipeline, metering and regulating, and compressor stations. Long-term air impacts may result from the operation of the turbines and other equipment. From a regulatory standpoint, the emissions and associated air quality impacts are addressed in two separate ways:

1) Construction Permitting – Construction (and operation) permitting addresses the emissions and associated impacts from the operational equipment and sources at the Project facilities. Depending on the major/minor status of the Project and the location of the Project, Prevention of Significant Deterioration ("PSD"), Nonattainment NSR ("NNSR"), and/or associated state permitting programs ensure that the proposed installation of new air emissions sources (i.e., operational equipment) meet required emission levels, install appropriate control technologies, and meet other regulatory requirements, where appropriate. The regulatory applicability of permitting programs to the Project is discussed in Section 9.2.4. The Project will perform air quality modeling of the emissions of all criteria pollutants resulting from the Project. This modeling assessment will

demonstrate that all National Ambient Air Quality Standards ("NAAQS") standards are met during operation of the Project. The modeling approach and results are assessed in detail in Appendices 9-E and 9-F (Modeling Reports) and are not discussed further as part of the regulatory requirements and compliance demonstrations of Sections 9.2.4 through 9.2.6. *[Note: The Project will provide the air dispersion modeling analysis in the final Resource Report 9 to be filed with the FERC.]*

2) General Conformity – General Conformity addresses the sources of emissions not covered by permitting actions (e.g., construction activities or an increase in traffic to the sites) and ensures that they comply with the applicable State Implementation Plan(s). Generally, these include the short-term/temporary emissions from construction activities and new emissions increases from non-permitted emission sources such as mobile sources. General Conformity, discussed in Section 9.2.5, is only applicable in maintenance/non-attainment areas. All counties that are impacted by the Project are in attainment for all criteria pollutants (USEPA, 2018). As such, General Conformity does not apply. However, the Project has included the construction emissions per the FERC's *Guidance Manual for Environmental Report Preparation* issued February 2017.

9.2.1 Existing Air Quality

9.2.1.1 Climate

The climate in the Project area is primarily continental in character, but is subject to modification by the Atlantic Ocean; the proper classification for the climate is "modified continental." The mid- latitude site location and proximity to the Atlantic Ocean exposes the region to a variety of meteorological conditions and events. Varying weather conditions can occur in the Project area including tropical storms and hurricanes, thunderstorms, and droughts. The mid-latitude location exposes the area to large annual ranges in temperatures. Cold outbreaks originating from the northern latitudes contrast significantly with the heat and humidity that is often transported from the Gulf of Mexico. The primary interaction point between these mid-latitude regions results in weather characterized by frequent, sometimes powerful, change. At times, mesoscale influences alter this meteorological variety.

Southcentral Virginia and Northern North Carolina Climate

Southcentral Virginia and northern North Carolina have a varied climate. The eastern half of each state, including the eastern shores, lie within the Humid Subtropical climate zone. This region experiences hot, humid summers and mild to cool winters, with evenly dispersed precipitation. The western half of the states are within the transition zone between the Humid Subtropical and Humid Continental zones, with more mild summertime temperatures and colder winters that experience frequent subfreezing low temperatures and moderate snowfall (Wikipedia, 2018).

In the Project area, summers are warm and humid and winters are cold, but not severe. Thunderstorms can occur at any time but are most frequent during the late spring and summer. The storms are most often accompanied by downpours and gusty winds, but are not usually severe. Tornadoes, which infrequently occur, have resulted in significant damage. Severe hailstorms have occurred in the spring. Tropical storms can bring heavy rain, high winds and flooding in the late summer and fall.

The National Climatic Data Center's ("NCDC") 1981-2010 Climate Normals (NCDC, 2012) were evaluated from meteorological stations located in Chatham, Pittsylvania County, Virginia, and in Reidsville, Rockingham County, North Carolina. Temperatures near the Project facilities are generally

highest in July and lowest in January. Maximum temperatures of 90 degrees Fahrenheit (°F) or higher occur about 20-28 days per year on average, while minimum temperatures of 0°F or lower occur less than one day per year on average. The mean annual precipitation is about 45 to 46 inches, with monthly average precipitation ranging from a low of about 3.0 inches in February to a maximum of about 4.8 inches in July. Precipitation of 0.01 inch or greater occurs on about 115 days per year on average. Precipitation of 1.0 inch or greater occurs on average about 12 days per year. The average annual snowfall for the region is approximately 4 to 9 inches. The average annual wind speed for Chatham, VA is 7.4 miles per hour, with a prevailing wind direction from the west-southwest. The average annual wind speed for Reidsville, NC is 7.1 miles per hour, with a prevailing wind direction from the southwest.

Table 9.2-1 provides a summary of the climate parameters associated with the Project compressor stations.

Table 9.2-1

Climate Parameters at the Compressor Station Locations

Compressor Station	Monitoring Station	ID	Approximate Distance and Direction from Existing Monitoring Station to Compressor Station	Average Daily Minimum Temperature – January (°F)	Average Daily Maximum Temperature – July (°F)	Annual Precipitation (inches)
Lambert	Chatham, VA	USC00441614	6 km west	22.8	86.3	45.2
Russell	Reidsville, NC	USC00317202	17 km south	28.0	87.6	46.4

km = kilometer

9.2.1.2 National Ambient Air Quality Standards

NAAQS have been established for each of the following criteria air pollutants: particulate matter with an aerodynamic diameter of 10 microns or less ("PM_{10}"), particulate matter with an aerodynamic diameter of 2.5 microns or less ("$PM_{2.5}$"), sulfur dioxide ("SO_2"), ozone ("O_3"), nitrogen dioxide ("NO_2"), carbon monoxide ("CO"), and lead ("Pb"). Standards are designated as primary or secondary. Primary standards are set at a level designed to protect public health. Secondary standards are set to protect welfare values such as vegetation, visibility, and property values. NAAQS values are listed in the Code of Federal Regulations ("CFR") at 40 CFR Part 50. The current NAAQS for these criteria pollutants are summarized in Table 9.2-2. Footnotes to Table 9.2-2 explain how compliance with each NAAQS is assessed.

Note that both states have adopted State Ambient Air Quality Standards that are equivalent to the NAAQS.

Table 9.2-2

National Ambient Air Quality Standards for Criteria Pollutants

Pollutant	Averaging Period	Standards	
		Primary	Secondary
SO_2	1-hour [l,m]	75 ppb 196 µg/m^3	--
	3-hour [b]	--	0.5 ppm 1300 µg/m^3
	Annual [a,m]	0.03 ppm 80 µg/m^3	--
	24-hour [b,m]	0.14 ppm 365 µg/m^3	--
PM_{10}	24-hour [d]	150 µg/m^3	150 µg/m^3
$PM_{2.5}$ (2012 Standard)	Annual [e,]	12.0 µg/m^3	15.0 µg/m^3
$PM_{2.5}$ (2006 Standard)	24-hour [f]	35 µg/m^3	35 µg/m^3
NO_2	Annual [a]	0.053 ppm (53 ppb) 100 µg/m^3	0.053 ppm (53 ppb) 100 µg/m^3
	1-hour [c]	100 ppb 188 ug/m^3	--
CO	8-hour [b]	9 ppm 10,000 µg/m^3	--
	1-hour [b]	35 ppm 40,000 µg/m^3	--
O_3 (2008 Standard)	8-hour [g,h]	0.075 ppm	0.075 ppm
O_3 (2015 Standard)	8-Hour[i]	0.070 ppm	0.070 ppm
O_3	1-hour [j,k]	0.12 ppm	0.12 ppm
Pb	Rolling 3-month [a]	0.15 µg/m^3	0.15 µg/m^3

Table 9.2-2

National Ambient Air Quality Standards for Criteria Pollutants

Pollutant	Averaging Period	Standards	
		Primary	Secondary

Notes:

a/ Not to be exceeded.
b/ Not to be exceeded more than once per year.
c/ Compliance based on 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area.
d/ Not to be exceeded more than once per year on average over 3 years.
e/ Compliance based on 3-year average of weighted annual mean $PM_{2.5}$ concentrations at community-oriented monitors.
f/ Compliance based on 3-year average of 98th percentile of 24-hour concentrations at each population-oriented monitor within an area.
g/ Compliance based on 3-year average of fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area.
h/ The 2008 8-hour ozone standard will remain in effect until one year after an area is designated for the 2015 8-hour ozone standard, which corresponds with January 16, 2019 based upon attainment designations for the 2015 ozone standard issued on January 16, 2018.
i/ Permit applications that have not met U.S. Environmental Protection Agency's ("USEPA's") grandfathering criteria would have to demonstrate that the proposed project does not cause or contribute to a violation of any revised ozone standards that are in effect when the permit is issued, including the 2015 revised standards.
j/ Maximum 1-hour daily average not to be exceeded more than one day per calendar year on average.
k/ The 1-hour ozone standard has been revoked in all areas in which Project activities will occur.
l/ Compliance based on 3-year average of 99th percentile of the daily maximum 1-hour average at each monitor within an area.
m/ The 24-hour and annual average primary standards for SO_2 have been revoked.

ppm = parts per million by volume.
ppb = parts per billion by volume.
$\mu g/m^3$ = micrograms per cubic meter.

9.2.1.3 Section 107 Attainment Status Designations

The standard method for characterizing existing air quality in a given area is to identify the attainment status of the air quality control region ("AQCR") in which it is located. An AQCR, as defined in Section 107 of the Clean Air Act ("CAA"), is a federally-designated area in which NAAQS must be met. An implementation plan is developed for each AQCR describing how ambient air quality standards will be achieved and maintained.

The U.S. Environmental Protection Agency ("USEPA") designates the attainment status of an area on a pollutant-specific basis based on whether an area meets the NAAQS. Areas that meet the NAAQS are termed "attainment areas." Areas that do not meet the NAAQS are termed "nonattainment areas." Areas for which insufficient data are available to determine attainment status are termed "unclassified areas." Areas formerly designated as nonattainment areas that have subsequently reached attainment are termed "maintenance areas."

The attainment status designations appear at 40 CFR Part 81. The attainment status of a region, in conjunction with projected emission rates or emissions increases, determines the regulatory review process

for a new project. The Lambert Compressor Station and associated pipeline in Virginia is located in AQCR 143, the Central Virginia Intrastate AQCR. These facilities are in a region that is designated as attainment/unclassifiable for all criteria air pollutants (USEPA, 2018).

The Russell Compressor Station and associated pipeline in North Carolina is located in AQCR 150, the Northern Piedmont Intrastate AQCR. This region is designated as attainment/unclassifiable for all criteria air pollutants (USEPA, 2018).

9.2.1.4 Existing Ambient Background Levels

The Project is located in Pittsylvania County, Virginia and in Rockingham and Alamance Counties, North Carolina. These counties contain ambient air quality monitors that collect data concerning existing levels of various air pollutants. Summary data from the USEPA AirData database were reviewed to characterize existing concentrations at the Project for comparison with NAAQS. Specifically, data from the closest ambient air quality monitoring stations were used to represent existing air quality at the Project. If no county data were available, data from a nearby county were used as a substitute.

Ambient air quality monitoring data from the 3-year period 2015-2017 are summarized in Tables 9.2-3 and Table 9.2-4 for monitoring stations nearest to the Project. Tables 9.2-3 and 9.2-4 list the maximum annual mean concentration and/or a near-maximum short-term concentration by station. Second-high short-term concentrations are listed for most pollutants, but Tables 9.2-3 and 9.2-4 include the fourth-highest 8-hour average concentration for ozone, the 98th percentile 1-hour average concentration for NO_2, the 98th percentile 24-hour average concentration for $PM_{2.5}$, and the 99th percentile 1-hour average concentration for SO_2, consistent with the structure of the NAAQS for those pollutants and averaging periods.

Table 9.2-3

Existing Ambient Background Levels in the Vicinity of the Lambert Compressor Station

Pollutant	Averaging Period	Monitoring Station	AQS Site ID	County	State	Approx. Distance from Facility (km)	Background Concentration	Primary NAAQS	Units a/
Ozone	8-hour	Reidsville	37-033-0001	Caswell	NC	59	0.064	0.070	ppm
CO	1-hour	East Vinton Elementary School	51-161-1004	Roanoke	VA	69	1.1	35	ppm
CO	8-hour	East Vinton Elementary School	51-161-1004	Roanoke	VA	69	0.7	9	ppm
NO_2	1-hour	East Vinton Elementary School	51-161-1004	Roanoke	VA	69	33.3	100	ppb
NO_2	Annual	East Vinton Elementary School	51-161-1004	Roanoke	VA	69	5.7	53	ppb
PM_{10}	24-hour	Mendenhall School	37-081-0013	Guilford	NC	90	35	150	ug/m^3
$PM_{2.5}$	24-hour	East Vinton Elementary School	51-161-1004	Roanoke	VA	69	15.7	35	ug/m^3
$PM_{2.5}$	Annual	East Vinton Elementary School	51-161-1004	Roanoke	VA	69	7.0	12	ug/m^3
SO_2	1-hour	East Vinton Elementary School	51-161-1004	Roanoke	VA	69	4.0	75	ppb
SO_2	24-hour	East Vinton Elementary School	51-161-1004	Roanoke	VA	69	2.8	140	ppb
SO_2	Annual	East Vinton Elementary School	51-161-1004	Roanoke	VA	69	0.4	30	ppb

a/ ppm = parts per million by volume. ppb = parts per billion by volume. µg/m3 = micrograms per cubic meter.

Table 9.2-4

Existing Ambient Background Levels in the Vicinity of the Russell Compressor Station

Pollutant	Averaging Period	Monitoring Station	AQS Site ID	County	State	Approx. Distance from Facility (km)	Background Concentration	Primary NAAQS	Units a/
Ozone	8-hour	Reidsville	37-033-0001	Caswell	NC	30	0.064	0.070	ppm
CO	1-hour	East Vinton Elementary School	51-161-1004	Roanoke	VA	86	1.1	35	ppm
CO	8-hour	East Vinton Elementary School	51-161-1004	Roanoke	VA	86	0.7	9	ppm
NO_2	1-hour	Hattie Avenue	37-067-0022	Forsyth	NC	70	36.3	100	ppb
NO_2	Annual	Hattie Avenue	37-067-0022	Forsyth	NC	70	7.0	53	ppb
PM_{10}	24-hour	Mendenhall School	37-081-0013	Guilford	NC	48	35	150	ug/m^3
$PM_{2.5}$	24-hour	Mendenhall School	37-081-0013	Guilford	NC	48	16.3	35	ug/m^3
$PM_{2.5}$	Annual	Mendenhall School	37-081-0013	Guilford	NC	48	8.1	12	ug/m^3
SO_2	1-hour	Hattie Avenue	37-067-0022	Forsyth	NC	70	6.0	75	ppb
SO_2	24-hour	Hattie Avenue	37-067-0022	Forsyth	NC	70	2.1	140	ppb
SO_2	Annual	Hattie Avenue	37-067-0022	Forsyth	NC	70	0.2	30	ppb

a/ ppm = parts per million by volume. ppb = parts per billion by volume. µg/m3 = micrograms per cubic meter.

9.2.1.5 Federal Class I Areas

Federal Class I areas are certain areas established by Congress, such as wilderness areas and national parks, that are afforded special protection under the Clean Air Act. Once designated as a Class I area, an area cannot be re-designated to another (lower) classification. Class I areas are allowed the smallest degree of air quality deterioration through New Source Review ("NSR") / PSD permitting, and special considerations must be made in the NSR permitting process when a Class I area is located close to a proposed site. The Project is not anticipated to require major source PSD review and thus, Class I air quality modeling will not be required. Regardless, the Class I areas nearest to the proposed locations of the Lambert and Russell Compressor Stations have been identified. The Class I areas are listed in Tables 9.2-5 and 9.2-6.

Table 9.2-5

Federal Class I Areas Closest to the Lambert Compressor Station

Class I Area	Managing Agency	Direction from Lambert	Distance to Compressor Station	
			Kilometers	Miles
James River Face Wilderness Area, VA	U.S. Forest Service	North	81	50
Shenandoah National Park, VA	National Park Service	North	143	89

Table 9.2-6

Federal Class I Areas Closest to the Russell Compressor Station

Class I Area	Managing Agency	Direction from Russell	Distance to Compressor Station	
			Kilometers	Miles
James River Face Wilderness Area, VA	U.S. Forest Service	North	117	73
Shenandoah National Park, VA	National Park Service	North	183	114

9.2.2 Project Emissions

9.2.2.1 Construction

Construction activities associated with the Project will result in temporary increases in emissions of some pollutants due to the use of non-stationary equipment powered by diesel fuel or gasoline engines; the temporary generation of fugitive dust due to disturbance of the ground surface, vegetation clearing, and other dust generating actions; and indirect emissions attributable to workers commuting to and from work sites during construction. Detailed construction emissions calculations along with the methodology and emissions factors used are provided in Appendix 9-A. *[Note: The Project will provide the construction emissions as a supplemental filing.]*

These sources are not considered stationary sources, and their impacts will generally be temporary and localized. Therefore, the emissions are not required to be evaluated as part of the PSD or NNSR major source determination analysis. Furthermore, the emissions from construction activities are not expected to cause or significantly contribute to an exceedance of the NAAQS.

Potential emissions from construction of the Project are presented in Section 9.2.5.

9.2.2.2 Operation (including maintenance and malfunctions)

The following sections list the equipment to be installed at each compressor station. Emission calculations have been performed and are presented in Appendix 9-B for these emission sources. *[Note: The Project will provide emissions information in the final Resource Reports included with the Certificate application expected to be filed in November 2018.]* The Project has included volatile organic compounds ("VOC") and greenhouse gas ("GHG") emissions from blowdown events at the compressor stations using the following assumptions:

- While only 8 blowdown events are planned per year, due to system testing and maintenance activities, permitting will reflect 16 for the compressors and one emergency shutdown vent for the Lambert and Russell Compressor Stations in case additional blowdown events become necessary.

Lambert Compressor Station

The proposed Lambert Compressor Station will involve the installation of:

- Two (2) turbines for the compression and transmission of natural gas;
- Five (5) microturbines to provide power;
- One (1) fuel gas heater;
- One (1) produced fluids tank and associated loadout;
- One (1) waste oil tank; and
- Associated piping and components.

Russell Compressor Station

The proposed Russell Compressor Station will involve the installation of:

- One (1) turbine for the compression and transmission of natural gas;
- Five (5) microturbines to provide power;
- One (1) fuel gas heater;
- One (1) produced fluids tank and associated loadout;
- One (1) waste oil tank; and
- Associated piping and components.

Operational emission estimates associated with fugitive gas releases from the pipeline, valves, meter stations, regulation facilities, and pig launcher/receivers along the pipeline are provided in Appendix 9-B *[Not included in this Draft]*. The calculations in Appendix 9-B are based on a methodology described in

Interstate Natural Gas Association of America guidelines[1] and a representative natural gas sample, which is also included in Appendix 9-B *[Not included in this Draft]*.

9.2.2.3 Decommissioning

Decommissioning is not currently planned. Mountain Valley will obtain the necessary state and federal permits for decommissioning at the end of the useful Project life.

9.2.3 Air Permitting Requirements

The Virginia Code of State Rules ("CSR") require sources of air contamination to notify the state and receive a permit to construct, modify, relocate and operate the stationary source, unless otherwise exempt. The Project will submit the necessary construction permit applications and other relevant documentation prior to construction. A copy of the minor source air permit application for Lambert Station is included in Appendix 9-C. *[Note: The Project will provide the VADEQ air permit application in the final Resource Reports included with the Certificate application expected to be filed in November 2018.]*

The combustion turbine compressor proposed for the Russell Station to be located in Rockingham County, North Carolina, is subject to air quality regulations in 15A North Carolina Administrative Code ("NCAC") 02Q.0300. This rule establishes the authority to require a source to obtain an air quality permit prior to construction. A copy of the minor source air permit application for Russell Station is included in Appendix 9-D. *[Note: The Project will provide the NCDEQ air permit application in the final Resource Reports included with the Certificate application expected to be filed in November 2018.]*

9.2.4 Regulatory Review and Applicability

This section lists federal and state air quality regulations that may be applicable to the Project.

9.2.4.1 Prevention of Significant Deterioration Source Classification

Federal construction permitting programs regulate new and modified sources of attainment pollutants under PSD and new and modified sources of non-attainment pollutants under NNSR. PSD regulations apply when a new source is constructed in which emissions exceed PSD major source thresholds, an existing minor source undergoes a modification in which emission increases exceed PSD major source thresholds, or an existing major source undergoes a modification in which emission increases exceed PSD significant emission rates. The Lambert and Russell Compressor Stations will be designed as minor sources with respect to PSD, as shown in Table 9.2-7. *[Note: The Project will provide emissions information in the final Resource Reports included with the Certificate application expected to be filed in November 2018.]* As such, PSD permitting is not triggered.

[1] Greenhouse Gas Emission Estimation Guidelines for Natural Gas Transmission and Storage, Volume 1 - GHG Emission Estimation Methodologies and Procedures, Interstate Natural Gas Association of America, September 28, 2005

Table 9.2-7

Emissions from Compressor Stations versus NSR Major Source Thresholds

Pollutant	Lambert Compressor Station Site-Wide PTE (TPY) a/	Russell Compressor Station Site-Wide PTE (TPY)[1]	Major Source Threshold (TPY)	NSR Program	Subject to Major NSR?
NO_2	TBD	TBD	250	PSD	NO
PM_{10}	TBD	TBD	250	PSD	NO
$PM_{2.5}$	TBD	TBD	250	PSD	NO
CO	TBD	TBD	250	PSD	NO
SO_2	TBD	TBD	250	PSD	NO
VOC	TBD	TBD	250	PSD	NO

a/ PTE includes emissions from fugitive sources. PTE = potential to emit

NNSR regulations apply only in areas designated as non-attainment. The compressor stations will be located in Pittsylvania County, Virginia and Rockingham County, North Carolina, which are designated as attainment/unclassifiable areas for all criteria pollutants (USEPA, 2018) Therefore, NNSR regulations do not apply to either of the compressor stations.

9.2.4.2 Title V Operating Permit Program

Title 40 of the Code of Federal Regulations, Chapter 70 (40 CFR 70) establishes the Federal Title V operating permit program ("Title V"). Virginia has incorporated the provisions of this federal program in its Title V operating permit program in Virginia 45 CSR 30. The major source thresholds with respect to the Virginia and North Carolina Title V operating permit program regulations are 10 tons per year ("tpy") of a single hazardous air pollutant ("HAP"), 25 tpy of any combination of HAP and 100 tpy of all other regulated pollutants, except GHG.[2]

The potential emissions of all regulated pollutants at the Lambert and Russell Compressor Stations will be below the corresponding Title V thresholds. Therefore, the Lambert and Russell Compressor Stations are not anticipated to be a major sources for Title V purposes.

9.2.4.3 New Source Performance Standards

New Source Performance Standards ("NSPS"), located in 40 CFR 60, require new, modified, or reconstructed sources to control emissions to the level achievable by the best demonstrated technology as specified in the applicable provisions. Moreover, any source subject to an NSPS is also subject to the general provisions of NSPS Subpart A, except where expressly noted. The following is a summary of applicability and non-applicability determinations for NSPS regulations of relevance to the facilities.

[2] On June 23, 2014, the U.S Supreme Court decision in the case of *Utility Air Regulatory Group v. EPA* effectively changed the permitting procedures for GHGs under the PSD and Title V programs.

NSPS Subpart Dc – Steam Generating Units

Subpart Dc, Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units, applies to all steam generating units with a heat input greater than or equal to 10 million British thermal units per hour ("MMBtu/hr") and less than 100 MMBtu/hr. No units at the proposed facilities meet the definition of a steam generating unit nor have a heat input greater than 10 MMBtu/hr; therefore, the requirements of this subpart will not apply.

NSPS Subpart GG – Stationary Gas Turbines

Subpart GG, Standards of Performance for Stationary Gas Turbines, applies to all gas turbines with a heat input at peak load greater than or equal to 10 MMBtu/hr based on the lower heating value of the fuel fired. This standard was promulgated in 1979. The applicability of Subpart KKKK, promulgated in 2006, is similar to that of Subpart GG and applies to stationary combustion turbines that commence construction after February 18, 2005. Turbines subject to Subpart KKKK are specifically exempt from the requirements of Subpart GG per 40 CFR § 60.4305(b). As such, this subpart does not apply to the proposed Solar turbines at each compressor station, which are subject to the requirements of Subpart KKKK as discussed in the below section. The proposed microturbines have a heat input less than 10 MMBtu/hr and are not subject to the requirements of Subpart GG.

NSPS Subparts K, Ka, and Kb – Storage Vessels for Petroleum Liquids/Volatile Organic Liquids

These subparts apply to storage tanks of certain sizes constructed, reconstructed, or modified during various time periods. Subpart K applies to storage tanks constructed, reconstructed, or modified prior to 1978, and Subpart Ka to those constructed, reconstructed, or modified prior to 1984. All storage tanks located at the compressor stations will be constructed after these dates; therefore, the requirements of Subparts K and Ka do not apply. Subpart Kb applies to volatile organic liquid storage tanks constructed, reconstructed, or modified after July 23, 1984 with a capacity equal to or greater than 75 m^3 (approximately 19,813 gallons). All storage tanks at the compressor stations will be new construction, but will not have a capacity greater than 75 m^3. Therefore, Subpart Kb does not apply to the storage tanks at the compressor stations.

NSPS Subpart JJJJ – Stationary Spark Ignition Internal Combustion Engines

Subpart JJJJ, Standards of Performance for Stationary Spark Ignition Internal Combustion Engines, applies to manufacturers, owners and operators of stationary spark engines. There will be no stationary spark engines installed at the compressor stations. Therefore, this subpart is not applicable to the Project.

NSPS Subpart KKKK – Stationary Combustion Turbines

Subpart KKKK, Standards of Performance for Stationary Combustion Turbines, applies to stationary combustion units with a heat input at peak load equal to or greater than 10 MMBtu/hr, based on the higher heating value of the fuel, commencing construction after February 18, 2005. The microturbines at the compressor stations will each have a heat input less than 10 MMBtu/hr. Therefore, they are not subject to this standard.

The proposed Solar turbines for the compressor stations will be subject to the nitrogen oxide ("NO_X") emissions limitations in NSPS KKKK. Turbines with a rated capacity between 50 to 850 MMBtu/hr at peak

load are limited to NO_X emissions of 25 ppm at 15 percent O_2 when firing natural gas. The Solar turbines that will be installed at the stations are equipped with lean pre-mix combustion technology and are guaranteed by the manufacturer to emit a maximum of 15 ppm of NO_X at 15 percent O_2 under variable turbine load conditions when firing on natural gas. This vendor guarantee is below the NSPS KKKK standard.

The Project will perform annual performance tests in accordance with §60.4340(a) and§ 60.4400 to demonstrate compliance with the NO_X emission limitations, or as an alternative, will continuously monitor the appropriate parameters to determine whether each turbine is operating in low-NO_X mode in accordance with §60.4340(b)(2)(ii) and §60.4355(a). The Solar turbines will also comply with the SO_2 emission limits in NSPS KKKK. The Project will comply with the SO_2 requirements by the exclusive use of natural gas which contains total potential sulfur emissions less than 0.060 pound SO_2/MMBtu heat input in accordance with §60.4330(a)(2).

NSPS Subpart OOOO – Natural Gas Production, Transmission, and Storage

Subpart OOOO, Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution, applies to facilities that commenced construction, reconstruction, or modification after August 23, 2011. This NSPS was published in the Federal Register on August 16, 2012, and was subsequently amended. The list of potentially affected facilities includes:

- Gas wellheads;
- Centrifugal compressors located between the wellhead and the point of custody transfer to the natural gas transmission and storage segment;
- Reciprocating compressors located between the wellhead and the point of custody transfer to the natural gas transmission and storage segment;
- Continuous bleed natural gas-driven pneumatic controllers with a bleed rate of greater than 6 standard cubic feet per hour located between the wellhead and the point of custody transfer to the natural gas transmission and storage segment (excluding natural gas processing plants);
- Continuous bleed natural gas-driven pneumatic controllers located at natural gas processing plants;
- Storage vessels in the production, processing, or transmission and storage segments; and
- Sweetening units located onshore that process natural gas produced from either onshore or offshore wells.

Since the proposed compressor stations will be natural gas transmission facilities located after the point of custody transfer, the only potentially applicable requirements for the proposed equipment at the compressor stations are those for new storage vessels where construction commenced after August 23, 2011.

The regulatory standards applicable to storage vessels are detailed in 40 CFR §60.5395. The only tanks that fall under the Subpart's definition of a "storage vessel" are the produced fluid storage tanks; however, these tanks will have potential VOC emissions below 6 tpy each. As such, per 60.5365(e), the tank is not a storage vessel affected facility under the rule.

NSPS Subpart OOOOa - Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution

40 CFR Part 60, Subpart OOOOa applies to sources that are constructed/modified after September 18, 2015 including centrifugal compressors, reciprocating compressors, pneumatic controllers, pneumatic pumps, storage vessels, equipment leaks and sweetening units within the crude oil and natural gas sector. In the natural gas transmission segment, Subpart OOOOa defines standards for each of these affected facilities, except for pneumatic pumps and sweetening units.

Centrifugal compressors with wet seals constructed after September 18, 2015 are subject to the control, recordkeeping, and reporting requirements of Subpart OOOOa. Mountain Valley will not be installing any centrifugal compressors with wet seals as part of the Project. Any new natural gas pneumatic controller installed will have a bleed rate less than or equal to six standard cubic feet per hour, as required by Subpart OOOOa.

Subpart OOOOa has added Leak Detection and Repair requirements for new or modified compressor stations in the transmission segment. For equipment leaks, Subpart OOOOa requires quarterly surveys using optical gas imaging ("OGI") technology and subsequent repair of any identified leaks. The Project will comply with all applicable leak detection provisions of Subpart OOOOa.

9.2.4.4 National Emission Standards for Hazardous Air Pollutants

Regulatory requirements for facilities subject to National Emission Standards for Hazardous Air Pollutants ("NESHAP") standards, otherwise known as Maximum Available Control Technology ("MACT") Standards for source categories, are contained in 40 CFR Part 63. 40 CFR Part 61 NESHAP standards are defined for specific pollutants while Part 63 NESHAPs are defined for source categories where allowable emission limits are established on the basis of a MACT determination for a particular major source. A major source of HAP is defined as having potential emissions in excess of 25 tpy for total HAP and/or potential emissions in excess of 10 tpy for any individual HAP. Area sources consist of smaller-size facilities that release lesser quantities of toxic pollutants into the air and are defined as sources that emit less than 10 tpy of a single air toxin or less than 25 tpy of a combination of air toxins. Part 63 NESHAPs apply to sources in specifically-regulated industrial source categories (CAA Section 112(d)) or on a case-by-case basis (Section 112(g)) for facilities not regulated as a specific industrial source type.

Potential HAP emissions from each of the proposed compressor stations will be below the major source thresholds (i.e., less than 10 tpy of individual HAP and 25 tpy of total HAP) and therefore, the facilities will be area sources of HAP. The potential applicability of specific MACT standards to each compressor station is discussed below.

NESHAP Subpart HH – Natural Gas Production Facilities

This standard applies to sources at natural gas production facilities that are major or area sources of HAP emissions. The proposed compressor stations are transmission facilities; therefore, the facilities will not be subject to Subpart HH.

NESHAP Subpart HHH – Natural Gas Transmission and Storage Facilities

This standard applies to sources at natural gas transmission and storage facilities that are major sources of HAP emissions located downstream of the point of custody transfer (after processing and/or treatment in the production sector), but upstream of the distribution sector. The proposed compressor stations are transmission facilities and are area (not major) source of HAP emissions. Therefore, the facilities will not be subject to Subpart HHH.

NESHAP Subpart YYYY – Stationary Combustion Turbines.

Stationary combustion turbines located at facilities that are major sources of HAPs are potentially subject to Subpart YYYY, NESHAP for Stationary Combustion Turbines. Subpart YYYY establishes emissions and operating limitations for lean premix gas-fired, lean premix oil-fired, diffusion flame gas-fired and diffusion flame oil-fired stationary combustion turbines. The proposed compressor stations are area (not major) sources of HAP and therefore are not subject to the requirements of this subpart.

NESHAP Subpart ZZZZ – Stationary Reciprocating Internal Combustion Engines

Stationary reciprocating internal combustion engines at both area and major sources of HAP emissions are potentially subject to Subpart ZZZZ – *NESHAP for Stationary Reciprocating Internal Combustion Engines*. There are no proposed stationary reciprocating internal combustion engines at the compressor stations. Therefore, the stations are not subject to this subpart.

NESHAP Subpart DDDDD – Industrial, Commercial, and Institutional Boilers and Process Heaters (Major Source Boiler MACT)

This MACT standard applies to industrial, commercial, and institutional boilers of various sizes and fuel types at major sources of HAP. The proposed facilities are area (not major) sources of HAP; therefore, the requirements of this subpart will not apply.

NESHAP Subpart JJJJJJ – Industrial, Commercial, and Institutional Boilers (Area Source Boiler MACT)

This MACT standard applies to industrial, commercial, and institutional boilers of various sizes and fuel types. The rule does not apply to natural gas fired boilers and does not apply to process heaters at area sources. The proposed fuel heaters are natural gas-fired and are specifically exempt from this subpart. Therefore, the requirements of this subpart will not apply.

9.2.4.5 Greenhouse Gas Reporting Rule

Per 40 CFR 98.2(a)(2), facilities that contain a source category listed in Table A-4 and emit 25,000 metric tons or more per year of carbon dioxide equivalent ("CO_2e") in combined emissions from stationary fuel combustion units, miscellaneous uses of carbonate, and all applicable source categories in Tables A-3 and A-4 are subject to reporting under the Greenhouse Gas Mandatory Reporting Rule ("MRR"). Table A-4 of 40 CFR 98 Subpart A includes Petroleum and Natural Gas Systems. Greenhouse gas emissions from each of the compressor stations are over 25,000 metric tpy on a potential basis. The actual emissions will be calculated annually following support W applicability and calculation methodology and compared with the 25,000 metric tpy of CO_2 to address the applicability of the rule. The Project will meet all requirements of

the MRR for these new compressor stations, as applicable. No other subparts under the MRR are applicable to the compressor stations.

9.2.4.6 Virginia Air Quality Regulations

The Lambert Compressor Station is subject to regulations contained in the Virginia CSR, which requires sources of air contamination to notify the state and receive a permit to construct, modify, relocate and operate the stationary source, unless otherwise exempt. The air quality regulations for the Commonwealth of Virginia are codified in Title 9 of the Virginia Administrative Code (9 VAC) Agency 5, State Air Pollution Control Board. The following sections present a discussion of potentially applicable Virginia air quality regulations.

9 VAC 5-20: General Provisions on Air Pollution Control

The General Provisions on Air Pollution Control contain provisions to secure and maintain all air quality levels in Virginia. Under 9 VAC 5-20-170, the air pollution control board may require an owner of a stationary source to submit a control program, in a form and manner satisfactory to the board, showing how compliance shall be achieved. For cases of equipment maintenance or malfunctions, 9 VAC 5-20-180 will require the facility record and notify the board of such instances.

9 VAC 5-30: Ambient Air Quality Standards

Ambient air quality standards are required to assure that ambient concentrations of air pollutants are consistent with established criteria and shall serve as the basis for effective and reasonable management of the air resources. Depending on the ambient air quality concentrations, air dispersion modeling may be required. State operating permits ("SOP") are covered in 9 VAC 5-80, which is discussed in more detail below.

9 VAC 5-50: New and Modified Sources

The owner or operator of a new or modified emission source must achieve compliance with all standards of performance prescribed under this chapter within 60 days of achieving maximum production rate, but no later than 180 days after initial startup. Upon the request of the board, the owner or operator may be requested to continuously monitor emissions and process parameters by procedures and methods acceptable to the board. Performance tests will include odor, toxic pollutants, dust, and visible emissions testing. Recordkeeping and reporting requirements include notification of startup, shutdown, malfunction, performance tests, monitoring device malfunctions or repairs, monitoring start and end times. Records must be kept for at least 5 years.

In addition, new or modified stationary sources under Article 6 may be required to demonstrate the use of Best Available Control Technology ("BACT") under 9 VAC 5-50-260. A copy of air permit application for Lambert Station, which includes BACT applicability and assessment is included in Appendix 9-C. *[Note: The Project will provide the VADEQ air permit application in the final Resource Reports included with the Certificate application expected to be filed in November 2018.]*

9 VAC 5-60: Hazardous Air Pollutant Sources

Standards and criteria on regulated HAPs are included within 9 VAC 5-60. Emissions testing and recordkeeping is also included in this chapter. A source is exempt from this chapter if the source emits less

than the Federal standards for HAP emissions. Air dispersion modeling may be required depending on the site-specific emissions calculations.

9 VAC 5-80-50: Federal Operating Permits

A Federal operating permit is required for any major source or an area source subject to a standard, limitation, or other requirement under Sections 111-112 of the Clean Air Act, unless otherwise exempt. A copy of air permit application for Lambert Station, which includes an applicability assessment for major source federal operating permits is included in Appendix 9-C. *[Note: The Project will provide the VADEQ air permit application in the final Resource Reports included with the Certificate application expected to be filed in November 2018.]*

9 VAC 5-80: State Operating Permits

Article 6 permitting must be completed before construction of a new source, per 9 VAC 5-80-1100. Virginia's SOPs are most often used by stationary sources to establish federally enforceable limits on potential emissions to avoid major NSR permitting (PSD and NNSR permits), Title V permitting, and/or major source MACT applicability. When a source chooses to use a SOP to limit their emissions below major source permitting thresholds, it is commonly referred to as a "synthetic minor" source. SOPs can also be used to combine multiple permits from a stationary source into one permit or to implement emissions trading requirements.

A copy of air permit application for Lambert Station, which includes an applicability assessment for SOP regulations is included in Appendix 9-C *[Not included with this Draft]*.

9 VAC 5-80-1100: Construction Permits

Article 6 permitting must be completed before construction of a new source. The required Form 7 application forms and attachments are included in the VADEQ air permit application provided in Appendix 9-C *[Not included with this Draft]* to satisfy this requirement for the construction of sources at the facility.

9 VAC 5-85: Permits for Stationary Sources of Pollutants Subject To Regulation

This chapter contains definitions and general provisions which are essentially identical to those discussed in chapter 5-20 above.

9.2.4.7 North Carolina Air Quality Regulations

The combustion turbine compressor proposed for the Russell Station would be subject to air quality regulations in 15A NCAC 02Q.0300. This rule establishes the authority to require a source to obtain an air quality permit prior to construction. A discussion of the NCDEQ air quality regulations that are potentially applicable to the Russell Station is provided below.

15A NCAC 02Q.0500: Title V Procedures

This rule outlines the NCDEQ major source Title V Permitting Program. The Russell Station criteria pollutant PTE will be designed to not exceed the applicable Title V major source threshold of 100 tpy per criteria pollutant. In addition, the facility's HAP PTE will not exceed 10 tpy per individual HAP, and will not exceed 25 tpy for combined HAPs. Therefore, the facility will be a minor source of emissions with respect to the Title V Operating Program.

15A NCAC 02Q .0300: Construction and Operation Permits

This rule establishes the authority to require a source to obtain an air quality permit through the guidelines and rules established in 02Q.0300 prior to construction. The definition of construction in North Carolina is consistent with the USEPA's rulings and definitions. The required construction air permit application and attachments are included in the NCDEQ air permit application provided in Appendix 9-D to satisfy this requirement for the construction of sources at the facility. *[Note: The Project will provide the NCDEQ air permit application in the final Resource Reports included with the Certificate application expected to be filed in November 2018.]*

15A NCAC 02D .0516: Sulfur Dioxide Emissions from Combustion Sources

This regulation limits SO_2 from any source of combustion that is discharged to the atmosphere to no more than 2.3 pounds of SO_2 per million British thermal unit ("Btu") input. Natural gas combustion complies with this rule. If an NSPS has an SO_2 standard, the facility will comply with the NSPS instead of this Rule, if more stringent.

15A NCAC 02D .0519: Control of Nitrogen Dioxide and Nitrogen Oxides Emissions

This regulation limits the nitrogen oxides from sulfuric acid plants, and the combustion of coal, oil or coal, and oil in combination with gaseous fuels in boilers. It will not be applicable to the turbines or the heaters at the site.

15A NCAC 02D .0521: Control of Visible Emissions

This regulation limits the opacity from newly constructed combustion sources to 20 percent opacity. If a NSPS has an opacity standard, the facility will comply with the NSPS instead of this Rule, if more stringent.

15A NCAC 02D .0530: Prevention of Significant Deterioration

This rule incorporates nearly all of 40 CFR 51.166, however, North Carolina has added some State-specific issues that would impact existing sources and establishes new guidelines for impacts to the Class I areas in North Carolina. Since the Russell Station will be designed as a minor facility, this rule will not apply at this time.

15A NCAC 02D .0535: Excess Emissions Reporting and Malfunctions

This rule establishes State-specific requirements and definitions for a malfunction and the reporting requirements for a malfunction. The facility will comply with these requirements as applicable. In addition, sources subject to an NSPS or NESHAP rule are not subject to this regulation, unless an emission limit established in a permit issued under 15A NCAC 02Q.0700 is more stringent than the applicable NSPS or NESHAP rule.

15A NCAC 02D.0540: Particulates from Fugitive Dust Emission Sources

This rule requires facilities to obtain a permit under 15A NCAC 02Q or subjects facilities to requirements under 15A NCAC 02D, which state that the facility shall not cause or allow fugitive dust emissions to cause or contribute to substantive complaints. The facility will comply with all applicable requirements, including reporting requirements in the event of substantive fugitive dust complaints.

15A NCAC 02D.0600: Monitoring, Recordkeeping, and Reporting

This rule sets forth general monitoring, recordkeeping, and reporting requirements applicable to sources subject to the requirements of 15A NCAC 02D or 15A NCAC 02Q. The facility will comply with all applicable requirements in this regulation.

15A NCAC 02D.0900: Volatile Organic Compounds

This rule sets forth various requirements for sources emitting VOCs. The facility is not expected to emit greater than 15 pounds VOC per day, and is therefore only potentially subject to sections .0925 and .0958 of this regulation. However, all storage tanks at the facility will have a capacity less than 39,000 gallons, and the facility is therefore not subject to section .0925. The facility will comply with all applicable requirements of section .0958.

15A NCAC 02D .0544: Prevention of Significant Deterioration Requirements for GHGs

This rule supersedes .0530 for GHGs and alone cannot trigger a PSD review. Since the Russell Station will be designed as a minor facility with regards to criteria pollutants, this rule will not apply at this time.

15A NCAC 02D .1100 and 15A NCAC 02Q .0700: Control of Toxic Air Pollutants

These rules establish the procedures and permitting requirements for the State toxic air pollutants identified for North Carolina Ambient Air. Its procedures include de minimis evaluation and air dispersion modeling requirements for non-de minimis toxic air pollutants. A copy of air permit application for Russell Station, which includes an applicability assessment for toxic air pollutant regulations is included in Appendix 9-D. *[Note: The Project will provide the NCDEQ air permit application in the final Resource Reports included with the Certificate application expected to be filed in November 2018.]*

9.2.5 General Conformity

Under the Clean Air Act, a General Conformity analysis is required for any project that requires federal action. General Conformity applies to those emission generating activities resulting from the Project that are not already covered by permitting and located in an area that is designated as nonattainment or a maintenance area (40 CFR 93.153(b)).

The Lambert Compressor Station and pipeline in Virginia is located in AQCR 143, the Central Virginia Intrastate AQCR. These facilities are in a region that is designated as attainment/unclassifiable for all criteria air pollutants. The Russell Compressor Station and pipeline in North Carolina is located in AQCR 150, the Northern Piedmont Intrastate AQCR. This region is designated as attainment/unclassifiable for all criteria air pollutants. Therefore, a General Conformity analysis is not required for the Project.

Construction emissions are presented in Section 9.2.5.1 per FERC's *Guidance Manual for Environmental Report Preparation* issued February 2017. Operation emissions are presented in Section 9.2.5.2.

9.2.5.1 Construction Emissions

The use of equipment to construct the Project will result in temporary, short-term emissions of air pollutants that will be restricted to the construction period for the compressor stations and pipeline and will terminate

once construction has been completed. Construction for the Project is expected to take place in 2020. In addition, some right-of-way restoration may occur during the first half of 2021.

Construction activities can generally be categorized into the following activities:

- Construction Equipment Engines – Emissions from air compressors, backhoes, cranes, and other construction equipment;
- On-Road Vehicle Travel – Emissions from commuter buses, passenger vehicles, and diesel or gasoline trucks;
- Off-Road Vehicle Travel – Emissions from dump trucks, light/medium duty trucks, and water/fuel trucks;
- Earthmoving Fugitives – Emissions resulting from bulldozing, grading, and land disturbance; and
- Wind Erosion – Emissions resulting from soil piles.

Emissions from these source categories were calculated using emission factors and USEPA models from the following sources:

- WRAP Fugitive Dust Handbook, Countess Environmental, September 2006;
- USEPA NONROAD2008a Model; and
- USEPA MOVES2014a Vehicle Emission Modeling Software.

Compressor Station and Meter Station Emissions

Emissions from the compressor stations and meter stations were estimated based on the type of construction activity occurring and the length of time that type of activity was expected to last at each station. The total emissions are based on the year the construction is expected to occur at each station and exhibited in Tables 9.2-8 through 9.2-9. Detailed construction emissions calculations along with the methodology and emissions factors used are provided in Appendix 9-A. *[Note: The Project will provide the construction emissions as a supplemental filing.]*

Pipeline Emissions

Emissions from the construction of the pipeline are calculated based on the length of pipeline being constructed in each county. Emissions were estimated based on the type of construction activity occurring and the length of time that type of activity was expected to last within each county of pipeline construction. The total emissions expected to occur for each construction year by county are exhibited in Tables 9.2-8 through 9.2-9. Detailed construction emissions calculations along with the methodology and emissions factors used are provided in Appendix 9-A. *[Note: The Project will provide the construction emissions as a supplemental filing.]*

9.2.5.2 Operations Emissions

Emissions from operating the equipment at the new Lambert and Russell Compressor Stations are a result of combustion of natural gas in compressor turbines at the stations. The main emission sources at each compressor station are the natural gas turbines and the microturbines. Emissions of all pollutants have been minimized through the selection of the most efficient turbines. Larger turbines, with greater horsepower ("hp") output, are more efficient. More efficient models use less fuel and produce fewer emissions for the same hp output. The new compressor stations will utilize the largest, most efficient turbines that meet the pipeline operational requirements. The microturbines that will be installed as part of the Project have very low emissions compared to viable alternatives such as reciprocating internal combustion engines. Table 9.2-10 presents the operational emissions potential to emit in tons per year. *[Note: The Project will provide the operation emissions in the final Resource Reports included with the Certificate application expected to be filed in November 2018.]*

For the natural gas turbines, the Project is planning to purchase and install Solar turbines at the two compressor stations which are equipped with SoLoNOx, Solar's emission reduction technology. SoLoNOx is a lean, pre-mixed technology that controls the air to fuel ratio and the temperature of the flame to reduce NOX emissions without significantly increasing CO. As noted in section 9.2.4.3, the manufacturer's guaranteed NOX emissions of 15 ppm are below the 25 ppm limit of NSPS Subpart KKKK. Further, the Project will further mitigate these emissions through the development and implementation of an Operation and Maintenance Plan that is consistent with the manufacturer's recommendations for good combustion practices. Proper operation and preventative maintenance activities will ensure that emissions from the turbines will be minimized and continue to meet or exceed the applicable emission standards.

Table 9.2-8

Estimated Construction Emissions from the MVP Southgate Project – 2020 [TBD]

SOURCE	2020 CONSTRUCTION EMISSIONS (TPY)						
	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CO_2
Lambert Compressor Station:							
Construction Equipment Engines	--	--	--	--	--	--	--
On-Road Vehicle Travel	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	--	--	--
Earthmoving Fugitives	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--
Lambert Total	**--**	**--**	**--**	**--**	**--**	**--**	**--**
Russell Compressor Station:							
Construction Equipment Engines	--	--	--	--	--	--	--
On-Road Vehicle Travel	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	--	--	--
Earthmoving Fugitives	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--
Russell Total	**--**	**--**	**--**	**--**	**--**	**--**	**--**
Meter Stations:							
Construction Equipment Engines	--	--	--	--	--	--	--
On-Road Vehicle Travel	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	--	--	--

Table 9.2-8

Estimated Construction Emissions from the MVP Southgate Project – 2020 [TBD]

SOURCE	2020 CONSTRUCTION EMISSIONS (TPY)						
	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CO_2
Earthmoving Fugitives	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--
Meter Station Total	**--**	**--**	**--**	**--**	**--**	**--**	**--**
Pipeline:							
Construction Equipment Engines	--	--	--	--	--	--	--
On-Road Vehicle Travel	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	--	--	--
Earthmoving Fugitives	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--
Pipeline Total	**--**	**--**	**--**	**--**	**--**	**--**	**--**
Pipeline in Pittsylvania, VA	--	--	--	--	--	--	--
Pipeline in Rockingham, NC	--	--	--	--	--	--	--
Pipeline in Alamance, NC	--	--	--	--	--	--	--
2020 TOTAL:	**--**	**--**	**--**	**--**	**--**	**--**	**--**

Table 9.2-9

Estimated Construction Emissions from the MVP Southgate Project – 2021 [TBD]

SOURCE	2021 CONSTRUCTION EMISSIONS (TPY)						
	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CO_2
Lambert Compressor Station:							
Construction Equipment Engines	--	--	--	--	--	--	--
On-Road Vehicle Travel	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	--	--	--
Earthmoving Fugitives	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--
Lambert Total	**--**	**--**	**--**	**--**	**--**	**--**	**--**
Russell Compressor Station:							
Construction Equipment Engines	--	--	--	--	--	--	--
On-Road Vehicle Travel	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	--	--	--
Earthmoving Fugitives	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--
Russell Total	**--**	**--**	**--**	**--**	**--**	**--**	**--**
Meter Stations:							
Construction Equipment Engines	--	--	--	--	--	--	--
On-Road Vehicle Travel	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	--	--	--
Earthmoving Fugitives	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--
Meter Station Total	**--**	**--**	**--**	**--**	**--**	**--**	**--**

Table 9.2-9 Estimated Construction Emissions from the MVP Southgate Project – 2021 [TBD]							
SOURCE	**2021 CONSTRUCTION EMISSIONS (TPY)**						
	NO_X	**CO**	**SO_2**	**VOC**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**
Pipeline:							
Construction Equipment Engines	--	--	--	--	--	--	--
On-Road Vehicle Travel	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	--	--	--
Earthmoving Fugitives	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--
Pipeline Total	**--**	**--**	**--**	**--**	**--**	**--**	**--**
Pipeline in Pittsylvania, VA	--	--	--	--	--	--	--
Pipeline in Rockingham, NC	--	--	--	--	--	--	--
Pipeline in Alamance, NC	--	--	--	--	--	--	--
2021 TOTAL:	**--**	**--**	**--**	**--**	**--**	**--**	**--**

Table 9.2-10 Operational and Fugitive Emissions from Compressor Stations Equipment						
Pollutant	**Lambert Compressor Station Equipment PTE (TPY)**	**Lambert Compressor Station Fugitive PTE (TPY)**	**Lambert Compressor Station Total PTE (TPY)**	**Russell Compressor Station Equipment PTE (TPY)**	**Russell Compressor Station Equipment PTE (TPY)**	**Russell Compressor Station Total PTE (TPY)**
NO_2	TBD	TBD	TBD	TBD	TBD	TBD
PM_{10}	TBD	TBD	TBD	TBD	TBD	TBD
$PM_{2.5}$	TBD	TBD	TBD	TBD	TBD	TBD
CO	TBD	TBD	TBD	TBD	TBD	TBD
SO_2	TBD	TBD	TBD	TBD	TBD	TBD
VOC	TBD	TBD	TBD	TBD	TBD	TBD

9.2.6 Air Quality Mitigation Measures

Construction Emissions

The construction emissions associated with the Project are temporary in nature and are expected to have minimal impact on the air quality in the surrounding area. However, the Project will implement various mitigation measures to minimize construction emissions. These include:

- The Project will avoid unnecessary construction activities leading to increased emissions, where possible;

- The Project will follow manufacturer's operating recommendations regarding good combustion practices to ensure that fuel efficiency is maximized and engines are operated such that emissions are minimized;
- The Project will implement the Fugitive Dust Control Plan as described below; and
- The Project will avoid idling of the construction equipment to the extent possible.

The fugitive dust control measures will include the following specific steps to be taken during construction:

- Fugitive dust emissions from vegetation removal, clearing and grading, cutting and filling, topsoil removal, trenching, backfilling and stockpile storage will be controlled to a great extent by following the construction sequencing and disturbing limited areas at a time;
- Fugitive dust emissions generated by motorized equipment and miscellaneous vehicle traffic will be controlled by wet suppression as necessary;
- Fugitive dust emissions from paved roads will be controlled with a combination of water trucks, power washers, sweeping and/or vacuuming;
- Track out of loose materials will be controlled using rock construction entrances on access roads that begin at a junction with paved roads; and
- When environmental conditions are dry, inspection of dust control measures will be conducted daily.

The Project will perform a complete air dispersion modeling analysis, which will be presented in Appendix 9-E through 9-F *[Not included with this Draft]* to ensure that the concentration levels from the emission sources at the compressor stations will not exceed the NAAQS levels. *[Note: The Project will provide the air dispersion modelling in the final Resource Reports included with the Certificate application expected to be filed in November 2018.]* Table 9.2-11 presents the list of the major existing and reasonably foreseeable future projects that may cumulatively or additively impact air quality that could be affected by the construction and operation of the Project along with an approximate distance from the nearest Project facility. Operation of the existing and reasonably foreseeable major air emissions sources listed in Table 9.2-11 will have air emissions associated with them; however, the other sources of air emissions from operation of these recent or planned projects are or will be controlled in accordance with state and federal air pollution laws and regulations. Additionally, Transcontinental Gas Pipe Line Company, LLC ("Transco") will need to obtain FERC authorization for the natural gas transmission projects associated with modifications at Transco Stations 165 and 166 prior to construction and operation; the review of those projects will include a detailed air quality assessment for construction and operation.

Table 9.2-11

Major Air Quality Facilities in the Vicinity of the MVP Southgate Stations

County / State	Facility	Approximate Distance to Closest Project Station (miles)	Closest Station
Pittsylvania, VA	Transco - Station 165	<1	Lambert
Pittsylvania, VA	Transco - Station 166	<1	Lambert
Pittsylvania, VA	Arkema Inc.	5	Lambert
Pittsylvania, VA	Owens-Brockway Glass Container Inc.	16	Lambert
Pittsylvania, VA	Intertape Polymer Corporation	16	Lambert
Pittsylvania, VA	Elkay Wood Product Company	17	Lambert
Pittsylvania, VA	Dominion - Pittsylvania Power Station	19	Lambert
Rockingham, NC	Duke Energy Carolinas, LLC - Dan River Combined Cycle Facility	4	Russell
Rockingham, NC	Loparex LLC	4	Russell
Rockingham, NC	Ball Metal Beverage Container Corp.	13	Russell
Rockingham, NC	Rockingham County Landfill	15	Russell
Rockingham, NC	NTE Carolinas II, LLC - Reidsville Energy Center	16	Russell
Rockingham, NC	Transco - Station 160	16	Russell
Rockingham, NC	Duke Energy Carolinas, LLC-Rockingham Co.	17	Russell
Rockingham, NC	Pine Hall Brick Co., Inc.	21	Russell
Alamance, NC	Stericycle, Inc.	36	Russell
Alamance, NC	Liggett Group LLC	37	Russell
Alamance, NC	New South Lumber Company, Inc. - Graham Plant	40	Russell

The existing and proposed offsite major air emissions sources are or will be operated in compliance with all applicable state and federal air regulations; including, stack testing, recordkeeping, reporting, and monitoring requirements to establish compliance with federally enforceable emissions standards. Because operation of the Project, along with the other existing and proposed major Title V projects/facilities, will be regulated by the VADEQ and NCDEQ through the air permitting process, the cumulative effect of operation of the Project with other projects is not expected to result in adverse air quality impacts.

Climate Change and Greenhouse Gases

Construction activities will result in temporary increases in GHG emissions due to the use of non-stationary equipment powered by diesel fuel or gasoline engines and indirect emissions attributable to workers commuting to and from work sites during construction. These sources are not considered stationary sources, and their impacts will generally be temporary and localized. The Project will, to the extent practical, employ good management practices, as described above, to limit these emissions.

With respect to operational emissions, USEPA has not published formal white papers for different industries to discuss available GHG control technologies. In permitting guidance, USEPA agrees that energy efficiency improvements will satisfy the control requirements for GHGs in most cases. As such, operational GHG emissions would be expected to be limited to the use of energy efficient design and the minimization of GHG releases through good work practices for the natural gas industry. The use of the combustion turbines represents one element of the Project's energy efficient design.

Fugitive GHG (and to a lesser extent, VOC) leaks will be minimized by adhering to good operating and maintenance practices and meeting the requirements of the federal NSPS OOOOa regulation. Mountain Valley has designed the Project to reduce GHG emissions where technically and economically feasible. In addition, the Project has reviewed USEPA's voluntary Natural Gas Star program for potential emission reduction measures, and Table 9.2-12 summarizes the feasibility of various measures for the Project. Total, site-wide VOC and GHG emissions from fugitive and blowdown sources are estimated to be low. Therefore, any additional emission reduction will not be cost effective due to the minimal emission reductions achieved.

Natural gas that will flow on the Project will be received at either the Mountain Valley Pipeline interconnection near Chatham, Virginia or from East Tennessee at the LN 3600 Interconnect near Eden, North Carolina. Accordingly, any GHGs attributable to this natural gas that could subsequently be attributed to a downstream use will either: (1) already have been considered as part of the Commission's upstream pipeline approval; or (2) is not an incremental increase in natural gas being transported but rather represents a different utilization of the upstream pipeline capacity. Therefore, it would be double counting if these GHG emissions were to be considered as part of the Project and such downstream GHG emissions should not be attributed to the Southgate Project. Through the use of good management practices and energy efficient design, the Project has employed measures to minimize GHG emissions and any resulting impact on climate change.

Table 9.2-12

Summary of Natural Gas Star Program

Energy Star Project[3]	Feasibility Assessment
Replace Gas Starters with Air or Nitrogen	Feasible – Gas starters may be replaced with air.
Reduce Natural Gas Venting with Fewer Compressor Engine Startups and Improved Engine Ignition	Feasible – Turbines are intended to operate at all times other than preventative maintenance shutdowns. The Project's preventative maintenance program will reduce starts related to unanticipated shutdown/repairs.
Reducing Methane Emissions from Compressor Rod Packing Systems	Not feasible – This reduction strategy is applicable to older compressors with potentially worn packing. Compressors are equipped with newly installed packing by design. The Project will follow the manufacturer's recommended procedures for proper maintenance and inspection of compressor rod packing systems.
Test and Repair Pressure Safety Valves	Feasible - Completed by the Project on periodic basis.

[3] https://www.epa.gov/natural-gas-star-program/recommended-technologies-reduce-methane-emissions

Table 9.2-12 Summary of Natural Gas Star Program	
Energy Star Project[3]	**Feasibility Assessment**
Eliminate Unnecessary Equipment and/or Systems	The Project will only be installing what is required for this application.
Install Automated Air/Fuel Ratio Controls	Feasible – Turbines will be equipped with state-of-the art AFR (air-to- fuel-ratio) controllers/SoLoNOx technology.
Install Electric Motor Starters	The turbines are intended to operate at all times therefore the number of starts is minimized and the potential methane reductions would be minimal. Nonetheless, current design includes electric motor starts.
Reducing Emissions When Taking Compressors Off-Line	Feasible - Blowdown gas may be injected into the fuel gas recovery system. However, the proposed facility is a gathering facility that is expected to operate at or near 100% capacity year round. Shutdown events are expected to be very infrequent, and the current design of the station does not allow for recycling of turbine blowdowns.
Replace Compressor Cylinder Unloaders	Not Applicable.
Install Electric Compressors	Not Feasible - Electric compressors are cost prohibitive even if electric supply is available. As stated in the NG Star fact sheet "The capital costs and the electricity costs, however, are higher for an electric motor compared to those for a gas driven engine. The savings from maintenance costs relative to the cost of energy will not be justified unless the engine is at the end of its economic life."
Wet Seal Degassing Recovery System for Centrifugal Compressors	Turbine centrifugal compressors will be dry seal.

9.3 Noise

This section provides an overview of the proposed noise generating equipment for the Project, the noise study approach for each compressor station, meter stations, locations of horizontal directional drill ("HDD") and railroad conventional bores, a description of noise associated with construction activities and a discussion of typical noise mitigation methods for the type of equipment associated with each component of the Project. Environmental noise will be generated during construction and operation of the compressor stations and meter stations associated with the Project. There will also be noise associated with the construction of the meter stations and the pipeline.

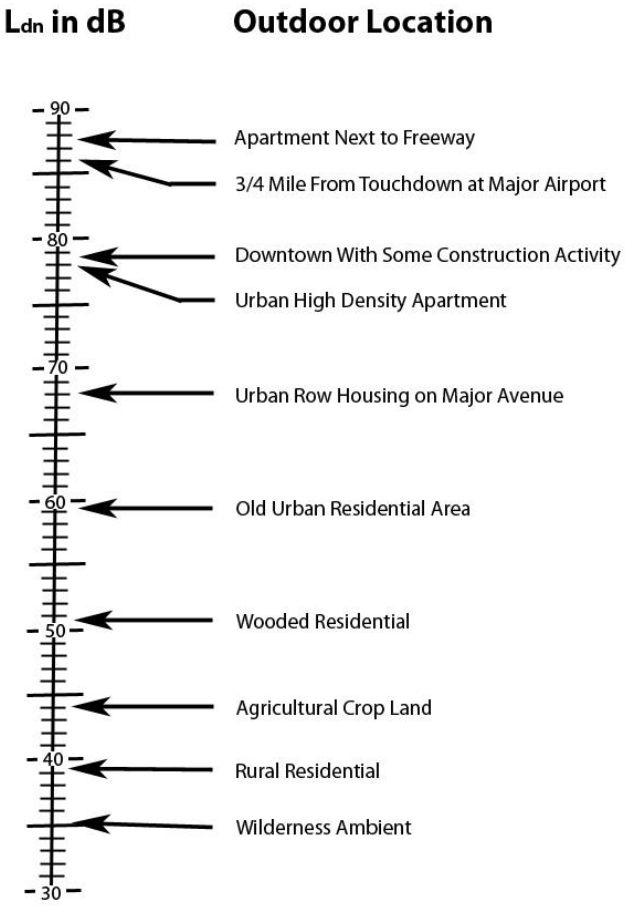
9.3.1 Background Information on Sound and Noise

A sound source is defined by a sound power level ("L_W"), which is the rate at which acoustical energy is radiated outward and is expressed in units of watts. A sound pressure level ("L_P") is a measure of fluctuation at a given receiver location and can be obtained through the use of a microphone or calculated from information associated with the source sound power level and surrounding environment. Sound power cannot be measured directly but can be calculated from measurements of sound intensity or sound pressure at a given distance from the source.

The perception of sound as "noise" is influenced by several technical factors such as intensity, sound quality, tonality, duration, and existing background levels. Sound levels are presented on a logarithmic scale to account for the large range of acoustic pressures that the human ear is exposed to and are expressed

in units of decibels ("dB"). Broadband sound includes sound energy summed across the frequency spectrum. In addition to broadband sound pressure levels, analysis of the various frequency components of the sound spectrum is used to determine tonal characteristics. The unit of frequency is Hertz ("Hz") which is a measure of the cycles per second of the sound pressure waves. Typically, the frequency analysis examines 11 octave (or 33 1/3 octave) bands ranging from 16 Hz (low) to 16,000 Hz (high). One-third (1/3) octave bands have one third the width of full octave bands, which gives a higher resolution and a more detailed description of the frequency content of the sound. Since the human ear does not perceive every frequency with equal loudness, spectrally varying sounds are often adjusted with a weighting filter.

The A-weighted filter is applied to compensate for the frequency response of the human auditory system and sound exposure in acoustic assessments and is designated in A-weighted decibels ("dBA"). Environmental noise is commonly described in terms of equivalent sound level ("L_{eq}"). The L_{eq} value, conventionally expressed in dBA, is the energy-averaged, A-weighted sound level for the complete time period represented as a steady, continuous sound level. Another common noise descriptor used when assessing environmental noise is the day-night sound level ("L_{dn}"), which is calculated by averaging the 24-hour hourly L_{eq} levels at a given location and adding 10 dB to noise emitted during the nighttime period (10:00 p.m. to 7:00 a.m.) to account for the increased sensitivity of people to hear noises that occur at night. The L_{max} is the maximum instantaneous sound level as measured during a specified time period. It can also be used to quantify the time-varying maximum instantaneous sound pressure level (as generated by equipment or an activity) or a manufacturer maximum source emission level. Estimates of common noise sources and outdoor acoustic environments, and the comparison of relative loudness are presented in Figure 9.3-1a.



(Adapted from USEPA, 1974)

Figure 9.3-1a. Environmental Sound Pressure Levels (L_{dn})

9.3.2 Applicable Noise Regulations

The Project is located in Virginia and North Carolina and crosses portions of three counties. The Project reviewed noise regulations at the federal, state, county, and local levels to identify regulations that may be applicable to the Project. A regulatory search found no state noise standards applicable to the Project; however, there are several federal requirements and county noise regulations that are potentially applicable to the Project as described in Sections 9.3.2.1 and 9.3.2.2, respectively.

9.3.2.1 FERC Requirements

The FERC noise regulations, set forth in 18 CFR §380.12(k)(2), require an applicant to identify existing noise sensitive areas ("NSAs") within one mile of Project facilities (e.g., residences, schools, churches) and quantitatively describe existing sound levels at NSAs and at other areas covered by relevant state and local noise ordinances. The following stipulations are given:

- If new compressor station sites are proposed, measure or estimate the existing ambient sound environment based on current land uses and activities;

- For existing compressor stations (operated at full load), include the results of a sound level survey at the site property line and nearby NSAs;
- Include a plot plan that identifies the locations and duration of noise measurements; and
- All surveys must identify the time of day, weather conditions, wind speed and direction, engine load and other noise sources present during each measurement.

In addition, the FERC requirement for noise quality, in the absence of any applicable state or local noise regulation, is that the post-construction noise attributable to any new compressor station and associated pipeline facilities must not exceed an L_{dn} of 55 dBA at any pre-existing NSA such as schools, hospitals, or residences. This criterion limits the sound level contribution from the Project at any pre-existing NSA to 55 dBA (L_{dn}). An L_{dn} of 55 dBA is equivalent to a continuous noise level of 48.6 dBA L_{eq} for facilities that operate at a constant level of noise.

Regarding HDD construction sites, conditions set forth by the FERC typically require that the sound attributable to drilling operations should not exceed 55 dBA (L_{dn}) at any NSA during HDD operations. If this sound criterion/guideline is expected to exceed this level at any nearby NSA, it is generally necessary to describe noise mitigation measures/options which would be implemented during the drilling activity to reduce the noise impact of the drilling operations and achieve the sound criterion/guideline.

As per FERC's *Guidance Manual for Environmental Report Preparation* issued February 2017, "Construction activity that would or may occur during nighttime hours should be performed with the goal that the activity contribute noise levels below 55 dBA L_{dn} and 48.6 dBA L_{eq}, or no more than 10 dBA over background if ambient noise levels are above 55 dBA L_{dn}." at all surrounding NSAs. NSAs are typically residences, schools, churches, or hospitals.

In addition to the 55 dBA L_{dn} and 48.6 dBA L_{eq} nighttime sound level targets, for this Project, the nighttime construction noise has been compared to the existing nighttime ambient sound levels, to calculate the short-term increase in sound levels expected due to the construction activities.

9.3.2.2 County Limits

The three counties that the Project crosses have noise ordinances that may be applicable to the Project. Table 9.3-1 provides a summary of the noise limits identified within the ordinances. The Pittsylvania County ordinance is the only one that provides quantitative limits. Both Rockingham County and Alamance County have ordinances that are primarily nuisance-based and provide no numerical limits.

The Pittsylvania County limits apply at the property boundary of the noise source or at any point within any other affected property, rather than at the NSA structure, so they cannot be directly compared to the FERC sound level requirements. The Pittsylvania County ordinance has an exemption for construction provided it takes place between 7 am and 10 pm. The Lambert Compressor Station is located in Pittsylvania County, Virginia and the Russell Compressor Station is located in Rockingham County, North Carolina. The sound levels from the stations have been evaluated against both the FERC and the county sound level requirements.

Table 9.3-1

Noise Level Limits for Counties with Noise Ordinances Crossed by the MVP Southgate Project

County, State	Daytime (7 AM – 10 PM)	Nighttime (10 PM – 7 AM)
Pittsylvania, Virginia	Residential: 57 L_{eq} dBA Industrial: 77 L_{eq} dBA	Residential: 52 L_{eq} dBA Industrial: 77 L_{eq} dBA
Rockingham, North Carolina	Not Applicable (Nuisance based)	
Alamance, North Carolina	Not Applicable (Nuisance based)	

9.3.3 Existing Sound Environment

The existing sound environment surrounding each proposed compressor station, meter station, HDD work area or railroad crossing was quantified during a baseline environmental sound level survey in the vicinity of each proposed site. Sound levels were measured at accessible locations near the NSAs at each site. Observations of the primary existing environmental sound sources were documented.

Type 1 sound level instrumentation was used with field calibration conducted before and after each measurement. Windscreens were installed on all microphones. All instrumentation has current laboratory certification. Weather conditions during each survey were recorded, and the measurements were taken during weather periods appropriate for environmental sound level surveys.

Insect activity was the dominant source of ambient noise at most of the measurement locations. Because insect activity varies seasonally, insect noise may not be present during substantial portions of the year. Ambient data are therefore presented both as measured with the insect noise present, and with the insect noise filtered out by omitting sound energy in the whole octave bands above 1000 Hz in accordance with American National Standard method (ANSI/ASA, 2014). For the purposes of evaluating operational sound level impact, the insect-filtered data is used as the primary point of comparison to be conservative. However, if construction is going to be taking place in the spring or summer when insects will be present, it may be more appropriate to compare construction sound levels to the unfiltered ambient data.

9.3.3.1 Compressor Stations

Lambert Compressor Station

The proposed Lambert Compressor Station site is located in Pittsylvania County, Virginia approximately 3.0 miles east of Chatham, Virginia. The area surrounding the station is mostly rural, though there are several residences within a one-mile radius of the proposed station site. There is an existing Transco compressor station located just northeast of the site. The four closest NSAs were identified, all residences. Figure 9.3-1 (Appendix 9-G) shows the NSAs in proximity of the Lambert Compressor Station and sound level measurement locations.

Table 9.3-2 shows the weather conditions at the start of the environmental sound level survey.

Table 9.3-2 Weather Conditions during the Lambert Compressor Station Sound Level Survey	
Dates	July 18 – July 19, 2018
Temperature Range	81-86° F
Relative Humidity Range	48-64 %
Wind Speed	1-4 mph
Wind From	S, W, SSW
Precipitation	none

Table 9.3-3 shows the measured daytime and nighttime sound levels (L_{eq}, dBA) as well as the equivalent day-night sound levels (L_{dn}, dBA). The measured sound level results at the three measurement locations were quite similar, indicating that the sound environment around the proposed station site is uniform. Measurement locations are shown on Figure 9.3-1 (Appendix 9-G).

Table 9.3-3

Existing Sound Level Measurement Results – Lambert Compressor Station

Monitoring Location	Measurement Duration	All Octave Bands Included			Processed to Remove Insect Noise a/		
		Measured Day Average	Measured Night Average	Measured Day-Night Average	Measured Day Average	Measured Night Average	Measured Day-Night Average
	HH:MM	L_{eq} dBA	L_{eq} dBA	L_{dn} dBA	L_{eq} dBA	L_{eq} dBA	L_{dn} dBA
NSA 1	24:00	42.6	44.5	**50.7**	36.8	40.8	**46.8**
NSA 2	24:00						
NSA 3	24:00	61.8	56.3	**64.0**	60.4	55.1	**62.8**
NSA 4	24:00	56.4	46.5	**56.4**	38.6	38.4	**44.8**

a/ Insect noise was removed by omitting sound energy in the whole octave bands above 1000 Hz in accordance with American National Standard method (ANSI/ASA, 2014)

Russell Compressor Station

The proposed Russell Compressor Station site is located in Rockingham County, North Carolina approximately six miles northeast of Eden, North Carolina. The area surrounding the station is mostly rural, though there are several residences within a one-mile radius of the proposed station site. There is an industrial facility located just southwest of the site. The three closest NSAs were identified, all residences. Figure 9.3-2 (Appendix 9-G) shows the NSA and measurement locations.

Ambient sound levels were measured for 24 hours from July 16 to July 17, 2018. Table 9.3-4 shows the weather conditions at the start of the environmental sound level survey.

Table 9.3-4 Weather Conditions during the Russell Compressor Station Sound Level Survey	
Dates	July 16 – July 17, 2018
Temperature Range	84 - 92 °F
Relative Humidity Range	52 – 72
Wind Speed	2 - 3 mph
Wind From	W
Precipitation	0.1 inches

Table 9.3-5 shows the measured daytime and nighttime sound levels (L_{eq}, dBA) as well as the equivalent day-night sound levels (L_{dn}, dBA). The measured sound level results at all three measurement locations were quite similar, indicating that the sound environment around the proposed station site is uniform.

Table 9.3-5

Existing Sound Level Measurement Results – Russell Compressor Station

Monitoring Location	Measurement Duration	All Octave Bands Included			Processed to Remove Insect Noise a/		
		Measured Day Average	Measured Night Average	Measured Day-Night Average	Measured Day Average	Measured Night Average	Measured Day-Night Average
	HH:MM	L_{eq} dBA	L_{eq} dBA	L_{dn} dBA	L_{eq} dBA	L_{eq} dBA	L_{dn} dBA
NSA 1	24:00	54.3	54.3	**60.7**	47.2	42.1	**49.7**
NSA 2	24:00	63.1	57.2	**65.1**	60.4	55.6	**63.1**
NSA 3	24:00	54.3	54.3	**60.7**	47.2	42.1	**49.7**

a/ Insect noise was removed by omitting sound energy in the whole octave bands above 1000 Hz in accordance with American National Standard method (ANSI/ASA, 2014)

9.3.3.2 Meter Stations

There are currently four meter (interconnect) stations planned as part of the Project.

Lambert Interconnect

The Lambert Interconnect will be located on the same site as the Lambert Compressor Station. The noise analysis for this interconnect has been included in the Lambert Compressor Station analysis. The NSAs for this site are therefore the same as for the Lambert Compressor Station. See Figure 9.3-1 (Appendix 9-G) for the meter station, compressor station, NSAs, and measurement locations for this site.

LN 3600 Interconnect

The LN 3600 Interconnect will be located approximately 0.3 mile south of the Russell Compressor Station. The noise analysis for this interconnect has been included in the Russell Compressor Station analysis. The NSAs for this site are therefore the same as for the Russell Compressor Station. .See Figure 9.3-2 (Appendix 9-G) for the meter station, compressor station, NSAs, and measurement locations for this site.

T-15 Dan River Interconnect

The proposed T-15 Dan River Interconnect site is located in Rockingham County, North Carolina approximately 5.0 miles east of Eden, North Carolina. The closest NSA to the site is a residence. See Figure 9.3-3 (Appendix 9-G) for the NSA and measurement locations for this site.

T-21 Haw River Interconnect

The proposed T-21 Haw River Interconnect is located in Alamance County, North Carolina approximately 2.0 miles southeast of Graham, North Carolina. The closest NSA to the site is a residence. See Figure 9.3-4 (Appendix 9-G) for the NSA and measurement locations for this site.

Ambient sound levels were measured for 24 hours from July 16 to July 17, 2018. Table 9.3-6 shows the weather conditions during the meter station sound level surveys.

Table 9.3-6

Weather Conditions during the Meter Station Sound Level Surveys

Station	T-15 Dan River Interconnect	T-21 Haw River Interconnect
Dates	July 16 – July 17	July 16 – July 17
Temperature Range	83 - 94° F	91 – 92° F
Relative Humidity Range	47 - 71%	51 – 62%
Wind Speed	2 - 3 mph	1 mph
Wind From	NNW	NNW
Precipitation	none	none

Table 9.3-7 shows the measured daytime and nighttime sound levels (L_{eq}, dBA) as well as the equivalent day-night sound levels (L_{dn}, dBA) near the proposed meter stations.

Table 9.3-7

Existing Sound Level Measurement Results – Meter Stations

Monitoring Location	Measurement Duration	All Octave Bands Included			Processed to Remove Insect Noise a/		
		Measured Day Average	Estimated Night Average	Estimated Day-Night Average	Measured Day Average	Estimated Night Average	Estimated Day-Night Average
	HH:MM	L_{eq} dBA	L_{eq} dBA	L_{dn} dBA	L_{eq} dBA	L_{eq} dBA	L_{dn} dBA
T-15 Dan River Interconnect	24:00	64.7	59.7	67.3	63.1	57.1	65.0
T-21 Haw River Interconnect	24:00	64.9	60.6	67.9	62.8	57.2	65.0

a/ Insect noise was removed by omitting sound energy in the whole octave bands above 1000 Hz in accordance with American National Standard method (ANSI/ASA, 2014)

9.3.3.3 Horizontal Directional Drilling and Railroad Crossing Sites

The HDD method will be used to cross the Dan River in Virginia and the Stoney Creek Reservoir in North Carolina. In addition, there will be four railroad crossings that will be performed using the direct bore method and will likely require nighttime construction work. A noise evaluation has been performed for each HDD site and railroad crossing. An ambient noise survey at the potential HDD and railroad crossing sites was conducted to quantify the current ambient sound levels around each site and to document/identify existing NSAs. All NSAs are residences.

Table 9.3-8 shows the weather conditions during the HDD and railroad crossing sound level measurements.

Table 9.3-8

Weather Conditions during the HDD / Railroad Crossing Sound Level Surveys

Location	HDD: Stoney Creek Reservoir	HDD: Dan River	Railroad Crossing 1	Railroad Crossing 2	Railroad Crossing 3	Railroad Crossing 4
Dates	July 18, 2018	July 16, 2018	July 16, 2018	July 16, 2018	July 17, 2018	July 18, 2018
Temperature	75° F	80° F	80° F	80° F	82° F	80° F
Relative Humidity	89%	70%	71%	74%	69%	53%
Wind Speed	0 mph	0 mph	1 mph	0 mph	0 mph	0 mph
Wind From	N/A	N/A	W	N/A	N/A	N/A
Precipitation	none	none	none	none	none	none

Figures 9.3-5 through 9.3-10 (Appendix 9-G) show the HDD and railroad crossing work areas along with the identified NSAs and sound level measurement locations. Table 9.3-9 shows the measured daytime and

nighttime sound levels (L_{eq}, dBA) as well as the equivalent day-night sound levels (L_{dn}, dBA) near the proposed HDD work areas and railroad crossings.

At all HDD and railroad crossing locations, short-duration nighttime measurements were taken near the closest NSA. Effort was made to exclude noise from vehicle pass-bys from the measurements. Daytime levels were estimated by applying the average day-night sound level difference from a nearby 24-hour measurement location. The average day-night difference of 5 dB from the T-21 Haw River Interconnect measurement position was applied at the Stoney Creek Reservoir HDD site and railroad crossing 4, and the average day-night difference of 5.5 dB from the T-15 Dan River Interconnect measurement location was applied to the other four locations.

Table 9.3-9

Existing Sound Level Measurement Results – HDD and Railroad Crossings

Monitoring Location and MP	Measurement Duration	All Octave Bands Included			Processed to Remove Insect Noise a/		
		Estimated Day Average	Measured Night Average	Estimated Day-Night Average	Estimated Day Average	Measured Night Average	Estimated Day-Night Average
	HH:MM	L_{eq} dBA	L_{eq} dBA	L_{dn} dBA	L_{eq} dBA	L_{eq} dBA	L_{dn} dBA
HDD: Stoney Creek Reservoir, MP 63.6	00:10	52.8	47.8	55.4	37.1	32.1	39.7
HDD: Dan River, MP 30.2	00:10	61.6	56.1	63.9	40.5	35.0	42.8
Railroad Crossing 1, MP 5.4	00:10	60.4	54.9	62.7	56.6	51.1	58.9
Railroad Crossing 2, MP 25.1	00:10	63.0	57.5	65.3	38.8	33.3	41.1
Railroad Crossing 3, MP 39.8	00:10	54.9	49.4	57.2	43.2	37.7	45.5
Railroad Crossing 4, MP 69.3	00:10	58.3	53.3	60.9	46.3	41.3	48.9

a/ Insect noise was removed by omitting sound energy in the whole octave bands above 1000 Hz in accordance with American National Standard method (ANSI/ASA, 2014)

9.3.4 Project Construction Noise

9.3.4.1 Pipeline Construction Noise and Mitigation

Potential impacts from pipeline construction could include short-term increases in sound. Construction of the pipeline will generate noise from heavy machinery and equipment as construction moves in phases along the right-of-way (see Resource Report 1 for description of pipeline construction). Sound from pipeline construction will generally be temporary, sporadic, and short-term in any one location along the pipeline route. Because of the temporary and generally daytime-only nature of pipeline construction

activities, no special noise mitigation or noise monitoring program will be implemented during the construction phase.

9.3.4.2 Compressor Station and Meter Station Construction Noise and Mitigation

Potential impacts at compressor and meter station locations could include short-term increases in sound levels during construction. Only standard construction equipment will be used in the construction of the stations, with no dynamic compaction or pile driving expected. Most construction will occur during daytime working hours of 7:00 a.m. until 7:00 p.m. Emergencies or other non-typical circumstances may necessitate limited nighttime work. The highest sound levels during construction are expected during the early earthmoving phase. Equipment that may be operating during this phase would include bulldozers, front end loaders, dump trucks, generators, etc.

Based on the equipment usage predictions, a sound level calculation was performed for Compressor Station and Meter Station construction using the Federal Highway Administration's Roadway Construction Noise Model version 1.1 (FHWA, 2008) The following equipment was included in the construction evaluation:

Daytime Civil Work – total sound power level of 123.9 dBA Lw

- Three (3) Excavators, Komatsu 228 or similar
- Three (3) Bulldozers, Cat D6 or similar
- Three (3) Dump trucks, 26-ton, articulated
- One (1) Generator
- Three (3) Drilling rigs
- Two (2) Pile augers
- One (1) Roller, smooth drum, 25 ton, Bomag or similar

Nighttime Civil Work – total sound power level of 120.2 dBA L_w

- Two (2) Excavators, Komatsu 228 or similar
- Two (2) Bulldozers, Cat D6 or similar
- Two (2) Dump trucks, 26 ton, articulated
- Three (3) Light plants
- One (1) Roller, smooth drum, 25 ton, Bomag or similar

Table 9.3-10 shows a summary of the predicted short-term, daytime construction sound levels at the NSAs for each of the compressor stations and meter stations. The worst-case NSAs are not necessarily the closest NSAs due to terrain shielding between the compressor stations and the NSAs. Although operation of LN 3600 Interconnect was modeled concurrently with Russell Compressor Station, it was assumed that they will not be constructed simultaneously. Therefore, construction noise for LN 3600 Interconnect was modeled separately.

As shown in Table 9.3-10, the predicted construction sound levels are all below 55 dBA L_{dn} at the Lambert Compressor Station and Russell Compressor Station NSAs, low enough that no special noise mitigation or noise monitoring program will be implemented during daytime only construction. Some of the construction sound level contributions exceed 55 dBA L_{dn} at NSAs close to the T-15 Dan River and T-21 Haw River Interconnects. However, ambient sound levels at those locations are well above 55 dBA L_{dn} and the temporary sound level increase expected during construction is less than 6 decibels during the day and 3.1

decibels for the 24-hour L_{dn}. At all other NSAs, the expected construction sound levels are lower than 55 dBA L_{dn}.

Table 9.3-10

Predicted Temporary Sound Levels Due to Construction, Single 12-Hour Daytime Shift

Compressor / Meter Station	NSA	Existing Ambient Sound Levels, dBA a/			Predicted Sound Level –Single Daytime Shift, dBA		Construction Plus Ambient, dBA		Temporary Increase in Sound Level, dBA	
		Day	Night	L_{dn}	Day	L_{dn}	Day	L_{dn}	Day	L_{dn}
Lambert Compressor Station	1	36.8	40.8	**46.8**	48.7	46.6	49.0	49.7	12.2	2.9
	2				46.5	44.4	46.9	48.8	10.2	2.0
	3	60.4	55.1	**62.8**	43.8	41.7	60.5	62.8	0.1	0.0
	4	38.6	38.4	**44.8**	42.7	40.7	44.1	46.3	5.5	1.4
Russell Compressor Station	1	47.2	42.1	**49.7**	44.9	42.8	49.2	50.5	2.0	0.8
	2	60.4	55.6	**63.1**	44.2	42.1	60.5	63.2	0.1	0.0
	3	47.2	42.1	**49.7**	41.0	39.0	48.2	50.1	0.9	0.4
LN 3600 Interconnect	3	47.2	42.1	**49.7**	45.5	43.5	49.5	50.6	2.2	0.9
T-15 Dan River Interconnect	1	63.1	57.1	**65.0**	64.7	62.7	67.0	67.0	3.9	2.0
T-21 Haw River Interconnect	1	62.8	57.2	**65.0**	67.1	65.1	68.5	68.1	5.6	3.1

a/ To be conservative, ambient levels have been processed to remove insect noise.

Nighttime construction work may be required due to weather delays or other unforeseen circumstances. Table 9.3-11 shows the predicted temporary nighttime sound level impact for 24-hour construction activities. As shown in this table, nighttime construction sound levels are above 48.6 dBA and 55 dBA L_{dn} at certain NSAs.

As shown in Table 9.3-11, the predicted construction sound levels are all below 55 dBA L_{dn} at the Lambert Compressor Station and Russell Compressor Station NSAs, low enough that no special noise mitigation or noise monitoring program should be required for 24-hour construction. However, due to the uncertainty of the equipment that might be operating during night construction, the Project will develop a nighttime construction noise management plan if nighttime construction is required at this compressor station. This noise management plan will outline the specific equipment that will be operating at night, the location of the equipment, and will predict the sound levels from the expected nighttime equipment. The management plan will include specific noise mitigation, such as noise barriers, quieter equipment, or partial equipment enclosures to ensure that sound levels at the NSAs do not exceed 48.6 dBA at night or 55 dBA L_{dn} overall.

[Note: The Project is in the process of preparing a nighttime construction mitigation plan, which will be provided in the final Resource Reports included with the Certificate application expected to be filed in November 2018.]

Table 9.3-11

Predicted Temporary Sound Levels Due to Construction, 24-Hour Construction Activities

Compressor / Meter Station	NSA	Existing Ambient Sound Levels, dBA a/			Predicted Sound Level –Single Daytime Shift, dBA		Construction Plus Ambient, dBA		Temporary Increase in Sound Level, dBA	
		Day	Night	L_{dn}	Night	L_{dn}	Night	L_{dn}	Night	L_{dn}
Lambert Compressor Station	1	36.8	40.8	**46.8**	45.9	53.1	47.1	54.0	6.3	7.2
	2				43.7	50.9	45.5	52.3	4.7	5.5
	3	60.4	55.1	**62.8**	41.0	48.2	55.3	63.0	0.2	0.1
	4	38.6	38.4	**44.8**	40.0	47.1	42.3	49.1	3.9	4.3
Russell Compressor Station	1	47.2	42.1	**49.7**	41.6	49.1	44.9	52.4	2.8	2.7
	2	60.4	55.6	**63.1**	41.3	48.6	55.7	63.3	0.2	0.2
	3	47.2	42.1	**49.7**	37.9	45.3	43.5	51.0	1.4	1.3
LN 3600 Interconnect	3	47.2	42.1	**49.7**	42.8	50.0	45.5	52.9	3.4	3.2
T-15 Dan River Interconnect	1	63.1	57.1	**65.0**	62.0	69.2	63.2	70.6	6.2	5.6
T-21 Haw River Interconnect	1	62.8	57.2	**65.0**	64.4	71.5	65.2	72.4	8.0	7.4

a/: To be conservative, ambient levels have been processed to remove insect noise.

9.3.4.3 Horizontal Directional Drilling and Railroad Crossing Construction Noise and Mitigation

The HDD method will be used to install the pipeline underneath the Dan River in Virginia and Stoney Creek Reservoir in North Carolina. In addition, there will be four railroad crossings that will performed using the conventional bore method that will likely require nighttime construction work. A noise evaluation has been performed for each HDD site and railroad crossing.

Equipment Data

The HDD entry and exit sites will have several sound sources in operation during the temporary construction work. On the entry side, sound sources will include the drilling rig itself, mud pumps, generators, drilling mud mixers, shale shakers, light plants, and the driving engines associated with this equipment. Additional sound sources include mobile equipment such as cranes, front-end loaders, forklifts, and trucks. On the exit side, less equipment is required, typically including a backhoe or bulldozer, and possibly a generator and light plant. The actual equipment used, and the site layout and configuration, will depend on the drilling contractor(s) selected for the Project, the site conditions, and other factors. Typical sound power levels (L_w) for peak HDD construction operations based on measurements of previous HDD operations are shown in Table 9.3.12, below. These levels will be used in all HDD calculations in this study.

Table 9.3-12

Sound Power Levels of HDD and Railroad Crossing Equipment

Octave Band Center Frequency, Hz	Unweighted Sound Power Level at Octave Band Center Frequency									Total
	31.5	63	125	250	500	1000	2000	4000	8000	dBA
HDD Entry Site	118	115	112	114	112	109	108	106	98	115
HDD Exit Site	110	108	105	102	100	98	95	92	88	103
Railroad crossing: Auger Boring Machine	116	117	124	107	95	100	97	99	79	110
Railroad crossing: Backhoe	114	115	122	106	93	98	95	97	77	108
Railroad crossing: Light Plant	88	93	93	98	93	88	83	78	73	94

For the conventional bore crossings of the railroads, an auger boring machine will be used similar to the Barbco HD48RCBM. That manufacturer reports that the auger produces sound level of 87 dBA at 20 feet. A standard diesel powered engine spectrum was applied to the reported sound levels, and six light plants and two backhoes were included (or similar engine-driven earthmovers) at each railroad crossings. Sound level data for the ancillary equipment were derived from the Federal Highway Administration's Roadway Construction Noise Model (FHWA 2008)[4]. The sources were used as inputs in a three-dimensional computer noise model developed using Cadna/A acoustical modeling software.

These values represent conservative estimates without assumption of any additional noise control treatments. These levels do assume that all original equipment manufacturer noise control treatments are correctly installed and that all operating equipment is well-maintained and in good operating condition. These levels also assume some slight typical shielding and screening effects from the tanks and trailers that are used in typical construction operations.

Operations Schedule

The current drilling operation plan is to perform HDD activities whenever dictated by schedule or operations, 24-hours per day if necessary. As such, all calculations are based on the maximum HDD activity sound power levels shown in Table 9.3-12 without any adjustment for reduced activities during nighttime hours.

[4] FHWA (2008) Roadway Construction Noise Model, Federal Highway Administration, US Department of Transportation. Version 1.1, December 8, 2008.

For the railroad crossings, 24-hour construction activities will be required for two to three days at each crossing. The duration could extend up to 14 days if problems are encountered during construction. The pipeline construction beyond the railroad crossing zones will take place during daytime only.

Calculations

A noise model was developed for each HDD work area and railroad crossing using CadnaA version 2017 build 161.4801. The models were used to calculate the expected temporary sound level contributions due to the HDD and railroad crossing equipment. The ISO 9613-2 standard was used to calculate the divergence, atmospheric absorption, foliage, and ground absorption for the path from the HDD entry or exit site to the closest NSA. If the calculations indicated that the sound level at the closest NSA would exceed the sound level target, the required noise mitigation has been evaluated to meet the targets. A summary of the calculation results for all of the NSAs and railroad crossings is included in Table 9.3-13 below.

Predicted Temporary Sound Level Impact

The predicted HDD and railroad crossing equipment sound level contribution for each NSA was calculated using the noise model. The calculated sound level contribution was then combined with the measured ambient sound levels to determine the potential short-term sound level impact of the HDD or railroad crossing activities.

Noise Mitigation for HDD and Railroad Sites

For those HDD or railroad crossing sites where the predicted HDD or boring activity sound levels at the NSAs are predicted to be greater than 55 dBA L_{dn}, noise mitigation for the equipment or compensation/relocation will likely be necessary in order to achieve the noise goals. For noise mitigation on HDD or conventional bore equipment, engine exhaust and barrier treatments are typically used to reduce the sound level contribution to less than 55 dBA L_{dn}. Typically, all engines on power units, gensets, etc. would be fitted with residential-grade exhaust mufflers, and temporary barriers may be installed between the HDD / conventional bore site and the nearest NSAs. Secondary noise control treatments may be required, depending on the actual equipment and site layout used.

As an alternative to these primary and/or secondary noise control treatments, the Project may consider offering the residents compensation or temporary relocation as a means of reducing the temporary construction noise impact.

Table 9.3-13 provides a summary of the Noise Quality Analysis for the planned HDD and railroad crossing sites at the closest NSA to the entry and exit side of the planned HDD and assumes that a "standard" drilling rig is employed (i.e., no additional noise mitigation measures included).

Table 9.3-13

Predicted Temporary Sound Levels Due to HDD / Railroad Crossing

HDD and Railroad Crossing	Distance and Direction of the Closest NSA to Site Center	Existing Ambient	Calculated Sound Level		Existing Ambient L_{dn} Plus L_{dn} of Operations	Temporary Change in the Ambient Sound Level
		L_{dn} dBA	L_{eq} dBA	L_{dn} dBA	L_{dn} dBA	L_{dn} dBA
Dan River HDD	1400 feet N	39.7	46.5	52.9	53.1	13.4
Stoney Creek Reservoir HDD	300 feet NW	42.8	54.2	60.6	60.7	17.9
Railroad Crossing 1	3550 feet E	58.9	38.7	45.1	59.0	0.2
Railroad Crossing 2	3000 feet S	41.1	31.9	38.3	42.9	1.8
Railroad Crossing 3	250 feet NW	45.5	63.1	69.5	69.5	24.1
Railroad Crossing 4	700 feet N	48.9	50.3	56.7	57.4	8.5

Railroad Crossings 1 and 2 are located in Pittsylvania County and therefore are subject to the county noise ordinance. Construction noise is exempt from the Pittsylvania County noise ordinance if it occurs between 7 am and 10 pm. However, if nighttime construction is necessary, the sound due to construction is expected to be less than 52 dBA at the nearest resident's property line for both locations.

The acoustical assessment indicates that the noise of HDD operations at the entry site for the planned HDD crossing at the Stoney Creek Reservoir could exceed 55 dBA L_{dn} at the closest NSAs. Noise from the direct bore work at Railroad Crossings 3 and 4 will likely also exceed 55 dBA L_{dn} at the closest NSAs.

HDD activities can occur over the course of several weeks, so compensation or relocation are typically not practical for HDD work areas. Railroad crossings typically take one to three days, so compensation or relocation of affected residents of the most impacted NSAs is a practical noise mitigation option.

Noise mitigation for the Stoney Creek Reservoir HDD site will likely take the form of a noise barrier, erected between the HDD site and the closest NSAs. Calculations indicate that an approximately 12 decibel reduction in the HDD site sound level contributions are possible through the implementation of a series of 12-14 foot tall noise barriers located approximately 20 feet from the primary noise generating equipment at the HDD site. Similar reductions would be expected for the direct bore equipment at the railroad crossings. Table 9.3-14 shows the predicted sound levels with a noise barrier in place for the Stoney Creek Reservoir HDD site and at Railroad Crossings 3 and 4.

Even with noise barriers in place, it is likely that the sound levels due to the direct bore at Railroad Crossing 3 will exceed 55 dBA L_{dn} due to the close proximity of the NSA to the work area. Due to the short-term nature of the railroad crossing work, temporary compensation or relocation of the effected residents is likely the most efficient method.

Table 9.3-14

Predicted Temporary Sound Levels Due to HDD / Railroad Crossings with Noise Mitigation

HDD Crossing (Entry or Exit Site)	Distance and Direction of the Closest NSA to Site Center	Existing Ambient	Calculated L_{dn} of the Operations	Existing Ambient L_{dn} Plus L_{dn} of Operations	Temporary Change in the Ambient Sound Level
		L_{dn} dBA	L_{dn} dBA	L_{dn} dBA	L_{dn} dBA
Stoney Creek Reservoir HDD	300 feet NW	42.8	48.7	49.7	6.9
Railroad Crossing 3	250 feet NW	45.5	57.5	57.8	12.3
Railroad Crossing 4	700 feet N	48.9	44.7	50.3	1.4

9.3.5 Project Operation Noise

9.3.5.1 Compressor and Meter Station Operational Noise and Mitigation

The Project has developed noise models for the Lambert and Russell Compressor Stations using the most current station designs and manufacturer specifications.

The following equipment items were considered significant sound sources in the model:

- Noise from the turbine exhaust, including the exhaust outlet and noise radiated from the exhaust ductwork, expansion joints, and silencer shell;
- Noise from the turbine intake air system, including the inlet opening and noise radiated from the silencer/ductwork shell and any duct joints;
- Turbine/Compressor casing noise that penetrates the building and building ventilation openings;
- Noise from the lube oil/auxiliary cooler and gas aftercooler; and
- Noise radiated by aboveground station piping.

Noise Model Methodology

The noise model for each compressor station was developed using CadnaA, version 2018 build 161.4801, a commercial noise modeling package developed by DataKustik GmbH. The software takes into account spreading losses, ground and atmospheric effects, shielding from barriers and buildings, reflections from surfaces and other sound propagation properties. The software is based on published engineering standards. The ISO 9613 standard was used for air absorption and other noise propagation calculations. To be conservative, no foliage was included in the noise model. The model presents a worst-case prediction without any influence of trees or vegetation.

Noise Model Inputs

Sound power and sound pressure level data for the equipment in the noise model were taken from manufacturer data (if available) or from measurements of similar equipment at other compressor stations. An exhaust system consistent with the planned turbine installations and current vendor proposals for the

Project was modeled assuming an exhaust height of 50 feet above grade. The Lambert Compressor Station was modeled with one 20,500 hp Titan 130 turbine and one 15,900 hp Mars 100 turbine. The Russell Compressor Station was modeled with one 10,915 hp Taurus 70 turbine.

Table 9.3-15 shows the sound pressure levels and sound power levels used to model the Project compressor station equipment along with the source of the information.

Table 9.3-15

Sound Pressure Levels (L_p) and Sound Power Levels (L_w) for Station Equipment

Source	Linear L_p or L_w at Octave Center Frequency									Total
	31.5	63	125	250	500	1k	2k	4k	8k	dBA
Lambert Compressor Station										
Solar Mars 100 Silenced Exhaust and Breakout, Sound Pressure Level at 200 ft., L_p a/	56	56	52	46	39	35	34	34	34	43
Solar Mars 100 Unsilenced Inlet, Sound Pressure Level at 50 ft., L_p b/	81	87	93	94	95	97	100	129	121	130
Solar Titan 130 Exhaust and Ductwork, Sound Pressure Level with Silencer at 50 ft., L_p b/	84	86	72	63	63	54	46	32	21	65
Solar Titan 130 Intake and Ductwork, Sound Pressure Level at 50 ft., L_p b/	82	86	76	68	42	9	8	35	26	65
Solar 90 dBA Lube Oil Cooler, Sound Pressure Level at 50 ft., L_p b/	64	71	68	61	56	53	49	45	39	60
Total Sound Power Level of Mars 100 Gas Aftercooler, L_w c/	95	95	94	91	86	84	78	72	66	89
Total Sound Power Level of Titan 130 Gas Aftercooler, L_w c/	103	103	102	99	94	92	86	80	74	97
Solar Mars 100 Inlet Breakout, Total L_w d/	89	77	75	80	70	68	70	77	63	80
Sound Level in Compressor Building at Inner Wall Surface, L_p d/	83	83	94	97	96	95	97	105	95	107
Unlagged Suction Piping, Total L_w per unit d/	96	98	97	92	93	98	113	102	92	114
Unlagged Discharge Piping, Total L_w per unit d/	90	86	86	92	97	90	102	94	83	104
Fuel Gas Skid, L_w d/	-	-	-	85	85	66	72	67	66	84
Capstone C-1000 Generator, Sound Pressure Level at 10 meters L_p e/	71	71	69	61	62	58	54	58	57	65
54” Building Wall Panel Fan, L_w d/	101	101	98	94	93	90	86	83	82	95
Unit Venting	137	125	114	103	95	96	97	99	97	107
Russell Compressor Station										
Solar Taurus 70 Silenced Exhaust, Sound Pressure Level at 200 ft., L_p b/	67	65	50	45	36	33	34	31	34	44
Solar Taurus 70 Unsilenced Inlet, Sound Pressure Level at 50 ft., L_p b/	79	85	91	92	93	95	98	126	118	127
Solar Lube Oil Cooler, Sound Pressure Level at 50 ft., L_p b/	63	70	67	60	55	52	48	44	39	58

Table 9.3-15

Sound Pressure Levels (L_p) and Sound Power Levels (L_w) for Station Equipment

Source	Linear L_p or L_w at Octave Center Frequency									Total
	31.5	63	125	250	500	1k	2k	4k	8k	dBA
Total Sound Power Level of Gas Aftercooler, L_w c/	97	97	96	93	88	86	80	74	68	91
Solar Taurus 70 Exhaust Breakout, Total L_w d/	93	95	92	92	86	84	93	92	81	98
Solar Taurus 70 Inlet Breakout, Total L_w d/	103	91	89	94	84	82	84	91	77	95
Sound Level in Compressor Building at Inner Wall Surface, L_p d/	78	78	89	92	91	90	92	100	90	102
Suction Piping, Total L_w per unit d/	94	96	95	90	91	96	111	100	90	113
Discharge Piping, Total L_w per unit d/	88	84	84	90	95	88	100	92	81	103
Fuel Gas Skid, L_w d/	-	-	-	85	85	66	72	67	66	84
Capstone C-1000 Generator, L_w d/	92	90	97	90	88	90	84	87	87	95
Building Ventilator, Unsilenced, L_w d/	73	73	77	73	72	72	69	64	57	76
Unit Venting	137	125	114	103	95	96	97	99	97	107
Interconnects										
Meter Station Piping d/	31	49	56	62	69	74	77	79	64	83
Flow Control Valves d/	72	77	73	73	74	76	78	80	67	84

a/ From Mueller "Alternate Exhaust System" quote.
b/ From Solar.
c/ From Moore Fan Datasheet
d/ Based on measurements of similar installed equipment.
e/ From Capstone

Each compressor building will include wall exhaust fans and an acoustically baffled roof ridge vent. The sound levels due to intake ductwork, exhaust system ductwork, and suction and discharge piping were based on sound level measurements of similar equipment at existing compressor stations. The gas cooler sound power levels were taken from a manufacturer datasheet. The lube oil cooler sound power levels were supplied by Solar.

Noise Control Treatments

The noise models include certain noise control treatments as part of each compressor station design; however, there are many different combinations of noise control mitigation measures that would provide similar noise control. As the station designs are finalized, noise mitigation treatments will also be finalized and will be modified as needed to ensure each station operates in compliance with FERC and local sound level requirements. Noise control treatments included in the noise model are shown in Table 9.3-16 and summarized below.

Table 9.3-16

Modeled Noise Control Treatments, Insertion Loss (IL) or Transmission Loss (TL)

Source	Treatment Description	Modeled Treatment Performance								
		31.5	63	125	250	500	1k	2k	4k	8k
Lambert Compressor Station										
Mars 100 Turbine Inlet	Stock Mars 100 Inlet Silencer, DIL	2	4	7	16	40	50	51	55	55
	Pulse Updraft Filter	2	4	8	9	13	26	27	27	33
	Combined Silencer and Filter Performance	4	8	15	25	53	76	78	82	88
Titan 130 Turbine Inlet	Stock Titan 130 Inlet Silencer, DIL	3	7	13	23	40	54	57	59	48
	Pulse Updraft Filter	2	4	8	9	13	26	27	27	33
	Combined Silencer and Filter Performance	5	11	21	32	53	80	84	86	81
Compressor Building	Wall and Roof System, TL	10	15	22	34	49	54	55	56	58
Personnel Door	Insulated Personnel Door, TL	2	7	12	17	18	19	22	30	35
Equipment Door	Insulated Roll-up Door, TL	2	7	12	17	18	19	22	30	35
Building Ventilation	Three-foot silencers and lined hoods, DIL	0	2	7	16	25	32	32	21	14
Ridge Vent	Acoustic Baffle, TL	0	0	0	4	6	9	9	14	9
Comp. Suction and Discharge Piping	Lagging (ISO Type B2), DIL	0	0	0	0	6	15	24	33	42
Russell Compressor Station										
Turbine Inlet	Stock Inlet Silencer, DIL	0	0	3	7	22	42	47	53	49
	Pulse Updraft Filter	2	4	8	9	13	26	27	27	33
	Combined Silencer and Filter Performance	2	4	11	16	35	68	74	80	82
Compressor Building	Wall and Roof System, TL	10	16	17	24	44	49	55	55	58
Personnel Door	Insulated Personnel Door, TL	2	7	12	17	18	19	22	30	35
Equipment Door	Insulated Roll-up Door, TL	2	7	12	17	18	19	22	30	35
Building Ventilation	Three-foot silencers and lined hoods, DIL	2	6	10	15	25	30	30	25	15
Ridge Vent	Acoustic Baffle, TL	0	0	0	4	6	9	9	14	9

Compressor Building Walls and Roof

The compressor buildings will include a minimum STC-39 wall and roof system. The compressor buildings will have no windows, skylights, or translucent panels. The building will be well sealed with no cracks or gaps, and all piping penetrations through the building walls will be flashed and caulked. The interior surfaces of the compressor building walls have been modeled as acoustically absorptive with an average Noise Reduction Coefficient of 0.8 or better.

Compressor Building Doors and Ventilation

The compressor buildings will have standard insulated overhead doors and industrial metal doors with good perimeter seals, all meeting defined acoustic transmission loss specifications. All building ventilation openings should include standard acoustical louvers or silencers to meet the Project requirements.

Turbine Exhaust Silencers and Breakout

The manufacturer warrants that the sound pressure level of the entire exhaust system at a distance of 200 feet from the Russell Compressor Station exhaust will not exceed 45 dBA. The breakout noise generated by the exhaust system ductwork was included at this level.

Turbine Intake Silencers and Breakout

The sound pressure level of the intake system was warranted by the manufacturer to not exceed 73 dBA at 50 feet from the air inlet. This level includes the performance of the entire system, including any filter insertion losses and breakout noise.

Station Piping

Noise from centrifugal compressors can cause significant noise radiation from connected piping. To the extent practical, suction and discharge piping will be run underground. No acoustical lagging was included in the compressor station models, but aboveground main gas piping can be acoustically lagged as necessary.

Noise Modeling Results

The predicted sound levels from the acoustic modeling for the Lambert and Russell Compressor Stations are shown in Figures 9.3-11 and 9.3-12, (Appendix 9-G) and the predicted sound levels due to meter station operations are shown in Figures 9.3-13 and 9.3-14 (Appendix 9-G). Predicted noise impacts on the nearest NSAs to each station are presented in Table 9.3-17. Site locations, layouts, and modeled equipment were determined from best available information and incorporated site-specific sound mitigation measures for these compressor and meter stations such as acoustical building enclosures, turbine intake and exhaust silencers.

Table 9.3-17

Predicted Sound Levels –Compressor and Meter Station

Compressor/ Meter Station	NSA	Distance from Compressor Station to NSA (feet)	Direction	Measured Existing Ambient (L_{dn} dBA)	Estimated Contribution of Station Equipment (L_{eq} dBA / L_{dn} dBA)		Combined, All Sources Including Ambient (L_{dn} dBA)	Increase Above Existing Condition (dB)
Lambert Compressor Station	1	3,480	WSW	42.6	41.1	47.5	50.2	3.4
	2	3,500	SW		36.3	42.7	48.2	1.4
	3	3,290	SE	61.7	35.6	42.0	64.8	0.0
	4	3,800	N	43.1	29.3	35.7	45.3	0.5
Russell Compressor Station	1	4,730	SW	49.7	32.4	38.8	50.0	0.3
	2	3,260	W	63.1	33.7	40.1	63.1	0.0
	3	4,360	SSE	49.7	28.2	34.6	49.8	0.1
T-15 Dan River Interconnect	1	750	S	65.0	40.4	46.8	65.1	0.1
T-21 Haw River Interconnect	1	550	N	65.0	35.4	41.8	65.0	0.0

As demonstrated by the noise model results, operation of the compressor and meter stations, with the noise mitigation included in the design, will contribute sound levels of less than 55 dBA L_{dn} at all NSAs. The predicted increase in the ambient sound levels ranges from 0.0 to 3.4 dB and is less than 10 decibels at all NSAs. The stations are predicted to operate in full compliance with FERC noise regulations.

Lambert Compressor Station is subject to the Pittsylvania County noise ordinance which limits sound levels at the station property line to 57 dBA during the day and 52 dBA at night for residential areas and to 77 dBA during both day and night for industrial areas. The parcels along the northeast property line are zoned industrial. The highest predicted sound level at the station property line is 63 dBA at the northeast property line adjacent to the Transco station. This is less than the 77 dBA limit for industrial areas. The highest predicted station sound level at a non-industrial property line is 51 dBA at the property line southeast of the station. This is less than the nighttime limit of 52 dBA. The station is therefore predicted to comply with the Pittsylvania County noise ordinance.

9.3.5.2 Compressor Station Unit Venting Noise and Mitigation

Under certain circumstances, the pressure in the compressor casing and unit piping must be released in a controlled manner. These events are called unit venting and occur when a unit is shut down for an extended period. During venting, the high pressure gas in the system is released in a controlled fashion through a silencer. Venting events may cause a temporary increase in sound level that usually lasts for approximately five minutes.

Compressor units will vent through silencers to limit the noise during venting. Compressor unit venting scenarios were modeled for the Project stations using a silencer designed to limit the maximum sound level due to venting to less than 85 dBA at 3 feet from each silencer.

Table 9.3-18 shows a summary of the NSAs at which the unit venting is predicted to be loudest for each compressor station. The worst-case NSAs are not necessarily the closest NSAs due to terrain shielding

between the stations and NSAs. The unit venting sound levels are compared to the nighttime average levels at each NSA to show the potential short-term sound level impact at each station. The predicted unit venting sound levels are low, with the highest predicted sound level of 39.6 dBA at NSA 2 of the Russell Compressor Station.

Table 9.3-18

Unit Venting Sound Level Predictions

Compressor Station	Worst Case NSA	Measured Existing Ambient, Night Average (L_{eq} dBA)	Estimated Contribution of Unit Venting (L_{eq} dBA)	Combined Venting and Ambient (L_{eq} dBA)	Short-term Sound Level Increase During Venting (dB)
Lambert	1	44.5	36.5	45.1	0.6
Russell	2	57.2	39.6	57.3	0.1

9.3.5.3 Emergency Shutdown Noise and Mitigation

Each compressor station has an emergency shutdown ("ESD") system that automatically halts operation of the station in the event of an irregularity. This results in full station venting during which the gas from all station piping is released in a controlled manner. These events are extremely rare and take place only in the event of an emergency or when the system is tested once every year.

The sound level due to an ESD event will depend on the gas flow rate, the ESD valve size, and the pressure drop across the ESD valve. Table 9.3-19 shows a summary of the NSAs at which the station ESD venting is predicted to be loudest for each of the compressor stations. *[Note: The Project will provide sound level survey information in the final Resource Reports included with the Certificate application expected to be filed in November 2018.]*

Table 9.3-19

Station ESD Venting Sound Level Predictions

Compressor Station	Worst Case NSA	Measured Existing Ambient, Night Average (L_{eq} dBA)	Estimated Contribution of ESD Venting (L_{eq} dBA)	Combined Venting and Ambient (L_{eq} dBA)	Short-term Sound Level Increase During Venting (dB)
Lambert	To Be Determined	To Be Determined	To Be Determined	To Be Determined	To Be Determined
Russell	To Be Determined	To Be Determined	To Be Determined	To Be Determined	To Be Determined

9.3.5.4 Vibration

Large turbine exhausts, such as those present at the Lambert and Russell compressor stations can be a source of low-frequency noise. Low-frequency noise can result in acoustically induced vibrations if the sound pressure level is above 65 dB in the 31.5 Hz octave band or above 75 dB in the 63 Hz octave band.

The model predicts the station contribution will be 53 dB at 31.5 Hz and 55 dB at 63 Hz at the closest NSA to Lambert Compressor Station, and 44 dB at 31.5 Hz and 44 dB at 63 Hz at Russell Compressor Station. Therefore, low-frequency noise induced vibration of structures should not be a concern.

9.3.6 Post Construction Sound Survey

As per FERC requirements, the Project will undertake post-construction sound level testing at both compressor stations within 60 days of the stations being placed into constant service. The testing will consist of sound level measurements at the closest NSAs with the station equipment in full-load operation. If full-load operation is not possible, then appropriate adjustments will be applied to the measured levels to estimate the sound levels under full-load conditions. The measured levels, along with the measurement methodology, measurement equipment used, station operating and weather conditions during the testing will be included in a report that will be submitted to the Commission. If the station sound level contributions are found to exceed the Commission's sound level limits, then the reports wil.l include the noise mitigation or equipment modifications that will be implemented to bring the station sound level contributions to below 55 dBA L_{dn}.

9.3.7 Cumulative Effect

Section 1.10 of Resource Report 1 discusses the reasonably foreseeable future actions that have been included in the cumulative impacts assessment for the Project, with the projects considered shown in Table 1.10-1. Generally, the cumulative impact assessment radius for noise is one-mile. Of the projects listed in Table 1.10-1, only the Mountain Valley Pipeline and Stony Mill Road Construction are within one-mile of the Project.

The Mountain Valley Pipeline Project is under construction and should be complete by the time that construction begins on the MVP Southgate Project, so there is limited opportunity for cumulative construction noise impacts. In addition, there are no Mountain Valley Pipeline above-ground facilities (compressor stations or meter stations) within one-mile of any of the MVP Southgate Project above-ground facilities, so there are no cumulative operational noise impacts expected.

The Stony Mill Road construction project is a small road construction project at the intersection of Stony Mill Road and Tunstall High Road in Pittsylvania County, Virginia. There are no Project compressor stations, meter stations, HDD, or railroad crossings within one-mile of this project, so the only potential cumulative noise impact that could arise would be during pipeline construction. At the 0.5 mile distance from the pipeline corridor to the intersection, it is not expected that pipeline construction activities will be a significant noise source. No cumulative noise impacts are expected for the Stony Mill Road construction.

9.4 References

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MVP Southgate Project

Docket No. PF18-4-000

Draft Resource Report 9

Appendix 9-A

Construction Emissions Calculations

[*Not Included with this Draft*]

MVP Southgate Project

Docket No. PF18-4-000

Draft Resource Report 9

Appendix 9-B

Operational Emissions Calculations

[*Not Included with this Draft*]

MVP Southgate Project

Docket No. PF18-4-000

Draft Resource Report 9

Appendix 9-C

Virginia State Air Permit Application

[*Not Included with this Draft*]

MVP Southgate Project

Docket No. PF18-4-000

Draft Resource Report 9

Appendix 9-D

North Carolina State Air Permit Application

[*Not Included with this Draft*]

MVP Southgate Project

Docket No. PF18-4-000

Draft Resource Report 9

Appendix 9-E

Lambert Compressor Station Air Quality Modeling Report

[*Not Included with this Draft*]

MVP Southgate Project

Docket No. PF18-4-000

Resource Report 9

Appendix 9-F

Russell Compressor Station Air Quality Modeling Report

[*Not Included with this Draft*]

MVP Southgate Project

Docket No. PF18-4-000

Resource Report 9

Appendix 9-G

Noise Sensitive/Measurements and Predicted Sound Level Figures

Project:
Southgate Project

Description:
Lambert CS:
Noise Sensitive Areas and
Measurement Locations

Prepared By:
SLR International Corporation

FIGURE 9.3-1 08.21.2018

N

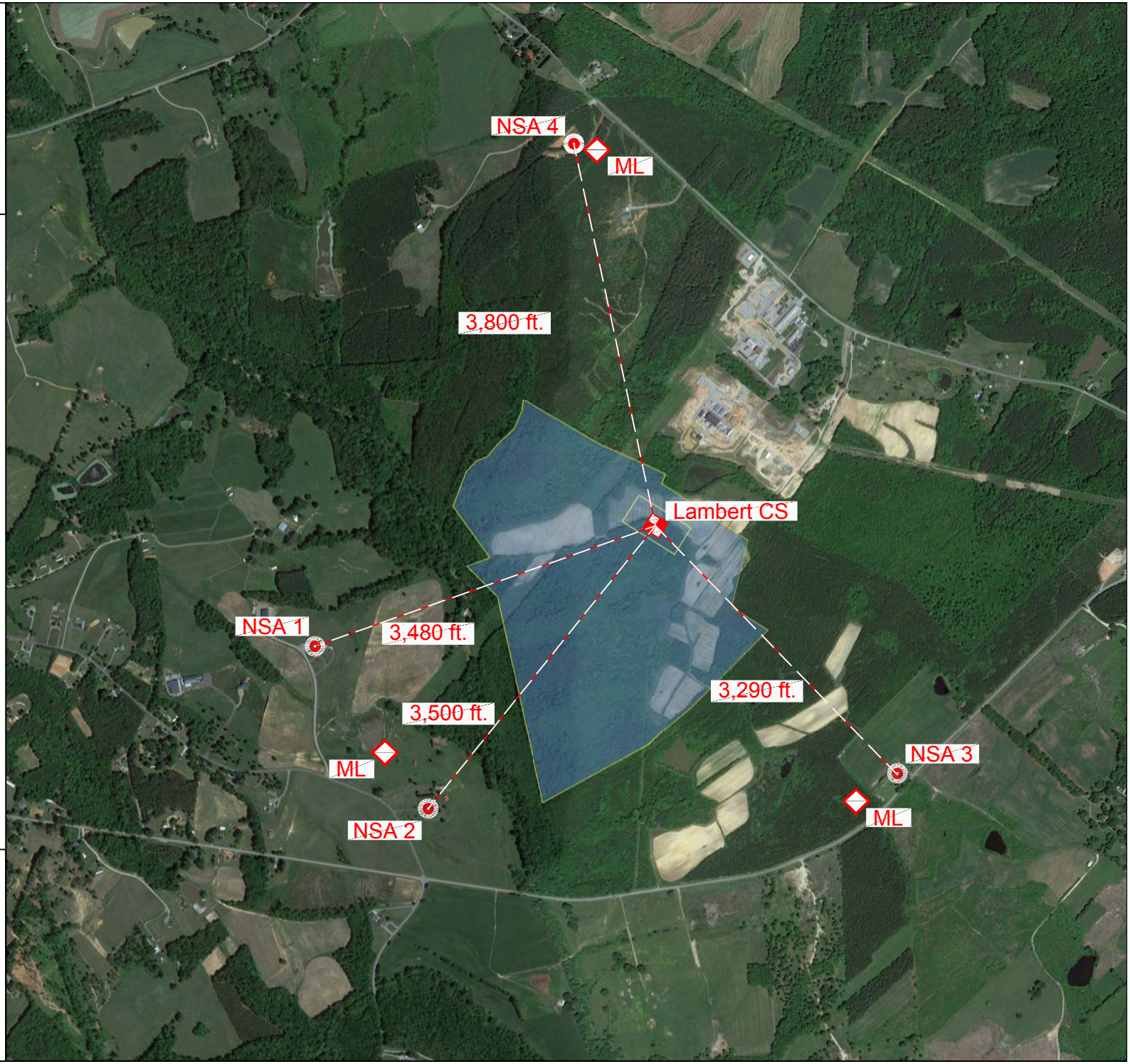
Legend

- Noise Sensitive Area (NSA)
- Measurement Location (ML)
- Compressor Station Building

Scale

0 750 1500

units in feet



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Project:
Southgate Project

Description:
Russell CS:
Noise Sensitive Areas and
Measurement Locations

Prepared By:
SLR International Corporation

FIGURE 9.3-2 08.21.2018

N

Legend

- Noise Sensitive Area (NSA)
- Measurement Location (ML)
- Compressor Station Building

Scale

0 600 1200

units in feet

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Project:
Southgate Project

Description:
T-15 Dan River Interconnect (IC): Noise Sensitive Areas and Measurement Locations

Prepared By:
SLR International Corporation

FIGURE 9.3-3 08.03.2018

N

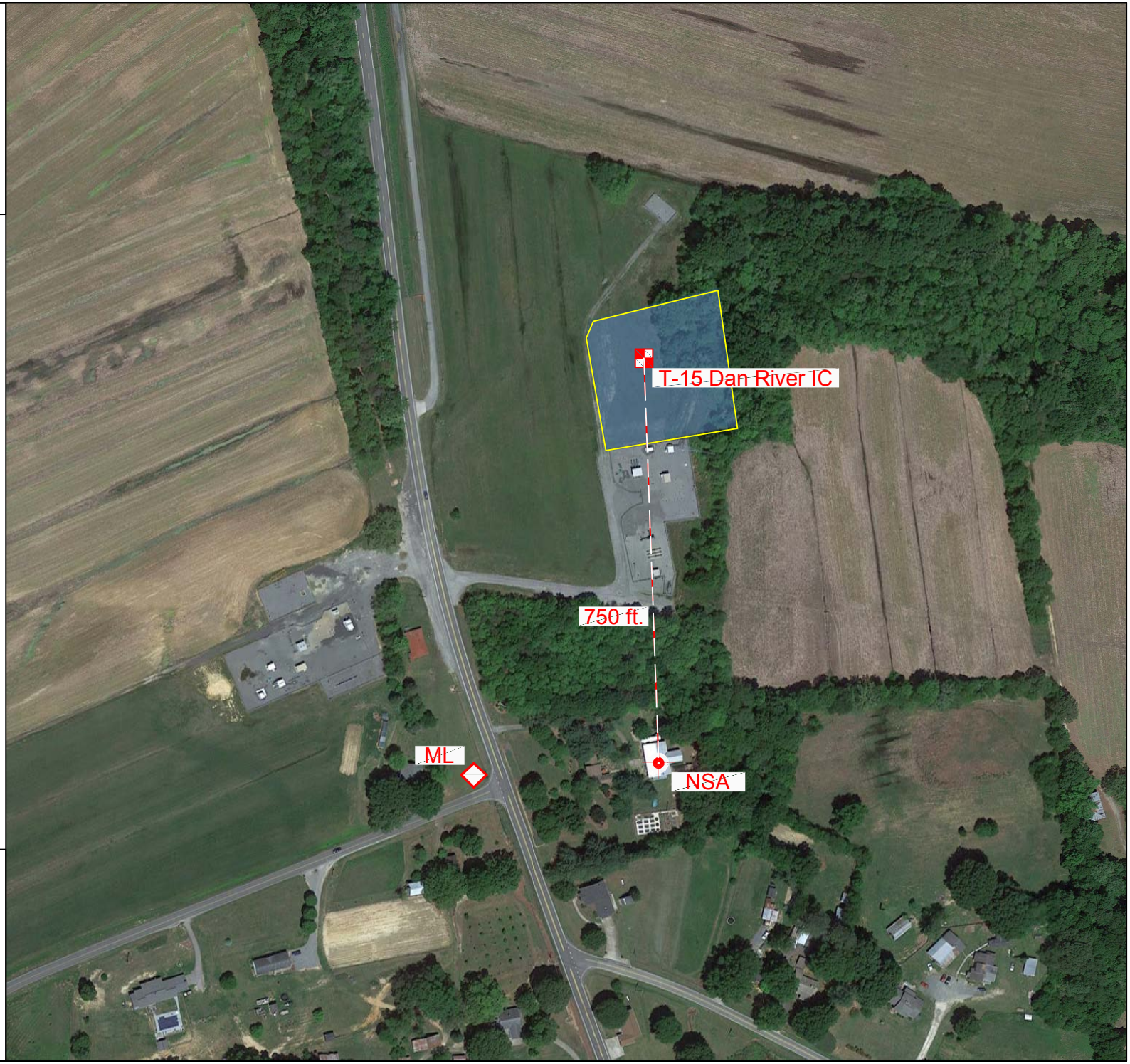
Legend

- Noise Sensitive Area (NSA)
- Measurement Location (ML)
- Interconnect Location

Scale

0 150 300

units in feet



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Project:
Southgate Project

Description:
T-21 Haw River Interconnect (IC): Noise Sensitive Areas and Measurement Locations

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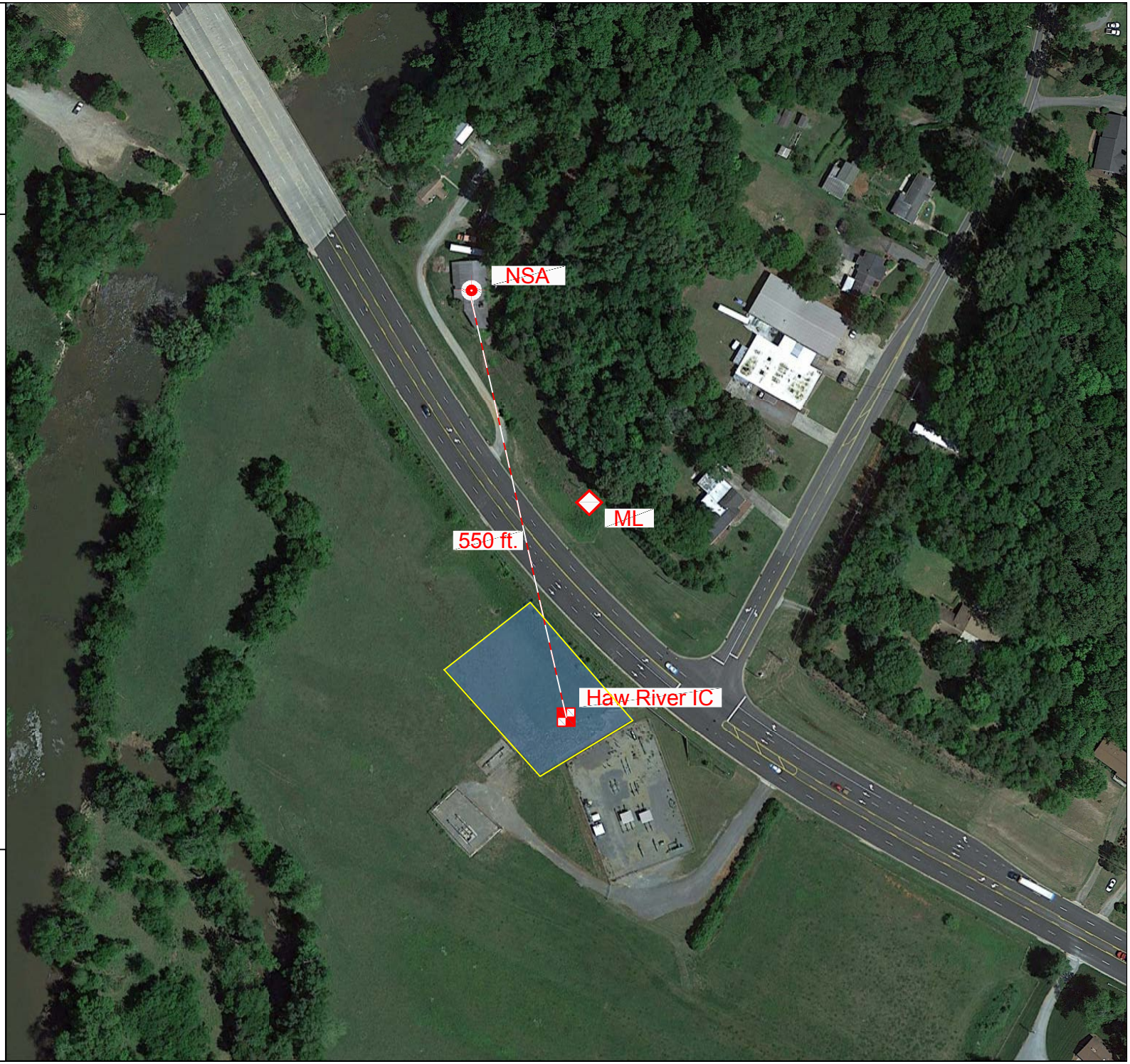
FIGURE 9.3-4 08.03.2018



N

Legend

- Noise Sensitive Area (NSA)
- Measurement Location (ML)
- HDD Location

Scale

0 150 300

units in feet

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Project:
Southgate Project

Description:
Stony Creek Reservoir HDD: Noise Sensitive Areas and Measurement Locations

Prepared By:
SLR International Corporation

FIGURE 9.3-5 08.03.2018

N

Legend

- Noise Sensitive Area (NSA)
- Measurement Location (ML)
- HDD Location

Scale

0 200 400

units in feet

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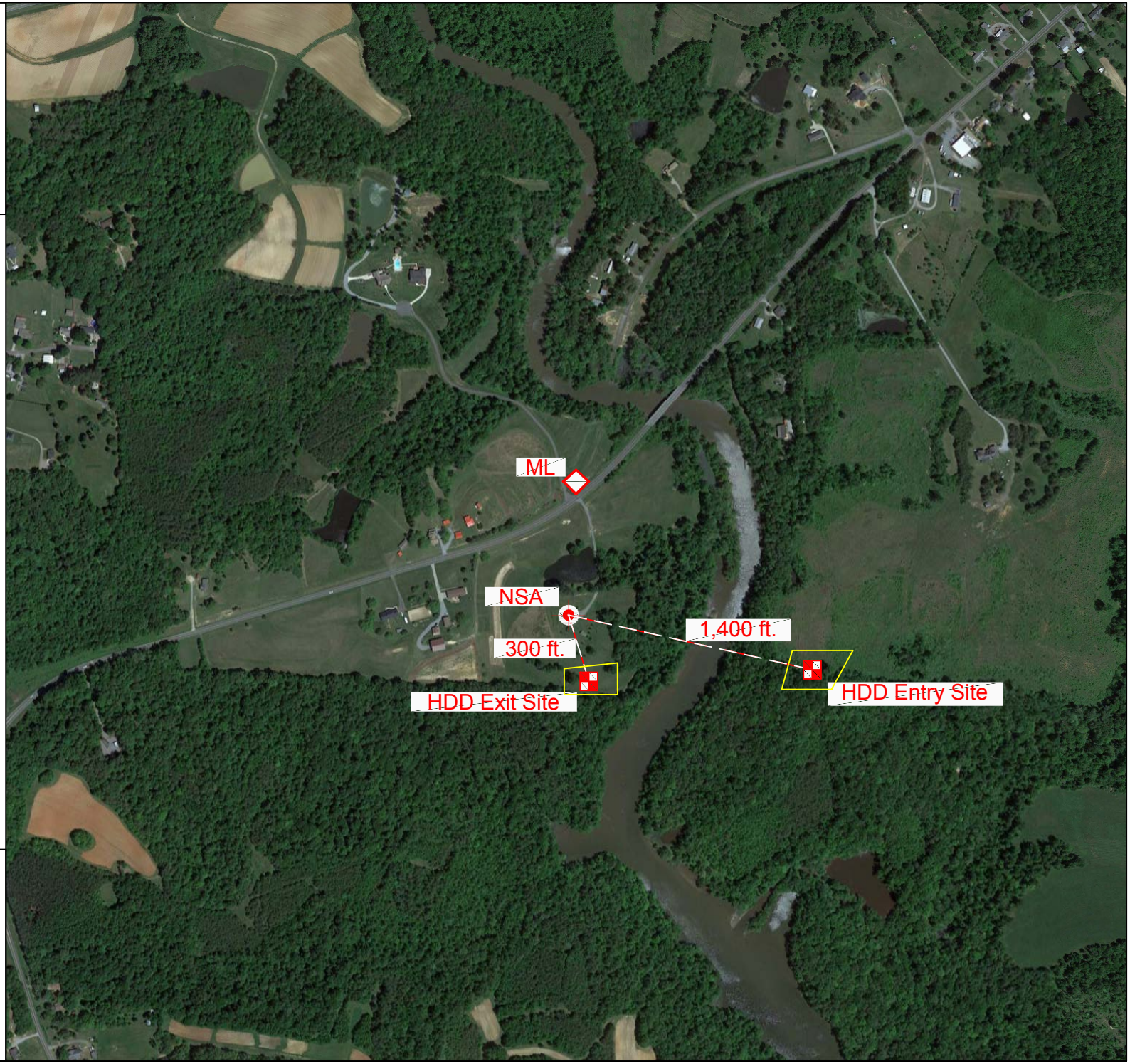

Project:
Southgate Project

Description:
Dan River HDD:
Noise Sensitive Areas and
Measurement Locations

Prepared By:
SLR International Corporation

FIGURE 9.3-6 08.03.2018

N

Legend

- Noise Sensitive Area (NSA)
- Measurement Location (ML)
- HDD Location

Scale

0 300 600

units in feet

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Project:
Southgate Project

Description:
Railroad Crossing #1:
Noise Sensitive Areas and
Measurement Locations

Prepared By:
SLR International Corporation

FIGURE 9.3-7 08.03.2018

N

Legend

- Noise Sensitive Area (NSA)
- Measurement Location (ML)
- RR Crossing

Scale

0 250 500

units in feet

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Project:
Southgate Project

Description:
Railroad Crossing #2:
Noise Sensitive Areas and
Measurement Locations

Prepared By:
SLR International Corporation

FIGURE 9.3-8 08.03.2018

N

Legend

- Noise Sensitive Area (NSA)
- Measurement Location (ML)
- RR Crossing

Scale

0 300 600

units in feet

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Project:
Southgate Project

Description:
Railroad Crossing #3:
Noise Sensitive Areas and
Measurement Locations

Prepared By:
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FIGURE 9.3-9 08.03.2018

N

Legend

- Noise Sensitive Area (NSA)
- Measurement Location (ML)
- RR Crossing

Scale

0 300 600

units in feet

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Project:
Southgate Project

Description:
Railroad Crossing #4:
Noise Sensitive Areas and
Measurement Locations

Prepared By:
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FIGURE 9.3-10 08.03.2018

N

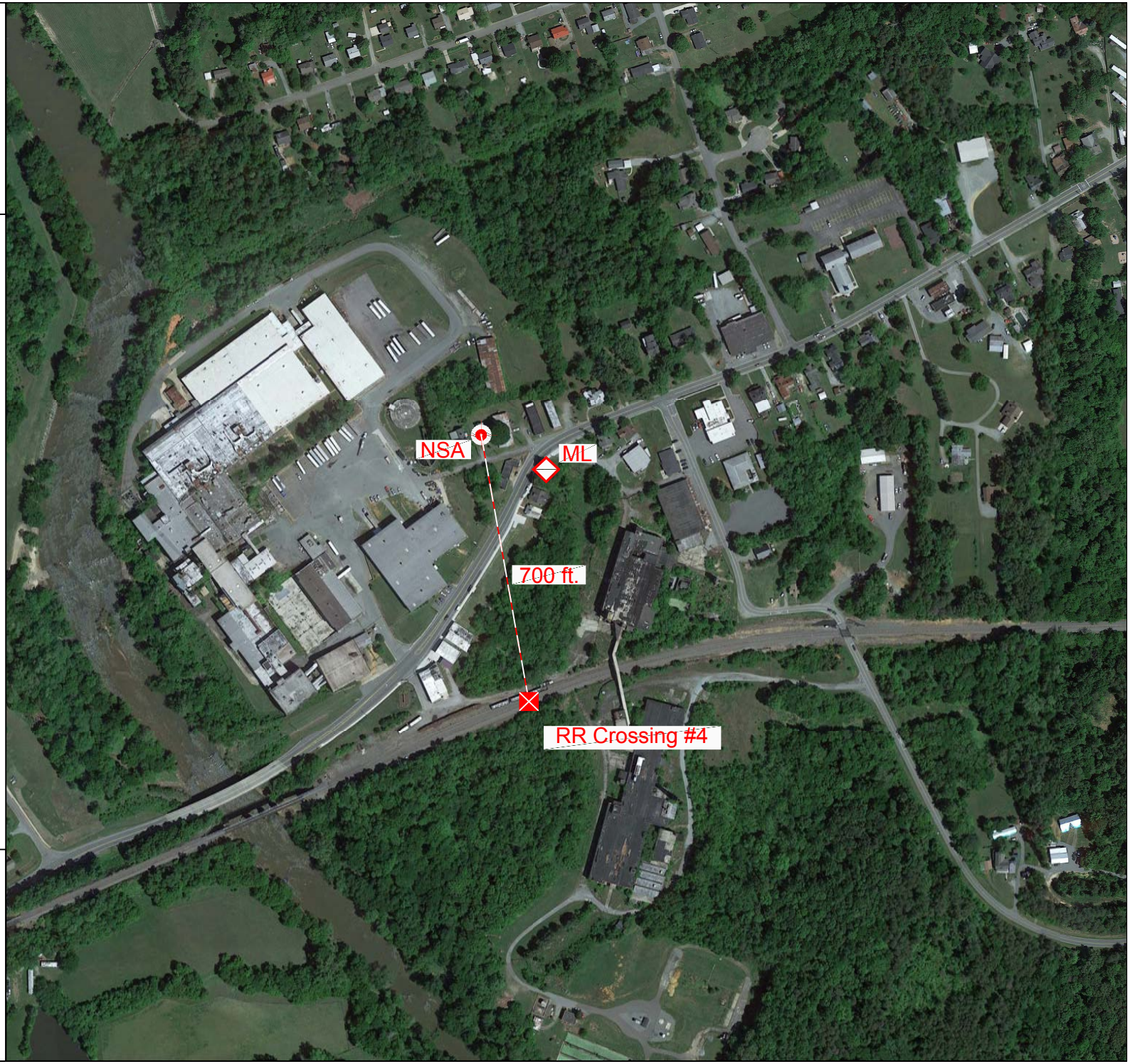
Legend

- Noise Sensitive Area (NSA)
- Measurement Location (ML)
- RR Crossing

Scale

0 250 500

units in feet



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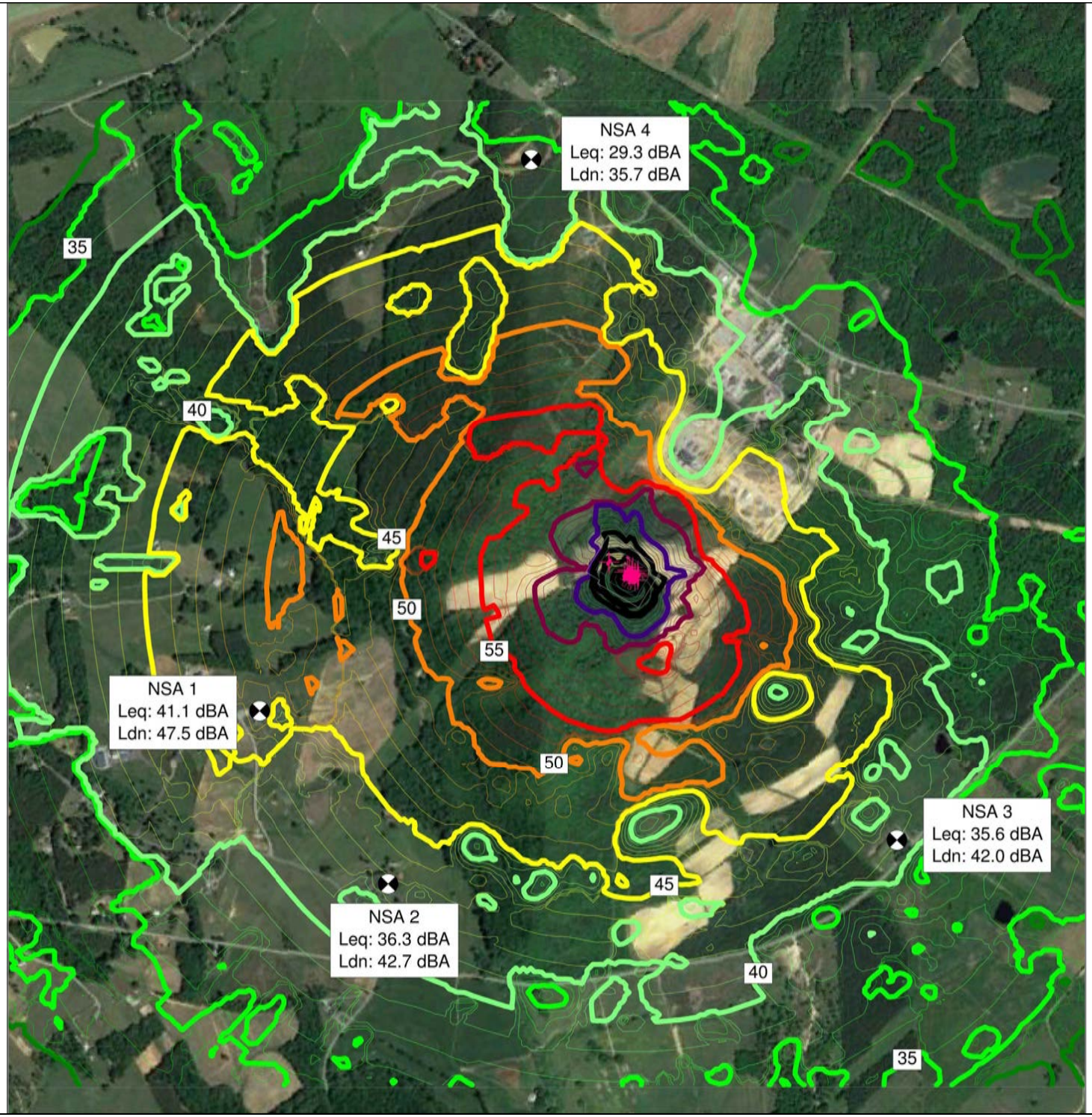
Project:
Southgate Project

Description:
Lambert Compressor Station (CS): Noise Contour

Prepared By:
SLR International Corporation

FIGURE 9.3-11 08.21.2018



N

Legend

Noise Sensitive Area (NSA)

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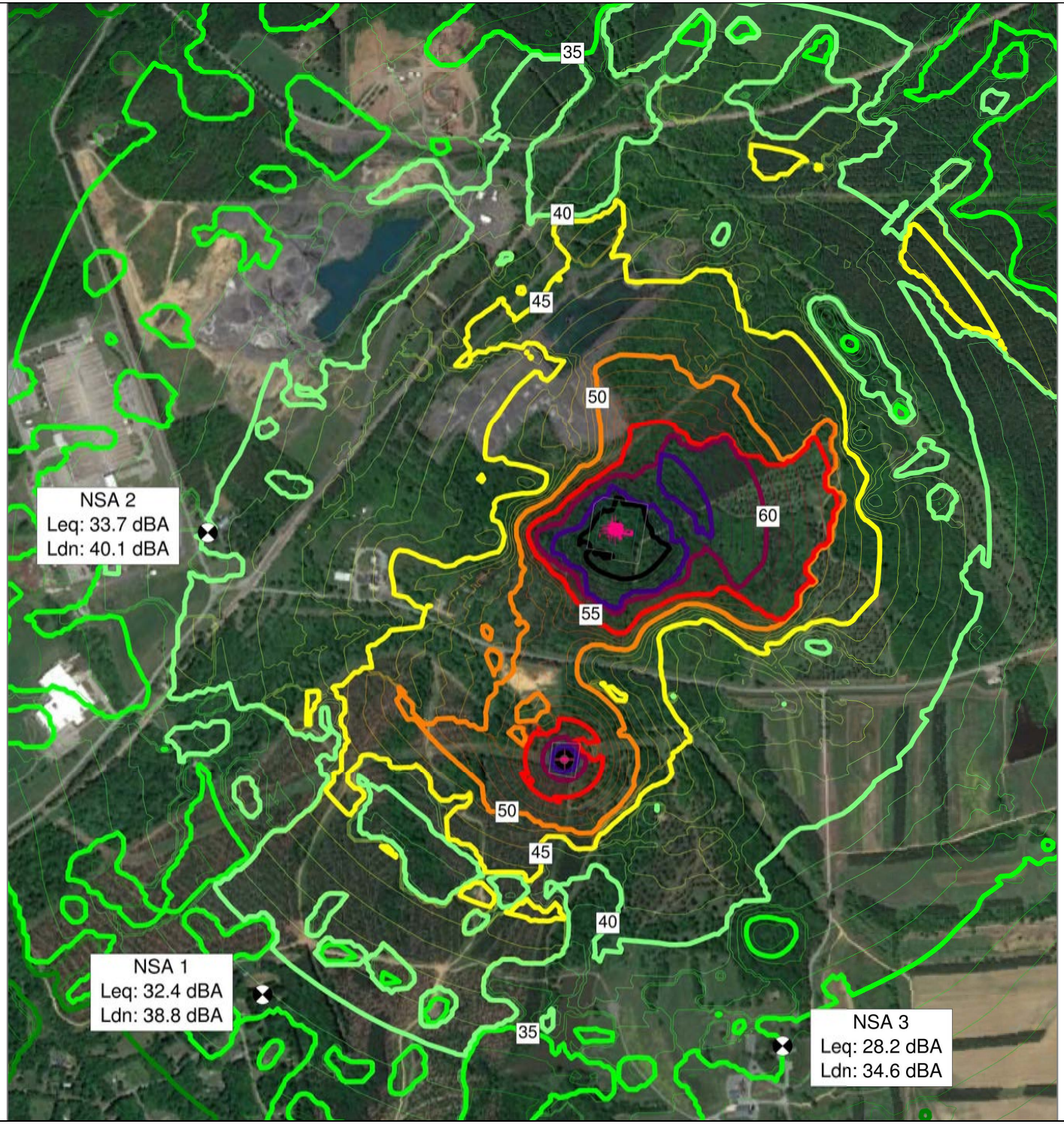
Project:
Southgate Project

Description:
Russell Compressor Station (CS): Noise Contour

Prepared By:
SLR International Corporation

FIGURE 9.3-12 08.21.2018



N

Legend

Noise Sensitive Area (NSA)

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Project:
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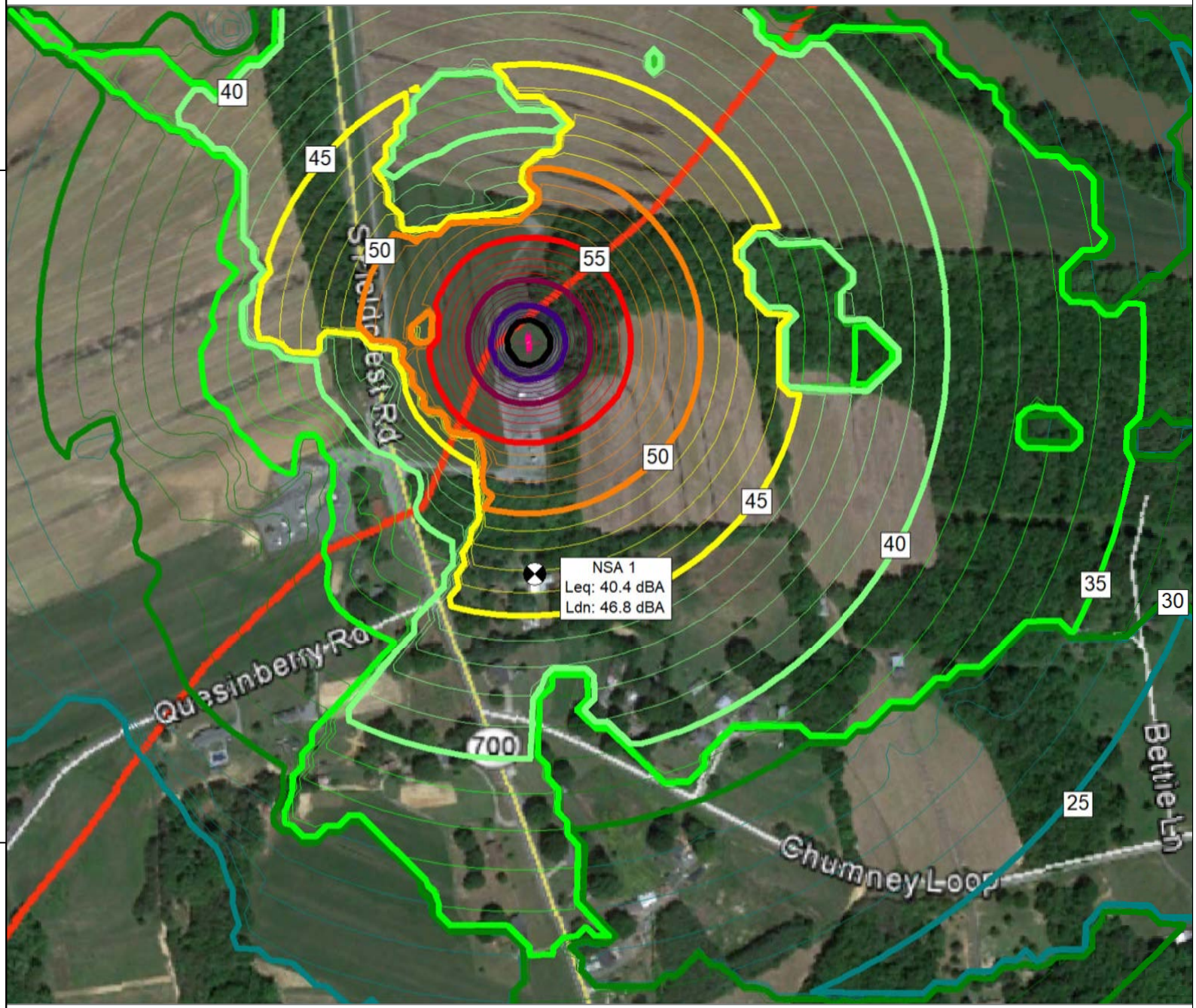
Description:
Dan River Interconnect (IC):
Noise Contour

Prepared By:
SLR International Corporation

FIGURE 9.3-13 08.03.2018



N

Legend

Noise Sensitive Area (NSA)

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Project:
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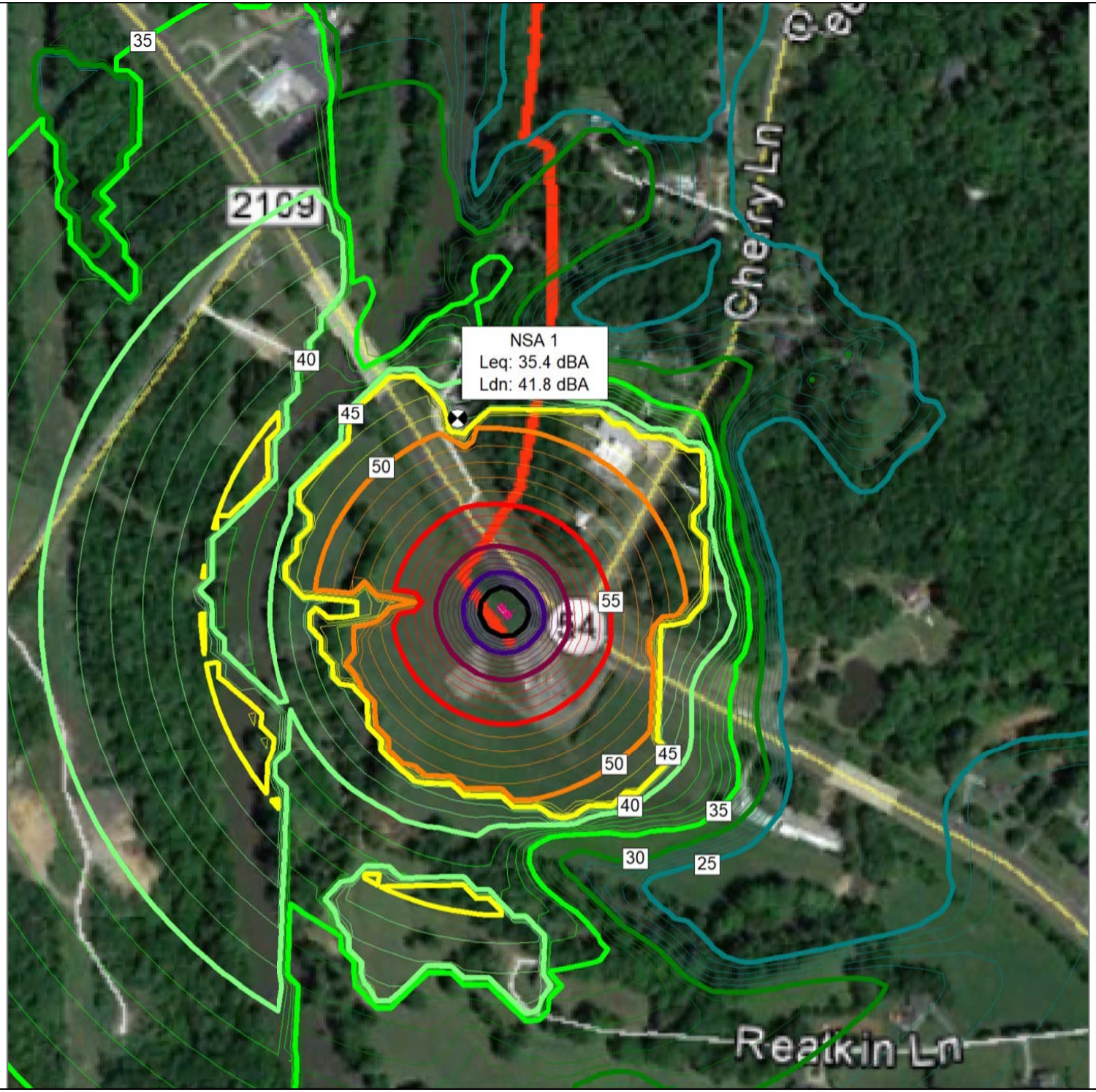
Description:
Haw River Interconnect (IC): Noise Contour

Prepared By:
SLR International Corporation

FIGURE 9.3-14 08.03.2018



Legend

Noise Sensitive Area (NSA)

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