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April 30, 2020

BY: ELECTRONIC MAIL and HAND DELIVERY
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Mr. Michael Dowd
Director of Air Division
Virginia Department of Environmental Quality
1111 East Main St., Suite 1400
Richmond, VA 23219

Subject: **Atlantic Coast Pipeline, LLC**
Buckingham Compressor Station
Supplemental Information in Support of Application for Stationary Source Permit to Construct and Operate Buckingham Compressor Station
Registration Number 21599

Dear Mr. Dowd:

On January 7, 2020, the United States Court of Appeals for the Fourth Circuit issued its decision in *Friends of Buckingham, et al. v. State Air Pollution Control Board, et al.*, No. 19-1152. In that decision, the Court vacated and remanded the minor source permit to construct and operate the Buckingham Compressor Station with specific instructions to the Air Pollution Control Board.[*] According to the Court's opinion, the remand is for two purposes:

- "for further explanation of reliance on the redefining the source doctrine, and/or why electric turbines are not required to be considered in Virginia's BACT analysis of the Compressor Station" (Opinion at 31); and

- "for the Board to make findings with regard to conflicting evidence in the record, the particular stud(ies) it relied on, and the corresponding *local character and degree of injury* from particulate matter and toxic substances threatened by construction and operation of the Compressor Station" (Opinion at 47 (emphasis in original)).

On behalf of Atlantic Coast Pipeline, LLC ("Atlantic"), we are submitting the attached supplemental information to address the second issue on which the Fourth Circuit remanded the permit to the Board: Supplemental Information on Site Suitability, Including Environmental Justice, to Support the Buckingham Compressor Station Air Permit. Atlantic previously submitted supplemental information to address the first issue to Ms. Tamera Thompson on April 24, 2020.

[*] Pursuant to the Natural Gas Act, when a federal court of appeals finds an error in a permit such as this, it "shall remand the proceeding to the agency to take appropriate action consistent with the order of the Court". 15 U.S.C. § 717r(d)(3).

Should you have any questions, please do not hesitate to contact Molly Parker at 804-273-2929 or at molly.a.parker@dominionenergy.com.

Sincerely,

Amanda B. Tornabene
Vice President and Chief Environmental Officer
Environmental Services

Attachment

Cc: Tamera Thompson, Manager, Office of Air Permitting

DOCUMENT CERTIFICATION STATEMENT

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering and evaluating the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

I certify that I understand that the existence of a permit under [Article 6 of the Regulations] does not shield the source from potential enforcement of any regulation of the board governing the major NSR program and does not relieve the source of the responsibility to comply with any applicable provision of the major NSR regulations.

SIGNATURE: Brian Wright DATE: 4/24/2020

NAME: Brian M. Wright

TITLE: VP Major Projects

COMPANY: Atlantic Coast Pipeline, LLC

Supplemental Information
Site Suitability, Including Environmental Justice, to Support the Buckingham Compressor Station Air Permit

Atlantic Coast Pipeline LLC
Supplemental Information on Site Suitability, Including Environmental Justice, to Support the Buckingham Compressor Station Air Permit

The United States Court of Appeals for the Fourth Circuit vacated and remanded the Buckingham Compressor Station ("BCS") Air Permit with specific instructions. *Friends of Buckingham v. State Air Pollution Control Bd.*, 947 F.3d 68 (4th Cir. 2020). Regarding Environmental Justice, the court directed the Virginia State Air Pollution Control Board ("Board") to "make findings with regard to conflicting evidence in the record, the particular stud(ies) relied on, and the corresponding local character and degree of injury from PM and toxic substances threatened" by the Project. *Id.* at 86. The following analysis provides support for the Board to make the appropriate findings, and demonstrates that the BCS Permit is fully consistent with site suitability and the principles of Environmental Justice.

Executive Summary

The Fourth Circuit's decision directed the Board to make specific findings about site suitability and Environmental Justice. Here, Atlantic Coast Pipeline, LLC ("Atlantic") provides the necessary analyses to make those findings.

Section I explains the current status of legal standards governing site suitability and Environmental Justice in Virginia. In addition to Va. Code § 10.1-1307.E, this section discusses the impact of legislative developments since the Fourth Circuit's decision, as well as the Virginia Department of Transportation ("VDOT") *Environmental Justice Guidelines* ("VDOT Guidelines") to which DEQ can refer. Of particular note, the General Assembly has provided specific new criteria to identify "Environmental Justice communities." Atlantic recommends that the Board make an explicit finding in its written Decision Statement that recites the standards used to assess Environmental Justice.

Section II applies the new definitions of "Environmental Justice community" to the demographics of the community. Using the recommendations of the VDOT Guidelines and other guidance, Atlantic called upon various local sources to delve deeper into the demographics beyond that revealed by census data to determine whether pockets of communities of color reside near the facility.

The analysis shows that an Environmental Justice community exists to the north and east of the facility along Union Hill Road, the northern and eastern section of Shelton Store Road, and to the southeast of the facility. Areas to the west of the facility, including the southwest, do not qualify as Environmental Justice communities as defined in the legislation awaiting the Governor's signature. Atlantic recommends that the Board make an explicit finding in its written Decision Statement as to the presence and location of the Environmental Justice community.

Section III provides an analysis of the character and degree of injury, if any, from the facility's air emissions. Based on a variety of different sources—and specifically considering sensitivities or vulnerabilities that are often associated with Environmental Justice communities—this analysis demonstrates that the facility will not cause injury to the Environmental Justice community or to any other surrounding community. Sources considered include standards

approved by regulatory agencies specifically to assess potential health impacts in sensitive populations such as the National Ambient Air Quality Standards ("NAAQS"), Significant Impact Levels ("SILs"), the State Air Toxics Rule, and additional analyses of toxics.[1] The NAAQS, in particular, have been widely cited by EPA, the EPA Environmental Appeals Board, and courts as showing that Environmental Justice communities are protected.[2] Indeed, the 2018 Virginia Energy Plan expressly directs DEQ to rely on the NAAQS when evaluating Environmental Justice. In addition, the levels of exposure here are far below the NAAQS, even at the closest residences located in an Environmental Justice community (as well as nearest in a non-Environmental Justice community). Rather, levels of exposure are so low that, over the entire course of a year, they are generally analogous to mowing the lawn for about 3 hours. Furthermore, publicly available data establish that the communities are not overburdened by other sources of pollution.

This conclusion is further buttressed by the Health Consultation conducted by the Virginia Department of Health ("VDH") (hereinafter "VDH Study"). The Board is entitled to rely on the findings of the expert agency charged by the Commonwealth to protect public health, especially when those findings are consistent with accepted regulatory health-based standards. In addition, Atlantic commissioned a health screening assessment that found no appreciable health effects from toxic air pollutants from BCS. Atlantic recommends that the Board make an explicit finding in its written Decision Statement that the BCS will not pose health risks in nearby communities, even accounting for potential sensitivities.

In addition, Atlantic provides supplemental information confirming that BCS will have no impacts on historic cultural resources of importance to the community. While it is clear that Buckingham County has a rich history, the distance, topography, and existing vegetation between BCS and historic cultural resources identified as important to the Environmental Justice community preclude measurable impacts with regard to noise, aesthetics, light pollution, and other potential indirect effects. Atlantic recommends that the Board make an explicit finding in its written Decision Statement that the BCS site is suitable from a historic cultural resources standpoint.

Section IV provides an analysis showing no disproportionate impacts on the Environmental Justice community as compared to the other neighboring communities. As an initial matter, the Environmental Justice community will bear no adverse disproportionate health risks because *no* community will face any appreciable health risk as a result of the facility's emissions, notwithstanding any particular sensitivities or vulnerabilities in the Environmental Justice

[1] While the Fourth Circuit appeared to criticize the Board for "falling back on the NAAQS," the Board had not made any specific written findings in its Decision Statement explaining why it was relying on the NAAQS and why the NAAQS are persuasive in the context of Environmental Justice. *See id.* at 90. Atlantic recommends the Board make specific findings in its written Decision Statement about the NAAQS, in conjunction with findings concerning any identified Environmental Justice community and the other evidence negating any appreciable health risks from the facility.

[2] *See, e.g., In re Shell Gulf of Mex. Inc.*, 15 E.A.D. 103, 156 (EAB 2010) ("In the context of an Environmental Justice analysis, compliance with the NAAQS is emblematic of achieving a level of public health protection that, based on the level of protection afforded by a primary NAAQS, demonstrates that minority or low-income populations will not experience disproportionately high and adverse human health or environmental effects due to exposure to relevant criteria pollutants.").

community. In addition, air modeling demonstrates that, even to the limited extent there could be any impacts in the surrounding communities, the Environmental Justice community does not bear a disproportionate share of those impacts. This is apparent from graphic representations of the modeling overlaid on the aerial photographs of the surrounding communities. Nor do any other sources of pollution lead to any disproportionate overburdening effect. Atlantic recommends that the Board make an explicit finding in its written Decision Statement regarding the lack of any disproportionate burden on the Environmental Justice community.

Section V addresses the extensive mitigation and enhancement measures responsive to community concerns regarding health, safety, and other issues. Those concerns were expressed during the significant public participation and community outreach associated with BCS. The VDOT Guidelines recommend taking into account mitigation and enhancement as part of Environmental Justice. Atlantic recommends that the Board make an explicit finding in its written Decision Statement about mitigation and enhancement.

I. Current Legal Status of Environmental Justice in Virginia Air Permitting

Section 10.1-1307.E of the Virginia Code establishes certain factors the Board is required to consider when issuing permits. Site suitability and the potential for impacts on health are among these factors. Environmental Justice, through this proceeding, has come to be considered in conjunction with the site suitability analysis. In addition to these general statements, current Virginia law provides little to prescribe how to implement Environmental Justice, and nothing specific to the air permitting context. In the absence of clear implementation standards, the Board should consider the following:

1) *Section 10.1-1307.E(1) and (3)* – establishing that the Board must consider certain health and site factors;

2) *The Energy Policy of the Commonwealth* – establishing that energy resources should be developed in a manner not causing a disproportionate adverse impact on Environmental Justice communities;

3) *The Virginia Energy Plan* – establishing that DEQ's existing obligations to ensure that all regulated entities comply with health-based standards will continue in all permitting activities to reduce public health burdens on all populations;

4) *Virginia Environmental Justice Act ("VEJA")* – providing a general Environmental Justice policy and supplying critical definitions;

5) *VDOT Guidelines* – providing Environmental Justice implementation guidance followed by a sister agency; and

6) *Other federal guidance and EPA/EAB decisions* – providing implementation guidance, including appropriate use of NAAQS and SILs.

Generally, there are three steps to an Environmental Justice analysis: (1) identify whether an Environmental Justice community is implicated; and if so, (2) provide enhanced public participation to ensure Environmental Justice communities have a meaningful voice (process-

based)[3]; and (3) ensure no negative disproportionate impacts on any Environmental Justice community, taking into account mitigation and enhancement measures (substantive analysis).

A. Current Virginia Law and Environmental Justice Policy

As described below, the Board has several existing authorities through which it may implement Environmental Justice. Although the new VEJA defines "Environmental Justice community," there is still minimal guidance on how the Board should apply the principles of Environmental Justice in a permit proceeding.

1. Section 10.1-1307.E

Before approving permits, the Board is required to consider the following facts and circumstances relevant to the reasonableness of the activity involved:

- The character and degree of injury to, or interference with, safety, health, or the reasonable use of property which is caused or threatened to be caused;
- The social and economic value of the activity involved;
- The suitability of the activity to the area in which it is located; and
- The scientific and economic practicality of reducing or eliminating the discharge resulting from such activity. Va. Code § 10.1-1307(E).

After the *Friends of Buckingham* decision, Environmental Justice is implicit in the analysis of the first and third factors.

2. The Energy Policy of the Commonwealth

The Energy Policy of the Commonwealth ("Energy Policy") seeks to develop "energy resources and facilities in a manner that does not impose a disproportionate adverse impact on economically disadvantaged or minority communities…." Va. Code § 67-101.12.

3. The Virginia Energy Plan

The Division of Mines, Minerals, and Energy is required to prepare a comprehensive Virginia Energy Plan ("Energy Plan") that is consistent with the Energy Policy and proposes actions that will implement the Energy Policy. Va. Code § 67-201. The Energy Plan must include, among other things, "[a]n analysis of siting of energy resource development, refining or transmission facilities to identify any disproportionate adverse impact of such activities on economically disadvantaged or minority communities…." *Id.* § 67-201.B.7.

[3] As is evident from the permitting record, the local community has been extensively involved in this minor source permit. In addition, Atlantic engaged—and continues to engage—in comprehensive community outreach during the permitting process, as reflected in the Community Engagement Report in the record. *See* Dominion Energy, *Community Engagement Report* (Oct. 26, 2018) (discussing dozens of community meetings) (included as Attachment 1). The public participation prong of Environmental Justice has been thoroughly satisfied.

In accordance with the Energy Policy requirements, Governor Northam released the Virginia 2018 Energy Plan ("2018 Energy Plan") in October 2018. Office of the Secretary of Commerce and Trade, Dept. of Mines, Minerals and Energy, *The Commonwealth of Virginia's 2018 Energy Plan* (Oct. 2018). The 2018 Energy Plan states that "Virginia is dedicated to ensuring that there are not disproportionate impacts on economically-disadvantaged or minority communities during the siting of energy resources. Ensuring that certain populations are not disproportionately impacted during energy development is critical to Environmental Justice efforts." *Id.* at 58. It defines Environmental Justice as "the fair treatment and meaningful involvement of all people regardless of race, color, faith, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies." *Id.* The 2018 Energy Plan further states that "DEQ's existing obligations to ensure that all regulated entities comply with health-based standards [e.g., NAAQS, state air toxic requirements] will continue in all permitting activities to reduce public health burdens on all populations." *Id.*

B. Virginia Environmental Justice Act

Although the Board has not yet adopted Environmental Justice guidance, the General Assembly has just adopted relevant definitions in a new statute, the Virginia Environmental Justice Act ("VEJA").[4] Va. Code § 2.2-234, *et seq*. Although VEJA will not go into effect until July 1, 2020, Atlantic has used those definitions in its analysis.

The statute defines "Environmental Justice" and "Environmental Justice community," among other definitions. Va. Code § 2.2-234. It also confirms Virginia's policy to "promote Environmental Justice and ensure that it is carried out throughout the Commonwealth, with a focus on environmental justice communities and fenceline communities." Va. Code § 2.2-235. Note, however, that while the new statute provides a reasonably objective definition of "Environmental Justice community" and a general Environmental Justice policy, it offers little guidance on how to implement Environmental Justice once an Environmental Justice community is identified.

Key definitions are described below.

- "Fenceline community" means an area that contains all or part of a low-income community or community of color and that presents an increased health risk to its residents due to its proximity to a major source of pollution. Va. Code § 2.2-234.

- "Environment" means the natural, cultural, social, economic, and political assets or

[4] H.B. 704, Gen. Assemb., Reg. Sess. (Va. 2020), available https://lis.virginia.gov/cgi-bin/legp604.exe?201+ful+HB704ER2 (adding Va. Code § 2.2-234, *et seq.*). In addition to VEJA, the General Assembly adopted revisions to Va. Code § 10.1-1182 (defining Environmental Justice consistent with the VEJA definition) and §10.1-1183 (making it a purpose of DEQ to "further environmental justice" in regulatory and permitting processes and to "ensure the fair treatment and meaningful involvement of all people regardless of race, color, national origin, faith, disability, or income with respect to the administration of environmental laws, regulations, and policies"). *See* H.B. 1162, Gen. Assemb., Reg. Sess. (Va. 2020), available at https://lis.virginia.gov/cgi-bin/legp604.exe?201+ful+CHAP0454; H.B. 1163, Gen. Assemb., Reg. Sess. (Va. 2020), available at https://lis.virginia.gov/cgi-bin/legp604.exe?201+ful+CHAP0492. The revisions to Va. Code §§ 10.1-1182 and 1183 will also go into effect on July 1, 2020.

components of a community. *Id.*

- "Environmental Justice" means the fair treatment and meaningful involvement of every person, regardless of race, color, national origin, income, faith, or disability, regarding the development, implementation, or enforcement of any environmental law, regulation, or policy. *Id.*
    - "Fair treatment" means the equitable consideration of all people whereby no group of people bears a disproportionate share of any negative environmental consequence resulting from an industrial, governmental, or commercial operation, program, or policy. *Id.*
    - "Meaningful involvement" means the requirements that (i) affected and vulnerable community residents have access and opportunities to participate in the full cycle of the decision-making process about a proposed activity that will affect their environment or health and (ii) decision makers will seek out and consider such participation, allowing the views and perspectives of community residents to shape and influence the decision. *Id.*
- "Environmental Justice community" means any low-income community or community of color. *Id.*
    - "Low-income community" means any census block group in which 30 percent or more of the population is composed of people with low-income. *Id.*
        - "Low-income" means having an annual household income equal to or less than the greater of (i) an amount equal to 80 percent of the median income of the area in which the household is located, as reported by the Department of Housing and Urban Development, and (ii) 200 percent of the Federal Poverty Level. *Id.*
    - "Community of color" means any geographically distinct area where the population of color, expressed as a percentage of the total population of such area, is higher than the population of color in the Commonwealth expressed as a percentage of the total population of the Commonwealth. However, if a community of color is composed primarily of one of the groups listed in the definition of "population of color," the percentage population of such group in the Commonwealth shall be used instead of the percentage population of color in the Commonwealth. *Id.*
        - "Population of color" means a population of individuals who identify as belonging to one or more of the following groups: Black, African American, Asian, Pacific Islander, Native American, other non-white race, mixed race, Hispanic, Latino, or linguistically isolated. *Id.*[5]

[5] The General Assembly also recently passed a bill permanently establishing the Virginia Council on Environmental Justice ("VCEJ") as an advisory council. H.B. 1042, Gen. Assemb., Reg. Sess. (Va. 2020), available at

C. VDOT Guidance

To implement the policies of Environmental Justice, the Board can look to the *Environmental Justice Guidelines* developed and followed by a sister agency, VDOT. The VDOT Guidelines are based on federal guidance. Atlantic has incorporated the VDOT Guidelines into its analysis where informative. While not binding on the Board, the VDOT Guidelines represent a reasonable approach used by another Virginia agency to implement Environmental Justice.

Several aspects of the VDOT Guidelines are especially pertinent here. To identify an Environmental Justice community, VDOT recognizes that the first step is to consider census data, but census data is only a starting point to "flag" potential Environmental Justice communities. *Id.* at 7. VDOT recognizes that localized pockets of minority or low-income persons may not be picked up by census data so local site visits and/or calls should be conducted. *Id.*[6] VDOT further suggests that the project team contact specific sources to refine demographic information. *Id.* at 9. Some of these sources may include groups like homeowner/community associations; community action agencies; religious organizations; minority business associations; chambers of commerce; schools; economic and job development agencies; or community recreation centers, to name a few. *Id.* at 9-10.

The VDOT Guidelines further address how to determine whether an Environmental Justice community will suffer disproportionate impacts, including impacts to historic, religious, and cultural resources that are "especially important" to the community. The guidelines provide a list of specific items and questions to consider when performing this evaluation. These are considered and assessed below in Section IV.

II. Identification of Environmental Justice Community for BCS

A. Board's Prior Assumption That Environmental Justice Community Existed

In issuing the BCS permit, the Board assumed an Environmental Justice community existed and concluded that any Environmental Justice concerns were satisfied by the lack of health impacts to anyone (based on localized modeling results), including sensitive communities. On appeal, the Fourth Circuit found that the Board must make a specific finding whether an Environmental Justice community exists. Specifically, the court seeks "findings regarding the character of the local population at Union Hill, in the face of conflicting evidence." *Friends of Buckingham*, 947 F.3d at 86.

Given recent legislative developments, much of the prior debate over identifying whether an

http://lis.virginia.gov/cgi-bin/legp604.exe?201+sum+HB1042. The Governor signed it into law on March 3, 2020. The purpose of the VCEJ will be to "advise the Governor and provide recommendations that maintain a foundation of Environmental Justice principles intended to protect vulnerable communities from disproportionate impacts of pollution." *Id.* at § 2.2-2699.9. VCEJ defines "Environmental Justice" in a slightly more narrow way than VEJA, because it does not specifically mention people with disabilities. *See id.* at § 2.2-2699.8. VCEJ defines "Fair Treatment" and "Meaningful involvement" the same as VEJA. *Id.*

[6] This is consistent with federal guidance that also recognizes the possibility of "pockets" of Environmental Justice community that may not be reflected by census data. See EPA, Final Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analysis (Apr. 1998); EPA, Final Guidance for Consideration of Environmental Justice in Clean Air Act 309 Reviews (July 1999).

Environmental Justice community exists in the vicinity of BCS is now moot. The new statutory definition of "Environmental Justice community" will control in this permit process, and Atlantic applies the new definition here.

B. Additional Investigation

Atlantic performed additional investigation in accordance with the Fourth Circuit's decision, the definition of Environmental Justice community under VEJA, and VDOT guidance.

This investigation concludes that an "Environmental Justice community" exists to the north and east of the proposed facility along Union Hill Road, the north and eastern section of Shelton Store Road, and to the southeast of the facility. These areas qualify under the definitions of both "community of color" and "low-income community."[7] Although these areas do not qualify as a fenceline community because BCS is not a major source,[8] the Environmental Justice analysis has considered the health impacts to the identified "community of color" and "low-income community" in proximity to BCS and no health impacts were found. Attachment 2 depicts the locations of the community of color and of the low-income community, respectively. Areas to the west of the facility, including the southwest, do not qualify as Environmental Justice communities.

1. Existence of "Community of Color"

Building on the prior investigation of demographics near the proposed facility, Atlantic updated the analysis by conducting a more localized investigation. In accordance with VDOT guidance, Atlantic has conducted site visits and consulted with a variety of local sources (e.g., Buckingham government and religious leaders and other community members) to determine whether pockets of populations of color exist within 2 miles of the facility.

The investigation concludes that, in the area generally north and east of the proposed facility, the percentage of Black/African-American individuals significantly exceeds the percentage of Black/African American individuals in the Commonwealth as a whole.[9] Thus, this area qualifies as an Environmental Justice community. The area runs to the east of the facility north of S. James River Road (Rt. 56) along Union Hill Road (Rt. 663) until the intersection with Shelton Store Road (Rt. 660). The area continues along Shelton Store Road both west and east from that intersection. It runs west until approximately due north of the facility, and east until

[7] Note that VEJA defines a community to be an "Environmental Justice community" if a certain percentage of households in the community qualify as individuals of color or as low-income. Va. Code § 2.2-234. Therefore, not every resident in an Environmental Justice community is an individual of color or low-income. For instance, an Environmental Justice community exists if more than 30% of households are considered low-income, and here a significant number of households in the Environmental Justice community near the facility are not low-income. Likewise, the General Assembly has defined a community to be a "Community of Color" if the percentage of its population of color exceeds the statewide percentage. Id. Thus, any geographically distinct area where the Black/African American population exceeds approximately 20% is considered a Community of Color.

[8] BCS is not a major source because its potential to emit is less than 100 tons per year of any regulated pollutant. *See* 9 VAC 5-80-1110.C (defining major stationary source).

[9] The percentage of Black/African American individuals in Virginia is 19.9% according to the U.S. Census Bureau. *See* U.S. Census Bureau, *Quick Facts Virginia*, available at https://www.census.gov/quickfacts/fact/table/VA/RHI225218#RHI225218.

approximately its intersection with Sycamore Creek Road. *See* Attachment 2 (areas outlined in yellow). Also, an area generally southeast of the facility would be considered a Community of Color.

The investigation further showed that the areas generally to the west, including northwest and southwest of the facility do not meet the definition of Communities of Color. These areas have a very small minority population. Starting adjacent to the facility, the areas run to the west of the facility along South James River Road and north along Shelton Store Road until roughly due north of the facility. The area continues along Texas School Road. *See id.* (areas outlined in blue).

2. Existence of "Low-Income Community"

There is also an Environmental Justice community based on low-income status that encompasses roughly the same area as the Community of Color.

VEJA defines a "low-income community" as "any census block group in which 30 percent or more of the population is composed of people with low-income." Va. Code § 2.2-234. "Low-income" is defined as "having an annual household income equal to or less than the greater of (i) an amount equal to 80 percent of the median income of the area in which the household is located, as reported by the Department of Housing and Urban Development, and (ii) 200 percent of the Federal Poverty Level." *Id.*

For Buckingham County, the Buckingham County median family income ("MFI") for FY 2020 as reported by the Department of Housing and Urban Development ("HUD") is $61,700, 80 percent of which is $49,360. HUD, FY 2020 Median Family Income Documentation System, Median Family Income Calculation Methodology Applicable to Buckingham County, VA HUD Metro FMR Area.[10] The Federal Poverty Level ("FPL") depends on the size of the household. Atlantic used the FPL for 4 people per household to be consistent with the basis for the HUD MFI. The 2020 FPL for 4 people is $26,200 (85 Fed. Reg. 3060 (Jan. 17, 2020)) and 200 percent of the FPL is $52,400. The VEJA gives two different thresholds for low-income then directs the analyst to use the greater of the two values. Therefore, according to definitions from the VEJA, the low-income threshold for the area around the compressor station is $52,400. That value, derived from the FPL test, is the appropriate choice because it is higher than 80% of the HUD MFI.

The next step in the analysis is to determine if there is a low-income community in the area of the compressor station. To be considered a low-income community, at least 30% of the households in a census block group must have income below $52,400. There are three census block groups covering the 2-mile (3.2 kilometer) radius around the proposed facility as shown in Attachment 2. Based on EJSCREEN[11], two of those census block groups, B and C, are low-

[10] Available at https://www.huduser.gov/portal/datasets/il/il2020/2020MedCalc.odn. The HUD MFI is based on a 4-person household. HUD, Estimated Median Family Incomes for Fiscal Year (FY) 2020, Notice PDR-2020-01 (Apr. 1, 2020).

[11] The current version of EJSCREEN is based on 200 percent of the FPL, using 2019 data in its analysis. It does not allow the user to set a different income threshold. The 2019 4-person FPL was $25,750 as compared to the 2020 4-

income communities, while block group A is not.

Low-Income Community Screening with EJSCREEN

Geographic Area	% Low-income
Census Block Group 510299302.022 (A)	24%
Census Block Group 510299301.012 (B)	39%
Census Block Group 510299302.021 (C)	49%

The low-income communities roughly correspond with the communities of color. The exception is the community west of BCS and north of S. James River Hwy. The boundary between census block groups designated A and B in this analysis is the highway, which bisects this community. The population north of the highway is located in census block group B, which is considered a low-income community, while that south of the highway is located in census block group A, which is not a low-income community. As depicted in Attachment 2, this community is not considered a community of color, while part of it would be considered a low-income community per the VEJA definitions.

III. BCS Will Cause No Negative Environmental Consequences or Health Impacts To Any Community

Numerous analyses demonstrate that the facility will not cause adverse health impacts to any local or surrounding community, specifically including the Environmental Justice community. These analyses take into consideration sensitive populations such as may be found in Environmental Justice communities.[12] The analyses include:

1) Consideration of NAAQS and SILs (*de minimis* screening levels) as compared to modeled impacts;

2) Air toxics screening as compared to state regulatory levels and other cancer-risk screening levels;

3) The local community-focused study by VDH;

4) Analysis showing that the extremely small exposure levels are consistent with the minimal exposures that people experience in everyday life; and

5) Of particular significance for purposes of Environmental Justice, assessment showing that the area is not burdened with cumulative exposures from other major

person FPL of $26,200. Given the small difference between the two (< $500 difference), Atlantic evaluated whether there is a low-income community using the current version EJSCREEN.

[12] *See, e.g.*, FERC, *Atlantic Coast Pipeline and Supply Header Project, Final Environmental Impact Statement*, Docket Nos. CP15-554-000, CP15-554-001, CP15-555-000, and CP15-556-000 FERC/EIS-0274F, Vol. I, at 5-30 to -31 (July 2017) (AR012077-78) (African Americans are "especially sensitive" to increased pollution in part due to higher rates of asthma); EPA, *Environmental Justice Research Roadmap*, EPA 601/R-16/006, iv (Dec. 2016) ("…these population groups tend to be most burdened with adverse health conditions that either have environmental triggers or affect similar physiological systems as environmental pollution, such as cardiovascular disease, preterm birth, low birth weight, and asthma.").

sources of pollution.

These analyses all show, as noted previously, that even after BCS is operating, the air in the community – including the Environmental Justice community – will be cleaner than the air that the vast majority of Virginians breathe every day. *See* Board Meeting, Official Tr., at 18 (Jan. 8, 2019) (AR013879) (DEQ presentation). It will also be substantially the same as the air quality in the rest of Buckingham County.

Moreover, a supplemental analysis confirms that construction and operation of BCS will not cause negative impacts to historic cultural resources that are important to the community.

For the reasons detailed further below, the Board should make comprehensive findings that BCS will not cause adverse impacts to *any* community, even considering the potential sensitivities of the Environmental Justice community, as part of the Board's analysis of the "local character and degree of injury from PM and toxic substances" as directed by the Fourth Circuit's decision. The Board should also find that the site will not cause adverse impacts to historic cultural resources.

A. NAAQS

While the Fourth Circuit seemed to downplay their importance, compliance with the NAAQS has been widely accepted as powerful evidence to demonstrate a lack of health impacts, considering localized impacts and specifically including on sensitive Environmental Justice populations. NAAQS have been expressly accepted for this purpose in Virginia policy, and in state and federal regulatory proceedings and related appeals. Moreover, air modeling shows that ambient concentrations will not only be below the NAAQS, they will be *far below* them for all criteria pollutants.

1. Background on NAAQS

Atlantic recommends that the Board make specific findings explaining why the NAAQS are persuasive and why it is reasonable to rely on them in this permit proceeding. As shown below, and discussed in more detail in Attachment 3, the NAAQS are promulgated to protect sensitive populations at the local level and only after a comprehensive, science-driven process that includes substantial public participation. NAAQS are based on a review of numerous scientific studies, including studies of the most sensitive populations such as asthmatics.

The Clean Air Act requires EPA to set NAAQS for pollutants considered harmful to public health with an "adequate margin of safety." 42 U.S.C. §§ 7408(a); 7409(b). The NAAQS are developed and applied to protect health of sensitive populations at the local level. For example, EPA eliminated the option of using spatial averaging to assess compliance with the $PM_{2.5}$ NAAQS when it realized the technique could result in averaging away locally higher concentration in areas with larger populations of minorities or with lower socioeconomic status. 78 Fed. Reg. 3086, 3126-27 (Jan. 15, 2013).

Primary NAAQS are set to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly, wherever they may reside and are based on the best

available science. *See id.* § 7409(d), § 7408. Congress "emphasize[d] that among those persons whose health should be protected by the ambient standard are particularly sensitive citizens such as bronchial asthmatics and emphysematics who in the normal course of daily activity are exposed to the ambient environment." S. Rep. No. 91:1196 at 10, reprinted in 1 S. Comm. on Pub. Works, 93d Cong., *A Legislative History of the Clean Air Act Amendments of 1970*, at 410 (1974). The standard is to be set at "… the maximum permissible ambient air level…which will protect the health of any [sensitive] group of the population," and that for this purpose "reference should be made to a representative sample of persons comprising the sensitive group rather than to a single person in such a group." *Id.*

The NAAQS are science-driven. The Clean Air Act directs EPA to set NAAQS based on criteria that "accurately reflect the latest scientific knowledge." 42 U.S.C. §§ 7408(a)(2), 7409(b)(1)-(2). EPA recognizes that primary NAAQS must be set "at a level that avoids unacceptable risks to public health, including the health of at-risk populations."[13] When reducing the level of the annual $PM_{2.5}$ NAAQS from 15 $\mu g/m^3$ to 12 $\mu g/m^3$ in 2013, EPA was "mindful" that the Act required the standard be set "at a level that reduces risk sufficiently so as to protect public health, including the health of at-risk populations, with an adequate margin of safety." 78 Fed. Reg. 3086, 3161 (Jan. 15, 2013). EPA rejected a level of 13 $\mu g/m^3$ because it "would not appropriately take into account the more limited evidence of effects in some at-risk populations (e.g., low birth weight)." *Id*. at 3162. EPA based its decision, in part, on quantitative health risk and exposure assessments. IRP at 4-1 to 4-5. On April 14, 2020, EPA proposed to retain the current $PM_{2.5}$ NAAQS after reviewing thousands of studies, identifying populations at increased risk of pollution-related health effects, and considering analyses by agency experts and input from the Clean Air Act Scientific Advisory Committee.[14]

The standards recognize that risks from exposure to a pollutant may be influenced by intrinsic factors such as pre-existing disease, genetic factors, life stage, or extrinsic factors such as sociodemographic status. These influences may also be present in combination. For example, subsets of the population may be at increased risk due to socioeconomic status and also have a pre-existing condition. The NAAQS are set to be protective for even these sub-populations.

2. Widespread Acceptance of NAAQS in Environmental Justice Context

The 2018 Energy Plan directs DEQ to apply the NAAQS when evaluating Environmental Justice: "DEQ's existing obligations to ensure that all regulated entities comply with health-based standards will continue in all permitting activities to reduce public health burdens on all populations." *Id.* at 58. Thus, it is the policy of Virginia to use the health-based NAAQS to ensure that Environmental Justice communities do not bear disproportionate health burdens from energy facilities.

Virginia is not alone. EPA and the Environmental Appeals Board ("EAB") accept that

[13] Health and Envtl. Impacts Div., Office of Air Quality Planning and Standards, EPA, EPA-452/R-16-005, *Integrated Review Plan for the National Ambient Air Quality Standards for Particulate Matter* 6-1 to 6-2 (2016), *available at* https://www.epa.gov/naaqs/particulate-matter-pm-standards-planning-documents-current-review ("IRP").

[14] Information regarding EPA's proposal is available at https://www.epa.gov/pm-pollution/national-ambient-air-quality-standards-naaqs-pm.

compliance with the NAAQS demonstrates no negative impacts on Environmental Justice communities. The EAB has found that the "rigor of review" of the studies used to set the NAAQS makes them "the most reliable source of scientific information on which to base decisions." *In re Shell Gulf of Mex. Inc.*, 15 E.A.D. 103, 156 (EAB 2010) (citing 75 Fed. Reg. 6474, 6478 (Feb. 9, 2010)).

The EAB has consistently and unequivocally supported use of the NAAQS to show Environmental Justice communities are protected:

- *In re Pio Pico Energy Ctr.*, 16 E.A.D. 56 (EAB 2013) ("NAAQS are standards designed to protect public health, including the health of 'sensitive' populations such as asthmatics, children, and the elderly, with an adequate margin of safety, and to protect public welfare, including protection against visibility impairment and damage to animals, crops, vegetation, and buildings. Because NAAQS are health-based standards, the Agency often uses compliance with the NAAQS in the context of Environmental Justice as an indicator that Agency action will not result in disproportionately high and adverse human health or environmental effects on minority and low-income populations residing near a proposed facility.") (citing *In re Avenal Power*, 15 E.A.D. 384, 399 (EAB 2011); *In re Shell Offshore*, 13 E.A.D. at 404-05 (EAB 2007); *In re Knauf Fiber Glass, GmbH*, 9 E.A.D. 1, 16-17 (EAB 2000); *In re Ash Grove Cement Co.*, 7 E.A.D. 387, 417-18 (EAB 1997)).

- *In re Sutter Power Plant*, 8 E.A.D. 680, 692 (EAB 1999) (describing the NAAQS as the "bellwether of health protection").

- *In re Energy Answers Arecibo, LLC*, 16 E.A.D. 294, 326 (EAB 2014) (NAAQS are appropriate to use in Environmental Justice analysis because they "are designed to protect public health with an adequate margin of safety, including sensitive populations such as children, the elderly, and asthmatics.").

- *In re Shell Gulf of Mex. Inc.*, 15 E.A.D. at 156 ("In the context of an Environmental Justice analysis, compliance with the NAAQS is emblematic of achieving a level of public health protection that, based on the level of protection afforded by a primary NAAQS, demonstrates that minority or low-income populations will not experience disproportionately high and adverse human health or environmental effects due to exposure to relevant criteria pollutants.").

Courts have likewise agreed that agencies can reasonably rely on the NAAQS when evaluating Environmental Justice impacts. *See Coalition for Healthy Ports v. U.S. Coast Guard*, 2015 WL 7460018, *25 n.33 (S.D.N.Y. Nov. 24, 2015) ("The Coast Guard's determination that air quality in the communities immediately adjacent to the Project would comply with NAAQS even during the construction phase further supports its conclusion that such local adverse impacts would not be significant.").

B. Concentrations are Far Below NAAQS

Air modeling has shown that the facility will not cause or contribute to an exceedance of any of

the NAAQS—even at the closest residences in the Environmental Justice community (and any other community). As Table 1 below shows, the highest total modeled concentrations will be far below the NAAQS and are mostly reflective of background; that is, they are not even associated with the facility itself. *See* M. Kiss, Air Quality Analysis–Buckingham County Compressor Station (DEQ July 13, 2018). The highest modeled concentrations are generally at the BCS fenceline, within the property boundary (*see* Board Meeting Transcript at 27-29 (Dec. 19, 2018) (AR011688-90); concentrations rapidly decrease the farther away from the facility. Given that NAAQS are set to protect even the most sensitive populations with an adequate margin of safety, the fact that BCS's modeled concentrations are far below the NAAQS is further evidence that the Environmental Justice community is protected. *See In re Energy Answers Arecibo, LLC*, 16 E.A.D. at 329 (agreeing that where modeled concentrations are far below the NAAQS, emissions do not pose a disproportionate or adverse impact); *In re Ecoelectrica*, L.P., 7 E.A.D. 56, 68-69 (EAB 1997) (same).

Table 1 – Maximum Modeled Impacts

Pollutant (Averaging Period)	Highest Modeled Concentration (Facility and Other Sources) ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Total Concentration (Modeled plus Background) ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	% of Standard
NO_2 (1-hour)	42.0	75.2	117.2	188	62%
NO_2 (Annual)	3.5	16.92	20.4	100	20%
CO (1-hour)	303	1,374	1,677	40,000	4%
CO (8-hour)	122	1,259.5	1,382	10,000	14%
$PM_{2.5}$ (24-hour)	6.6	15	21.6	35	62%
$PM_{2.5}$ (Annual)	1.5	7.2	8.7	12	73%
PM_{10} (24-hour)	9.1	27	36.1	150	24%

Indeed, the VDH Study verifies both (i) how quickly the concentrations drop off when moving away from the facility and (ii) how far below the NAAQS and other standards are those concentrations at the five nearest residences in each direction.[15] The concentrations presented in Table 1 of the VDH Study,[16] reproduced as Table 2 below, represent the highest modeled and total concentration at any of the five nearest residences.

[15] Of note, the annual and 24-hour $PM_{2.2}$ total concentrations at any of the nearest residences are even below the most recent alternative standard levels considered by EPA (8-10 $\mu g/m^3$ for the annual standard and 30 $\mu g/m^3$ for 24-hour standard). EPA-452/R-20-002, "Policy Assessment for the Review of the National Ambient Air Quality Standards for Particulate Matter" (January 2020). As previously discussed, EPA has proposed to retain the current $PM_{2.5}$ NAAQS.

[16] VDH Study at 3-4 (Table 1).

Table 2 – Maximum Impact at Residential Location

Pollutant	Averaging Period	Highest Modeled Concentration (µg/m^3)	Highest Total Concentration with Background (µg/m^3)	Comparison Value (µg/m^3)	Comparison Value Type
NO_2	1-hour	8.05	83.25	188	NAAQS
NO_2	Annual	0.63	17.55	100	NAAQS
CO	1-hour	120.58	1494.58	40,000	NAAQS
CO	8-hour	18.67	1278.17	10,000	NAAQS
PM_{10}	24-hour	1.97	28.97	150	NAAQS
$PM_{2.5}$	24-hour	1.06	16.06	35	NAAQS
$PM_{2.5}$	Annual	0.19	7.39	12	NAAQS
Formaldehyde	1-hour	10.85	10.85	49	Acute EMEG
Formaldehyde	Annual	0.02242	0.02242	0.077	CREG
Hexane	1-hour (Pigging – Receiving)	521.63	521.63	180,000	PEL
Hexane	1-hour (Pigging – Launching)	422.11	422.11	180,000	PEL
Hexane	1-hour (Normal Operation)	3.71	3.71	700	RfC
Hexane	1-hour (Startup Purge)	228.12	228.12	180,000	PEL
Hexane	1-hour (Shutdown Vent)	737.16	737.16	180,000	PEL

NAAQS: National Ambient Air Quality Standards. EMEG: Environmental Media Evaluation Guide. CREG: Cancer Risk Evaluation Guide. PEL: Permissible Exposure Limit (10 hour time-weighted average). RfC: Reference Concentration.

The PM concentrations at those nearest five residences are almost entirely due to background, and the facility's modeled contributions are a small fraction of the total concentrations.

In addition, the isopleths from the original modeling further confirm that the impacts from the facility, which are extremely small in any event and far below health-based standards, are confined to areas very close to the facility. Buckingham County Compressor Station Air Quality Modeling Report (July 10, 2018). *See also* Board Meeting, Official Tr., at 89-90 (Nov. 9, 2018) (AR010998-99). Most of the modeled concentrations in the Environmental Justice community are below screening levels that EPA considers *de minimis*.[17]

For $PM_{2.5}$ in particular, the SILs demonstrate just how insignificant the facility's impact is. In

[17] For criteria pollutants, EPA has adopted screening levels that are considered to be *de minimis*, known as Significant Impact Levels ("SILs"). If modeling demonstrates that a source will contribute less than the SIL, those emissions are deemed to have *de minimis* impacts. Accordingly, SILs have been used to show no adverse impact on an Environmental Justice community. *See, e.g.*, *In re Prairie State Generating Co.*, 13 E.A.D. 1, 124 (EAB 2006); *In re AES Puerto Rico*, 8 E.A.D. 324, 350-51 (EAB 1999); *In re Heritage Power LLC*, 2000 WL 34440871 (N.Y. State Bd. Elec. Generation Siting and Envt. 2000).

April 2018, EPA released guidance about use of certain SILs.[18] *See* Memorandum from Peter Tsirigotis, Dir., Office of Air Quality Planning & Standards, EPA, to Regional Air Div. Dirs., Regions 1-10, (Apr. 17, 2018) ("Tsirigotis Memo"). This guidance specified SILs, including the SIL for $PM_{2.5}$, that could be used on a case-by-case basis to show that a proposed source would have an insignificant impact on air quality. *Id.* Attachment at 3, 7. The $PM_{2.5}$ SILs are set at a level at which a proposed source's impact on air quality would not even be *detectable*.[19]

C. Air Toxics

Virginia regulates toxics, including pollutants designated as Hazardous Air Pollutants ("HAP") not otherwise subject to federal standards, under the "state toxics rule." 9 VAC 60-300, *et seq.* This rule sets health-based criteria for toxic emissions. Here, only emissions of formaldehyde were above the screening levels ("exemption levels") in 9 VAC 5-60-300C and thus subject to modeling to determine the ambient air concentrations resulting from those emissions. Although below the screening levels, hexane emissions were also modeled at DEQ's direction. Modeled air concentrations resulting from the formaldehyde and hexane emission are well below the regulatory levels that Virginia has determined to be acceptable. Those levels, like the NAAQS, are entirely health-based with no consideration given to economic or technical feasibility.

Evaluation of the modeling of formaldehyde and hexane emissions with a focus on the Environmental Justice community (as well as other immediately adjacent residences) confirms the lack of appreciable health risks from air toxics. In addition to showing that the ambient air concentrations will be well below the Virginia health-based standards, the modeling also shows that *no* receptors outside the facility's fenceline experience concentrations representing exposures at or above risk-based concentrations (RBCs).[20] As with NAAQS, the RBCs are set to protect sensitive populations and to provide margins of safety to account for uncertainty. Thus, this modeling analysis provides additional support for the conclusion that no group will suffer any appreciable health risks from air toxics emitted by BCS.

To further verify that air toxics from BCS will not pose a threat to health in the community, Atlantic retained Ramboll to perform a health screening assessment for lifetime cancer and non-cancer risks. *See* Ramboll US Corp., *Health Screening Assessment, Buckingham Compressor*

[18] Available at https://www.epa.gov/nsr/guidance-significant-impact-levels-ozone-and-fine-particles-prevention-significant-deterioration.

[19] EPA derived the $PM_{2.5}$ SILs using a statistical approach that allowed EPA to set SILs at a level "indistinguishable from the inherent variability in the measured atmosphere [that] may be observed even in the absence of the increased emissions" from the proposed source. Tsirigotis Memo Attachment at 10-11; Air Quality Assessment Division, Office of Air Quality Planning & Standards, EPA, EPA-454/R-18-001, Technical Basis for the EPA's Development of the Significant Impact Thresholds for $PM_{2.5}$ and Ozone 8-22 (2018), *available at* https://www.epa.gov/nsr/significant-impact-levels-ozone-and-fine-particles.

[20] The inhalation cancer RBC for formaldehyde of 0.22 $\mu g/m^3$ corresponds to an excess lifetime cancer risk of 1 x 10^{-6}; the inhalation non-cancer chronic RBC for formaldehyde of 10 $\mu g/m^3$ and hexane of 730 $\mu g/m^3$ corresponds to a hazard quotient of 1. EPA, *Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites* (Nov. 2019). The inhalation acute RBC for formaldehyde of 55 $\mu g/m^3$ corresponds to a hazard quotient of 1. California Environmental Protection Agency, Office of Environmental Health Hazard Assessment ("OEHHA"), *Acute, 8-hour and Chronic Reference Exposure Level (REL) Summary* (2018); available online at https://oehha.ca.gov/air/general-info/oehha-acute-8-hour-and-chronic-reference-exposure-level-rel-summary (last accessed March 4, 2020). The inhalation acute RBC for hexane of 910,000 $\mu g/m^3$ is the DOE Protective Action Criteria ("PAC") - Revision 29 (May 2016).

Station (March 12, 2020) (Attachment 4). Using a methodology that is accepted by EPA and DEQ, the assessment concluded: "[m]odeled emissions from normal operations will be below concentrations that might pose a level of health concern, using consistently conservative assumptions." *Id.* at ES-1. Further, for short-term exposures, the Assessment concluded: "chemical concentrations will be below the concentrations that USEPA and other States or the Commonwealth have determined even a sensitive individual can be exposed to without risk for noncancer acute health impacts." *Id.* at ES-2.

D. VDH Study

As the Board required when issuing the permit originally, VDH has since analyzed the potential public health implications of emissions from BCS. VDH concluded that the modeled air concentrations do not represent a health hazard in the community, even to sensitive populations.[21] VDH Study at 1.

In making its findings about BCS, it is reasonable and prudent for the Board to rely on VDH's conclusions. VDH is the sister agency charged with protecting, improving, and preserving public health in the Commonwealth.[22] It is staffed by public health experts who have confirmed that prior analyses were correct.

The Friends of Buckingham have submitted a brief criticism of the VDH Study, but this superficial paper falls well short of establishing that the VDH Study is flawed. *See* Attachment 5 (explaining shortcomings of the Friends of Buckingham criticism).

E. Low Level of Exposures in Context

As the Board is aware, emissions from BCS are very low. It is a minor source with advanced controls to minimize emissions. Background concentrations are likewise low in the area.

To place the concentrations in context for the pollutants that have drawn the most attention in this proceeding, Ramboll compared exposures from the facility's emissions to a variety of exposures that might be encountered in common situations. *See* Ramboll US Corp., Memo from D. Kaden, et al. to T. Andrake (Attachment 6). For instance, exposure to $PM_{2.5}$ from mowing a lawn with a gas-fueled push mower for 3 hours a year, or gas-fueled riding mower for 1.5 hours a year, would be equivalent to the $PM_{2.5}$ exposure from a year's emissions from BCS. For formaldehyde, the equivalent exposure would be mowing a lawn with a gas-fueled riding mower for 2 hours per year, or a gas-fueled push mower for 16 minutes in a year.

[21] For each pollutant, VDH evaluated the maximum modeled concentration of the five receptors selected by DEQ to represent the nearest houses to the facility in each direction.

[22] *See* Va. Code § 32.1-2 ("The General Assembly finds that the protection, improvement and preservation of the public health and of the environment are essential to the general welfare of the citizens of the Commonwealth. For this reason, the State Board of Health and the State Health Commissioner, assisted by the State Department of Health, shall administer and provide a comprehensive program of preventive, curative, restorative and environmental health services, educate the citizenry in health and environmental matters, develop and implement health resource plans, collect and preserve vital records and health statistics, assist in research, and abate hazards and nuisances to the health and to the environment, both emergency and otherwise, thereby improving the quality of life in the Commonwealth.").

These comparisons are further evidence that BCS will not cause health impacts anywhere in the community.

F. The Area is Not Burdened by Pre-existing Sources of Pollution

When conducting Environmental Justice analyses, many agencies take into account whether the community is already overburdened by other sources of pollution.[23] As a preliminary matter, the NAAQS analysis considers cumulative impacts by including background concentrations and by including other sources in air modeling (i.e., cumulative modeling). In addition to the NAAQS modeling, DEQ used EJSCREEN earlier in the permitting process to evaluate various indicators of cumulative burdens. *See* Board Meeting, Official Tr., at 60-63 (Nov. 9, 2018) (AR010969-72).

As shown previously and as re-affirmed below, the area near BCS is not burdened by other major sources of pollution. Thus, the Environmental Justice community will not suffer any disproportionate health impacts as a result of cumulative exposures. Atlantic recommends that the Board make a specific finding that the minimal cumulative burden on the Environmental Justice community does not result in any disproportionate impact.

As has been noted by DEQ, the individuals in the community will be breathing cleaner air than the vast majority of Virginia residents even after BCS goes into operation. Board Meeting, Official Tr., at 18 (Jan. 8, 2019) (AR013879); *Friends of Buckingham*, 947 F.3d at 79.

In addition, Atlantic commissioned a review of the TRI Inventory to determine toxic releases within 10 kilometers of BCS.[24] *See* Ramboll US Corp., *Considerations Related to Whether Neighboring Communities are Overburdened Based on Information Reported in the Toxics Release Inventory (TRI)* (Feb. 25, 2020) (Attachment 7). The data is current through 2018. There are no facilities subject to TRI reporting within the 10 kilometers.

Furthermore, DEQ maintains an inventory of major and minor sources of air pollution, as defined in Article 6 and Article 8 of the Board's regulations. DEQ developed an inventory of major and minor sources for use in the cumulative air quality modeling analysis performed for BCS. The inventory did not include any such sources within 10 kilometers.

[23] *See, e.g., Environmental Justice: Research Roadmap* at 4 (EPA Dec. 2016) ("'Overburdened'" describes ethnic minority, low-income, Tribal, and indigenous populations or communities in the United States that potentially experience disproportionate environmental harms and risks due to exposures or cumulative impacts or greater vulnerability to environmental hazards. This increased vulnerability may be attributable to an accumulation of both negative and lack of positive environmental, health, economic, or social conditions within these populations or communities, including the inability to participate meaningfully in the decision-making process."), *available at* https://www.epa.gov/sites/production/files/2017-01/documents/researchroadmap_environmentaljustice_508_compliant.pdf.

[24] *See also In re Energy Answers Arecibo, LLC*, 16 E.A.D. at 324 (appropriate to consider the Toxic Release Inventory ("TRI") when evaluating the cumulative impact of pollution on a community); *In re AES Puerto Rico*, 8 E.A.D. at 351 (same). The TRI is an EPA database that provides a rigorous compilation of data on toxic chemical releases and pollution prevention activities by industrial and federal facilities throughout the United States.

G. Site Suitability – Historic Cultural Resources

Some commenters have suggested that the Board did not address impacts to historic cultural resources that are significant to the Environmental Justice community. To the extent that Va. Code § 10.1-1307.E encompasses such impacts, Atlantic commissioned an analysis to supplement the prior work of DEQ and the Department of Historic Resources ("DHR"). *See* ERM, *Summary of Cultural Resource Findings and Recommendations for the Buckingham Compressor Station, Buckingham County, Virginia* (Attachment 8). This analysis confirms that BCS will not result in impacts that render the site unsuitable for the compressor station, whether from a general standpoint or based on Environmental Justice principles.

The ERM study reviewed the historic cultural resources in the community, and considered the potential impacts from BCS. The study also applied the VDOT Guidelines on Environmental Justice, which ask whether the project will impact any "especially important social, religious, or cultural function" for the Environmental Justice community. VDOT Guidelines at 12. The impacts considered included noise, visual, and other impacts. *Id*. The ERM study also addresses each of the comments that had criticized the prior analyses of historic cultural resources performed in support of the FERC licensing process.

The ERM study concludes that historic and cultural resources are not impacted by BCS. Distance plays a large role. For instance, the Union Hill Baptist Church, Variety Shade Plantation, and Union Grove Baptist Church, resources identified as important to the community, are all more than one mile from BCS. BCS is outside the viewshed of the identifiable resources, and existing conditions in the FERC certificate, the Special Use Permit ("SUP"), and the Board's previously issued air permit protect against air and noise impacts to those resources. *Id*. Trees and buffers provide additional protection against impacts.

Moreover, Atlantic developed an Unanticipated Discovery Plan outlining the steps to be taken if currently unknown resources are later discovered during project construction (e.g., unmarked gravesites). *Plan for the Unanticipated Discovery of Historic Properties or Human Remains During Construction in Virginia* (AR011259-72). The Plan is part of the Programmatic Agreement entered into by FERC, DHR and the Advisory Council on Historic Preservation, among others, to resolve any adverse effects on resources that could not be fully determined prior to approval. *See* AR011273-94 (Programmatic Agreement without attachments). The Programmatic Agreement establishes a process, which includes opportunity for public participation, and identifies the necessary parties for resolving any outstanding potential adverse effects to historic and cultural resources.

IV. BCS Will Cause No Disproportionate Health Impacts in the Environmental Justice Community

Because the facility's strictly controlled emissions will not threaten adverse health impacts in *any* community – even accounting for sensitive populations – there can be no adverse disproportionate impacts on the Environmental Justice community.[25] Absent any adverse

[25] This is entirely consistent with the Commonwealth's 2018 Energy Plan, which implements the statutory policy to ensure no disproportionate impacts result from energy developments: "DEQ's existing obligations to ensure that all

impact, the "fair treatment" requirement of the VEJA is satisfied because "no group of people bears a disproportionate share of any negative environmental consequence." This is true whether the comparison population is at the local, county, or state level.

Moreover, there can be no disproportionate impact on an Environmental Justice community because multiple analyses demonstrate that the potential health impacts—no matter how small—will not fall disproportionately on the Environmental Justice community. These analyses compare the impacts in the Environmental Justice communities to the impacts on their neighbors, and they consider the questions suggested by VDOT guidance.

A. Localized Comparative Analysis

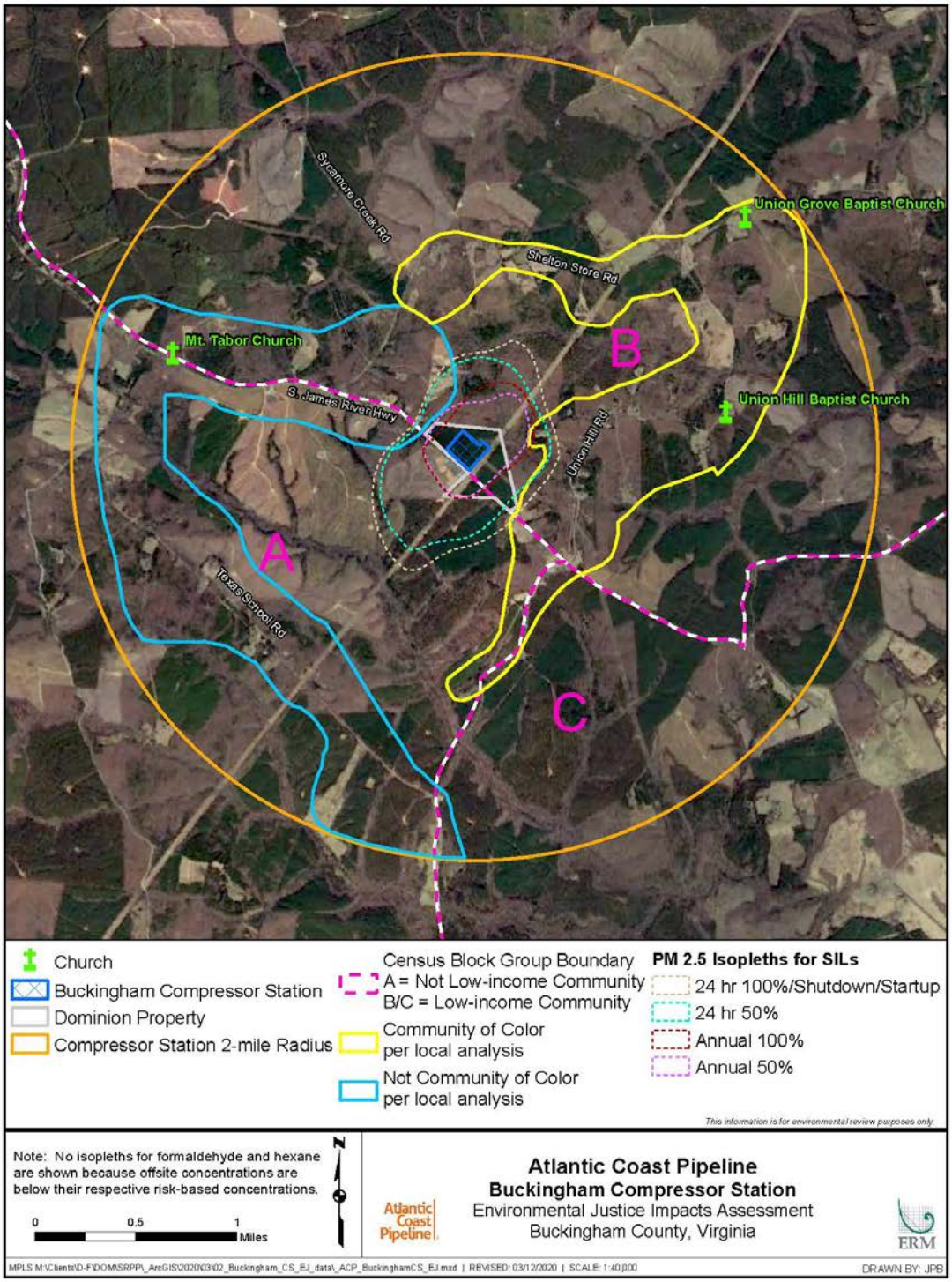
The Fourth Circuit expressed concern that the Board had not considered the relative impact of the facility's emissions on the Environmental Justice community as compared to their neighbors in Buckingham County. But, Atlantic performed, and DEQ validated, air quality modeling out to 20 kilometers from the facility that included emissions from both BCS and other nearby sources. That modeling establishes that the Environmental Justice community bears no greater share of impacts than their neighbors do. A comparison of the impacts – no matter how slight – on both the Environmental Justice community and their neighbors demonstrates that the Environmental Justice community is not bearing any greater share of those impacts than any other group. The air quality will remain comparable to the air quality in the rest of Buckingham County.

This can be shown graphically with isopleths based on the $PM_{2.5}$ SILs (i.e., *de minimis* screening levels) using the air modeling already in the record.[26] As noted above, the communities of color are to the north, east, and southeast of the facility. The non-communities of color households are situated to the west and southwest of the facility, and hence, to the west of the communities of color. As shown in Figure 1 below for $PM_{2.5}$, the modeled low-level impacts run from the facility for a short distance essentially between the communities of color and non-communities of color. Figure 1 likewise shows no disproportionate impacts on the low-income communities.

regulated entities comply with health-based standards will continue in all permitting activities to reduce public health burdens on *all* populations." 2018 Energy Plan at 58 (emphasis added).

[26] Atlantic Coast Pipeline, LLC, Buckingham County Compressor Station Air Quality Modeling Report (July 2018) (AR001901-87); Final and Supplemental Modeling files at AR013986. Isopleths for each operating scenario for the criteria pollutants (based on the NAAQS) and the air toxics formaldehyde and hexane are provided in the Modeling Report.

Figure 1 – Environmental Justice Impacts Assessment



As Figure 1 demonstrates, the concentrations for $PM_{2.5}$ for all operating scenarios extend barely beyond the BCS fence-line and do not affect the Environmental Justice communities any more than the non-Environmental Justice communities. These isopleths show that, even at the screening levels that EPA deems *de minimis* (i.e., SILs), the Environmental Justice community will not bear a disproportionate burden.[27] Similarly, Atlantic evaluated the air toxics concentrations as compared to accepted risk-based concentration ("RBC") levels and found that the offsite impacts were all less than those levels (i.e., isopleths based on the RBCs for formaldehyde and hexane would not extend beyond the fenceline much less the Atlantic property boundary). See Health Screening Assessment. Thus, to the extent the impacts for the relevant pollutants even reach the various communities, those impacts do not disproportionately fall on the Environmental Justice communities.[28]

B. VDOT Considerations for Assessing Disproportionate Impacts

As noted previously, while not controlling in the air permit context, VDOT provides guidance for analyzing the potential for disproportionate impacts. The responses to the VDOT questions are in italics below:

- Is the adverse effect predominantly borne by the Environmental Justice population? For example, are more minority or low-income people impacted than non-minority or non-low-income people? Is the percentage of minority or low-income people impacted greater than the percentage of minority or low-income people in the study area?

  No. There are no adverse or negative environmental consequences; and irrespective of the de minimis scope of potential health impacts, those impacts will not fall disproportionately on the Environmental Justice community. See Sections III and IV.

- Will the adverse effect on the Environmental Justice population be appreciably more severe or greater in magnitude than the adverse effect on the non-minority or non-low-income population? In other words, will the Environmental Justice population carry an unfair portion of the impact?

  No. See response to 1.

- Does the project impact a resource that is especially important to Environmental Justice populations? Does it serve an especially important social, religious or cultural

[27] *See Ash Grove Cement*, 7 E.A.D. at 413-14 (upholding permitting authority's finding of no disproportionately high and adverse human health or environmental effects based on conclusion that minority and/or low-income populations identified were outside the area principally impacted by facility's emissions) (cited in *Shell Gulf of Mex. Inc.*, 15 E.A.D. at 478).

[28] The EAB approved an Environmental Justice analysis that similarly compared modeled air impacts on specific low-income barrios in a community that was otherwise not considered low-income. *See In re Energy Answers Arecibo, LLC*, 16 E.A.D. at 329 ("These maps showed that the predicted impacts of the proposed facility, at their highest levels in terms of area and time, were distributed evenly in and around the Arecibo area without disproportionately impacting low-income communities."). *See also In re Prairie State Generating Co.*, 13 E.A.D. 1, 124 (approving agency's conclusion that "residents of low-income communities would not experience air quality impacts from the plant that are different than those experienced by residents of more affluent communities.").

function for the Environmental Justice community?

No. The resources identified (e.g., Union Hill Church, Union Grove Church) are far outside the areas covered by the SILs. See Figure 1. That is, the modeling shows that the facility's impacts on those resources are below levels that are considered by regulatory agencies as de minimis or trivial.[29] *Moreover, these sources are located outside of the BCS viewshed and are protected from noise impacts. See Sections III and IV.*

- Are there mitigations, enhancement measures or offsetting project benefits to the affected Environmental Justice population?

  Yes, see Section V.

- What are the type and severity of adverse effects on non-Environmental Justice populations?

  As with the Environmental Justice populations, there are no adverse effects. See Section III.

In the context of BCS, the answers to these questions uniformly demonstrate that there will be no disproportionate impacts to an Environmental Justice community. Even in the absence of disproportionate impacts, and as discussed below, Atlantic has implemented significant enhancements to address issues of community concern – access to health care, emergency services, and a community center, to name a few.

V. The Board Should Explicitly Recognize the Significant Mitigation and Enhancement Measures in Place

Environmental Justice guidance, such as the VDOT Guidelines, widely recognize that mitigation and enhancement are appropriate measures to offset potential impacts on Environmental Justice communities. *See, e.g.*, Plan EJ 2014, Considering Environmental Justice in Permitting at 11, 14 (EPA 2011) (mitigation as part of Environmental Justice in permitting).[30] Here, BCS will cause no adverse health impacts, much less disproportionate impacts on an Environmental Justice community. Nonetheless, Atlantic has agreed to significant mitigation and enhancement measures, and the Board should make specific findings about them to further support the conclusion that the BCS site is suitable under Va. Code § 10.1-1307.E and that the permit is consistent with Environmental Justice.

A. Mitigation

The BCS permit calls for unprecedented measures to mitigate the impact of emissions from the facility. As DEQ has noted on many occasions, the permit is the most stringent in the nation for

[29] *See, e.g., Prairie* State, 13 E.A.D. at 96 (Petitioners failed to show evidence of "potential non-trivial impact"); *Ash Grove Cement*, 7 E.A.D. at 413-14 (no disproportionate impact on Environmental Justice community if farther away than the area principally impacted by facility's emissions).
[30] Available at https://nepis.epa.gov/Exe/ZyPDF.cgi/P100ETRR.PDF?Dockey=P100ETRR.PDF.

a compressor station such as this. *See* DEQ, *Response to Public Comments*, at 33 (Oct. 24, 2018) (AR009831); Board Meeting, Official Tr., at 14-15, 32, (Jan. 8, 2019) (AR013875-76, 93); Board Meeting, Official Tr., at 18 (Nov. 8, 2018) (AR009872). It has become a template for recent permits for similar facilities. For instance, the permit sets emission limits based on use of a control device, selective catalytic reduction ("SCR"). SCR will reduce emissions of NOx by approximately 58%. An oxidation catalyst and vent gas reduction systems, among others, are also being utilized to significantly reduce emissions. Moreover, Atlantic has agreed to install continuous emission monitors on its combustion turbine exhaust stacks, to conduct additional emissions testing and monitoring, to perform fuel testing, and to conduct ambient monitoring to provide ongoing air quality data. The Board also required the additional VDH study, which found no impacts and calls for additional study after the facility is operational.

These mitigation measures build on the measures required by Buckingham County and by the Federal Energy Regulatory Commission ("FERC") to ensure appropriate site suitability and mitigation of any potential site impacts. For example, the Buckingham County Board of Supervisors issued a comprehensive SUP for the proposed BCS and imposed 41 specific requirements, many of which relate to the compressor station's operations, safety, emergency procedures, noise, light, traffic, compliance, and enforcement. These local conditions address the non-air related safety, emergency response, and quality of life issues that commenters raised in the proceedings. They are intended to, and do, mitigate various aspects of the impacts from construction and operation of BCS.[31]

B. Enhancement

One of the express purposes of Environmental Justice is to give communities a meaningful voice in the process. *See* VEJA ("'Meaningful involvement'" means … that (i) affected and vulnerable community residents have access and opportunities to participate in the full cycle of the decision-making process about a proposed activity that will affect their environment or health and (ii) decision makers will seek out and consider such participation, allowing the views and perspectives of community residents to shape and influence the decision."). In addition to the DEQ and Board's efforts, Atlantic here solicited meaningful involvement, which led directly to numerous significant measures that qualify as community "enhancement" under the VDOT Guidelines.[32]

Atlantic has worked closely with stakeholders and residents in the community to develop and commit to a $5.1 million community investment package for the Greater Union Hill Community Development Corporation. *See* Dominion Energy, *Community Engagement Report*, (Oct. 26, 2018) (AR011178-195) (Attachment 1). The community enhancement includes public safety items and community revitalization efforts, with a focus on community health improvements. For public safety, enhancements include (i) six emergency responder positions through a revised

[31] The Fourth Circuit made clear that the Board may not rely exclusively on the County's SUP to satisfy site suitability under Va. Code § 10.1-1307.E. *Friends of Buckingham*, 947 F.3d at 92. The Board should therefore make a specific finding that it is not relying solely on the SUP, but on a combination of numerous facts in the record, including but not limited to those discussed herein.

[32] Environmental Justice should not look only at potential negative impacts, but also consider the positive impacts of development activity on a community. Environmental Justice communities should not be deprived of opportunities to improve economic well-being, health, education, and safety that other communities benefit from.

contract with Delta Response Team; (ii) needed emergency facility upgrades; (iii) a dedicated emergency line/channel designated for Union Hill; and (iv) supplemental emergency equipment for Buckingham County. For community revitalization and to improve community health, education and economic development, enhancements include (i) a Community Wellness, Education and Economic Development Center in the Union Hill community; (ii) a community park and event pavilion in the Union Hill community; and (iii) a Community Development Cooperation to support and/or administer the Community Center and Park and to provide specific economic benefits to Union Hill residents living in close proximity to the proposed facility.

VI. Conclusion

The permit for BCS satisfies all legal requirements of Environmental Justice, and the analyses herein provide ample basis for the Board to issue detailed findings as directed by the Fourth Circuit Court of Appeals.

List of Attachments

Attachment 1 – Dominion Energy Transmission Inc., *Community Engagement Report* (Oct. 26, 2018)

Attachment 2 – Figure depicting Environmental Justice Community

Attachment 3 – NAAQS and Environmental Justice

Attachment 4 – Ramboll US Corp., *Health Screening Assessment, Buckingham Compressor Station* (March 12, 2020)

Attachment 5 – Response to Friends of Buckingham Critique of the VDH Letter Health Consultation

Attachment 6 – Ramboll US Corp., Memo from D. Kaden, et al. to T. Andrake (March 12, 2020)

Attachment 7 – Ramboll US Corp., *Considerations Related to Whether Neighboring Communities are Overburdened Based on Information Reported in the Toxics Release Inventory (TRI)* (Feb. 25, 2020)

Attachment 8 – ERM, *Summary of Cultural Resource Findings and Recommendations for the Buckingham Compressor Station, Buckingham County, Virginia* (Apr. 22, 2020)

ATTACHMENT 1

Community Engagement Report

Atlantic Coast Pipeline

Union Hill/Union Grove/Shelton's Store Communities

Buckingham County, Virginia

October 26, 2018

Executive Summary

The Atlantic Coast Pipeline ("ACP" or "Project") is a proposed interstate natural gas transmission system that will serve the growing energy needs in the Mid-Atlantic including Virginia, West Virginia and North Carolina. The ACP is being developed by Atlantic Coast Pipeline, LLC ("Atlantic"), a company comprised of subsidiaries of Dominion Energy, Duke Energy and Southern Company. Atlantic has contracted Dominion Energy Transmission, Inc. ("Dominion Energy") to permit, construct, operate and maintain the ACP.

At certain locations along the route of the ACP, compressor stations are required to compress the natural gas to maintain the flow of gas as changes in elevation and friction slow down the flow of gas over long distances. One such compressor station is planned to be located on an approximately 70 acre parcel owned by Atlantic and located along Route 56 in Buckingham County, Virginia ("Buckingham Compressor Station"). During the course of developing the Buckingham Compressor Station, Dominion Energy engaged with and heard concerns from many stakeholders relating to the health, safety, economic and other effects of the proposed Buckingham Compressor Station, including concerns from residents of the nearby Union Hill/Union Grove/Shelton's Store communities ("Union Hill").

Dominion Energy is committed to operating its businesses in a long-term sustainable manner protecting the environment; ensuring the safety of its employees, customers and stakeholders; and acting as a socially responsible good corporate citizen. One key aspect of operating in a sustainable manner involves Dominion Energy's commitment to partner and strengthen the communities where it does business, which are also the same communities that its employees live, work and play. Accordingly, Dominion Energy engaged in dozens of community meetings, events and activities with the residents of Buckingham County and Union Hill in particular with the goal of working in concert with the residents to strengthen the Union Hill community, address concerns raised by Union Hill residents and inform the community on the safety and environmental systems and plans that form an integral part of the ACP and specifically the Buckingham Compressor Station.

As a result of these community engagement activities, and in furtherance of Dominion Energy's commitment to partner and strengthen the communities where it does business, Dominion Energy in concert with residents of Union Hill, developed a set of comprehensive proposals that we believe will serve to enhance and strengthen the Union Hill community while also simultaneously addressing concerns identified by residents of Union Hill. The support package is divided into two primary sections: 1.) public safety items, and 2.) community revitalization efforts. The recommended investments in enhancements and activities total an estimated **$5,120,000**. Community support for these recommendations is evidenced by the letters signed by numerous residents of Union Hill attached hereto in **Appendix A**.

1 Introduction

The Atlantic Coast Pipeline ("ACP" or "Project") is a proposed interstate natural gas transmission system that will serve the growing energy needs in the Mid-Atlantic including Virginia, West Virginia and North Carolina. The natural gas transported by the ACP will be used to generate electricity, heat homes, run local businesses and increase the reliability and security of natural gas supplies in Virginia. The developer of the ACP is Atlantic Coast Pipeline, LLC ("Atlantic"), a company comprised of subsidiaries of Dominion Energy, Duke Energy and Southern Company formed for the purposes of operating as a Natural Gas Company as defined by the Natural Gas Act, 15 U.S.C. § 717 *et seq*. ("Natural Gas Act"). Specifically, Atlantic intends to own, develop, construct, operate and maintain the ACP, an approximately 600-mile underground natural gas transmission pipeline originating in Harrison County, West Virginia, running generally southeast to Northampton County, North Carolina and then continuing south into eastern North Carolina terminating in Robeson County, North Carolina. Atlantic contracted Dominion Energy Transmission, Inc. ("Dominion Energy") to permit, construct, operate and maintain the ACP.

At certain locations along the route of the ACP, above ground facilities are required to deliver the natural gas to customers (metering and regulation stations), provide isolation points and entry points for safety inspections (valves and launcher/receiver sites) and compress the natural gas to maintain the flow of gas as changes in elevation and friction slow down the flow of gas over long distances (compressor stations). The general location of these facilities are dictated by safety regulations, contractually required delivery points, and technical requirements based on many factors including the diameter of the pipeline, the volume of gas being transported and the type of terrain being crossed.

One such compressor station is planned to be located on an approximately 70 acre parcel owned by Atlantic and located along Route 56 in Buckingham County, Virginia ("Buckingham Compressor Station"). The location of the Buckingham Compressor Station was largely dictated by the technical considerations described above, the required delivery point to the Transco pipeline located on the Buckingham Compressor Station site and many other factors considered to minimize impacts on adjacent landowners and nearby communities. During the process of developing the ACP, and specifically the Buckingham Compressor Station, Dominion Energy conducted outreach to determine the concerns of stakeholders relating to the health, safety, economic and other effects of the proposed Buckingham Compressor Station, including concerns specifically from residents of the nearby Union Hill/Union Grove/Shelton's Store communities (collectively herein referred to as "Union Hill"). In response to these concerns, Dominion Energy engaged in a series of community engagement activities with residents of Union Hill. This report outlines those interactions and a recommended package to support Buckingham County and the Union Hill community in particular.

1.1 Background

Dominion Energy and its partners in Atlantic are committed to operating their businesses in a long-term sustainable manner protecting the environment; ensuring the safety of its employees, customers and stakeholders; and acting as a socially responsible good corporate citizen. One key aspect of operating in a sustainable manner involves Atlantic's and Dominion Energy's commitment to partner and strengthen the communities where it does business, which are also the same communities that its employees live, work and play. Accordingly, Dominion Energy engaged in dozens of community meetings, events and activities with the residents of Buckingham County and Union Hill in particular with the goal of working in concert with the residents to strengthen the Union Hill community, address concerns raised by the residents and inform the Union Hill community on the safety and environmental systems and plans that form an integral part of the ACP and specifically the Buckingham Compressor Station.

1.2 Union Hill Engagement Goals and Objectives

Specific Goals and objectives of Dominion Energy's engagement with the residents of Union Hill include:

- Listen to and address concerns of the residents of Union Hill related to the ACP and Buckingham Compressor Station;
- Discuss the needs of the Union Hill community and how Dominion Energy may help support these community needs;
- Focus on ideas that improve the health, safety, education, economic well-being and revitalization of the Union Hill Community; and
- Assist the Union Hill Community to organize and take advantage of opportunities that may be presented by the ACP and Dominion Energy.

2 Meeting, Event and Activity Summary

The following table provides a summary of the meetings, events and activities that Dominion Energy conducted as part of its community engagement with residents of Buckingham County and Union Hill:

Compilation of Dominion Energy Community Engagement/Meetings/Activities related to Buckingham County and Union Hill		
Date	**Event/Activities**	**Summary**
Sept 30, 2015	**First Community Advisory Group (CAG) Meeting** Buckingham County Ag. Center	Meeting to review the proposed process while getting to know each of the participants and Dominion Energy Representatives. At this time the scope of the CAG process was reviewed, discussed and agreed upon by CAG and Dominion Energy Team Members from representing engineering, safety, operations, environment, and community relations. CAG meetings were generally attended by 10-12 representatives of stakeholders, and were open to the public.
Nov 5, 2015	**Second Meeting of CAG** Buckingham County Ag. Center	Work session where participants learned more about the planned Buckingham Compressor Station and began to work in small groups to provide feedback on specific areas. The areas included lighting, building design and color, landscaping, walls or fences.
Dec 11, 2015	**Tour of existing compressor station** Chambersburg, PA	Five CAG members joined Dominion Energy representatives for this tour of an existing compressor station, which included an interview with a local resident and representative from the Chambersburg Fire Department.
Jan 28, 2016	**Third Meeting of CAG** Buckingham County Ag. Center	Continuation of the work sessions from the second meeting. Dominion Energy Representatives provided CAG participants with a draft design plan that incorporated many of the recommendations that had come from previous discussions.

Feb 16, 2016	**Informational Meeting to discuss outcomes of CAG Process** Buckingham County Middle School	Informational workshop held by Dominion Energy to publicly share more information about the plans for the Buckingham Compressor Station, the work the CAG did on the compressor station design elements and also to provide ACP project-related information. 37 community stakeholders signed in for the workshop, which was advertised in the local paper over two weeks prior to the meeting date.
April 12, 2018 5:00 – 7:30 pm	**Meeting with Buckingham Middle School Officials** Buckingham County Middle School	Dominion Energy representatives Ron Gillet and Basil Gooden met with the Buckingham County Middle School officials including Principal and Media Specialist Mrs. Melissa Hanes to discuss ACP support of educational initiatives.
April 25, 2018 5:00 – 7:30 pm	**ACP Construction Open House and Job Fair** Buckingham County Middle School	Many Dominion Energy representatives met and engaged with the residents of Buckingham County and Union Hill. Excellent turnout with approximately 200+ residents attending.
April 27, 2018 12:30-3:00 pm	**Meeting with Reverend Paul Wilson** Longhorn Steakhouse, Richmond, VA	Dominion Energy representative Basil Gooden met with Reverend Wilson to discuss Dominion Energy-Union Hill community partnership.
May 2, 2018 1:00-4:00 pm	**Meeting with Yogaville Representatives** Yogaville, VA	Dominion Energy representative Basil Gooden met with individuals from the Yogaville community to discuss Dominion Energy partnership.
May 13, 2018 1:00-3:00 pm	**Meeting with Buckingham Circle of Protection Group** Union Hill Baptist Church	Dominion Energy representative Basil Gooden met with individuals from the Friends of Buckingham, Union Hill and the Yogaville community.
May 16, 2018 3:00-6:00 pm	**Meeting with joint Union Hill and Yogaville Group** Union Hill Baptist Church	Dominion Energy representative Basil Gooden met with group of about 20 people to discuss ACP issues.
May 17, 2018 6:00-9:00 pm	**Richmond NAACP 100th Anniversary Banquet** Virginia Union University	Dominion Energy representative Basil Gooden met with Pastor Paul Wilson at the NAACP event.
May 24, 2018 6:30 – 8:00 pm	**1st Community Meeting with Buckingham/Union Hill** Crystal Cathedral, Dillwyn, VA	Many Dominion Energy representatives including Anne Loomis, Leslie Hartz, Emmet Toms and Jeff Furr met with Buckingham County and Union Hill Community leaders. It was a great community meeting, good interaction and discussion of issues. Approximately 30+ people attended.
May 30, 2018 11:00 – 4:00 pm	**Advisory Council on Environmental Justice (ACEJ)** Buckingham County	Meeting of ACEJ, several Dominion Energy representatives attended and engaged with community.

June 19, 2018 5:30 – 7:00 pm	**Meeting with Individual Family in Union Hill Community** Union Hill Community	Dominion Energy representative Basil Gooden met with Chrissy Burnley, Ricky Burnley and Herman Burnley at their home on Shelton Store Road about ACP matters and Dominion Energy's interest in working with the community.
June 25 - 31, 2018	**Compilation of Vendors and Suppliers List**	Dominion Energy representatives worked extensively with community members to compile extensive list of suppliers and vendors from Buckingham County and especially Union Hill Community.
July 16, 2018 6:00 – 8:30 pm	**Meeting with Pastor Wilson, John Laury** Longhorn Steakhouse, Chesterfield	Dominion Energy representatives Carlos Brown, Leslie Hartz, Suzie King met with Pastor Wilson and John Laury to discuss community support.
July 24, 2018 6:00-8:00 pm	**2nd Community Meeting with Buckingham/Union Hill** Union Grove Baptist Church	Many Dominion Energy representatives, including Carlos Brown, Ann Loomis and Leslie Hartz attended this community meeting. Approximately 70+ community members attended.
July 31, 2018 5:00 – 6:45 pm	**Buckingham Community – Dominion Energy Partnership Meeting** Cheryl's Barbershop, Dillwyn, VA	Dominion Energy representatives Felix Sarfo-Kantanka and Basil Gooden attended this meeting. About 15 community people attended.
Aug 6, 2018 11:00 – 12:00	**Dominion Energy Meeting with Reverend Kevin Chandler, President, VA State Conference NAACP, and Dr. Merritt with the Southern Christian Leadership Conference** South Boston, VA	Dominion Energy representatives Felix Sarfo-Kantanka, Nikki Taylor and Basil Gooden met with Reverend Kevin Chandler and Dr. Merritt about Dominion Energy's community support efforts.
Aug 7, 2018 5:30 – 7:00 pm	**Meeting with Individual Family in Union Hill Community** Union Hill Community	Dominion Energy representative Basil Gooden met with Shelley Harper, Edith Harper and Tatiana Jones at their home in Union Hill about ACP matters and Dominion Energy's interest in working with the community.
Aug 15, 2018 5:30 – 8:00 pm	**Union Hill Community Meeting** Union Hill Baptist Church	The purpose of this meeting was to hear and address concerns exclusively with Union Hill residents. About 25 community people attended.
Aug 21, 2018 5:30 – 8:00 pm	**Union Hill Community Visit** Union Hill/Union Grove Community	Dominion Energy representatives and consultants Basil Gooden and Ken Johnson met with several members (i.e. Kathie Mosely, Cora Lee Perkins, Adrian McDonald), of the Union Hill Community to discuss community partnerships.
Aug 23, 2018 5:30 – 8:00 pm	**Union Hill Community Visit** Union Hill/Union Grove Community	Dominion Energy representative Carlos Brown and Basil Gooden visited the Union Hill Community and met with community members including Mrs. Ella Rose.

Aug 27, 2018 5:30 – 8:00 pm	**3rd Community Meeting with Buckingham/Union Hill** Union Hill Baptist Church	Many Dominion Energy employees and representatives attended this community engagement event. About 100 community people attended.
Sept 3, 2018 7:00 – 8:30 pm	**Meeting with Buckingham County Officials and Emergency Responders** Buckingham Fire Operations and Training Center	Dominion Energy representatives Felix Sarfo-Kantanka and Jeff Furr met with Buckingham County Officials including the Asst. County Administrator, Cody Davis, E-911 Emergency Services Manager and the Volunteer Fire Chiefs for the County.
Sept 17, 2018 5:30 – 7:00 pm	**Union Hill Community Meeting** Union Hill Baptist Church	Dominion Energy representative Basil Gooden met with the Union Hill community. About 30 people attended. Union Hill residents expressed their displeasure with the protesting and lack of focus on community improvement.
Sept 24, 2018 10:00 – 12:00 pm	**Meeting with Individual Family in Union Hill Community** Union Hill Community	Dominion Energy representatives Felix Sarfo-Kantanka and T.R. Andrake met with John and Ruby Laury at their home in the Union Hill community about ACP matters and Dominion Energy's interest in working with the community.
Sept 27, 2018 6:00 – 7:30 pm	**Public Safety Task Force Meeting** Buckingham Fire Operations and Training Center	Dominion Energy representatives, including Felix Sarfo-Kantanka met with Union Hill Community members and the Buckingham County Emergency Responders to discuss community partnerships.
Oct. 10, 2018 5:30 – 6:15 pm	**Conference Call Meeting with Union Hill Community Partnership Committee**	Dominion Energy representatives, including Carlos Brown convened a conference call with Union Hill Community members to discuss Dominion Energy's community support package. More than 10 Community Members participated in this call--Adrian Jones, Shelley Harper, Tatiana Jones, Cheryl White, Joyce Gooden, Andrew Hartless, Gerald Washington, Michelle Ford, Chrissy Burnley, Kathie Mosely.
Oct. 14, 2018 2:00 – 5:30 pm	**Meeting with Union Hill Community Partnership Committee** Ellis Acres Park, Community Center, Dillwyn, VA	Dominion Energy representatives Carlos Brown, Felix Sarfo-Kantanka and consultants Ken Johnson and Basil Gooden met with members of the Union Hill Community Partnership Committee to discuss Dominion Energy's community support package. Seven committee members participated in this meeting. Shelley Harper, Tatiana Jones, Cheryl White, Joyce Gooden, Gerald Washington, Chrissy Burnley, Herman Burnley.
Weeks of October 15 and 22	**Local vendor outreach**	Dominion Energy representatives and consultants reached out to local vendors including gravel companies and those providing rental services to inquire about abilities around construction needs. More

		than 15 local businesses were contacted and discussions are ongoing with several.
Oct. 24, 2018 9:00 – 10:15 am	**Meeting with Buckingham County representatives**	Dominion Energy representatives, Katharine Bond, Felix Sarfo-Kantanka and Emmett Toms met with county representatives including Rebecca Carter, Karl Carter Jamie Shumaker and Cody Davis to discuss Dominion Energy's community support package.
Nov. 1, 2018 (one additional day TBD)	**Hiring event in Buckingham County**	Dominion Energy and LIUNA representatives will hold a hiring event for pipeline jobs at a location within Buckingham. Local advertising will include newspaper and road signage in advance to provide community notification.
Early Nov. 2018	**Training begins in Buckingham County**	LIUNA representatives will hold training session in Buckingham for local workers.

3 Issues Raised by the Union Hill Community

The following is not intended to be an exhaustive list of every single issue that was raised by residents of Union Hill, but rather is a representative group of the reoccurring concerns expressed to Dominion Energy by the residents Union Hill throughout the community engagement activities in Buckingham County.

3.1 Public Safety

- Potential impact radius of an explosion at the Buckingham Compressor Station.
- What is Dominion Energy's plan to notify and evacuate residents if there is an emergency at the Buckingham Compressor Station or on the ACP?
- How are the spacing between valves determined? Why can't the valves be closer together?
- The need for paid emergency responders in Buckingham County.
    - Concerns about response times in the community.
- The need for enhanced 911 emergency alert systems in Buckingham County, including a community alert system specifically for Union Hill.

3.2 Community Health, Education and Economic Development

- Why was the Buckingham Compressor Station sited at its present location?
- Noise
- Air pollution
- Threat of explosion
- Erosion and sediment control
- Health of nearby residents
- Where are all of the jobs and economic development opportunities?
- There is a need to preserve the African-American history of the community
- Broadband access
- Funding for community initiatives (youth, seniors, scholarships, business development, revitalization, transportation, grants for community members, community centers/parks)
- Air monitors and health care assistance

3.3 Dominion Energy Responses

In 2015, Dominion Energy engaged in a community advisory process by the formation of a Community Advisory Group (CAG). The purpose of the CAG for the Buckingham Compressor Station was to provide a deeper understanding of the ACP project and gather input from the community members on preferences and priorities to be addressed by the project team in the design and construction phases of the Buckingham Compressor Station. The following groups and organizations were represented on the Buckingham CAG: Buckingham County Emergency Services, IDA, Virginia Department of Forestry, Yogaville, Friends of Buckingham, Sierra Club, Buckingham County Planning Dept., Chamber of Commerce, Kyanite Mining, VA Growth Alliance, Soil and Water Conservation District, Union Hill Community, Union Hill Church. The CAG process was an iterative one that began with broad-based information about the ACP project and compressor stations then stepped down to narrow and specific information about the Buckingham Compressor Station and design features to gather feedback on defined categories.

Dominion Energy hosted three CAG meetings. The meetings were generally attended by 10-12 of the CAG members, along with several Dominion Energy team members representing engineering, safety, operations, environment, and community relations. The meetings were also open to the public, and each meeting had 5-10 spectators in attendance. At the conclusion of each meeting, Dominion Energy representatives took questions from the CAG members and the audience. All questions were answered in a written document prior to the subsequent meeting, and the responses were shared with the participants and posted online. In addition to the three planned meetings, CAG members had an opportunity to tour an existing compressor station in Chambersburg, PA. Five CAG members joined Dominion representatives for this tour, which included an interview with a local resident and representative from the Chambersburg Fire Department.

Finally, Dominion Energy hosted an informational workshop to publicly share more information about the plans for the Buckingham Compressor Station, the work the CAG did on the compressor station design elements and also to provide ACP project-related information. 37 community stakeholders signed in for the workshop, which was advertised in the local paper over two weeks prior to the meeting date. The following are some of the specific actions taken by the project team members to address concerns from CAG members:

- Designing downward pointing lights to reduce light escape
- Moving station structures as far as possible from route 56 and from the Transco ROW to reduce facility visibility
- Leaving existing trees in front of station to screen facility
- Move microwave tower to rear corner to reduce visibility
- Microwave tower height of 195' or less to not have FAA required light
- Color scheme of buildings to resemble barn and blend with rural surrounding

Following the CAG process, in the Fall and Winter of 2016, Dominion Energy participated in a series of public hearings and meetings concerning the Special Use Permit for the Buckingham

Compressor Stations where the public, including residents of Buckingham County and Union Hill, were provided the opportunity to express concerns regarding the Buckingham Compressor Station. The result of this extensive public process was a Special Use Permit approved by the Buckingham County Board of Supervisors in January 2017 that included 41 conditions directly addressing many of the concerns raised by the community. The Special Use Permit is attached hereto as **Appendix B**, and is one of the most restrictive local permits for a compressor station ever issued and agreed to by Dominion Energy.

Subsequently, Dominion Energy has made every effort to continue to address as many of the concerns raised by residents of Union Hill as possible. Responses from Dominion Energy subject matter experts were made available at multiple additional meetings and events with residents of Union Hill, as well as Buckingham County officials who were also present at many of the meetings.

Many of the safety, environmental and health concerns are addressed through safety and environmental systems proposed for the ACP and the Buckingham Compressor Station, including, but not limited to:

- The ACP will be constructed of high strength steel pipe and will be installed with a minimum of 3 feet of cover.

- Atlantic and Dominion Energy comply with, and in most cases exceed, the requirements of the USDOT, OSHA and other applicable regulations, standards and guidelines for safety.

- From construction through operation of the pipeline, safety will be the top priority of Atlantic and Dominion Energy. Each stage of construction has built-in safety requirements, including, but not limited to:

    - Corrosion preventative epoxy coating of pipes;

    - Visually and radiographically inspecting each pipeline weld;

    - Remote-controlled shutoff valves to stop the flow of gas in case of emergency;

    - Cathodic protection, a low-voltage electrical system, would be applied to help prevent pipe corrosion;

    - Control systems that monitor the facilities 24 hours a day, seven days a week and effectively control situations outside of normal operating parameters; and

    - Highly trained operational staff and sophisticated computer and telecommunication monitoring equipment.

- The ACP will be fully automated, monitored and controlled 24 hours a day/7 days a week by Dominion Energy's state-of-the-art manned gas control center located in Bridgeport, WV.

- An Emergency Shut-down (ESD) System to react to any abnormal operating conditions by immediately stopping the flow of natural gas and removing any gas from the

Buckingham Compressor Station piping as quickly as possible. The removed gas is piped into the onsite blow down silencing equipment.

- A technically advanced gas detection system which continuously monitors for the presence of natural gas inside the Buckingham Compressor Station building. If the system detects low levels of gas, it is evacuated with ventilation fans and if higher levels of gas are detected, the above referenced ESD system is activated and the station is shut-down automatically.

- Fire Detection - The Buckingham Compressor Station building will include a technically advanced Ultra-Violet/Infra-Red fire detection system which can activate the ESD system and shut the station down automatically.

- Over-Pressure Protection Systems (OPP) – The Buckingham Compressor Station piping will contain multiple piping relief valves and pressure regulation devices designed and installed to ensure operating pressures are maintained and/or not exceeded.

- Unit Safety Shutdowns can detect a broad range of conditions including high pressure discharge, high temperature, high lube oil temperatures, over-speed along with many other conditions that would immediately trigger an automatic unit safety shutdown.

- The Buckingham Compressor Station will be equipped with an advanced technology security system including restricted access identification technology, cameras and alarms that will be transmitted to the Dominion Energy Security System personnel. Yard and building lighting will be designed to light the site for security purposes.
- Chain link fencing topped with barb wired strands will secure the Buckingham Compressor Station lot perimeter.

- Emissions of all pollutants will be minimized through the use of the most efficient turbines. Larger turbines, with greater horsepower output, are more efficient. More efficient models use less fuel and produce fewer emissions. The turbines include state-of-the art SoLoNOx technology to minimize NOx emissions. Dry seals would be used on compressors to minimize fugitive emissions and comply with the requirements of EPA's proposed New Source Performance Standards. Dry seal technology increases the safety, reliability and efficiency of the compressors. Gas Reduction Systems are included in the design to minimize methane releases during shutdowns and startups of the turbines by avoiding blowdowns from occurring altogether and reducing the amount blown down for maintenance purposes.

- The Buckingham Compressor Station is designed and operated with "best-in-class" technology. Best in class is defined as being the most efficient with the least environmental impact and providing reliable construction and operations above and beyond regulatory

requirements. For example, the use of low nitrogen oxide combustion technology turbines and addition of Selective Catalytic Reduction technology would reduce nitrogen oxide emission rates from nine (9) parts per million to 3.75 parts per million. In addition, an oxidation catalyst also would be installed to reduce emissions of CO by an estimated 92 percent, and VOC and formaldehyde emissions by an estimated 50 percent. The implementation of these control technologies exceeds limits required by regulation. Additionally, Atlantic will install valve enclosures at the Buckingham Compressor Station to reduce methane emissions from the ESD testing by greater than 99%. Finally, to further reduce methane emissions, Atlantic will implement a fugitive emissions monitoring program at the Buckingham Compressor Station that includes daily visual, audio, and olfactory (AVO) facility inspections and quarterly optical gas imaging (OGI) camera inspections with a 15 day repair requirement.

- The Federal Energy Regulatory Commission (FERC) requires that the sound from the operation of a new compressor station not exceed 55 decibels at any noise sensitive area (NSA), such as a school, hospital or residence, in the vicinity of the station. The 55 decibel limit is required regardless of the equipment inside or outside the facility. FERC guidelines also require that the operation of the compressor station should not result in a perceptible increase in vibration at a nearby NSA. Ambient sound studies and acoustical analyses were completed for all proposed ACP facility sites. These studies evaluate the existing noise conditions and estimate noise produced by equipment at the sites. For the analysis, the existing sound levels are combined with the expected sound contribution at the nearest NSA. Noise mitigation measures are then developed to achieve the desired level. The result of acoustical analysis indicates that, with the specified noise control measures successfully implemented, the continuous sound attributable to the station operating at full-rated load will be lower than the FERC limit of 55 decibels at all identified NSAs.

- The Buckingham Compressor Station is designed to include a number of noise control measures. For example, a muffler would be installed on the exhaust of each turbine unit. The exhaust pipes and intake ducts of the four turbine units would be acoustically insulated. The intake ducts would also have air cleaners and silencers. The walls and roof panels of the two compressor buildings would be constructed using sound dampening material. The doors of the compressor buildings would be insulated metal utilizing full weather stripping. Air inlet mufflers would be located between the air-handling units and the building walls to reduce sound from turbine units. Ventilation discharge hoods on the compressor building's roof would include air discharge mufflers. All aboveground sections of the unit suction, discharge, and bypass lines would be acoustically insulated.

Additionally, many of the concerns are addressed throughout the extensive regulatory review and permitting of the ACP by multiple federal, state and local agencies, including, but not limited to, FERC, Virginia Department of Environmental Quality, US Army Corps of Engineers, County of Buckingham Conditional Use Permitting Process, Virginia Department of Historical Resources, United States Department of Transportation – Pipeline and Hazardous Materials Safety Administration, Virginia Department of Transportation and ultimately the Federal Courts of the United States as many of the issued permits are reviewed through the judicial system.

Dominion Energy reiterated its commitment to working with the Buckingham County administration, emergency responders and Union Hill to develop and maintain emergency response and preparedness plans for its facilities, including conducting any training required or requested by relevant stakeholders, offering site visits to similar facilities and tours of the facilities in Buckingham County once in-service and assisting in setting up meetings with emergency

responders in other jurisdictions in which Dominion Energy operates similar facilities to discuss their experiences and advice. Buckingham County emergency responders also reiterated the adequacy of their training and preparedness for any expected events and their belief that the proposed facilities do not materially affect their current responsibilities or capabilities.

4 Community Support Package Recommendations

In furtherance of Atlantic's and Dominion Energy's commitment to partner and strengthen the communities where it does business, Dominion Energy, in concert with residents of Union Hill have developed a set of comprehensive proposals that we believe will serve to enhance and strengthen the Union Hill community while also simultaneously addressing concerns identified by residents Union Hill. The support package is divided into two primary sections: 1.) public safety items, and 2.) community revitalization efforts. The recommended investments in enhancements and activities total an estimated **$5,120,000**. Public safety investments are contingent upon Buckingham County's adoption of an ordinance accepting funds and the successful completion of the ACP. The community center investments are contingent upon the successful completion of the ACP.

As safety is a top priority for Dominion Energy and the residents of Buckingham County, including specifically the residents of Union Hill, Dominion Energy proposes to allocate approximately **$1,520,000** for Emergency Medical Enhancements to Buckingham County and the Union Hill community. These key enhancements are proposed to include: 1.) providing funding to support six (6) emergency responder positions through a revised contract with Delta Response Team (DRT); 2.) paying for needed emergency facility upgrades; 3.) paying for a dedicated emergency line/channel designated for Union Hill; and 4.) purchasing supplemental emergency equipment for Buckingham County.

Dominion Energy also proposes funding additional activities designed to improve community health, education and economic development opportunities for residents of Buckingham County and Union Hill totaling approximately **$3,600,000** to: 1.) build a Community Wellness, Education and Economic Development Center in the Union Hill community; 2.) develop a community park and event pavilion in the Union Hill community; and 3.) provide funding to operationalize a Community Development Cooperation which would be used to support and/or administer the Community Center, Park and provide specific economic benefits to Union Hill residents living in close proximity to the proposed Buckingham Compressor Station.

Community support for these recommendations is evidenced by the numerous signatures affixed to the letters from residents of Union Hill attached hereto in **Appendix A**.

4.1 Public Safety **Total: ≈$1,520,000**

4.1.1 Salary Support for Emergency Responders

Dominion Energy proposes to provide funding directly to Buckingham County to support six (6) paid, full-time emergency responder positions. These six positions will be secured by Buckingham County through a revised contract with Delta Response Team (DRT). The contracted DRT staffers will be stationed at the Glenmore Satellite Station of Buckingham County Rescue Squad 24/7/365. Dominion Energy funding for these contracted positions will be time-limited and will sunset after four (4) years. The job duties of the contracted staff will be clearly delineated from the volunteer staff as to avoid confusion or morale issues. Payments would be made annually in the amount of approximately **$240,000** per year for each of the four years of the contract extension. Dominion Energy will work with the county to encourage them to consider continuing the increased service levels at the Glenmore Satellite Station after the initial contract term.

4.1.2 Facility Upgrades

To support the EMS mission and increased staffing, Dominion Energy will provide **$160,000** in one-time funding directly to Buckingham County for upgrades to the Glenmore Satellite Station of the Buckingham County Rescue Squad.

4.1.3 Dedicated Emergency Channel

Dominion Energy will provide **$200,000** in one-time funding to secure a dedicated Emergency Line/Channel designated specifically for Union Hill and Buckingham County.

4.1.4 Emergency Equipment

To enhance the capabilities of Buckingham County's EMS, Dominion Energy proposed to provide **$12,000** in funding to secure a Utility Terrain Vehicle (UTV) and **$200,000** in funding for the purchase of an emergency response vehicle to be provided to the County and stationed at the Glenmore Satellite Station of the Buckingham County Rescue Squad.

4.2 Community Revitalization **Total: ≈$3,600,000**

4.2.1 Community Wellness, Education & Economic Development Center **$2,000,000**

As the centerpiece of its comprehensive community support package, Dominion Energy proposes to provide funding to construct a Community Wellness, Education and Economic Development Center in Union Hill. This proposed center could be located on the property on Route 56 (South James River Highway) directly across from the Buckingham Compressor Station and would focus on providing programmatic activities to improve the health, wellness, education, cultural and economic development of Buckingham County and Union Hill in particular.

The Community Wellness, Education and Economic Development Center would be dedicated to improving the health, wellness, education and economic opportunities for youth, adults and

families in Buckingham County and Union Hill in particular. It would serve as the hub for cultural, educational, social, wellness activities and services for the area. The proposed center would provide space for health, wellness and fitness programs such as yoga, indoor walking, basketball, volleyball, and other sports. There would also be opportunities for arts and crafts classes, and various cultural and historical activities. There could be space for civic organizations, social clubs and educational programs for the youth and senior citizens. Below are spaces and activities that could be accommodated within the proposed center.

- Educational/Academic Programming (Community College Courses, Vocational Training, Possible After-school Programs)
- Commercial Kitchen (For events and culinary training purposes)
- Community meeting space to be utilized in variety of ways such as Training Rooms (Emergency Responders, Companies, Organizations, etc.), Remote Work Office Space (Companies rent office space for teleworking opportunities)
- Cultural Reflection Center (The Origins of African-American History Collection)
- Gymnasium with Multipurpose Court (Basketball, Volleyball, Badminton, etc.)

Appendix C provides a draft design for a proposed center based on Recreation Unlimited, a center based in rural Ashely, Ohio. Cost estimates for the design, construction, operation and administration of the proposed center do not reflect the many possible sources of income as a community center business plan has not been fully developed. Specifics will be determined during a more detailed planning process to include additional community input.

Community Park and Pavilion

Dominion Energy also proposes to construct a Community Park that includes pavilion/shelter for outdoor events. The proposed community park would be a place for people and families to gather to enjoy the beauty of the area. The pavilion could serve as a location for any type of gathering including picnics, reunions and other social events.

According to research from the Robert Wood Johnson Foundation, parks contribute to the health and vibrancy of a community in a number of ways, from promoting physical activity to improving mental health and even having the potential to reduce health care costs. The study shows that parks: encourage physical activity; advance health equity; help kids flourish; help combat chronic illnesses such as diabetes, hypertension, high cholesterol and asthma.
Appendix D provides an illustration of a similar community park and pavilion project. These pictures are of the Wingfoot Lake State Park in Mogadore, Ohio. This park was developed by the Goodyear tire company. Construction of a lake is not within the scope of the project in Buckingham but the playground and picnic building are reflective of anticipated scope.

4.2.2 Community Development Cooperation (CDC) **$1,600,000**

The Community Wellness, Education & Economic Development Center would be owned and operated by community-based, non-profit, community development cooperation ("CDC"). The primary mission of the CDC would be to revitalize communities in Buckingham County, in particular Union Hill, through supporting health, education and economic development initiatives.

The CDC would be responsible for ongoing operations of the Community Wellness, Education and Economic Development Center in Union Hill.

This CDC could provide grants to the local community to start and expand businesses, revitalize the community, retain family property/land, support entrepreneurship with a focus on encouraging agri-businesses opportunities and renewable green energy businesses like solar farming. Special consideration could be provided to home- and property-owners within a 1-mile radius of the Buckingham Compressor Station.

To demonstrate its commitment to being a long-term community partner, Dominion Energy would provide an investment of $500,000 to establish the CDC and then provide **$100,000** annually for ten years. Up to **$250,000** could be utilized for local grants with the balance utilized for ongoing operations. The total commitment to the Union Hill CDC would be **$1,500,000**.

An additional **$100,000** will be invested for the purpose of documenting local history. The CDC will select the appropriate non-profit or subject-matter experts to provide a local history display to be located at the Community Wellness, Education and Economic Development Center in Union Hill or other local facility.

The funding, planning and development of the proposed center and park and the programming for the CDC would begin coincident with the construction of the ACP after all permits are received. The proposed center and park would be constructed near or adjacent to the Buckingham Compressor Station on land acquired for use during the construction. It would be anticipated that the construction would occur within 12 to 18 months after the Buckingham Compressor Station is in service.

Appendix A: Community Letters of Support

[SEE ATTACHED]

October 19, 2018

Mr. David Paylor
Director
Virginia Department of Environmental Quality
1111 E. Main St., Suite 1400
Richmond, VA 23219

Dear Mr. Paylor:

Dominion Energy has met with community members in our area on several occasions over the past months. While there has not always been agreement in these meetings, the representatives of Dominion have been willing to listen and have been professional in dealing with us. In each case, the meetings provided an opportunity for us to voice our concerns and learn more about Dominion's plans for the pipeline and the compressor station.

We are operating in good faith that Dominion will work with the Buckingham County community to provide financial investments to improve our community which will result in significant jobs and economic opportunities for local residents.

We look forward to continuing to work together in a cooperative and mutually respectful manner.

Sincerely,

Adrian Jones

Adrian Jones
Union Hill Road

October 15, 2017

David K. Paylor, Director
Virginia Department of Environmental Quality
1111 East Main Street, Suite 1400
Richmond, Virginia 23219

RE: Dominion Energy Community Engagement

Dear Director Paylor:

We the undersigned residents of Buckingham County, Union Hill/Union Grove community members, and property owners within close proximity of the proposed Buckingham County compressor station site, submit this letter of support and recognition of the community engagement activities initiated by Dominion Energy. Dominion Energy and their representatives have been reasonable, earnest and forthright in engaging with the residents of our community to address issues, concerns and needs. Dominion Energy representatives have met with us in large community meetings and also in smaller, individual personal meetings in resident's homes. These representatives have taken the time to listen to and address our many concerns related to the Atlantic Coast Pipeline and Compressor Station. We feel our concerns have been taken seriously by Dominion Energy.

Equally important, Dominion Energy has worked extensively with the community to develop a community partnership agreement that will invest more than $ 4.25 million into Buckingham County. This financial support is targeted to enhance Buckingham County's Emergency Medical Services and help further develop the community, cultural, educational and economic assets that exists in our community. This community-designed support from Dominion Energy will help empower our youth through education, leadership development and recreational programs. Additionally, the community support will help revitalize the community through programs designed to improve health, start and expand businesses, retain family property/land, support entrepreneurship with a focus on encouraging agri-businesses opportunities and renewable green energy businesses like solar farming.

Thank you for your service to the citizens of the Commonwealth of Virginia. We appreciate your consideration of this information.

Sincerely,

Signature	Printed Name	Residence/Property
Adrian Jonas	Adrian Jonas	Union Hill
Craig White	Craig White	Shelton Store & Route 56
Cheryl White	Cheryl White	Shelton Store Rd

Signature	Printed Name	Residence/Property
Christy White	Christy White	Shelton Store Road
Maureen Harris	Maureen Harris	Union Hill RD
Michelle Ford	Michelle Ford	Union Hill RD
Shelley Harper	Shelley Harper	Union Hill Road
Tatiana Jones	Tatiana Jones	Union Hill Road
Martha Louis	Martha Louis	Buckingham Co.
Joyce Gooden	Joyce Gooden	Shelton Store Road
Chelsea Seay	Chelsea Seay	Shelton Store Road
Adrian McDonald	Adrian McDonald	Shelton Store Road
Chrissy Burnley	Chrissy Burnley	Shelton Store Rd.
Ricky Burnley	Ricky Burnley	Shelton Store Rd
Herman Burnley	Herman Burnley	Shelton Store Road
Jennifer Burnley	Jennifer Burnley	Shelton Store RD

Christine Burnley
210 Shelton Store RD
Winginia, VA 24599

October 17, 2018

Mr. David Paylor
Director, VA DEQ
1111 E. Main St.
Suite 1400
Richmond, Virginia 23219

Mr. Paylor,

We want you to know that representatives of Dominion Energy have held meetings in the Buckingham Community. Some of these meetings have been held in homes and churches within the community. Many of the people attending these meetings have been lifelong residents of the area and we care a lot about the future of our community for our children and grandchildren. Dominion is promising to provide support to help the community grow and thrive and to provide things like a community center and health care, which we really need. We hope these things happen and that the Dominion people will keep their commitments. So far they have been willing to talk. We hope this talk also results in positive action for the community that is a lifelong home to us. Thank you.

Sincerely,

Chrissy Burnley

Chrissy Burnley

Appendix B:

Buckingham County Special Use Permit for the Buckingham Compressor Station

[SEE ATTACHED]

Buckingham County
Board of Supervisors
Office of the County Administrator
13380 W. James Anderson Highway
Post Office Box 252
Buckingham, Virginia 23921-0252
Telephone 434-969-4242
Fax 434-969-1638
www.buckinghamcountva.org

Rebecca S. Carter
County Administrator

E.M. Wright, Jr.
County Attorney

Robert C. "Bobby" Jones
District 1 Supervisor
Chairman

Danny R. Allen
District 7 Supervisor
Vice-Chairman

Donald E. Bryan
District 2 Supervisor

Don Matthews
District 3 Supervisor

E. Morgan Dunnavant
District 4 Supervisor

Harry W. Bryant
District 5 Supervisor

Joe N. Chambers, Jr.
District 6 Supervisor

Atlantic Coast Pipeline, LLC
Attn: Scott Summers
925 White Oaks Boulevard
Bridgeport, WV 26330

January 11, 2017

Dear Mr. Summers:

On January 5, 2017, the Board of Supervisors held a public hearing and then approved the Special Use Permit for the construction and operation of a Compressor Station on tax map 91-60.

The following are conditions the Board of Supervisors attached to the Special Use Permit:

1. The compression of natural gas will occur through natural gas fueled turbines with no greater than a combined 55,000 ISO horsepower rating and no turbine shall have an ISO horsepower rating greater than 22,000. An increase in horsepower will require new permitting.

2. The only use of the property shall be compression, measurement and regulation of natural gas and its transfer above ground and underground, except that a Microwave Tower shall be permitted provided a separate SUP is approved by the Board. No other non A-1 use shall be made of the property.

3 There shall be no abatement of local property taxes in association of this request.

4. During normal operating hours, the applicant is responsible for providing the first response to any emergency in relation to the compressor station. Applicant shall coordinate with the County for training needs of county volunteer first responders, to safeguard the public from any event that occurs from this compressor station. The applicant shall prepare, at its own cost, an Emergency Preparedness Plan, in accordance with the U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration regulations, to be submitted to the County for review and comment prior to implementation of operations.

5. During construction, activities that produce noise between the hours of 10:00 p. m. and 6.00 a. m. shall not exceed a noise level of 60 dBA (decibels) at the property line, without prior notification to the County.

6. Noise attenuation measures will be implemented making all reasonable efforts such that noise levels attributable to normal plant operations and during planned blowdown events will be kept to an L90 reading of 55 dBA (decibels) or less at the property lines with the exception that the front property line (along Route 56, S. James River Hwy) may have a dBA of 60. If testing by a qualified noise consultant shows an exceedance of these levels Dominion will consult with Buckingham County regarding the reasons for the exceedances and reasonably available noise mitigation measures. Also, noise levels attributable to normal plant operations will be less than 55 dBA at any adjacent existing building that is not on the subject property.

7. During construction dust shall be controlled with water or water and calcium chloride.

8. Exterior lighting will be directed downward and inward to the extent feasible in order to prevent any glare on adjacent properties. In addition, the facility will be designed to enable exterior lighting for work areas of the station to be switched off while not in use. Any lighting for surveillance will be at minimum foot-candles for visibility and shall be pointed in a down direction.

9. Site lighting shall not exceed 5 foot-candles in exterior working areas and 2 foot-candles in parking and non-working areas. All lighting will be shielded to prevent light pollution as provided in condition 8.

10. Light trespass shall be limited to and should not exceed 0.5 foot-candles at the property line. All exterior luminaries shall utilize full cut-off optics.

11. All driveways, parking areas, and access roads shall be maintained in a manner that will keep dust to a minimum so as not to adversely impact adjacent properties. Driveways and parking areas will have asphalt surface or better, exception may be applied if not feasible and dust can be controlled otherwise.

12. The compression station and accessory facilities, used for the compression, measurement and regulation of natural gas and its transfer above ground and underground, shall be centrally located on the property to the greatest extent feasible and shall conform to the layout shown on the drawing submitted with the application.

13. A natural colored chain link fence or similar security device shall be placed around the facility at least seven (7) feet in height and will feature 3 strands of barbed wire along the top and prominent "No Trespassing" signs.

14. There shall be one sign but no more than one (1) permanent detached sign for project identification purposes (exclusive of directional signs) which shall be a

ground-mounted monument type sign with landscaping. Any lighting of the sign shall be from above and shielded away from adjacent properties.

15. Fencing and all structures shall have a minimum setback of 100 feet from all property lines.

16. Existing trees along the northwestern property line and along the front of the property (as noted on the site layout submitted with the application) shall be maintained as a buffer for the life of the station. East of the station access road and east of the existing Transco lines there shall be trees planted and maintained after construction to provide a buffer and block visibility from the highway and adjacent properties.

17. Main Buildings and structures above the tree height, with exception of the microwave tower, shall be a neutral earth tone color (example: muted browns, greens, grays).

18. Silencers shall be used during blowdowns and noise levels shall be maintained as outlined in condition 6

19. The Virginia Department of Transportation shall approve access to the proposed facility and the applicant will provide all required improvements.

20. A traffic management plan shall be submitted as part of the overall site development plan. Review and approval by VDOT of the traffic management plan will ensure that temporary construction entrances and access roads are provided appropriately; that "wide load" deliveries are scheduled during appropriate times, and that access routes to and from the site are planned to minimize conflicts.

21. All necessary permits shall be acquired from all applicable regulatory bodies of the state and federal government and copies of such permits shall be provided to the County upon request. The applicant shall maintain periodic reports as required by permits and these reports shall be provided to the County upon request.

22. This facility shall utilize Best Available Control Technology (BACT) in accordance with the most current DEQ air permit; to include but not be limited to Selective Catalytic Reduction (SCR) for the reduction of Nitrogen Oxides (NOx) emissions and Oxidation Catalyst (OC) for the reduction of Carbon Monoxide (CO) and Volatile Organic Compounds (VOCs) emissions. As regulations require and BACT improves, the new technology shall be incorporated into this facility.

23. Prior to construction, the applicant must demonstrate that all wetland requirements applicable to the facility, if any, have been achieved to the satisfaction of the U. S. Army Corps of Engineers.

24. At such time as the facility is granted abandonment authorization by the Federal Energy Regulatory Commission, the applicant or its assignee shall remove all personal property, fixtures, buildings and other structures, and leave the site in a

reasonably comparable condition to that which existed prior to construction of the facility, provided that the applicant or its assignee at its option may, except for any underground fuel storage tanks, abandon any below ground utility infrastructure facilities, foundations and pavings in place.

25. The applicant shall operate in accordance with all permits, laws, rules and regulations of Federal, State and local law, including but not limited to the Federal Energy Regulatory Committee (FERC), Virginia Department of Environmental Quality (VADEQ) and this special use permit. Where there are differences in regulations and requirements the stricter shall apply. If a violation of any state or federal permit applicable to the facility is reported to the local government by the applicable regulatory agency, the Board of Supervisors, and/or the County Administrator, may request the applicant to provide, at the applicant's sole expense, the services of an appropriate firm to review the nature of the violation if any, and the remedy, if any. This firm shall be selected by and report solely to the county.

26. Any non-compliance of this permit's conditions could lead to a stop order and discontinuation of the special use permit, upon proper action of the Board of Supervisors, unless the non-compliance is cured within 30 days of the date applicant is first notified. If such a cure cannot reasonably be accomplished within such 30 day period, Applicant shall have additional time beyond that 30 day period provided that Applicant has commenced such cure within such 30 day period and thereafter diligently prosecutes such cure to completion within a reasonable period of time.

27. Upon start-up a report will be prepared and provided to the County showing operational factors associated with the compressor station that includes the name(s) and contact information for on-site supervisors, and verification of current, valid state and federal licenses and permits. The County will be promptly notified of any changes, within thirty business days.

28. Any complaints or inquiries by the Board of Supervisors, County Administrator, or Zoning Administrator will be responded to promptly. In the event the applicant is notified of any violation of applicable federal, state, or local laws, regulations, or permit conditions applicable to the facility, the applicant shall notify the Zoning Administrator in writing within two business days of receiving such notice and within 10 days fully inform the Zoning Administrator of the current steps being taken to correct and/or remediate the violation. Authorized county personnel or their authorized agents will be permitted to inspect the facility, with 24 hours prior notice and in accordance with Applicant's safety procedures, to ensure that all physical structures and plant operations comply with local regulations.

29. Nothing in this approval shall be deemed to obligate the County to acquire any interest in property, to construct, maintain or operate any facility or to grant any permits or approvals except as may be directly related hereto, i.e microwave tower

30. The applicant shall certify to the County annually that it is in compliance with all conditions of this special use permit.

31. In the event that any one or more of the conditions is declared void for any reason whatever; such decision shall not affect the remaining portion of the permit, which shall remain in full force and effect, and for this purpose the provisions of this are hereby declared to be severable.

32. A minimum of one employee, contractor or third party security personnel shall be onsite 24/7 for the first year of operation.

33. Shut off valves shall be installed on both the inflow and outflow lines of the compressor station as well as at the connection with Transco. These valves shall be designed to operate automatically, remotely and manually.

34. The monitoring system and valves must be programmed to alarm and call out personnel to investigate and manually monitor the station when monitoring communications are lost.

35. A back-up system for monitoring communications and emergency notification must be installed.

36. A fire break shall be created and maintained between the facility and adjacent properties, with the exception of the border of Route 56 and the existing Transco right-of-way. The break, which may be located in any required setback, shall consist of 50 feet of grass, grown in a manner to be utilized as a fire line for back burning,or gravel and shall be clear of trees and shrubs, where feasible, so as to not impact visual screening and noise attenuation, or conflict with Conditions 16 and 23.

37. Air quality studies, required by the Virginia Department of Environmental Quality and the Federal Energy Regulatory Commission, will be conducted to demonstrate compliance with the federal National Ambient Air Quality Standards (NAAQS) in the area potentially impacted by the compressor station. The air quality studies will be conducted by a third party company and a report will be submitted to the County at least 60 days prior to the start of construction.

38. Initial NOX, PM10, PM2.5, VOC, and CO stack testing will be completed within 180 days of first turbine startup to determine emission rates to demonstrate compliance with applicable Virginia Department of Environmental Quality and federal Environmental Protection Agency regulatory requirements. Additionally, periodic NOX stack emissions testing will be conducted to demonstrate compliance with 40 CFR Part 60 Subpart KKKK emissions limits. All emissions tests will be conducted by a third party company and all data and reports will be submitted to the County within 60 days of completing the test.

39. Any physical structures must be designed and located within the property, such that, should all or a portion of the structure(s) collapse, the structure(s) will fall completely within the subject property lines

40 Applicant will develop, in consultation with the County, a Crisis Response Plan that will incorporate appropriate notifications with the Buckingham County Dispatch

office so that if a gas leak, fire or other eminent danger occurs, the Buckingham Dispatch is promptly notified of the incident. Thereafter, the Buckingham Dispatch office will be contacted with further details for dissemination in the code red alert system. Applicant will also coordinate an emergency simulation with Buckingham County Emergency responders to practice the Crisis Response Plan within the first year of operation. Applicant will also implement a prior notification process with the County relative to planned blowdown events.

41. Any material changes as submitted in the application shall be resubmitted to the County for County approval.

Please keep a copy of this letter for your records and adhere to all conditions above. If you have any questions, please call 434-969-4242.

Sincerely,

Rebecca S. Cobb
Zoning Administrator/Planner

Appendix C: Simulated Illustration and Floor Plan of Community Center

IMAGES INCLUDED FOR ILLUSTRATION PURPOSES ONLY--FINAL FACILITY MAY DIFFER SUBSTANTIALLY

The 20,000 sq. ft. Community Center could offer physical fitness activities, recreation, arts, education and cultural programs. It would contain large dividable assembly rooms, multiple classrooms/breakout room, technology center, business incubator, commercial kitchen and a gymnasium. Final details on the design and footprint and attributes of the Center would be developed by a team of Union Hill residents, ACP/Dominion Energy and county representatives.

(Actual pictures and floor plan of the Life Center, Recreation Unlimited, Ashely, Ohio)

Appendix D: Simulated Illustration of Community Park and Pavilion

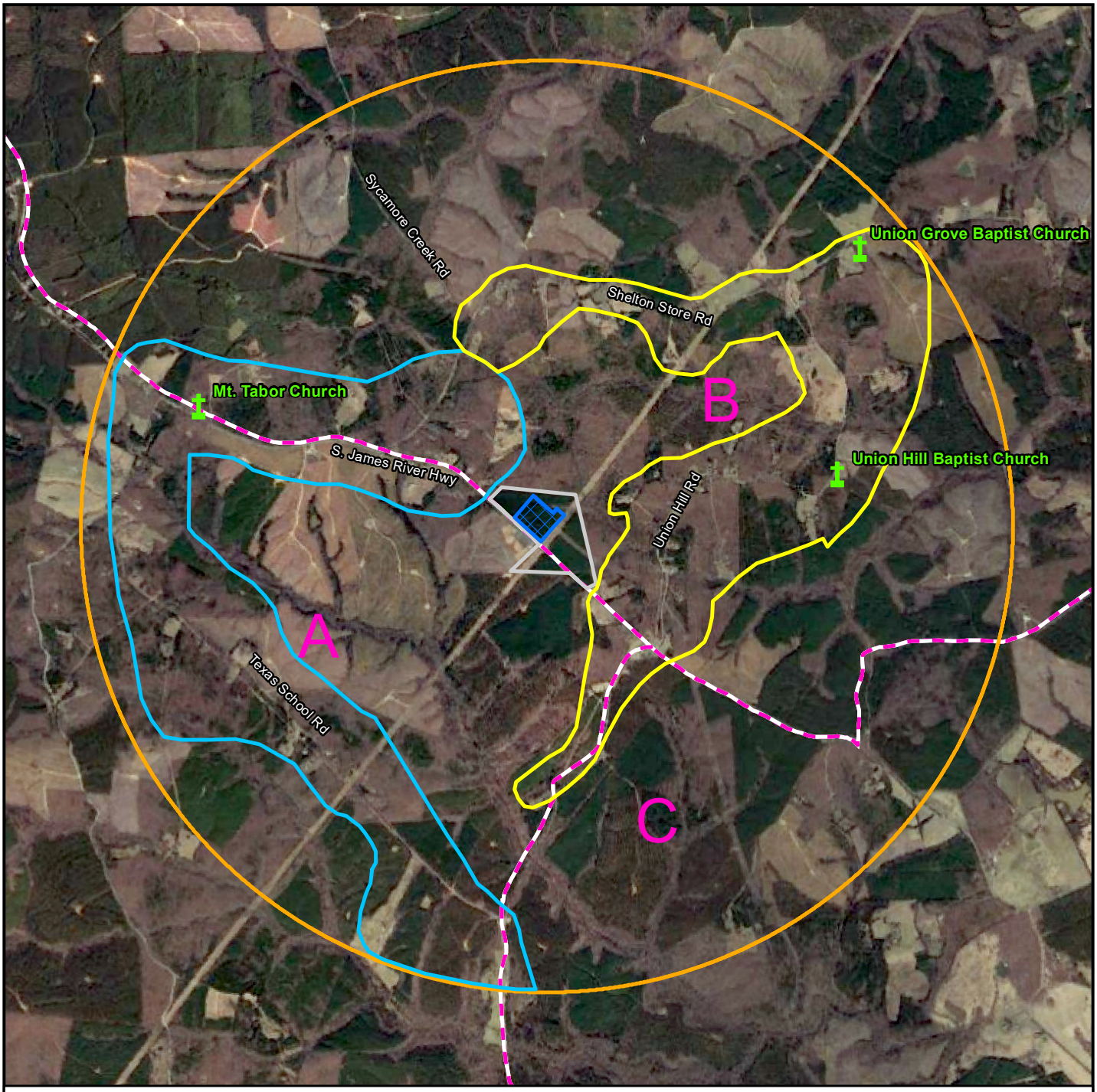
IMAGES INCLUDED FOR ILLUSTRATION PURPOSES ONLY--FINAL FACILITY MAY DIFFER SUBSTANTIALLY

The Community Park would include a playground area, pavilion/shelter for outdoor events. The community park would be the ideal place for people and families to gather for community events. The pavilion could serve as a location for any type of gathering including picnics or weddings.

(Actual pictures from Wingfoot Lake State Park, Mogadore, Ohio)

THIS ILLUSTRATION IS INCLUDED SOLELY AS AN EXAMPLE OF WHAT THE PARK AND PAVILLION COULD INCLUDE FINAL DETAILS WOULD BE DETERMINED AT LATER DATE BY THE COMMITTEE AND ACP/DOMINION.

ATTACHMENT 2



Church
Buckingham Compressor Station
Dominion Property
Compressor Station 2-mile Radius
Census Block Group Boundary
A = Not Low-income Community
B/C = Low-income Community
Community of Color per local analysis
Not Community of Color per local analysis

This information is for environmental review purposes only.

0 0.5 1 Miles

N

Atlantic Coast Pipeline

Atlantic Coast Pipeline
Buckingham Compressor Station
Environmental Justice Community Depiction
Buckingham County, Virginia

ERM

MPLS M:\Clients\D-F\DOM\SRPP_ArcGIS\2020\03\02_Buckingham_CS_EJ_data_ACP_BuckinghamCS_EJ_Comm_Dep.mxd | REVISED: 03/12/2020 | SCALE: 1:40,000

DRAWN BY: JPB

ATTACHMENT 3

NAAQS AND ENVIRONMENTAL JUSTICE

Clean Air Act Requirements for NAAQS and Protection of Sensitive Populations

The Clean Air Act (Act or CAA)[1] requires the Administrator of the Environmental Protection Agency (EPA or Agency) to set National Ambient Air Quality Standards (NAAQS) for certain pervasive air pollutants,[2] including particulate matter (PM). The Administrator sets primary NAAQS at the level that, in his judgment, protect the public health with an adequate margin of safety.[3] He sets NAAQS for an air pollutant "based on" air quality criteria that "accurately reflect the latest scientific knowledge useful in indicating the kind and extent of all identifiable effects on public health or welfare which may be expected from the presence of such pollutant in the ambient air, in varying quantities."[4] Both these air quality criteria and the NAAQS based on them must be reviewed at least every five year.[5]

Regarding protection of sensitive populations, the Act's legislative history explains:

> [T]he [Senate] Committee [on Public Works] emphasizes that among those persons whose health should be protected by the ambient standard are particularly sensitive citizens such as bronchial asthmatics and emphysematics who in the normal course of daily activity are exposed to the ambient environment. In establishing an ambient standard necessary to protect the health of these people, reference should be made to a representative sample of persons comprising the sensitive group rather than to a single person in such a group.
>
> Ambient air is sufficient to protect the health of such persons whenever there is an absence of adverse effect on the health of a statistically related sample of persons in sensitive groups from exposure to the ambient air. An ambient air quality standard, therefore, should be the maximum permissible ambient air level of an air pollution agent or class of such agents (related to a period of time) which will protect the health of any group of the population.[6]

The United States Court of Appeals for the District of Columbia Circuit, the federal court to which all petitions for review of a NAAQS must go, has repeatedly confirmed that NAAQS must protect sensitive populations. *See, e.g., Coalition of Battery Recyclers Ass'n v. EPA*, 604 F.3d

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[1] 42 U.S.C. §§ 7401-7671q.

[2] CAA §§ 108(a), 109(a), 42 U.S.C. §§ 7409(a), 7409(a).

[3] CAA § 109(b)(1), 42 U.S.C. § 7409(b)(1). Secondary NAAQS, which are less relevant here, protect the public welfare from known or anticipated adverse effects. CAA § 109(b)(2), 42 U.S.C. § 7409(b)(2).

[4] CAA §§ 108(a), 109(b)(1)-(2), 42 U.S.C. §§ 7408(a)(2), 7409(b)(1)-(2).

[5] CAA § 109(d)(1); 42 U.S.C. § 7409(d)(1). These air quality criteria are now found in an Integrated Science Assessment (ISA).

[6] S. Rpt. No. 91-1196, at 10 (1970), reprinted in 1 S. Comm. on Pub. Works, 93d Cong., A Legislative History of the Clean Air Act Amendments of 1970, at 410 (1974).

613, 617 (D.C. Cir. 2010) ("Petitioners' assertion that the revised lead NAAQS is overprotective because it is more stringent than necessary . . . ignores that the Clean Air Act allows protection of sensitive subpopulations."); *Am. Lung Ass'n v. EPA*, 134 F.3d 388, 389 (D.C. Cir. 1998) ("[T]his court has repeatedly held that NAAQS must protect not only average healthy individuals, but also sensitive citizens such as children."); *Lead Indus. Ass'n v. EPA*, 647 F.2d 1130, 1153 (D.C. Cir. 1980) (Congress specified that the air quality standards must also protect individuals who are particularly sensitive to the effects of pollution.").

Moreover, once NAAQS are set taking protection of sensitive groups into account, the Act requires implementation measures that serve to protect the health of these groups (and others) both in areas where a NAAQS is violated and elsewhere. In areas that do not meet the NAAQS and are therefore designated "nonattainment," the Act specifies use of all reasonably available control measures, including implementation of reasonably available control technology (RACT) on existing stationary sources, and deadlines by which each area must be brought into attainment.[7] For other areas, the Act specifies measures to prevent significant deterioration of air quality, including requirements that new major emission sources employ the best available control technology and demonstrate that they will not cause or contribute to violations of a NAAQS or specified increments above their baseline air quality.[8]

How EPA's Practices When Setting or Reviewing NAAQS Address Sensitive Populations

EPA has developed practices for setting and reviewing NAAQS that extend beyond those required by the Act and that further incorporate consideration of sensitive populations throughout. As early as 1979, when it established a primary hourly ozone NAAQS of 0.12 ppm, EPA said:

> The legislative history of the Clean Air Act makes quite clear Congress' intention to protect sensitive persons (asthmatics and emphysematous patients are cited as examples) who in the normal course of daily activity are exposed to the ambient environment. . . . . EPA interprets the Clean Air Act as providing citizens the opportunity to pursue their normal activities in a health environment.[9]

More recently, EPA has issued a preamble applicable to all of its ISAs that acknowledges the explains, "A critical part of assessing the public health impact of an air pollutant is the identification, evaluation, and characterization of populations potentially at greater risk of an air pollutant-related health effect."[10] It identifies "four broad categories" of factors that may increase the risk of a population.[11] Two of these categories are particularly relevant to environmental justice concerns: extrinsic factors such as socioeconomic status, and factors such

[7] CAA §§ 172,181-82, 184, 186-89, 191-92, 42 U.S.C. §§ 7502, 7511-11a, 7511c, 7512-13a, 7514-14a.
[8] CAA § 165, 42 U.S.C. § 7475.
[9] 44 Fed. Reg. 8202, 8210 (Feb. 8, 1979).
[10] Nat'l Ctr. for Envtl. Assessment, Office of Research and Dev., EPA, EPA/600/R-15/067, Preamble to the Integrated Science Assessments 25-26 (2015), https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=310244 [hereinafter ISA Preamble].
[11] ISA Preamble at 26.

as residence near a roadway that may increase the likelihood of exposure to higher pollutant concentrations.[12] Each ISA evaluates evidence concerning these factors to identify populations particularly at risk of adverse health effects from the pollutant being considered.[13]

Although the Act requires only that EPA prepare air quality criteria (currently found in an ISA) as a basis for setting or reviewing NAAQS, EPA has an established practice of preparing additional support for NAAQS decision. On such document is a Policy Assessment (PA). PAs are intended "to help 'bridge the gap' between the Agency's scientific assessments . . . and the judgments required of the Administrator in determining whether it is appropriate to retain or revise the standards."[14] These documents identify "a range of policy options" for the Administrator to take at the conclusion of a NAAQS review, recognizing that primary NAAQS must be set "at a level that avoids unacceptable risks to public health, including the health of at-risk populations."[15]

In addition, the Agency frequently conducts quantitative assessment of exposures and health risks posed by the pollutant that is the subject of a NAAQS review. These analyses estimate exposures and health risks associated with current and alternative NAAQS.[16] To the extent feasible, they specifically address populations considered at higher risk.[17] They may be reported in the PA or in a separate Exposure and Risk Assessment document.[18]

Finally, the Administrator considers the effect of the pollutant on sensitive populations and populations at higher risk when he or she decides whether to retain or revise a NAAQS. For example, in reviewing the particulate matter NAAQS in 2013, the Administrator acknowledged, "[T]here now exist more health data such that the [ISA] has identified persons from lower socioeconomic strata as an at-risk population."[19] Further, the Administrator pointed out "analyses showed that the [then] current constraints on spatial averaging may be inadequate in some areas to avoid . . . disproportionate impacts to at-risk populations, including low income populations as well as minority groups."[20] Accordingly, the Administrator revised the form of the annual $PM_{2.5}$ NAAQS to eliminate spatial averaging.[21] Moreover, in reducing the level of

[12] *See* ISA Preamble at 27.
[13] ISA Preamble at 26.
[14] Memorandum from Lisa Jackson, Adm'r, to Elizabeth Craig, Acting Assistant Adm'r for Air and Radiation, and Lek Kadeli, Acting Assistant Adm'r for Research and Dev., Attachment at 2 (May 21, 2009), *available at* https://www.epa.gov/naaqs/historical-information-naaqs-review-process.
[15] Health and Envtl. Impacts Div., Office of Air Quality Planning and Standards, EPA, EPA-452/R-16-005, Integrated Review Plan for the National Ambient Air Quality Standards for Particulate Matter 6-1 to 6-2 (2016), *available at* https://www.epa.gov/naaqs/particulate-matter-pm-standards-planning-documents-current-review [hereinafter IRP].
[16] IRP at 4-1.
[17] *See* IRP at 4-18.
[18] IRP at 4-10; *see also* Risk and Benefits Group, Health and Envtl. Impacts Div., Office of Air Quality Planning and Standards, Office of Air and Radiation, EPA, EPA-452/R-14-004a, Health Risk and Exposure Assessment for Ozone: Final Report ES-6 to ES-7 (2014) (analyses for review of the ozone NAAQS focused on estimates of effects in at-risk population groups), *available at* https://www.epa.gov/naaqs/ozone-o3-standards-risk-and-exposure-assessments-review-completed-2015.
[19] 78 Fed. Reg.3086, 3125 (Jan. 15, 2013).
[20] 78 Fed. Reg. at 3126-27.
[21] 78 Fed. Reg. at 3127.

the annual $PM_{2.5}$ NAAQS from 15 µg/m^3 to 12 µg/m^3, the Administrator was "mindful" that the Act required the standard be set "at a level that reduces risk sufficiently so as to protect public health, including the health of at-risk populations, with an adequate margin of safety."[22] She rejected a level of 13 µg/m^3 because it "would not appropriately take into account the more limited evidence of effects in some at-risk populations (e.g., low birth weight)."[23]

Sensitive Populations Are Taken into Account in the On-going PM NAAQS Review

EPA is currently conducting a review of the PM NAAQS promulgated in 2013. The Agency is following its practice of considering evidence of sensitive, or at-risk, populations in this current review. The ISA prepared for the current review,[24] indicates that "whether specific populations or life stages are at increased risk of a PM-related health effect" is an important consideration in evaluating the adequacy of the current PM NAAQS.[25] It includes substantial discussion of the evidence concerning populations that are potentially at greater risk from $PM_{2.5}$ exposures. Indeed, Chapter 12 of the document, which runs 66 pages and includes 15 pages of references, is titled "Populations and Lifestages Potentially at Increased Risk of a Particulate Matter-related Health Effect."[26] Both the ISA and subsequent PA extensively consider and acknowledge potential for increased risk to minority populations from $PM_{2.5}$-related health effects. Even considering this, EPA has proposed finding the current standard sufficiently protective without change.

On April 14, 2020, Administrator proposed to conclude the current review by retaining the current NAAQS without revision.[27] In doing so, he pointed to these conclusions from the ISA and PA concerning evidence of higher $PM_{2.5}$ exposures for black and Hispanic populations and populations with low socioeconomic status.[28] Based on the total body of evidence, including that concerning sensitive populations, the Administrator proposed to conclude that the primary $PM_{2.5}$ NAAQS "remain requisite to protect the public health."[29]

[22] 78 Fed. Reg. at 3161.
[23] 78 Fed. Reg. at 3162.
[24] Ctr. For Pub. Health & Envtl. Assessment, Office of Research and Dev., EPA, EPA/600R-19/188, Integrated Science Assessment for Particulate Matter (2019), https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=347534 (PM ISA).
[25] PM ISA at 1-53.
[26] PM ISA at 12-1.
[27] https://www.epa.gov/naaqs/particulate-matter-pm-standards-federal-register-notices-current-review (Proposal).
[28] Proposal at 77.
[29] Proposal at 102.

ATTACHMENT 4

Prepared for
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Date
April 21, 2020

HEALTH SCREENING ASSESSMENT

BUCKINGHAM COMPRESSOR STATION
BUCKINGHAM COUNTY, VIRGINIA

RAMBOLL

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ACRONYMS AND ABBREVIATIONS

ACP	Atlantic Coast Pipeline
ACP-2	Buckingham Compressor Station
ACS	American Community Survey
ADAF	Age-Dependent Adjustment Factor
AEGL	Acute Exposure Guideline Levels
AIHI	American Industrial Hygiene Association
AT	Averaging Time
ATSDR	Agency for Toxic Substances and Disease Registry
AUXB	Auxiliary Boiler
bscf	billion standard cubic feet
Cal/EPA	California Environmental Protection Agency
CDC	Centers for Disease Control
CF	Conversion Factor
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CPF	Cancer Potency Factor
Cr(III)	Trivalent Chromium
Cr(VI)	Hexavalent Chromium
CS	Census Estimate
CT	Combustion Turbine
d	day
DEQ	Department of Environmental Quality
DETI	Dominion Energy Transmission Inc.
DOE	Department of Energy
Dominion	Dominion Energy, Inc.
ED	Exposure Duration
EGEN	Emergency Generator
EF	Exposure Frequency
ERM	Environmental Resources Management
ERGP	Emergency Response Planning Guidelines
ESD	Emergency Shutdown

ET	Exposure Time
°F	Fahrenheit
FERC	Federal Energy Regulatory Commission
HAP	Hazardous Air Pollutant
Hg	Mercury
Hg(0)	elemental mercury
Hg(2+)	divalent mercury
Hg(p)	particulate-bound mercury
HHRAP	Human Health Risk Assessment Protocol
HI	Hazard Index
hp	horsepower
HQ	Hazard Quotient
HSA	Health Screening Assessment
HT	Heater
ISO	International Organization for Standardization
IUR	Inhalation Unit Risk
km	kilometer
km^2	square kilometer
LH	Line Heater
LOAEL	Lowest Observed Adverse Effect Level
m^3	cubic meter
µg	microgram
M&R	Metering and Regulating
MMBtu	Million British Thermal Units
MMIF	Mesoscale Model Interface Program
NAAQS	National Ambient Air Quality Standards
NCP	National Contingency Plan
NEI	National Emissions Inventory
NOx	Nitrogen Oxides
NOAEL	No Observed Adverse Effect Level
O_2	Oxygen
OEHHA	Office of Environmental Health Hazard Assessment
PAC	Protective Action Criteria

PIGL	pig launcher
PIGR	pig receiver
PM	Particulate Matter
ppmvd	Parts Per Million, Volumetric Dry
PSD	Prevention of Significant Deterioration
REL	Reference Exposure Level
RfC	Inhalation Reference Concentration
SCR	Selective Catalytic Reduction
SO_2	Sulfur Dioxide
TEEL	Temporary Emergency Exposure Limits
TNK	Storage or Accumulation Tank
UCL	Upper Confidence Limit
US	United States
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WAA	Washington-Arlington-Alexandria
WRF	Weather Research and Forecasting Model

EXECUTIVE SUMMARY

Emissions were modeled for normal operations as well as startup, shutdown, capped emergency shutdown (ESD) system testing, pig launching and pig receiving events from a variety of sources at the Buckingham Compressor Station and Woods Corner Measurement and Regulation (M&R) station (hereafter, referred to as Buckingham Station) including the four combustion turbines, auxiliary boiler, four-line heaters, emergency heater, other vent stacks, fugitive sources, tanks, and pig launching and receiving blowdown valves.

Over 80 chemicals, including organic gases and metals, were modeled with the dispersion model recommended by the United States Environmental Protection Agency (USEPA). Air concentrations for hourly and annual exposure periods were calculated in a grid pattern across receptor locations ranging from the fence line of the proposed compressor station to 20 kilometers (km) from the proposed facility. These modeled air concentrations were then used in this assessment.

This assessment was conducted in accordance with the general approach contained in the Virginia Department of Environmental Quality (Virginia DEQ) Unified Risk Assessment Model User's Guide (Virginia DEQ 2018), the USEPA Risk Assessment Guidelines (USEPA 2009 and 2018a), and the Human Health Risk Assessment Protocol (HHRAP) for Hazardous Waste Combustion Sources (USEPA 2005a). Typically, health screening analyses only examine hazardous air pollutants and not criteria pollutants, as the latter are regulated under the National Ambient Air Quality Standards (NAAQS).

Potential cancer and noncancer health effects that might be associated with either short-term or long-term exposures to the air emissions from the Buckingham Station were estimated for an individual who might be present at each grid point in the area, using air concentrations modeled at 1.8 meters in height (the approximate height of an adult breathing zone) at each location.

Modeled emissions from normal operations will be below concentrations that might pose a level of health concern, using consistently conservative assumptions. Potential excess lifetime cancer risk and noncancer hazard indices (HIs) were calculated across a grid-map of the area. For the residential location with the highest projected cancer risk, the excess lifetime cancer risks were below 1-in-a-million (1×10^{-6}), which is below the USEPA range of concern[1]. We understand that the location with the highest projected cancer risk is not an occupied residence. Thus, liefetime exposures would be adjusted by the residence time (x days per year divided by 350 days a year), and the risks would be even lower.

For long-term exposures, the noncancer HI, which sums the chronic hazard quotients (HQ) across all chemicals, was below the USEPA acceptable threshold of greater than 1 for the

[1] Excess lifetime cancer risks for residents are only calculated for long-term exposures because they assume that an individual is exposed 24 hours a day, 350 days per year, continuously, for 26 years. Residential locations are used to estimate lifetime cancer risk because the assumption is that an individual will not be present at the fence line for continuous long-term exposures; the assumption that they are at their residence 24 hours a day, 350 days a year is conservative, as most people spend time at other locations as well (e.g., school, work).

chronic HI, which the USEPA and other States or the Commonwealth have determined even a sensitive individual can be exposed to without appreciable noncancer chronic health effects.

For short-term exposures, six different exposure scenarios[2] were examined: normal operations, start-up, shut-down, capped ESD system testing, pig launching, and pig receiving events. This comparison showed that, at all locations across the grid, chemical concentrations will be below the concentrations that USEPA and other States or the Commonwealth have determined even a sensitive individual can be exposed to without risk for noncancer acute health impacts. These calculations take into account exposures to all of the air toxic chemicals that may be in the emissions.

All of these calculations, including the emissions projections and the health effects assessments are exceedingly conservative, and follow guidance by the Commonwealth of Virginia and from the Federal government. No appreciable health effects – even considering the possibility of sensitive population in the surrounding community – are projected due to exposure to air emissions from the Buckingham Station.

[2] In addition to the capped ESD system testing, the startup, shutdown, pig launching and pig receiving scenarios also include blowdown emissions.

1. INTRODUCTION

Atlantic Coast Pipeline, LLC proposes to construct and operate the Atlantic Coast Pipeline (ACP), an approximately 600-mile-long interstate natural gas transmission pipeline system designed to meet growing energy needs in Virginia and North Carolina. The proposed project has the capacity to deliver 1.5 billion standard cubic feet of natural gas per day (bscf/d) from Pennsylvania and West Virginia to power generation facilities and other end-users. To support the transmission of natural gas for the ACP, Dominion Energy Transmission Inc. (DETI), a subsidiary of Dominion Energy, Inc. (Dominion), will contract with Atlantic Coast Pipeline, LLC to construct and operate the Buckingham Compressor Station (ACP-2) in Buckingham County, Virginia (see Figure 1-1). DETI will operate the Buckingham Compressor Station and the adjacent Woods Corner Measurement and Regulation (M&R) station (Woods Corner) (together referred to as the "Buckingham Station"). Emissions from these two sources are therefore considered in aggregate in this health screening assessment (HSA).

The Buckingham Station will be located in Buckingham County, Virginia. The site where the Buckingham Station will be located is approximately 68 acres, located along Route 56. The facility will be centrally located on the site with vegetation along the perimeter to provide a buffer and block visibility from the highway and adjacent properties. The adjacent properties are primarily large acreage parcels utilized for agriculture or forestry.

This HSA is being performed to evaluate potential human health impacts on surrounding communities associated with projected air emissions from the Buckingham Station. The assessment was conducted following methodologies presented in the Virginia Department of Environmental Quality (Virginia DEQ) Unified Risk Assessment Model (URAM) User's Guide (2018), the U.S. Environmental Protection Agency (USEPA) Risk Assessment Guidelines (USEPA 2009 and 2018a), and the Human Health Risk Assessment Protocol (HHRAP) for Hazardous Waste Combustion Sources (USEPA 2005a). The assessment evaluates the area surrounding the facility and estimates potential excess lifetime cancer risk, as well as non-cancer chronic and acute hazards to individuals who may reside in the area. Typically, health screening analyses only examine hazardous air pollutants (HAPs) and not criteria pollutants, as the latter are regulated under the National Ambient Air Quality Standards (NAAQS).

The HSA was designed to characterize the potential human health impacts for normal operations, as well as startup, shutdown, capped emergency shutdown (ESD) system testing, pig launching and pig receiving events. This report describes the scope, process, and methodologies for each scenario and each step of the assessment. The assessment results are also discussed and summarized for each evaluated exposure population and scenario.

This HSA builds on documents prepared in support of the air permit application, including:

- Permit Application for Buckingham Compressor Station (Atlantic Coast Pipeline), prepared by Environmental Resources Management (ERM), May 2018 (ERM 2018a)
- Buckingham County Compressor Station Air Quality Modeling Protocol prepared by ERM, April 6 (ERM 2018b)
- Buckingham County Compressor Station Air Quality Modeling Report prepared by ERM, July 2018 (ERM 2018c).

The remainder of this report is organized into the following sections:

- Chapter 2, **Source of Air Emissions**, differentiates the sources of air emissions at the proposed Buckingham Station.
- Chapter 3, **Air Dispersion Modeling**, presents the methodology and results of the air emissions modeling for both long-term and short-term (1-hour) exposures.
- Chapter 4, **Quantitative Health Screening Analysis**, presents the results of a quantitative assessment of human health effects potentially associated with Buckingham Station emissions.
- Chapter 5, **Conclusions**, draws conclusions from the assessment, demonstrating that no appreciable adverse health impacts are anticipated due to exposure to air emissions from the Buckingham Station.
- Chapter 6, **References**, presents a list of the references for this report.

Supporting data are presented in the appendices to this report as follows:

Appendix A: Emission Inventory

2. SOURCES OF AIR EMISSIONS

The Clean Air Act Permit Application for the Buckingham Station, prepared by ERM (ERM 2018a), includes emission sources associated with both the compressor station and the M&R station. Both are included in this HSA as discussed below.

2.1 Emissions from Buckingham Station

Potential annual and hourly emissions of chemicals that may potentially be associated with the proposed equipment at the Buckingham Station were quantified using the methodologies documented in the air permit application (ERM 2018a), data in the emissions worksheets provided by Dominion ("Appendix C - ACP-2 PTE Calcs - 7.3.18.xlsx" dated July 3, 2018), and modeling protocol (ERM 2018b). The emission sources associated with the station include:

- Four combustion turbines (CT):
  - Solar Mars 100 CT with International Organization for Standardization (ISO) rated capacity of 15,900 horsepower (hp) (CT-01)
  - Solar Taurus 70 CT with a rated capacity of 11,107 hp (CT-02)
  - Solar Titan 130 CT with ISO rated capacity of 20,500 hp (CT-03)
  - Solar Centaur 50L CT with a rated capacity of 6,276 hp (CT-04)
- One Hurst S45 Auxiliary Boiler (AUXB) with a maximum heat input of 6.384 million British Thermal Units per hour (MMBtu/hour)
- Four ETI WB Line Heaters (HT) with two burners per line (HT11, HT12, HT21, HT22, HT31, HT32, HT41, HT42) rated at 10.61 MMBtu/hour each (located at the Woods Corner M&R station)
- One Caterpillar G3516C Emergency Generator (EGEN) rated at 1,500 kilowatts (2,175 hp) (located at the Woods Corner M&R station)
- Eight vent stacks
  - Two station suction vent stacks (STN1, STN2)
  - Two station discharge vent stacks (STN3, STN4)
  - Four CT vent stacks (UNT1, UNT2, UNT3, UNT4)
- Three storage or accumulation tanks (TNK):
  - Accumulation tank (TNK1) for waste water with 2,500-gallon capacity
  - Hydrocarbon waste tank (TNK2) with a capacity of 2,000 gallons
  - Aqueous ammonia storage tank (TNK3) with a capacity of 13,000 gallons
- Two CT building vents (CT12, CT34) where fugitive natural gas emissions from various Station components and piping sources are released
- Blowdown valves used to depressurize the piping of the pig launcher (PIGL) and pig receiver (PIGR) during pigging events.

Emissions were quantified for a range of potential scenarios including normal operations, startup and shutdown (includes combustion and venting), capped ESD system testing, pig launching and pig receiving events. In addition to the capped ESD system testing, the startup, shutdown, pig launching and pig receiving scenarios also include blowdown emissions as described below. Detailed emission calculations and source emission parameters can be found for each source and scenario in the modeling protocol (ERM 2018b) and modeling report (ERM 2018c).

The auxiliary boiler, emergency generator, line heaters, tanks and fugitive vents of the CT buildings were assumed to operate during all scenarios, and all sources except the emergency generator were assumed to operate continuously throughout the year (8,760 hours/year). In quantifying the annual emission rates, the emergency generator was assumed to be operated for 500 hours per year, while the hourly emission rates used for the emergency generator in modeling was the maximum hourly emission rate. Fugitive emissions from the accumulation tank were quantified using the percentage of oil in the waste water.

The potential emissions from the CTs were calculated separately for normal operations, startup events and shutdown events. Startup and shutdown events were assumed to last for 10 minutes each. The potential annual emissions conservatively included 100 startup events and 100 shutdown events for each CT and normal operation in all other hours of the year. The CT hourly emissions for startup and shutdown events assumed 10 minutes of startup/shutdown emissions and 50 minutes of emissions from normal operations. While the CT emissions used were the potential-to-emit (100% load), the stack parameters were from the 50% CT load scenario (detailed CT load analysis provided in modeling protocol [ERM 2018b]). The lowest CT exit gas temperature (0° F ambient temperature scenario) and exit gas velocity (100° F ambient temperature scenario) of the 50% combustion turbine load analysis were conservatively used for all modeling scenarios (normal operations, startup events, and shutdown events).

Natural gas emissions from blowdown occur during startup, shutdown, capped ESD system testing, pig launching and pig receiving. There are no blowdown emissions during normal operations. Blowdown emissions were calculated using the blowdown gas volume from each event (total volume for annual emission rates and maximum hourly for hourly emission rates) and gas composition (weight fraction of chemicals). Annual emission rates for blowdown included 10 startup events, 10 shutdown events, and one annual capped ESD system testing and four pig launching and receiving events. Hourly emission rates were quantified and modeled separately for startup, shutdown, capped ESD system testing and pigging events.

Blowdown emissions from startup and shutdown are only from the four CT vent stacks, while blowdown during capped ESD system testing includes emissions from the four CT vent stacks, two station suction vent stacks, and two station discharge vent stacks.

Pigging operations are a required maintenance activity that involve launching a pig device to inspect and/or clean the pipelines and then removing the pig device from the pipes (receiving) after maintenance is complete. Emissions from pigging operations consist of valves on the launcher or receiver chamber that are opened prior to or following an event respectively, in order to depressurize the chamber to either insert or extract the pig device. Annual emission rates included four pig launching events and four pig receiving events

(expected to occur once every five to seven years). The modeling assumes normal operations of non-turbine equipment within the same hour as a pigging event. Pigging events were modeled as occurring between the hours of 6:00 AM and 7:00 PM. Hourly emissions rates were quantified and modeled separately for pig launching events and pig receiving events.

Blowdown emission calculations from startup, shutdown, capped ESD system testing, and pigging for hexane were provided in Table C-12 of Appendix C of the modeling protocol (ERM 2018). Calculations of blowdown emissions of other chemicals followed the same procedures (chemicals for which the weight fraction in the natural gas was available were included).

Summaries of annual and maximum hourly emissions are provided in Table 2-1. Tables of the scenario specific emissions used in the modeling are provided for each chemical and source in Appendix A.

Additional details on the modeled emissions data for the Buckingham Station by source and release scenario including hourly emissions are provided in Appendix A.

2.2 Natural Gas Quality

The emissions from natural gas compression depend on the composition of the natural gas. The natural gas delivered to the Buckingham Station that will be compressed and transmitted through the transmission pipeline, will have been through various stages of processing and must be generally free of liquids, water vapor, and other impurities and has a higher level of methane than other (non-processed) compressed gas. Consequently, interstate or tariff quality natural gas will generally burn cleaner (and thus produce lower emissions) than an equivalent station combusting natural gas from upstream gathering lines.

3. AIR DISPERSION MODELING

3.1 Overview and Modeling Configuration and Inputs

Air dispersion modeling was conducted to estimate exposure concentrations of chemicals to support the HSA. The dispersion model AERMOD (version 16216r) was used to model the dispersion of the chemicals listed in Table 2-1. AERMOD is the USEPA-recommended model for near-source (within 50 km) dispersion modeling. The modeling used a model configuration similar to that described in the modeling protocol for the Buckingham Station (ERM 2018b)[3]. An overview of the air dispersion modeling performed for the health screening assessment is provided below.

Three years of meteorological data (for 2013, 2014 and 2015) generated with the Weather Research and Forecasting (WRF) model at 12 km horizontal grid resolution were used in the modeling; these data were provided by Virginia DEQ. Meteorological values from WRF at the model grid cell closest to Buckingham Station were extracted using the USEPA's Mesoscale Model Interface Program (MMIF). AERMET (version 16216) was used to process the MMIF output for use in AERMOD.

The spatial distribution of receptors was defined as follows:

- 25-meter spacing along the facility's fence line
- 50-meter spacing from the fence line extending to 1 km from the facility
- 100-meter spacing from 1 km to 3 km from the facility
- 250-meter spacing from 3 km to 10 km from the facility, and
- 500-meter spacing from 10 km to 20 km from the facility

The spatial distribution of receptors is shown on Figure 3-1. Receptor heights were set at breathing height (1.8 meters) for the purposes of the HSA.

AERMOD was run for each chemical and for each of the following exposure scenarios:

- Annual (that includes normal operations, startup, shutdown, capped ESD system testing and pigging events)
- 1-hour normal operations
- 1-hour combustion startup events
- 1-hour combustion shutdown events
- 1-hour blowdown from startup events
- 1-hour blowdown from shutdown events
- 1-hour capped ESD system testing
- 1-hour pig launching events, and
- 1-hour pig receiving events.

[3] The differences in the modeling performed to support the HSA of this report and the modeling described in the Buckingham Station Modeling Protocol (ERM 2018b) are the receptor height used (breathing height in this analysis and ground-level in the ERM modeling report) and the scenarios and pollutants modeled.

3.2 Modeled Air Concentrations

To support the HSA, the maximum 1-hour concentration and annual average concentration were determined at each receptor for each model scenario for the chemicals listed in Table 2-1. Summaries of the modeled air concentrations are provided in the following sections.

3.2.1 Air Concentrations for Long-Term Exposure

The annual average air concentrations were modeled to estimate long-term exposure concentrations. The annual results represent the total emissions from all sources and all hours in the year whether they had normal operations, startup events, shutdown events, capped ESD system testing, or pigging events. The maximum annual average across the three model runs was determined at each receptor location modeled. The annual average concentrations are provided in Table 3-1 for the maximum estimated cancer risk at any residential location (see Section 4).

3.2.2 Air Concentrations for Short-Term Exposure

The 1-hour air concentrations were modeled to estimate short-term exposure concentrations. The domain-wide annual maximum 1-hour concentrations are provided in Table 3-2 for normal operations, startup events, shutdown events, capped ESD system testing, pig launching and pig receiving events. For chemicals produced as a result of combustion, the modeled emissions for startup and shutdown are based on the emission rates of the combustion turbines during those events. For chemicals emitted due to the venting of natural gas during blowdown, the modeled startup and shutdown emission rates are based on the amount of gas vented during each event. Chemicals without combustion turbine emissions have the same emission rates across the normal operation, startup events, and shutdown events scenarios. Chemicals for which the weight fraction in the natural gas were not available were not modeled for capped ESD system testing or pigging events.

4. QUANTITATIVE HEALTH SCREENING ANALYSIS

The HSA is a process to quantitatively estimate the nature and probability of potential adverse health effects in humans who may be exposed to chemicals from environmental media. In addition to looking at the present situation, it also projects into future exposures. By nature, HSAs are very conservative, both in terms of estimating exposures and in terms of predicting possible health effects. The idea of an HSA is to conservatively screen for potential health impacts, purposely overestimating the likelihood of health effects, and if no significant impacts are predicted then having a high degree of confidence that there will not be any adverse health effects. If the HSA predicts impacts, that does not imply that impacts are likely; instead, the assumptions can then be refined to better reflect reality to examine whether an actual impact would exist.

4.1 Methodology for Estimating Human Health Characterization

This section describes the methodology and key assumptions used. In accordance with the general approach presented in the Virginia DEQ URAM User's Guide (Virginia DEQ 2018), the USEPA Risk Assessment Guidelines (USEPA 2009, and 2018a) and the HHRAP guidance (USEPA 2005a), the HSA is comprised of the following four main steps:

- Hazard Identification
- Dose-Response (or Toxicity) Assessment
- Exposure Assessment, and
- Risk and Hazard Characterization.

Each of the above four main steps is discussed in the following sections in terms of how they were used to conduct a quantitative assessment for the Buckingham Station for the following scenarios:

- **Long-term normal operations scenario:** Potential health effects, both cancer and noncancer, following long-term exposures (based on annual average concentrations)[4]. This scenario examines a normal operations scenario (which includes normal routine operations, as well as startup, shutdown, capped ESD system testing, and pig launching and receiving events).
- **Short-term normal operations scenario:** Potential noncancer health effects following short-term (1-hour) exposures under normal operations.
- **Short-term startup scenario:** Potential noncancer health effects following short-term (1-hour) exposures under startup conditions.
- **Short-term shutdown scenario:** Potential noncancer health effects following short-term (1-hour) exposures under shutdown conditions.
- **Short-term capped ESD system testing scenario:** Potential noncancer health effects following short-term (1-hour) exposures under capped ESD system testing conditions.

[4] Cancer risks are only calculated for long-term exposures because they assume that an individual is exposed 24 hours a day, 350 days per year, continuously, for 26 years.

- **Short-term pig launching scenario:** Potential noncancer health effects following short-term (1-hour) exposures under pig launching conditions.
- **Short-term pig receiving scenario:** Potential noncancer health effects following short-term (1-hour) exposures under pig receiving conditions.

These methods, detailed below, are consistent with current Virginia DEQ's risk assessment guidance in the URAM User's Guide (2018) and USEPA human health risk assessment guidance, and are considered a conservative approach to estimating potential health effects (i.e., health protectiveness). Uncertainties associated with the assessment methodologies and key assumptions, as well as how these uncertainties may affect the HSA conclusions, are discussed in detail in Section 4.1.5.

4.1.1 Hazard Identification

To identify the set of chemicals for quantitative evaluation in this HSA, chemicals typically emitted from compressor stations based on emission reporting were identified (Table 2-1). These chemicals include both gas phase and particle phase chemicals. All chemicals are quantitatively evaluated in the HSA for the six named scenarios: normal operations (both long-term and short-term), startup, shutdown, capped ESD system testing, pig launching, and pig receiving.

Chromium can exist in different ion forms, either in the trivalent (III) form or the hexavalent (IV) form. While chromium (III) ions are not considered toxic for the inhalation pathway or carcinogenic, hexavalent chromium (Cr[VI]) is considered both toxic and carcinogenic. Following USEPA (2016b), this HSA assumes that 96% of the chromium exists as Cr(III).

Mercury is ubiquitous and present in many forms in the environment. As mercury cycles through the environment between atmosphere, land, and water, it undergoes many complex chemical and physical transformations. The most common form of atmospheric mercury is gaseous elemental mercury [Hg(0)]. Other forms of atmospheric inorganic mercury include gaseous oxidized or divalent mercury [Hg(2+)] and particulate-bound mercury [Hg(p)]. Since elemental mercury and divalent mercury have the same inhalation toxicity value, it was assumed all the mercury emitted from the Buckingham Station was in the form of 50% elemental mercury and 50% divalent mercury.

4.1.2 Exposure Assessment

The USEPA (1989) defines exposure as "the contact of an organism with a chemical or physical agent" and defines the magnitude of exposure as "the amount of the agent available at the exchange boundaries of the organism (e.g., skin, lungs, gut,)." Exposure assessments are designed to determine the degree of contact a person has with a chemical over time, usually measured in concentration units (such as $\mu g/m^3$) over some averaging time (such as hours or years). The components of the exposure assessment include the identification of potentially exposed populations (the receptors), the identification of exposure pathways, and the selection of various assumptions to quantify how much of each chemical the population is exposed to (the chemical intake, or dose).

4.1.2.1 Potentially Exposed Populations

To evaluate potential human health impacts posed by a site or facility, it is necessary to first identify the populations that may be exposed to the chemicals, either now or in the future, and to then determine the pathways by which exposures may occur.

Identification of potentially exposed populations requires evaluating the human activity and land-use patterns at the site and in the vicinity of the site.

As noted earlier, Buckingham County is a rural community. Much of the land around the Buckingham Station is large acreage parcels utilized for agriculture or forestry. Based on inspection of an aerial photograph of the land use in the area surrounding the Buckingham Station, residential areas were identified within a 1 km radius from the facility. The populations considered in this HSA include individuals in these offsite residential areas in all directions, with a focus on those closest to the facility. Potential impacts will be lower at locations farther from the facility.

As described in Section 3, both maximum annual average and 1-hour concentrations of chemicals were determined at each modeled grid receptor location. For the short-term exposure evaluation, exposures were assessed based on the maximum 1-hour chemical concentrations at each grid receptor for each chemical. The grid receptor with the highest predicted health impact across all chemicals was identified for each of the six short-term scenarios. For long-term exposure, potential health impacts were estimated based on maximum annual average concentrations across the three model runs assuming a residential scenario at each modeled grid receptor, as well as for potential residential locations within a 1 km radius from the Buckingham Station.

4.1.2.2 Potential Exposure Pathways, Routes, and Exposure Assumptions

As discussed in Section 3, Buckingham Station emissions were used to model air concentrations within the modeling domain. It is assumed that residential populations within the domain can be exposed to compressor station emissions through direct inhalation.

Once populations and potential exposure pathways are identified, the concentrations of chemicals are modeled, and then chemical-specific intakes are estimated for each exposure scenario (resulting in dose). This methodology uses theoretically possible exposures, not actual exposures, and is designed to conservatively overestimate what any individual is likely to experience. For example, for chronic health effects, these calculations assume that the individual spends 24 hours a day, 350 days a year, 26 years at the same location. For acute health effects, these calculations assume the individual is located at the maximum impact point when the maximum impact occurs.

4.1.2.3 Exposure Assumptions and Calculations

The magnitude of exposure for any given receptor is a function of the amount of chemical in the exposure medium, and the frequency, intensity, and duration of contact with that medium. In order to quantify exposures, an upper-bound estimate of the theoretical intake was developed. The intake factor for the inhalation pathway is calculated using the following equation (Virginia DEQ 2018, USEPA 2009 and 2018a):

$$IF_{inh} = \frac{\mathrm{ET} \times \mathrm{EF} \times \mathrm{ED}}{AT \times CF}$$

Where:

IF_{inh} = Intake Factor for air inhalation (unitless)

ET	=	Exposure Time (hours/day)
EF	=	Exposure Frequency (days/year)
ED	=	Exposure Duration (years)
AT	=	Averaging Time (days)
CF	=	Conversion Factor (hours/day)

Table 4-1 summarizes the exposure assumptions for the residential scenario. These conservative assumptions are in accordance with Virginia DEQ' URAM User's Guide (Virginia DEQ 2018) and USEPA's Regional Screening Levels User's Guide (USEPA 2018a). For carcinogens, the intake factor averaged over a 70-year lifetime will be used in the risk characterization, while for non-carcinogens, the intake factor averaged over the exposure period will be used (USEPA 1989).

4.1.3 Toxicity Assessment (Dose/Response Assessment)

The toxicity assessment (also known as the dose/response assessment) examines the potential for a chemical to cause adverse health effects (toxicity) in exposed individuals at a given exposure concentration (dose). This HSA evaluated theoretical exposures to chemicals for two categories of potential health effects, cancer and noncancer; noncancer health effects were assessed for both short-term and long-term exposures. In general, chemicals are capable of inducing noncancer health effects when human exposure occurs at sufficiently high exposure concentrations over a certain period of time; some, but not all, chemicals may also be capable of inducing cancer health effects.

4.1.3.1 Chronic Toxicity Values

Possible cancer health effects resulting from lifetime exposure to chemicals by inhalation are quantitatively estimated using inhalation unit risks (IURs), which are expressed in unit of $(\mu g/m^3)^{-1}$. These numbers are chemical-specific and experimentally-derived potency values. In accordance with Virginia DEQ's URAM User's Guide (Virginia DEQ 2018), IURs published by USEPA (USEPA 2018b) are used. In accordance with USEPA's recommendation (USEPA 2018a), the Age-Dependent Adjustment Factor (ADAF) is incorporated in the excess lifetime cancer risk calculations for chemicals identified as potentially mutagenic. The ADAF accounts for the potentially increased susceptibility of children and infants.

Potential noncancer health impacts resulting from long-term inhalation exposures to chemicals are estimated using chronic reference concentrations (chronic RfCs), which are expressed in units of $\mu g/m^3$. These RfCs are chemical-specific and experimentally-derived values for which long-term inhalation exposure are not expected to cause adverse noncancer health effects. In accordance with Virginia DEQ's URAM User's Guide (Virginia DEQ 2018), chronic RfCs published by USEPA (USEPA 2018b) were used.

All IURs and chronic RfCs are presented in Table 4-2. Chemicals identified as potentially mutagenic are identified in the table; the calculated ADAF for the residential scenario is 2.8.

4.1.3.2 Acute Toxicity Values

The potential for noncancer health effects resulting from short-term inhalation exposures to chemicals are estimated using acute reference concentrations (acute RfCs), which are

expressed in units of $\mu g/m^3$. RfCs have been identified for each chemical by the USEPA or States or the Commonwealth to be air concentrations to which even the most sensitive individual can be exposed without a risk for noncancer health effects. They may be derived from a "no observable adverse effect level" (NOAEL), a "lowest observable adverse effect level" (LOAEL), or a benchmark concentration, with various uncertainty factors generally applied to reflect limitations of the data used (*e.g.*, extrapolation from experimental animal data to humans, use of LOAEL instead of NOAEL values, extrapolation from a study with short-term exposure to reflect long-term exposures, protection for sensitive individuals, and reflective of a limited strength of the database). For short-term exposures, acute RfCs are based on 1-hour averages.

In accordance with USEPA's recommendation for acute toxicity value selections (USEPA 2005a), the acute RfCs used in this HSA were based on the following 1-hour toxicity criteria hierarchy:

- California Environmental Protection Agency (Cal/EPA) Office of Environmental Health Hazard Assessment (OEHHA) Acute Reference Exposure Levels (RELs) (Cal/EPA 2018). Acute RELs are exposures that are not likely to cause adverse effects in a human population, including sensitive subgroups, exposed to that concentration for one hour on an intermittent basis
- USEPA Acute Exposure Guideline Levels (AEGL-1) (EPA 2015). AEGL-1s are airborne concentrations of substances above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.
- American Industrial Hygiene Association (AIHA) Level 1 Emergency Response Planning Guidelines (ERPG-1) (AIHA 2016). ERPG-1s are the maximum airborne concentrations below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined, objectionable odor.
- Department of Energy (DOE) Protective Action Criteria-1 (PAC-1) (DOE 2016). PAC-1s are airborne concentrations of a substance above which it is predicted that the general population, including susceptible individuals, when exposed for more than one hour, could experience notable discomfort, irritation, or certain asymptomatic, nonsensory effects. However, these effects are not disabling and are transient and reversible upon cessation of exposure.

The selected acute RfCs for the chemicals evaluated in this HSA are also presented in Table 4-2.

4.1.4 Risk and Hazard Characterization

4.1.4.1 Potential for Cancer

The resident receptor was assumed to be an individual exposed to the modeled maximum annual concentration for 24 hours per day, 350 days per year for 26 years. These conservative assumptions are in accordance with the Virginia DEQ URAM User's Guide (2018) and USEPA (USEPA 2018a).

The possibility for cancer associated with lifetime exposures is estimated as the upper-bound incremental probability that an individual will develop cancer over a lifetime as a direct result of exposure to potential carcinogens. The estimated risk is expressed as a unitless probability. The cancer risk attributed to a chemical is calculated by multiplying the chemical intake (dose) at the human exchange boundaries (e.g., lungs) by the chemical-specific cancer potency factor (CPF)

The equation used to calculate the potential excess lifetime cancer risk is as follows:

$$Cancer\ Risk = Dose_{inh} \times IUR$$

Where:

Cancer Risk	=	The incremental probability of an individual developing cancer as the result of exposure to a cumulative dose of a potential carcinogen over a lifetime (unitless)
$Dose_{inh}$	=	Dose or intake of a chemical ($\mu g/m^3$)
IUR	=	Inhalation Unit Risk $(\mu g/m^3)^{-1}$

An estimate of an individual's incremental excess cancer risk from exposure to the potential emissions from the Buckingham Station is then calculated by summing the chemical-specific excess cancer risks (i.e., Total risk =ΣRiski). Note that by summing the cancer risk estimates across all chemicals, the estimated excess lifetime cancer risk of all potential chemical emissions is considered, not just that of a single chemical.

The National Contingency Plan (NCP) (40 CFR § 300) is commonly cited as the basis for target risk and hazard levels. According to the NCP, lifetime incremental cancer risks posed by a site should not exceed one in a million (1×10^{-6}) to one hundred in a million (1×10^{-4}). In this HSA, the estimated cancer risks are expressed using scientific notation (e.g., 1×10^{-6}). Results presented in the text are expressed using one significant figure, as recommended by USEPA (1989).

4.1.4.2 Potential for Noncancer Health Effects

The potential for long-term exposures to result in noncancer effects is evaluated by comparing the estimated annual average air concentration for each chemical at each location to its corresponding chronic RfC. When calculated for a single chemical, the comparison yields a ratio termed a hazard quotient (HQ). To evaluate the potential for adverse chronic noncancer health effects from simultaneous exposure to multiple chemicals, the HQs for all chemicals are summed, yielding a hazard index (HI).

The equation used to calculate the chemical-specific chronic HQ is:

$$Chronic\ HQ_i = \frac{C_i}{RfC_i}$$

Where:

Chronic HQ_i	=	Chronic Hazard Quotient for $chemical_i$ (unitless)
C_i	=	Annual Average Air Concentration for $chemical_i$ ($\mu g/m^3$)
RfC_i	=	Chronic Noncancer Reference Concentration for $chemical_i$ ($\mu g/m^3$)

The chronic HQs are then summed across individual chemicals to calculate a chronic HI for each receptor. The equation used to calculate the overall HI for chronic effects is:

$$Chronic\ HI = \sum Chronic\ HQ_i$$

Where:

Chronic HI	=	Chronic Hazard Index
Chronic HQ_i	=	Chronic Hazard Quotient for $chemical_i$

The chronic HQs represent a ratio and are presented in decimal form in this HSA. For example, a chronic HQ of 0.3 means that the estimated exposure dose is 30 percent of the RfC. When the chronic HQ or HI is greater than 1, there may be concern for potential noncancer health effects (USEPA 1989). Since RfCs incorporate uncertainty factors designed to provide a margin of safety, chronic HQs and HIs greater than 1 do not necessarily suggest a likelihood of adverse effects and only indicate that a potential may exist for adverse health effects. A chronic HQs and HIs less than or equal to 1, however, suggests that exposures are likely to be without an appreciable risk of noncancer effects during a lifetime. In other words, a chronic HQs or HIs below or equal to 1 are considered safe with a margin of error (USEPA 1989). Note that because chronic HI sums the chronic HQs from all chemicals, this HSA examines chronic noncancer hazard of all potential emissions, not just that of a single chemical.

Similarly, the potential for short-term exposures to result in noncancer effects is evaluated by comparing the estimated maximum 1-hour air concentration to the chemical-specific noncancer acute RfC. When calculated for a single chemical, the comparison yields an acute HQ. To evaluate the potential for adverse acute health effects from simultaneous exposure to multiple chemicals, the acute HQs for all chemicals are summed, yielding an acute HI.

The equation used to calculate the chemical-specific acute HQs for acute effects is:

$$Acute\ HQ_i = \frac{C_i}{RfC_i}$$

Where:

Acute HQ_i	=	Acute Hazard Quotient for $chemical_i$ (unitless)
C_i	=	1-Hour Maximum Air Concentration for $chemical_i$ ($\mu g/m^3$)
RfC_i	=	Acute Noncancer Reference Concentration for $chemical_i$ ($\mu g/m^3$)

The acute HQs are then summed across individual chemicals to calculate an acute HI for each receptor. The equations used to calculate the overall HI for acute effects is:

$$Acute\ HI = \sum Acute\ HQ_i$$

Where:

Acute HI	=	Acute Hazard Index
Acute HQ_i	=	Acute Hazard Quotient for $chemical_i$

The acute HQs represent a ratio and are presented in decimal form in this report. For example, an acute HQ of 0.2 means that the estimated exposure dose is 20 percent of the REL. When the acute HQ or HI is greater than 1, there may be concern for potential noncancer health effects (USEPA 1989). Since acute RfCs incorporate uncertainty factors designed to provide a margin of safety, acute HQs and HIs greater than 1 do not necessarily suggest a likelihood of adverse effects and only indicate that a potential may exist for adverse health effects. Acute HQs and HIs less than or equal to 1, however, suggest that exposures are likely to be without an appreciable risk of noncancer effects. In other words, acute HQs and HIs equal to or below 1 are considered safe, with a margin of error (USEPA 1989). Note that because HI sums the acute HQs from all chemicals, acute hazard from all potential emissions, not just that of a single chemical, are evaluated in this HSA.

4.1.4.3 Lead Evaluation

There is no reference concentration for lead. USEPA currently recommends the Integrated Exposure Uptake Biokinetic model (IEUBK model, USEPA 2010) for children. USEPA's IEUBK model can be used to compute blood lead levels in children and predict the probability of elevated blood lead levels due to environmental exposure. Because the predicted lead in air at the maximum residential location is so low, 0.0000084 µg/m^3 (or 8.4 x 10^{-6} µg/m^3), there would be negligible effect on blood lead levels, well below both the USEPA target blood lead level of greater than 10 micrograms per deciliter (µg/dL) and the CDC recommended reference blood lead level of greater than 5 µg/dL.

In addition, the primary and secondary NAAQS standards for lead are 0.15 µg/m^3 in total suspended particles as a 3-month average. The predicted lead concentration in air at the maximum residential location is well below the NAAQS.

4.1.5 Uncertainties

The characterization of uncertainty is a key component of the HSA process (USEPA 1989, 2005a). This section provides a narrative discussion of the types of uncertainties that may influence the HSA results.

4.1.5.1 Chemical Selection

The chemicals evaluated in this HSA were from a comprehensive emissions inventory of over 80 substances developed for the Buckingham Station by Dominion. There may be other chemicals emitted from the Buckingham Station that were not evaluated by the HSA, but these chemicals in general are associated with very low or no adverse health effects especially when emitted at the low levels expected from the Station.

4.1.5.2 Toxicity values

The primary uncertainties associated with the toxicity assessment are related to the derivation of toxicity values for chemicals. Standard toxicity criteria established by the USEPA were used to estimate potential cancer and noncancer health effects from exposures to chemicals. These values are derived by applying health-protective

assumptions that are intended to protect the most sensitive individuals in potentially exposed populations. To derive toxicity criteria that are health-protective, the USEPA makes several conservative assumptions that tend to result in toxicity criteria that lead to significant overestimates of the actual hazard to human health.

4.1.5.3 Exposure Point Concentrations

There are many uncertainties associated with the estimate of exposure point concentrations that are used in the excess lifetime cancer risk and HI calculations.

The dispersion model AERMOD was used to estimate annual average off-site chemical exposure concentrations at modeled receptor locations. This model uses the Gaussian plume equation to calculate ambient air concentrations from emission sources.

When assessing the concentrations associated with health effects from long-term exposures, instead of using the maximum exposure concentrations, the USEPA recommends the 95% Upper Confidence Limits (UCLs) on the arithmetic average. This is viewed as a reasonable, while still conservative, estimate of exposure point concentrations likely to be contacted over time because in most situations, assuming long-term contact with the maximum concentration is overly-conservative and therefore not reasonable (USEPA 1989). The evaluation of health risks for cancer and noncancer effects following long-term exposures in this HSA were estimated at individual modeled receptor locations; the worst-case results at the maximally impacted residence locations were reported to represent the worst-case exposure for the residents. This is a conservative approach compared to using the 95% UCLs as the exposure point concentrations and tends to overestimate the actual cancer and chronic noncancer health effects. Similarly, the acute noncancer health effects were estimated and reported based on the worst-case results at the maximally impacted location (i.e., at the fence line of the compressor station) which may be covered by a vegetated buffer zone and is not accessible for the public. Thus, this process is designed to be overly conservative.

4.1.5.4 Exposure Assumptions

Health risks were calculated with the assumption that the individuals at the maximum off-site resident location spend every hour of 350 days per year at that location for 26 years. The USEPA has estimated that the 50th percentile for years lived in current home is 8 years, with a 90th percentile value of 32 years (USEPA 2011, Table 16-90). Further, adults, and most children, do not typically spend 100 percent of their total daily time at home (USEPA 2011), as assumed in the HSA. Accordingly, the actual risks to residents are expected to be lower than those calculated in this assessment.

For evaluating possible health effects from short-term exposures, we assume that the individual is located at the point of maximum impact at the hour that the maximum exposure occurs. Also, the underlying HSA assumptions and modeling parameters were mostly based on conservative defaults recommended by USEPA and therefore tend to overestimate exposure point concentrations.

Finally, concentration estimates for each residential location reflect both indoor and outdoor concentrations. In fact, many outdoor chemicals migrate from the outdoor air to the indoor air at reduced efficiency, meaning the indoor air concentrations are lower than the outdoor air, making this a conservative assumption.

4.1.5.5 Receptor Height

For the purposes of the HSA, the receptor height was set at 1.8 meters, which is approximately the height of the breathing zone of an adult.

4.2 Health Screening Assessment Results

To be the most conservative, cancer and noncancer health effects were estimated for each grid point in the modeling domain assuming residential land use and at the location of identified residential land use.

4.2.1 Normal Operations Scenario

4.2.1.1 Chronic Health Effects (Based on Annual Average Exposures)

Table 4-3 provides a summary of the estimated cancer risks and noncancer chronic HIs from long-term exposure to potential emissions from the Buckingham Station under normal operations at the maximum residential location. The maximum estimated excess lifetime cancer risk for a potential residential location is 2×10^{-7} which is below (less than) the USEPA's acceptable risk range and reflects minimal risk. As this is the maximum location, the cancer risk for all other residential locations near the facility would be below a level of health concern. The maximum estimated non-cancer chronic HI for a potential residential location is 0.02 (Table 4-3), which is well below the threshold of greater than 1, and therefore poses no risk.

Table 4-4 shows the estimated cancer risks at the maximum residential location by chemical and Table 4-5 shows the estimated cancer risk by source at this location. As shown on Table 4-4, formaldehyde contributes approximately half of the estimated risk (1×10^{-7}).

4.2.1.2 Acute Health Effects (Based on Hourly Exposures)

Table 4-6 summarizes the acute HIs for all scenarios. The maximum acute HI is 0.8 for normal operations, which is below the threshold of greater than one, and therefore below a level of concern. For the maximum acute HI, Table 4-7 shows the estimated acute HQs by chemical and Table 4-8 shows the acute HI breakdown by source. As shown in Table 4-7, the chemicals that contribute the most to the acute noncancer risks under normal operations are formaldehyde (acute HQ = 0.6) and acrolein (acute HQ = 0.2).

4.2.2 Startup Scenario

The maximum acute HI for the startup scenario is 0.9, which is below the threshold of greater than 1, and therefore below a level of concern. For the maximum acute HI, Table 4-7 shows the estimated acute HQs by chemical and Table 4-8 shows the acute HI breakdown by source. As shown in Table 4-7, the chemicals that contribute the most to the acute noncancer risks under the start-up scenario are formaldehyde (acute HQ = 0.7) and acrolein (acute HQ = 0.2).

4.2.3 Shutdown Scenario

The maximum acute HI for the shutdown scenario is 0.9, which is below the threshold of greater than 1, and therefore below a level of concern. For the maximum acute HI, Table 4-7 shows the estimated acute HQs by chemical and Table 4-8 shows the acute HI breakdown by source. As shown in Table 4-7, the chemicals that contribute the most to the acute noncancer risks under the shut-down scenario are formaldehyde (acute HQ = 0.6) and acrolein (acute HQ = 0.2).

4.2.4 Pig Launching Scenario

The maximum acute HI for the pig launching scenario is 0.4, which is below the threshold of greater than one, and therefore below a level of concern. For the maximum acute HI, Table 4-7 shows the estimated acute HQs by chemical and Table 4-8 shows the acute HI breakdown by source. As shown in Table 4-7, the chemical that contributes the most to the acute noncancer HI under the pig launching scenario is methane (acute HQ = 0.3).

4.2.5 Pig Receiving Scenario

The maximum acute HI for the pig receiving scenario is 0.2, which is below the threshold of greater than one, and therefore below a level of concern. For the maximum acute HI, Table 4-7 shows the estimated acute HQs by chemical and Table 4-8 shows the acute HI breakdown by source. As shown in Table 4-7, the chemical that contributes the most to the acute noncancer risks under the pig receiving scenario is methane (acute HQ = 0.1).

4.2.6 Capped ESD System Testing Scenario

The maximum acute HI for capped ESD system testing scenario is 0.0006, which is far below the threshold of greater than one, and therefore below a level of concern. For the maximum acute HI, Table 4-7 shows the estimated acute HQs by chemical and Table 4-8 shows the acute HI breakdown by source. Under this scenario, none of the chemicals contribute to acute noncancer risks (highest HI is 0.00003, for methane).

5. CONCLUSIONS

5.1 Emissions from Buckingham Station

Emissions of over 80 chemicals, including organic gases and metals, were modeled for normal operations as well as startup, shutdown, capped ESD system testing, pig launching, and pig receiving events from a variety of sources at the facility including the four combustion turbines, auxiliary boiler, four-line heaters, emergency heater, other vent stacks, fugitive sources and tanks. In addition to the capped ESD system testing, the startup, shutdown, pig launching and pig receiving scenarios also modeled blowdown emissions.

5.2 Potential Health Impacts Under Normal Operations

Modeled emissions from normal operations will be below concentrations that might pose a level of health concern, using consistently conservative assumptions. Potential excess lifetime cancer risk and noncancer HIs were calculated across a grid-map of the area. For the residential location with the highest projected cancer risk, the excess lifetime cancer risks were below 1-in-a-million (1×10^{-6})[5]. For long-term exposures, noncancer HI, which sums the health impacts across all chemicals, were below the benchmark level of greater than 1, which the USEPA and other States or the Commonwealth have determined even a sensitive individual can be exposed to without risk for noncancer chronic health effects. Similarly, assessment of short-term exposures to the maximum predicted 1-hour concentration of chemicals from emissions during normal operations will be below benchmark criteria, which the USEPA and other States or the Commonwealth have determined even a sensitive individual can be exposed to without risk for noncancer acute health effects.

5.3 Potential Health Impacts Under Start Up Operations

Modeled emissions from startup operations will be below concentrations that might pose a level of health concern, using consistently conservative assumptions. Acute HIs were calculated across a grid-map of the area. Using 1-hour maximum concentrations of chemicals from conservatively projected emissions, acute HIs, which sums the health impacts across all chemicals, were below the benchmark level of greater than 1 at all grid point locations. This benchmark is a point which the USEPA and other States or the Commonwealth have determined even a sensitive individual can be exposed to without risk for noncancer health effects.

5.4 Potential Health Impacts Under Shut Down Operations

Modeled emissions from shutdown operations will be below concentrations that might pose a level of health concern, using consistently conservative assumptions. Acute HIs were calculated across a grid-map of the area. Using 1-hour maximum concentrations of chemicals from conservatively projected emissions, acute HIs, which sums the health impacts across all chemicals, were below the benchmark level of greater than 1 at all grid point locations. This benchmark is a point which the USEPA and other States or the

[5] Lifetime cancer risks are only calculated for long-term exposures because they assume that an individual is exposed 24 hours a day, 350 days per year, continuously, for 26 years. Residential locations are used to estimate lifetime cancer risk because the assumption is that an individual will not be present at the fence line for continuous exposures; the assumption that they are at their residence 24 hours a day, 350 days a year is conservative, as most people spend time at other locations as well (e.g., school, work).

Commonwealth have determined even a sensitive individual can be exposed to without risk for noncancer health effects.

5.5 Potential Health Impacts Resulting from Capped ESD System Testing Events

Modeled emissions from the capped ESD system testing events will be below concentrations that might pose a level of health concern, using consistently conservative assumptions. Acute HIs were calculated across a grid-map of the area. Using 1-hour maximum concentrations of chemicals from conservatively projected emissions, acute HIs, which sums the health impacts across all chemicals, were below the benchmark level of greater than 1 at all grid point locations. This benchmark is a point which the USEPA and other States or the Commonwealth have determined even a sensitive individual can be exposed to without risk for noncancer health effects.

5.6 Potential Health Impacts Resulting from Pig Launching Events

Modeled emissions from pig launching events will be below concentrations that might pose a level of health concern, using consistently conservative assumptions. Acute HIs were calculated across a grid-map of the area. Using 1-hour maximum concentrations of chemicals from conservatively projected emissions, acute HIs, which sums the health impacts across all chemicals, were below the benchmark level of greater than 1 at all grid point locations. This benchmark is a point which the USEPA and other States or the Commonwealth have determined even a sensitive individual can be exposed to without risk for noncancer health effects.

5.7 Potential Health Impacts Resulting from Pig Receiving Events

Modeled emissions from pig receiving events will be below concentrations that might pose a level of health concern, using consistently conservative assumptions. Acute HIs were calculated across a grid-map of the area. Using 1-hour maximum concentrations of chemicals from conservatively projected emissions, acute HIs, which sums the health impacts across all chemicals, were below the benchmark level of greater than 1 at all grid point locations. This benchmark is a point which the USEPA and other States or the Commonwealth have determined even a sensitive individual can be exposed to without risk for noncancer health effects.

6. REFERENCES

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TABLES

Table 2-1: Summary of Annual Emission Rates from Buckingham Station (tons/year)
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Chemical	Combustion Turbines	Auxiliary Boiler	Emergency Generator	Line Heaters	Blowdown	Pig Launching and Receiving	Fugitives	Total
1,1,2,2-Tetrachloroethane			9.2E-05					**9.2E-05**
1,1,2-Trichloroethane			7.3E-05					**7.3E-05**
1,1-Dichloroethane			5.4E-05					**5.4E-05**
1,2,3-Trimethylbenzene			4.9E-05					**4.9E-05**
1,2,4-Trimethylbenzene			1.5E-04					**1.5E-04**
1,2-Dichloroethane			5.8E-05					**5.8E-05**
1,2-Dichloropropane			6.2E-05					**6.2E-05**
1,3,5-Trimethylbenzene			2.5E-05					**2.5E-05**
1,3-Butadiene	4.8E-04		1.1E-03					**1.6E-03**
1,3-Dichloropropene			6.1E-05					**6.1E-05**
2,2,4-Trimethylpentane			1.2E-03				2.9E-07	**1.2E-03**
2-Methylnaphthalene		6.6E-07	3.0E-05	8.7E-06				**3.9E-05**
3-Methylchloranthrene		4.9E-08		6.6E-07				**7.1E-07**
7,12-Dimethylbenz(a)anthracene		4.4E-07		5.8E-06				**6.3E-06**
Acenaphthene		4.9E-08	1.8E-06	6.6E-07				**2.5E-06**
Acenaphthylene		4.9E-08	4.4E-06	6.6E-07				**5.1E-06**
Acetaldehyde	4.5E-02		1.1E-02					**5.5E-02**
Acrolein	7.1E-03		1.1E-02					**1.8E-02**
Anthracene		6.6E-08	9.9E-07	8.7E-07				**1.9E-06**
Benz(a)anthracene		4.9E-08	4.6E-07	6.6E-07				**1.2E-06**
Benzene	1.3E-02	5.8E-05	2.7E-03	7.7E-04			2.9E-07	**1.7E-02**
Benzo(a)pyrene		3.3E-08	7.9E-09	4.4E-07				**4.8E-07**
Benzo(b)fluoranthene		4.9E-08	1.2E-08	6.6E-07				**7.2E-07**
Benzo(e)pyrene			3.2E-08					**3.2E-08**
Benzo(g,h,i)perylene		3.3E-08	3.4E-08	4.4E-07				**5.0E-07**
Benzo(k)fluoranthene		4.9E-08	5.9E-09	6.6E-07				**7.1E-07**
Biphenyl			5.5E-06					**5.5E-06**
Butane		5.8E-02	6.6E-03	7.7E-01	2.8E-02	1.8E-02	1.0E-01	**9.8E-01**
Butyr/Isobutyraldehyde			6.0E-04					**6.0E-04**
Carbon Tetrachloride			8.4E-05					**8.4E-05**
Chlorobenzene			6.1E-05					**6.1E-05**

Table 2-1: Summary of Annual Emission Rates from Buckingham Station (tons/year)
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Chemical	Combustion Turbines	Auxiliary Boiler	Emergency Generator	Line Heaters	Blowdown	Pig Launching and Receiving	Fugitives	Total
Chloroform			6.5E-05					**6.5E-05**
Chrysene		4.9E-08	9.3E-07	6.6E-07				**1.6E-06**
Cyclohexane			4.3E-04					**4.3E-04**
Cyclopentane			1.3E-04					**1.3E-04**
Dibenzo(a,h)anthracene		3.3E-08		4.4E-07				**4.7E-07**
Dichlorobenzene		3.3E-05		4.4E-04				**4.7E-04**
Ethane		8.5E-02	9.8E-02	1.1E+00	5.0E-01	3.3E-01	1.8E+00	**3.9E+00**
Ethylbenzene	3.6E-02		1.5E-04				2.9E-07	**3.6E-02**
Ethylene Dibromide			1.0E-04					**1.0E-04**
Fluoranthene		8.2E-08	5.0E-07	1.1E-06				**1.7E-06**
Fluorene		7.7E-08	2.3E-06	1.0E-06				**3.4E-06**
Formaldehyde	3.6E+00	2.1E-03	6.2E-01	2.7E-02				**4.2E+00**
Hexane (or n-Hexane)		4.9E-02	6.2E-04	6.6E-01	1.6E-02	1.0E-02	6.6E-02	**8.0E-01**
Indeno(1,2,3-c,d)pyrene		4.9E-08	1.4E-08	6.6E-07				**7.2E-07**
Isobutane			5.2E-03		2.6E-02	1.7E-02	9.4E-02	**1.4E-01**
IsoPentane					9.9E-03	6.4E-03	3.5E-02	**5.2E-02**
Methane	3.0E+01	6.3E-02	4.8E+00	8.4E-01	8.7E+00	5.6E+00	3.1E+01	**8.0E+01**
Methanol			3.4E-03					**3.4E-03**
Methylcyclohexane			4.7E-04					**4.7E-04**
Methylene Chloride			2.0E-04					**2.0E-04**
n-Heptane					2.8E-02	1.8E-02	1.0E-01	**1.5E-01**
n-Nonane			4.3E-05					**4.3E-05**
n-Octane			1.0E-04					**1.0E-04**
Naphthalene	1.4E-03	1.7E-05	1.3E-04	2.2E-04				**1.8E-03**
PAH	2.5E-03		1.9E-04					**2.6E-03**
Pentane (or n-Pentane)		7.1E-02	2.1E-03	9.5E-01	9.1E-03	5.9E-03	3.2E-02	**1.1E+00**
Perylene			6.9E-09					**6.9E-09**
Phenanthrene		4.7E-07	4.9E-06	6.2E-06				**1.2E-05**
Phenol			5.8E-05					**5.8E-05**
Propane		4.4E-02	4.0E-02	5.8E-01	1.4E-01	9.0E-02	4.9E-01	**1.4E+00**
Propylene Oxide	3.2E-02							**3.2E-02**

Table 2-1: Summary of Annual Emission Rates from Buckingham Station (tons/year)
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Chemical	Combustion Turbines	Auxiliary Boiler	Emergency Generator	Line Heaters	Blowdown	Pig Launching and Receiving	Fugitives	Total
Pyrene		1.4E-07	8.1E-07	1.8E-06				**2.8E-06**
Styrene			7.6E-05					**7.6E-05**
Toluene	1.4E-01	9.3E-05	1.3E-03	1.2E-03			2.9E-07	**1.5E-01**
Vinyl Chloride			3.4E-05					**3.4E-05**
Xylene			3.7E-04				2.9E-07	**3.7E-04**
Arsenic		5.5E-06		7.3E-05				**7.8E-05**
Barium		1.2E-04		1.6E-03				**1.7E-03**
Beryllium		3.3E-07		4.4E-06				**4.7E-06**
Cadmium		3.0E-05		4.0E-04				**4.3E-04**
Chromium		3.8E-05		5.1E-04				**5.5E-04**
Cobalt		2.3E-06		3.1E-05				**3.3E-05**
Copper		2.3E-05		3.1E-04				**3.3E-04**
Manganese		1.0E-05		1.4E-04				**1.5E-04**
Mercury		7.1E-06		9.5E-05				**1.0E-04**
Molybdenum		3.0E-05		4.0E-04				**4.3E-04**
Nickel		5.8E-05		7.7E-04				**8.2E-04**
Selenium		6.6E-07		8.7E-06				**9.4E-06**
Vanadium		6.3E-05		8.4E-04				**9.0E-04**
Zinc		7.9E-04		1.1E-02				**1.1E-02**
Lead		1.4E-05		1.8E-04				**2.0E-04**

Note: Blank cells indicate no emissions present/characterized for these pollutant-source combinations.

Table 3-1: Maximum Annual Average Concentrations at any Residential Location ($\mu g/m^3$)(a)
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Chemical	Concentration
1,1,2,2-Tetrachloroethane	1.5E-06
1,1,2-Trichloroethane	1.2E-06
1,1-Dichloroethane	8.7E-07
1,2,3-Trimethylbenzene	7.9E-07
1,2,4-Trimethylbenzene	2.5E-06
1,2-Dichloroethane	9.4E-07
1,2-Dichloropropane	1.0E-06
1,3,5-Trimethylbenzene	4.0E-07
1,3-Butadiene	2.0E-05
1,3-Dichloropropene	9.8E-07
2,2,4-Trimethylpentane	1.9E-05
2-Methylnaphthalene	8.8E-07
3-Methylchloranthrene	3.0E-08
7,12-Dimethylbenz(a)anthracene	2.7E-07
Acenaphthene	6.0E-08
Acenaphthylene	1.0E-07
Acetaldehyde	3.1E-04
Acrolein	2.0E-04
Anthracene	5.7E-08
Benz(a)anthracene	3.8E-08
Benzene	1.2E-04
Benzo(a)pyrene	2.0E-08
Benzo(b)fluoranthene	3.1E-08
Benzo(e)pyrene	5.2E-10
Benzo(g,h,i)perylene	2.1E-08
Benzo(k)fluoranthene	3.1E-08
Biphenyl	8.8E-08
Butane	5.1E-02
Butyr/Isobutyraldehyde	9.8E-06
Carbon Tetrachloride	1.4E-06
Chlorobenzene	9.9E-07
Chloroform	1.1E-06
Chrysene	4.5E-08
Cyclohexane	6.9E-06
Cyclopentane	2.1E-06
Dibenzo(a,h)anthracene	2.0E-08
Dichlorobenzene	2.0E-05
Ethane	3.4E-01
Ethylbenzene	1.2E-04
Ethylene Dibromide	1.6E-06

Table 3-1: Maximum Annual Average Concentrations at any Residential Location ($\mu g/m^3$)(a)
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Chemical	Concentration
Fluoranthene	5.9E-08
Fluorene	8.5E-08
Formaldehyde	2.3E-02
Hexane (or n-Hexane)	4.1E-02
Indeno(1,2,3-c,d)pyrene	3.1E-08
Isobutane	1.5E-02
IsoPentane	5.6E-03
Methane	5.1E+00
Methanol	5.5E-05
Methylcyclohexane	7.5E-06
Methylene Chloride	3.3E-06
n-Heptane	1.6E-02
n-Nonane	6.9E-07
n-Octane	1.7E-06
Naphthalene	1.7E-05
PAH	1.1E-05
Pentane (or n-Pentane)	4.9E-02
Perylene	1.1E-10
Phenanthrene	3.7E-07
Phenol	9.4E-07
Propane	1.1E-01
Propylene Oxide	1.0E-04
Pyrene	9.8E-08
Styrene	1.2E-06
Toluene	5.4E-04
Vinyl Chloride	5.5E-07
Xylene	6.0E-06
Arsenic	3.4E-06
Barium	7.4E-05
Beryllium	2.0E-07
Cadmium	1.9E-05
Chromium	2.4E-05
Cobalt	1.4E-06
Copper	1.4E-05
Manganese	6.4E-06
Mercury	4.4E-06
Molybdenum	1.9E-05
Nickel	3.6E-05
Selenium	4.1E-07
Vanadium	3.9E-05

Table 3-1: Maximum Annual Average Concentrations at any Residential Location ($\mu g/m^3$)(a)
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Chemical	Concentration
Zinc	4.9E-04
Lead	8.5E-06

(a) The residential location corresponds to the maximum estimated cancer risk as identified in Table 4-3.

Table 3-2: Domain-wide Maximum 1-Hour Average Concentrations (µg/m^3)
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Chemical	Normal	Startup	Shutdown	Capped Emergency Shutdown Valve Testing	Pig Launching	Pig Receiving
1,1,2,2-Tetrachloroethane	4.8E-03	4.8E-03	4.8E-03			
1,1,2-Trichloroethane	3.8E-03	3.8E-03	3.8E-03			
1,1-Dichloroethane	2.9E-03	2.9E-03	2.9E-03			
1,2,3-Trimethylbenzene	2.6E-03	2.6E-03	2.6E-03			
1,2,4-Trimethylbenzene	8.1E-03	8.1E-03	8.1E-03			
1,2-Dichloroethane	3.1E-03	3.1E-03	3.1E-03			
1,2-Dichloropropane	3.3E-03	3.3E-03	3.3E-03			
1,3,5-Trimethylbenzene	1.3E-03	1.3E-03	1.3E-03			
1,3-Butadiene	6.0E-02	6.0E-02	6.0E-02			
1,3-Dichloropropene	3.2E-03	3.2E-03	3.2E-03			
2,2,4-Trimethylpentane	6.5E-02	6.5E-02	6.5E-02			
2-Methylnaphthalene	1.6E-03	1.6E-03	1.6E-03			
3-Methylchloranthrene	2.0E-06	2.0E-06	2.0E-06			
7,12-Dimethylbenz(a)anthracene	1.8E-05	1.8E-05	1.8E-05			
Acenaphthene	9.8E-05	9.8E-05	9.8E-05			
Acenaphthylene	2.3E-04	2.3E-04	2.3E-04			
Acetaldehyde	5.7E-01	5.8E-01	5.8E-01			
Acrolein	5.7E-01	5.7E-01	5.7E-01			
Anthracene	5.3E-05	5.3E-05	5.3E-05			
Benz(a)anthracene	2.5E-05	2.5E-05	2.5E-05			
Benzene	6.5E-02	6.5E-02	6.5E-02			
Benzo(a)pyrene	1.4E-06	1.4E-06	1.4E-06			
Benzo(b)fluoranthene	2.0E-06	2.0E-06	2.0E-06			
Benzo(e)pyrene	1.7E-06	1.7E-06	1.7E-06			
Benzo(g,h,i)perylene	2.3E-06	2.3E-06	2.3E-06			
Benzo(k)fluoranthene	2.0E-06	2.0E-06	2.0E-06			
Biphenyl	2.9E-04	2.9E-04	2.9E-04			
Butane	2.4E+00	4.1E+02	1.3E+03	4.0E+00	3.8E+04	1.8E+04
Butyr/Isobutyraldehyde	3.2E-02	3.2E-02	3.2E-02			
Carbon Tetrachloride	4.4E-03	4.4E-03	4.4E-03			
Chlorobenzene	3.2E-03	3.2E-03	3.2E-03			
Chloroform	3.4E-03	3.4E-03	3.4E-03			
Chrysene	5.0E-05	5.0E-05	5.0E-05			
Cyclohexane	2.2E-02	2.2E-02	2.2E-02			
Cyclopentane	6.9E-03	6.9E-03	6.9E-03			
Dibenzo(a,h)anthracene	1.4E-06	1.4E-06	1.4E-06			
Dichlorobenzene	1.4E-03	1.4E-03	1.4E-03			
Ethane	2.6E+01	7.4E+03	2.3E+04	2.9E+01	6.8E+05	3.2E+05
Ethylbenzene	6.5E-02	6.5E-02	6.5E-02			
Ethylene Dibromide	5.4E-03	5.4E-03	5.4E-03			
Fluoranthene	2.7E-05	2.7E-05	2.7E-05			
Fluorene	1.2E-04	1.2E-04	1.2E-04			
Formaldehyde	3.3E+01	3.6E+01	3.5E+01			
n-Heptane	1.5E+00	4.1E+02	1.3E+03	1.6E+00	3.8E+04	1.8E+04
Hexane (or n-Hexane)	5.4E+01	2.4E+02	7.2E+02	5.5E+02	2.1E+04	1.0E+04
Indeno(1,2,3-c,d)pyrene	2.0E-06	2.0E-06	2.0E-06			
Isobutane	1.4E+00	3.9E+02	1.2E+03	1.5E+00	3.6E+04	1.7E+04
Isopentane	5.2E-01	1.5E+02	4.5E+02	5.8E-01	1.3E+04	6.3E+03
Methane	4.6E+02	1.3E+05	3.9E+05	1.2E+03	1.2E+07	5.5E+06
Methanol	1.8E-01	1.8E-01	1.8E-01			
Methylcyclohexane	2.5E-02	2.5E-02	2.5E-02			
Methylene Chloride	1.1E-02	1.1E-02	1.1E-02			
n-Nonane	2.2E-03	2.2E-03	2.2E-03			
n-Octane	5.4E-03	5.4E-03	5.4E-03			
Naphthalene	7.3E-03	7.7E-03	7.9E-03			
PAH	9.8E-03	1.1E-02	1.1E-02			
Pentane (or n-Pentane)	3.0E+00	1.3E+02	4.1E+02	4.9E+00	1.2E+04	5.8E+03
Perylene	3.6E-07	3.6E-07	3.6E-07			
Phenanthrene	2.6E-04	2.6E-04	2.6E-04			
Phenol	3.1E-03	3.1E-03	3.1E-03			
Propane	7.2E+00	2.0E+03	6.3E+03	8.0E+00	1.9E+05	8.8E+04
Propylene Oxide	4.0E-03	4.5E-02	3.4E-02			
Pyrene	4.5E-05	4.5E-05	4.5E-05			

Table 3-2: Domain-wide Maximum 1-Hour Average Concentrations (µg/m^3)
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Chemical	Normal	Startup	Shutdown	Capped Emergency Shutdown Valve Testing	Pig Launching	Pig Receiving
Styrene	4.0E-03	4.0E-03	4.0E-03			
Toluene	6.5E-02	6.5E-02	6.5E-02			
Vinyl Chloride	1.8E-03	1.8E-03	1.8E-03			
Xylene	6.5E-02	6.5E-02	6.5E-02			
Arsenic	2.3E-04	2.3E-04	2.3E-04			
Barium	5.0E-03	5.0E-03	5.0E-03			
Beryllium	1.4E-05	1.4E-05	1.4E-05			
Cadmium	1.2E-03	1.2E-03	1.2E-03			
Chromium	1.6E-03	1.6E-03	1.6E-03			
Cobalt	9.5E-05	9.5E-05	9.5E-05			
Copper	9.6E-04	9.6E-04	9.6E-04			
Manganese	4.3E-04	4.3E-04	4.3E-04			
Mercury	2.9E-04	2.9E-04	2.9E-04			
Molybdenum	1.2E-03	1.2E-03	1.2E-03			
Nickel	2.4E-03	2.4E-03	2.4E-03			
Selenium	2.7E-05	2.7E-05	2.7E-05			
Vanadium	2.6E-03	2.6E-03	2.6E-03			
Zinc	3.3E-02	3.3E-02	3.3E-02			
Lead	5.7E-04	5.7E-04	5.7E-04			

Note: Blank cells indicate pollutant-source combinations that were not modeled.

Table 4-1: Exposure Assumptions
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Receptor Type	Risk	Intake Factor Inhalation (unitless)	Exposure Frequency (days/year)	Exposure Duration (years)	Averaging Time (days)
Resident	Cancer	0.36	350	26	25550
Resident	Noncancer	0.96	350	26	9490

Notes:
VDEQ = Virginia Depertment of Environmental Quality

Source:
VDEQ. 2016. Virginia Unified Risk Assessment Model - VURAM User's Guide.

Table 4-2: Toxicity Values
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Chemical	Inhalation Unit Risk ($\mu g/m^3)^{-1}$		Inhalation Chronic RfC ($\mu g/m^3$)		Inhalation Acute RfC ($\mu g/m^3$)		Potential Mutagen [1]
1,1,2,2-Tetrachloroethane	0.000058	USEPA 2018a	--	--	21000	US DOE 2016	--
1,1,2-Trichloroethane	0.000016	USEPA 2018a	0.20	USEPA 2018a	160000	US DOE 2016	--
1,1-Dichloroethane	0.0000016	USEPA 2018a	--	--	1200000	US DOE 2016	--
1,2,3-Trimethylbenzene	--	--	60	USEPA 2018a	690000	USEPA 2016	--
1,2,4-Trimethylbenzene	--	--	60	USEPA 2018a	690000	USEPA 2016	--
1,2-Dichloroethane	0.000026	USEPA 2018a	7.0	USEPA 2018a	200000	AIHA 2016	--
1,2-Dichloropropane	0.0000037	USEPA 2018a	4.0	USEPA 2018a	140000	US DOE 2016	--
1,3,5-Trimethylbenzene	--	--	60	USEPA 2018a	690000	USEPA 2016	--
1,3-Butadiene	0.000030	USEPA 2018a	2	USEPA 2018a	1500000	USEPA 2016	--
1,3-Dichloropropene	0.0000040	USEPA 2018a	20	USEPA 2018a	14000	US DOE 2016	--
2,2,4-Trimethylpentane	--	--	--	--	1100000	US DOE 2016	--
2-Methylnaphthalene	--	--	--	--	9000	US DOE 2016	--
3-Methylchloranthrene	0.0063	USEPA 2018a	--	--	200	US DOE 2016	M
7,12-Dimethylbenz(a)anthracene	0.071	USEPA 2018a	--	--	--	--	M
Acenaphthene	--	--	--	--	3600	US DOE 2016	--
Acenaphthylene	--	--	--	--	10000	US DOE 2016	--
Acetaldehyde	0.0000022	USEPA 2018a	9.0	USEPA 2018a	470	Cal/EPA 2018	--
Acrolein	--	--	0.020	USEPA 2018a	2.5	Cal/EPA 2018	--
Anthracene	--	--	--	--	48000	US DOE 2016	--
Benz(a)anthracene	0.00006	USEPA 2018a	--	--	600	US DOE 2016	M
Benzene	0.0000078	USEPA 2018a	30	USEPA 2018a	27	--	--
Benzo(a)pyrene	0.00060	USEPA 2018a	0.0020	USEPA 2018a	600	US DOE 2016	M
Benzo(b)fluoranthene	0.000060	USEPA 2018a	--	--	120	US DOE 2016	M
Benzo(e)pyrene	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	--	--	--	--	30000	US DOE 2016	--
Benzo(k)fluoranthene	0.0000060	USEPA 2018a	--	--	--	--	M
Biphenyl	--	--	0.40	USEPA 2018a	5500	US DOE 2016	--
Butane	--	--	--	--	13000000	USEPA 2016	--
Butyr/Isobutyraldehyde	--	--	--	--	220000	US DOE 2016	--
Carbon Tetrachloride	0.0000060	USEPA 2018a	100	USEPA 2018a	1900	Cal/EPA 2018	--
Chlorobenzene	--	--	50	USEPA 2018a	46000	USEPA 2016	--
Chloroform	0.000023	USEPA 2018a	98	USEPA 2018a	150	Cal/EPA 2018	--
Chrysene	0.00000060	USEPA 2018a	--	--	600	US DOE 2016	M
Cyclohexane	--	--	6000	USEPA 2018a	1000000	US DOE 2016	--
Cyclopentane	--	--	--	--	5200000	US DOE 2016	--
Dibenzo(a,h)anthracene	0.0006	USEPA 2018a	--	--	93	US DOE 2016	M
Dichlorobenzene	0.000011	USEPA 2018a [2]	800	USEPA 2018a	36000	US DOE 2016 [3]	--

Table 4-2: Toxicity Values
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Chemical	Inhalation Unit Risk ($\mu g/m^3)^{-1}$		Inhalation Chronic RfC ($\mu g/m^3$)		Inhalation Acute RfC ($\mu g/m^3$)		Potential Mutagen [1]
Ethane	--	--	--	--	80000000	US DOE 2016	--
Ethylbenzene	0.0000025	USEPA 2018a	1000	USEPA 2018a	140000	USEPA 2016	--
Ethylene Dibromide	0.00060	USEPA 2018a	9.0	USEPA 2018a	130000	USEPA 2016	--
Fluoranthene	--	--	--	--	8200	US DOE 2016	--
Fluorene	--	--	--	--	6600	US DOE 2016	--
Formaldehyde	0.000013	USEPA 2018a	9.8	USEPA 2018a	55	Cal/EPA 2018	--
n-Heptane	--	--	400	USEPA 2018a	2000000	US DOE 2016	--
Hexane (or n-Hexane)	--	--	700	USEPA 2018a	910000	US DOE 2016	--
Indeno(1,2,3-c,d)pyrene	0.000060	USEPA 2018a	--	--	1200	US DOE 2016	M
Isobutane	--	--	--	--	13000000	US DOE 2016	--
Isopentane	--	--	--	--	8800000	US DOE 2016	--
Methane	--	--	--	--	43000000	US DOE 2016	--
Methanol	--	--	20000	USEPA 2018a	28000	Cal/EPA 2018	--
Methylcyclohexane	--	--	--	--	4800000	US DOE 2016	--
Methylene Chloride	0.000000010	USEPA 2018a	600	USEPA 2018a	14000	Cal/EPA 2018	M
n-Nonane	--	--	20	USEPA 2018a	3100000	US DOE 2016	--
n-Octane	--	--	--	--	1100000	US DOE 2016	--
Naphthalene	0.000034	USEPA 2018a	3	USEPA 2018a	79000	US DOE 2016	--
PAH	--	--	--	--	--	--	--
Pentane (or n-Pentane)	--	--	1000	USEPA 2018a	8800000	US DOE 2016	--
Perylene	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	5400	US DOE 2016	--
Phenol	--	--	200	USEPA 2018a	5800	Cal/EPA 2018	--
Propane	--	--	--	--	9900000	USEPA 2016	--
Propylene Oxide	0.0000037	USEPA 2018a	30	USEPA 2018a	3100	Cal/EPA 2018	--
Pyrene	--	--	--	--	150	US DOE 2016	--
Styrene	--	--	1000	USEPA 2018a	21000	Cal/EPA 2018	--
Toluene	--	--	5000	USEPA 2018a	37000	Cal/EPA 2018	--
Vinyl Chloride	0.0000044	USEPA 2018a	100	USEPA 2018a	180000	Cal/EPA 2018	M
Xylene	--	--	100	USEPA 2018a	22000	Cal/EPA 2018	--
Arsenic	0.0043	USEPA 2018a	0.015	USEPA 2018a	0.2	Cal/EPA 2018	--
Barium	--	--	0.50	USEPA 2018a	1500	US DOE 2016	--
Beryllium	0.0024	USEPA 2018a	0.020	USEPA 2018a	2.3	US DOE 2016	--
Cadmium	0.0018	USEPA 2018a	0.010	USEPA 2018a	100	USEPA 2016	--
Chromium, Hexavalent	0.084	USEPA 2018a	0.10	USEPA 2018a	290	US DOE 2016	M
Cobalt	0.0090	USEPA 2018a	0.0060	USEPA 2018a	180	US DOE 2016	--
Copper	--	--	--	--	100	Cal/EPA 2018	--

Table 4-2: Toxicity Values
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Chemical	Inhalation Unit Risk $(\mu g/m^3)^{-1}$		Inhalation Chronic RfC $(\mu g/m^3)$		Inhalation Acute RfC $(\mu g/m^3)$		Potential Mutagen [1]
Manganese	--	--	0.050	USEPA 2018a	3000	US DOE 2016	--
Mercury	--	--	0.30	USEPA 2018a	0.6	Cal/EPA 2018	--
Molybdenum	--	--	--	--	30000	US DOE 2016	--
Nickel	0.00026	USEPA 2018a	0.090	USEPA 2018a	0.2	Cal/EPA 2018	--
Selenium	--	--	20	USEPA 2018a	600	US DOE 2016	--
Vanadium	--	--	0.1	USEPA 2018a	3000	US DOE 2016	--
Zinc	--	--	--	--	6000	US DOE 2016	--
Lead	--	--	--	--	150	US DOE 2016	--
Chromium, Trivalent	--	--	--	--	4600	US DOE 2016	--

Notes:

-- = Not available
ADAF = Age-Dependent Adjustment Factor
AIHA = American Industrial Hygiene Association
Cal/EPA = California Environmental Protection Agency
M = Potential Mutagen
$\mu g/m^3$ = microgram per cubic meter
OEHHA = Office of Environmental Health Hazard Assessment
PAC = Protective Action Criteria
RfC = Reference concentration
US DOE = United States Department of Energy
USEPA = United States Environmental Protection Agency
VOC = Volatile organic compound (ase defined by USEPA)

[1] In accordance with USEPA's recommendation (USEPA 2018b), the Age-Dependent Adjustment Factor (ADAF) are incorporated in the excess lifetime cancer risk calculations for potential mutagens. ADAF accounts for the potentially increased susceptibility from early life exposures when assessing the cancer risk of mutagenic compounds. The mutagen scaling factors is based on the time-weighted Age-Dependent Adjustment Factor (ADAF). Based on the exposure durations for child and adult residents as well as ADAFs of 10 for <2 years, 3 for 2–<16 years, and 1 for ≥16 years, time-weighted ADAFs for child and adult residents were calculated to be 5.3 and 2.0, respectively with an age weighted resident at 2.8. The time-weighted average of these ADAFs were applied when calculating the excess lifetime cancer risks in the health assessment.

[2] Dichlorobenzene, 1,4- was used as a surrogate.
[3] Dichlorobenzene, 1,3- was used as a surrogate.

Sources:

American Industrial Hygiene Association (AIHA). 2016. Emergency Response Planning Guidelines (ERPG) Values.
Cal/EPA. 2018. Office of Environmental Health Hazard Assessment (OEHHA). Acute, 8-hour and Chronic Reference Exposure Level (REL) Summary. Available online at https://oehha.ca.gov/air/general-info/oehha-acute-8-hour-and-chronic-reference-exposure-level-rel-summary. Accessed April 30, 2018.
US DOE. 2016. Protective Action Criteria (PAC) - Revision 29. May.
USEPA. 2016. Compiled Acute Exposure Guideline Values (AEGLs). March.
USEPA. 2018a. Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites. May.
USEPA. 2018b. Regional Screening Levels (RSL) - User's Guide. May.

Table 4-3: Estimated Excess Lifetime Cancer Risks and Chronic Non-Cancer Hazard Index for the Maximum Residential Location

Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Population	Receptor		Cancer Risk	Chronic HI
	UTMX	UTMY		
Resident	707300	4163000	2E-07	0.02

Note:
HI = Hazard Index

Table 4-4: Estimated Excess Lifetime Cancer Risks for the Maximum Residential Location by Chemical
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Chemical	Cancer Risk
Formaldehyde	1.1E-07
Chromium, Hexavalent	7.9E-08
7,12-Dimethylbenz(a)anthracene	1.9E-08
Cadmium	1.2E-08
Arsenic	5.2E-09
Cobalt	4.6E-09
Nickel	3.3E-09
Ethylene Dibromide	3.5E-10
Benzene	3.4E-10
Acetaldehyde	2.5E-10
1,3-Butadiene	2.1E-10
Naphthalene	2.1E-10
3-Methylchloranthrene	1.9E-10
Beryllium	1.7E-10
Propylene Oxide	1.3E-10
Ethylbenzene	1.0E-10
Dichlorobenzene	8.0E-11
1,1,2,2-Tetrachloroethane	3.1E-11
Benzo(a)pyrene	1.2E-11
Dibenzo(a,h)anthracene	1.2E-11
1,2-Dichloroethane	8.7E-12
Chloroform	8.6E-12
1,1,2-Trichloroethane	6.7E-12
Carbon Tetrachloride	2.9E-12
Vinyl Chloride	2.4E-12
Benz(a)anthracene	2.2E-12
Indeno(1,2,3-c,d)pyrene	1.8E-12
Benzo(b)fluoranthene	1.8E-12
1,3-Dichloropropene	1.4E-12
1,2-Dichloropropane	1.3E-12
1,1-Dichloroethane	5.0E-13
Benzo(k)fluoranthene	1.8E-13
Benzo(e)pyrene	1.1E-13
Methylene Chloride	3.2E-14
Chrysene	2.7E-14
Total	**2E-07**

Note:

Restricted to residential receptor locations

Table 4-5: Estimated Excess Lifetime Cancer Risks for the Maximum Residential Location by Emission Source
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Source Group	CancerRisk
Emergency Generator	4.7E-08
Line Heater 42	1.5E-08
Line Heater 41	1.5E-08
Combustion Turbine 2_50	1.5E-08
Line Heater 32	1.5E-08
Line Heater 31	1.5E-08
Line Heater 22	1.5E-08
Line Heater 21	1.5E-08
Line Heater 12	1.5E-08
Line Heater 11	1.5E-08
Combustion Turbine 1_50	1.3E-08
Combustion Turbine 3_50	1.3E-08
Combustion Turbine 4_50	1.2E-08
Auxiliary Boiler	9.1E-09
Accumulation Tank 1	2.0E-13
Total	**2E-07**

Note:

*Restricted to residential receptor locations

Table 4-6: Maximum Estimated Acute Hazard Indices Across th
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Scenario	Acute HI
Normal	0.8
Startup	0.9
Shutdown	0.9
Pig Launch	0.4
Pig receiving	0.2
Capped Emergency Shutdown System Testing	0.0006

Note:
HI = Hazard Index

Table 4-7: Maximum Estimated Acute Hazard Indices Across the Domain by Chemical
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Chemical	Normal	Startup	Shutdown	Pig Launch	Pig Receiving	Capped Emergency Shutdown System Testing
Acenaphthene	2.7E-08	2.7E-08	2.7E-08			
Acenaphthylene	2.3E-08	2.3E-08	2.3E-08			
Acetaldehyde	0.0012	0.0012	0.0012			
Acrolein	0.23	0.23	0.23			
Anthracene	1.1E-09	1.1E-09	1.1E-09			
Arsenic	0.0011	0.0011	0.0011			
Barium	3.3E-06	3.3E-06	3.3E-06			
Benz(a)anthracene	4.2E-08	4.2E-08	4.2E-08			
Benzene	0.0024	0.0024	0.0024			
Benzo(a)pyrene	2.3E-09	2.3E-09	2.3E-09			
Benzo(b)fluoranthene	1.7E-08	1.7E-08	1.7E-08			
Benzo(g,h,i)perylene	7.7E-11	7.7E-11	7.7E-11			
Beryllium	5.9E-06	5.9E-06	5.9E-06			
Biphenyl	5.2E-08	5.2E-08	5.2E-08			
1,3-Butadiene	4.0E-08	4.0E-08	4.0E-08			
Butane	1.9E-07	3.2E-05	9.8E-05	0.0029	0.0014	3.0E-07
Butyr/Isobutyraldehyde	1.4E-07	1.4E-07	1.4E-07			
Cadmium	1.2E-05	1.2E-05	1.2E-05			
Carbon Tetrachloride	2.3E-06	2.3E-06	2.3E-06			
Chlorobenzene	7.0E-08	7.0E-08	7.0E-08			
Chloroform	2.3E-05	2.3E-05	2.3E-05			
Chromium, Hexavalent	2.2E-07	2.2E-07	2.2E-07			
Chromium, Trivalent	3.3E-07	3.3E-07	3.3E-07			
Chrysene	8.3E-08	8.3E-08	8.3E-08			
Cobalt	5.3E-07	5.3E-07	5.3E-07			
Copper	9.6E-06	9.6E-06	9.6E-06			
Cyclohexane	2.2E-08	2.2E-08	2.2E-08			
Cyclopentane	1.3E-09	1.3E-09	1.3E-09			
Dibenzo(a,h)anthracene	1.5E-08	1.5E-08	1.5E-08			
Dichlorobenzene	3.8E-08	3.8E-08	3.8E-08			
1,2-Dichloroethane	1.5E-08	1.5E-08	1.5E-08			
1,1-Dichloroethane	2.4E-09	2.4E-09	2.4E-09			
1,2-Dichloropropane	2.3E-08	2.3E-08	2.3E-08			
1,3-Dichloropropene	2.3E-07	2.3E-07	2.3E-07			
Ethane	3.3E-07	9.2E-05	0.00029	0.0086	0.0040	3.7E-07
Ethylbenzene	4.7E-07	4.7E-07	4.7E-07			
Ethylene Dibromide	4.1E-08	4.1E-08	4.1E-08			
Fluoranthene	3.4E-09	3.4E-09	3.4E-09			
Fluorene	1.9E-08	1.9E-08	1.9E-08			
Formaldehyde	0.60	0.65	0.64			
n-Heptane	7.3E-07	0.00021	0.00064	0.0191	0.0089	8.2E-07
Hexane (or n-Hexane)	6.0E-05	0.00026	0.00079	0.0236	0.0110	0.00061
Indeno(1,2,3-c,d)pyrene	1.7E-09	1.7E-09	1.7E-09			
Isobutane	1.1E-07	3.0E-05	9.2E-05	0.0027	0.0013	1.2E-07
Isopentane	5.9E-08	1.7E-05	5.1E-05	0.0015	0.00072	6.6E-08
Lead	3.8E-06	3.8E-06	3.8E-06			
Manganese	1.4E-07	1.4E-07	1.4E-07			
Mercury	0.00049	0.00049	0.00049			
Methane	1.1E-05	0.0030	0.0092	0.27	0.13	2.7E-05
Methanol	6.5E-06	6.5E-06	6.5E-06			
3-Methylchloranthrene	1.0E-08	1.0E-08	1.0E-08			
Methylcyclohexane	5.1E-09	5.1E-09	5.1E-09			
Methylene Chloride	7.7E-07	7.7E-07	7.7E-07			
2-Methylnaphthalene	1.7E-07	1.7E-07	1.7E-07			
Molybdenum	4.2E-08	4.2E-08	4.2E-08			

Table 4-7: Maximum Estimated Acute Hazard Indices Across the Domain by Chemical
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Chemical	Normal	Startup	Shutdown	Pig Launch	Pig Receiving	Capped Emergency Shutdown System Testing
Naphthalene	9.2E-08	9.7E-08	1.0E-07			
Nickel	0.012	0.012	0.012			
n-Nonane	7.2E-10	7.2E-10	7.2E-10			
n-Octane	4.9E-09	4.9E-09	4.9E-09			
Pentane (or n-Pentane)	3.4E-07	1.5E-05	4.7E-05	0.0014	0.00066	5.5E-07
Phenanthrene	4.9E-08	4.9E-08	4.9E-08			
Phenol	5.3E-07	5.3E-07	5.3E-07			
Propane	7.3E-07	0.00020	0.00063	0.019	0.0088	8.1E-07
Propylene Oxide	1.3E-06	1.5E-05	1.1E-05			
Pyrene	3.0E-07	3.0E-07	3.0E-07			
Selenium	4.5E-08	4.5E-08	4.5E-08			
Styrene	1.9E-07	1.9E-07	1.9E-07			
1,1,2,2-Tetrachloroethane	2.3E-07	2.3E-07	2.3E-07			
Toluene	1.8E-06	1.8E-06	1.8E-06			
1,1,2-Trichloroethane	2.4E-08	2.4E-08	2.4E-08			
1,2,4-Trimethylbenzene	1.2E-08	1.2E-08	1.2E-08			
1,2,3-Trimethylbenzene	3.7E-09	3.7E-09	3.7E-09			
1,3,5-Trimethylbenzene	1.9E-09	1.9E-09	1.9E-09			
2,2,4-Trimethylpentane	5.9E-08	5.9E-08	5.9E-08			
Vanadium	8.7E-07	8.7E-07	8.7E-07			
Vinyl Chloride	1.0E-08	1.0E-08	1.0E-08			
Xylene	3.0E-06	3.0E-06	3.0E-06			
Zinc	5.5E-06	5.5E-06	5.5E-06			
Total	**0.8**	**0.9**	**0.9**	**0.4**	**0.2**	**0.0006**

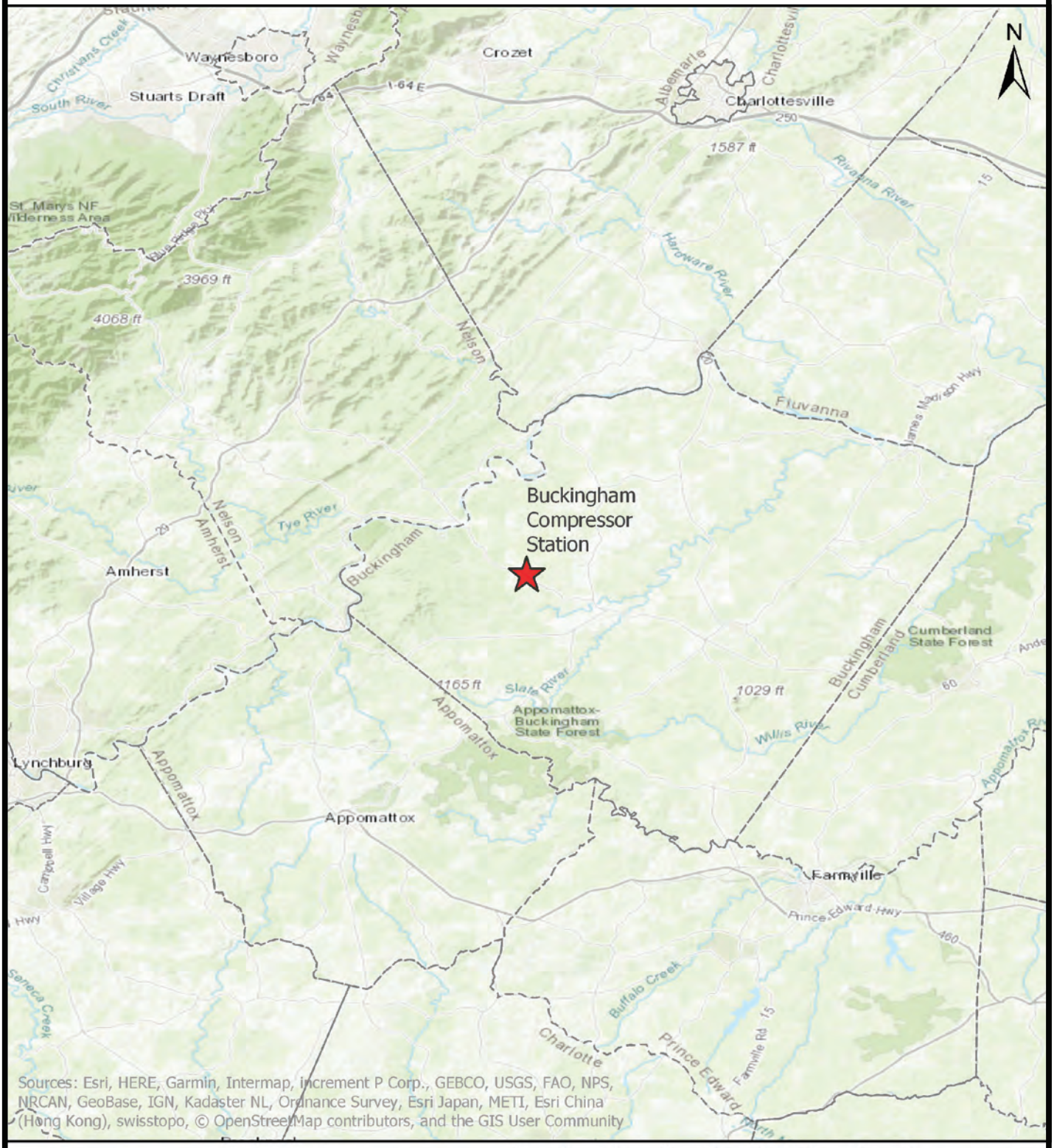
Note: Blank cells indicate pollutant-source combinations that were not modeled.

Table 4-8: Maximum Estimated Acute Hazard Indices Across the Domain by Emission Source
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Emissions Source	Normal	Startup	Shutdown	Pig Launch	Pig Receiving	Capped Emergency Shutdown System Testing
Auxiliary Boiler	0.00050	0.00044	0.00044	3.7E-14	2.3E-14	1.7E-09
Combustion Turbine 1_50	1.1E-07					
Combustion Turbine 12	6.6E-06	2.2E-07	2.2E-07	1.7E-08	8.4E-09	5.8E-06
Combustion Turbine 1D			8.6E-05			
Combustion Turbine 1U		9.8E-05				
Emergency Generator	2.4E-06					
Combustion Turbine 2D			8.6E-05			
Combustion Turbine 2U		0.00025				
Emergency Generator	0.0017					
Combustion Turbine 34	5.8E-06	4.9E-06	4.9E-06	2.2E-08	1.6E-08	2.9E-06
Combustion Turbine 3D			0.055			
Combustion Turbine 3U		0.066				
Emergency Generator	5.9E-06					
Combustion Turbine 4D			0.00015			
Combustion Turbine 4U		0.00017				
Emergency Generator	0.83	0.82	0.82	1.5E-13	3.8E-14	1.6E-09
Line Heater 11	0.0017	0.0017	0.0017	2.8E-11	4.6E-12	1.0E-07
Line Heater 12	0.0018	0.0017	0.0017	2.9E-11	4.7E-12	1.1E-07
Line Heater 21	0.0018	0.0017	0.0017	3.2E-11	4.9E-12	1.1E-07
Line Heater 22	0.0017	0.0017	0.0017	3.4E-11	4.9E-12	1.1E-07
Line Heater 31	0.0017	0.0017	0.0017	3.9E-11	5.1E-12	1.1E-07
Line Heater 32	0.0017	0.0017	0.0017	4.1E-11	5.2E-12	1.1E-07
Line Heater 41	0.0016	0.0016	0.0016	4.6E-11	5.3E-12	1.0E-07
Line Heater 42	0.0016	0.0016	0.0016	4.9E-11	5.4E-12	9.6E-08
Pig Launcher				0.35		
Pig Receiver					0.16	
Suction and Discharge Vent 1						
Suction and Discharge Vent 2						
Suction and Discharge Vent 3						
Suction and Discharge Vent 4						
Waste Water Accumulator Tank	0.0024	0.0024	0.0024	3.4E-09	6.4E-10	4.9E-07
Hydrocarbon Waste Tank	6.0E-05	4.9E-06	4.9E-06	3.0E-06	5.2E-07	0.00063
Combustion Turbine Stack Vent B1						
Combustion Turbine Stack Vent B2						
Combustion Turbine Stack Vent B3						
Combustion Turbine Stack Vent B4						
Combustion Turbine Stack Vent 1		5.6E-05	0.00018			
Combustion Turbine Stack Vent 2		9.3E-07	2.5E-06			
Combustion Turbine Stack Vent 3		0.0030	0.0098			
Combustion Turbine Stack Vent 4		0.00078	0.0019			
Total	**0.8**	**0.9**	**0.9**	**0.4**	**0.2**	**0.0006**

Note: Blank cells indicate pollutant-source combinations that were not modeled.

FIGURES



RAMBOLL

Facility Location
Buckingham Compressor Station,
Buckingham County, Virginia

FIGURE
1-1

DRAFTED BY: RS | DATE: 5-18-17 | 1690007773

RAMBOLL

DRAFTED BY: RZ | DATE: 12/3/2018

Model Receptor Locations

Buckingham Compressor Station, Buckingham County, Virginia

FIGURE
3-1

1690007773

APPENDIX A
EMISSION INVENTORY

Table A-1: Emission Rates Used in the Annual Modeling Scenario (g/s)
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Source	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	1,2,3-Trimethylbenzene	1,2,4-Trimethylbenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3,5-Trimethylbenzene	1,3-Butadiene	1,3-Dichloropropene	2,2,4-Trimethylpentane	2-Methylnaphthalene	3-Methylchloranthrene	7,12-Dimethylbenz(a)anthracene	Acenaphthene	Acenaphthylene	Acetaldehyde	Acrolein	Anthracene	Benz(a)anthracene	Benzene
CT1									4.2E-06								3.9E-04	6.2E-05			1.2E-04
CT2									3.1E-06								2.9E-04	4.6E-05			8.6E-05
CT3									4.7E-06								4.4E-04	7.0E-05			1.3E-04
CT4									1.8E-06								1.7E-04	2.6E-05			5.0E-05
AUXB												1.9E-08	1.4E-09	1.3E-08	1.4E-09	1.4E-09			1.9E-09	1.4E-09	1.7E-06
EGEN	2.6E-06	2.1E-06	1.6E-06	1.4E-06	4.4E-06	1.7E-06	1.8E-06	7.2E-07	3.3E-05	1.7E-06	3.4E-05	8.5E-07			5.3E-08	1.3E-07	3.1E-04	3.1E-04	2.9E-08	1.3E-08	7.7E-05
HT11												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT12												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT21												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT22												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT31												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT32												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT41												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT42												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
CT12																					
CT34																					
TNK1											8.4E-09										8.4E-09
TNK2																					
UNT1																					
UNT2																					
UNT3																					
UNT4																					
STN1																					
STN2																					
STN3																					
STN4																					
PIGL																					
PIGR																					

Notes:
1 CT1 – CT4 are combustion turbines 1-4, AUXB is the auxiliary boiler, EGEN is the emergency generator, HT11 – HT42 are the line heaters with the first number signifying the heater number and the second the burner per heater, CT12/CT34 are the combustion turbine building vents (volume source, fugitives), TNK is tank (1 is the hydrocarbon waste tank, and 2 is the waste water accumulator tank), UNT1 – UNT4 are the CT vent stacks for blowdown emissions, STN1 – STN4 are the station suction and discharge vents, PIGL and PIGR are the pigging launching and receiving vents.
* For conciseness, the values in scientific notation are shown using the exponent "E" where E-xx implies "x 10^{-xx}"
Blank cells indicate no emissions present/characterized for these pollutant-source combinations.

Table A-1: Emission Rates Used in the Annual Modeling Scenario (g/s)
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Source	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(e)pyrene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Biphenyl	Butane	Butyr/Isobutyraldehyde	Carbon Tetrachloride	Chlorobenzene	Chloroethane	Chloroform	Chrysene	Cyclohexane	Cyclopentane	Dibenzo(a,h)anthracene	Dichlorobenzene	Ethane	Ethylbenzene	Ethylene Dibromide	Fluoranthene
CT1																			3.1E-04		
CT2																			2.3E-04		
CT3																			3.5E-04		
CT4																			1.3E-04		
AUXB	9.5E-10	1.4E-09		9.5E-10	1.4E-09		1.7E-03						1.4E-09			9.5E-10	9.5E-07	2.4E-03			2.4E-09
EGEN	2.3E-10	3.4E-10	9.3E-10	9.9E-10	1.7E-10	1.6E-07	1.9E-04	1.7E-05	2.4E-06	1.8E-06		1.9E-06	2.7E-08	1.2E-05	3.8E-06			2.8E-03	4.3E-06	2.9E-06	1.4E-08
HT11	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT12	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT21	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT22	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT31	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT32	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT41	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT42	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
CT12							1.4E-03											2.6E-02			
CT34							1.4E-03											2.6E-02			
TNK1																			8.4E-09		
TNK2																					
UNT1							2.9E-04											5.2E-03			
UNT2							1.3E-04											2.3E-03			
UNT3							3.2E-04											5.8E-03			
UNT4							6.7E-05											1.2E-03			
STN1							9.7E-08											1.7E-06			
STN2							9.7E-08											1.7E-06			
STN3							7.9E-08											1.4E-06			
STN4							7.9E-08											1.4E-06			
PIGL							2.6E-04											4.6E-03			
PIGR							2.7E-04											4.8E-03			

Table A-1: Emission Rates Used in the Annual Modeling Scenario (g/s)
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Source	Fluorene	Formaldehyde	Hexane (or n-Hexane)	Indeno(1,2,3-c,d)pyrene	Isobutane	IsoPentane	Methane	Methanol	Methylcyclohexane	Methylene Chloride	n-Heptane	n-Nonane	n-Octane	Naphthalene	PAH	Pentane (or n-Pentane)	Perylene	Phenanthrene	Phenol	Propane	Propylene Oxide
CT1		3.0E-02					2.1E-01							1.3E-05	2.1E-05						2.8E-04
CT2		2.4E-02					2.5E-01							9.3E-06	1.6E-05						2.1E-04
CT3		3.6E-02					2.8E-01							1.4E-05	2.4E-05						3.2E-04
CT4		1.3E-02					1.1E-01							5.4E-06	9.1E-06						1.2E-04
AUXB	2.2E-09	5.9E-05	1.4E-03	1.4E-09			1.8E-03							4.8E-07		2.1E-03		1.3E-08		1.3E-03	
EGEN	6.7E-08	1.8E-02	1.8E-05	4.0E-10	1.5E-04		1.4E-01	9.9E-05	1.3E-05	5.9E-06		1.2E-06	3.0E-06	3.8E-06	5.3E-06	6.1E-05	2.0E-10	1.4E-07	1.7E-06	1.1E-03	
HT11	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT12	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT21	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT22	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT31	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT32	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT41	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT42	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
CT12			8.1E-04		1.3E-03	5.1E-04	4.4E-01				1.4E-03					4.7E-04				7.1E-03	
CT34			8.1E-04		1.3E-03	5.1E-04	4.4E-01				1.4E-03					4.7E-04				7.1E-03	
TNK1			8.4E-09																		
TNK2			2.9E-04				5.0E-04														
UNT1			1.6E-04		2.7E-04	1.0E-04	9.0E-02				2.9E-04					9.4E-05				1.4E-03	
UNT2			7.2E-05		1.2E-04	4.5E-05	4.0E-02				1.3E-04					4.2E-05				6.3E-04	
UNT3			1.8E-04		3.0E-04	1.1E-04	9.9E-02				3.2E-04					1.0E-04				1.6E-03	
UNT4			3.8E-05		6.3E-05	2.4E-05	2.1E-02				6.8E-05					2.2E-05				3.3E-04	
STN1			5.5E-08		9.1E-08	3.4E-08	3.0E-05				9.8E-08					3.2E-08				4.8E-07	
STN2			5.5E-08		9.1E-08	3.4E-08	3.0E-05				9.8E-08					3.2E-08				4.8E-07	
STN3			4.5E-08		7.4E-08	2.8E-08	2.5E-05				8.0E-08					2.6E-08				3.9E-07	
STN4			4.5E-08		7.4E-08	2.8E-08	2.5E-05				8.0E-08					2.6E-08				3.9E-07	
PIGL			1.4E-04		2.4E-04	9.1E-05	7.9E-02				2.6E-04					8.3E-05				1.3E-03	
PIGR			1.5E-04		2.5E-04	9.5E-05	8.3E-02				2.7E-04					8.7E-05				1.3E-03	

Table A-1: Emission Rates Used in the Annual Modeling Scenario (g/s)
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Source	Pyrene	Styrene	Tetrachloroethane	Toluene	Vinyl Chloride	Xylene	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Manganese	Mercury	Molybdenum	Nickel	Selenium	Vanadium	Zinc	Lead
CT1				1.3E-03																	
CT2				9.3E-04																	
CT3				1.4E-03																	
CT4				5.4E-04																	
AUXB	3.9E-09			2.7E-06			1.6E-07	3.5E-06	9.5E-09	8.7E-07	1.1E-06	6.6E-08	6.7E-07	3.0E-07	2.1E-07	8.7E-07	1.7E-06	1.9E-08	1.8E-06	2.3E-05	3.9E-07
EGEN	2.3E-08	2.2E-06		3.8E-05	9.8E-07	1.1E-05															
HT11	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT12	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT21	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT22	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT31	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT32	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT41	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT42	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
CT12																					
CT34																					
TNK1				8.4E-09		8.4E-09															
TNK2																					
UNT1																					
UNT2																					
UNT3																					
UNT4																					
STN1																					
STN2																					
STN3																					
STN4																					
PIGL																					
PIGR																					

Table A-2: Emission Rates Used in the 1-Hour Normal Operations Modeling Scenario (g/s)
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Source	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	1,2,3-Trimethylbenzene	1,2,4-Trimethylbenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3,5-Trimethylbenzene	1,3-Butadiene	1,3-Dichloropropene	2,2,4-Trimethylpentane	2-Methylnaphthalene	3-Methylchloranthrene	7,12-Dimethylbenz(a)anthracene	Acenaphthene	Acenaphthylene	Acetaldehyde	Acrolein	Anthracene	Benz(a)anthracene	Benzene
CT1									3.5E-06								3.3E-04	5.2E-05			9.8E-05
CT2									2.3E-06								2.2E-04	3.5E-05			6.5E-05
CT3									4.3E-06								4.0E-04	6.3E-05			1.2E-04
CT4									1.5E-06								1.4E-04	2.2E-05			4.2E-05
AUXB												1.9E-08	1.4E-09	1.3E-08	1.4E-09	1.4E-09			1.9E-09	1.4E-09	1.7E-06
EGEN	4.6E-05	3.7E-05	2.7E-05	2.5E-05	7.7E-05	2.9E-05	3.1E-05	1.3E-05	5.7E-04	3.1E-05	5.9E-04	1.5E-05			9.3E-07	2.2E-06	5.4E-03	5.4E-03	5.0E-07	2.3E-07	1.4E-03
HT11												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT12												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT21												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT22												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT31												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT32												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT41												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT42												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
CT12																					
CT34																					
TNK1											8.6E-06										8.6E-06
TNK2																					

Notes:

[1] CT1 – CT4 are combustion turbines 1-4, AUXB is the auxiliary boiler, EGEN is the emergency generator, HT11 – HT42 are the line heaters with the first number signifying the heater number and the second the burner per heater, CT12/CT34 are the combustion turbine building vents (volume source, fugitives), TNK is tank (1 is the hydrocarbon waste tank, and 2 is the waste water accumulator tank).

* For conciseness, the values in scientific notation are shown using the exponent “E” where E-xx implies “x 10^{-xx}”

Blank cells indicate no emissions present/characterized for these pollutant-source combinations.

Table A-2: Emission Rates Used in the 1-Hour Normal Operations Modeling Scenario (g/s)
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Source	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(e)pyrene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Biphenyl	Butane	Butyr/Isobutyraldehyde	Carbon Tetrachloride	Chlorobenzene	Chloroethane	Chloroform	Chrysene	Cyclohexane	Cyclopentane	Dibenzo(a,h)anthracene	Dichlorobenzene	Ethane	Ethylbenzene	Ethylene Dibromide	Fluoranthene
CT1																			2.6E-04		
CT2																			1.7E-04		
CT3																			3.2E-04		
CT4																			1.1E-04		
AUXB	9.5E-10	1.4E-09		9.5E-10	1.4E-09		1.7E-03						1.4E-09			9.5E-10	9.5E-07	2.4E-03			2.4E-09
EGEN	4.0E-09	5.9E-09	1.6E-08	1.7E-08	3.0E-09	2.8E-06	3.3E-03	3.0E-04	4.2E-05	3.1E-05		3.3E-05	4.7E-07	2.1E-04	6.6E-05			4.9E-02	7.5E-05	5.1E-05	2.5E-07
HT11	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT12	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT21	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT22	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT31	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT32	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT41	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT42	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
CT12							1.4E-03											2.6E-02			
CT34							1.4E-03											2.6E-02			
TNK1																			8.6E-06		
TNK2																					

Table A-2: Emission Rates Used in the 1-Hour Normal Operations Modeling Scenario (g/s)
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Source	Fluorene	Formaldehyde	Hexane (or n-Hexane)	Indeno(1,2,3-c,d)pyrene	Isobutane	IsoPentane	Methane	Methanol	Methylcyclohexane	Methylene Chloride	n-Heptane	n-Nonane	n-Octane	Naphthalene	PAH	Pentane (or n-Pentane)	Perylene	Phenanthrene	Phenol	Propane	Propylene Oxide
CT1		2.4E-02					1.5E-01							1.1E-05	1.8E-05						2.4E-04
CT2		1.6E-02					1.0E-01							7.0E-06	1.2E-05						1.6E-04
CT3		2.9E-02					1.9E-01							1.3E-05	2.2E-05						2.9E-04
CT4		1.0E-02					6.6E-02							4.5E-06	7.6E-06						1.0E-04
AUXB	2.2E-09	5.9E-05	1.4E-03	1.4E-09			1.8E-03							4.8E-07		2.1E-03		1.3E-08		1.3E-03	
EGEN	1.2E-06	3.1E-01	3.1E-04	6.9E-09	2.6E-03		2.4E+00	1.7E-03	2.4E-04	1.0E-04		2.1E-05	5.2E-05	6.7E-05	9.3E-05	1.1E-03	3.5E-09	2.5E-06	2.9E-05	2.0E-02	
HT11	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT12	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT21	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT22	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT31	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT32	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT41	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT42	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
CT12			8.1E-04		1.3E-03	5.1E-04	4.4E-01				1.4E-03					4.7E-04				7.1E-03	
CT34			8.1E-04		1.3E-03	5.1E-04	4.4E-01				1.4E-03					4.7E-04				7.1E-03	
TNK1			8.6E-06																		
TNK2			6.6E-03				1.1E-02														

Table A-2: Emission Rates Used in the 1-Hour Normal Operations Modeling Scenario (g/s)
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Source	Pyrene	Styrene	Tetrachloroethane	Toluene	Vinyl Chloride	Xylene	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Manganese	Mercury	Molybdenum	Nickel	Selenium	Vanadium	Zinc	Lead
CT1				1.1E-03																	
CT2				7.0E-04																	
CT3				1.3E-03																	
CT4				4.5E-04																	
AUXB	3.9E-09			2.7E-06			1.6E-07	3.5E-06	9.5E-09	8.7E-07	1.1E-06	6.6E-08	6.7E-07	3.0E-07	2.1E-07	8.7E-07	1.7E-06	1.9E-08	1.8E-06	2.3E-05	3.9E-07
EGEN	4.1E-07	3.8E-05		6.7E-04	1.7E-05	1.9E-04															
HT11	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT12	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT21	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT22	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT31	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT32	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT41	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT42	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
CT12																					
CT34																					
TNK1				8.6E-06		8.6E-06															
TNK2																					

Table A-3: Emission Rates Used in the 1-Hour Startup Modeling Scenario (g/s)
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Source	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	1,2,3-Trimethylbenzene	1,2,4-Trimethylbenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3,5-Trimethylbenzene	1,3-Butadiene	1,3-Dichloropropene	2,2,4-Trimethylpentane	2-Methylnaphthalene	3-Methylchloranthrene	7,12-Dimethylbenz(a)anthracene	Acenaphthene	Acenaphthylene	Acetaldehyde	Acrolein	Anthracene	Benz(a)anthracene	Benzene
CT1									3.7E-05								3.4E-03	5.5E-04			1.0E-03
CT2									5.3E-05								4.9E-03	7.9E-04			1.5E-03
CT3									2.1E-05								1.9E-03	3.1E-04			5.8E-04
CT4									1.8E-05								1.7E-03	2.7E-04			5.1E-04
AUXB												1.9E-08	1.4E-09	1.3E-08	1.4E-09	1.4E-09			1.9E-09	1.4E-09	1.7E-06
EGEN	4.6E-05	3.7E-05	2.7E-05	2.5E-05	7.7E-05	2.9E-05	3.1E-05	1.3E-05	5.7E-04	3.1E-05	5.9E-04	1.5E-05			9.3E-07	2.2E-06	5.4E-03	5.4E-03	5.0E-07	2.3E-07	1.4E-03
HT11												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT12												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT21												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT22												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT31												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT32												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT41												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT42												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
CT12																					
CT34																					
TNK1											8.6E-06										8.6E-06
TNK2																					
UNT1																					
UNT2																					
UNT3																					
UNT4																					

Notes:

[1] CT1 – CT4 are combustion turbines 1-4, AUXB is the auxiliary boiler, EGEN is the emergency generator, HT11 – HT42 are the line heaters with the first number signifying the heater number and the second the burner per heater, CT12/CT34 are the combustion turbine building vents (volume source, fugitives), TNK is tank (1 is the hydrocarbon waste tank, and 2 is the waste water accumulator tank), UNT1 – UNT4 are the CT vent stacks for blowdown emissions.

* For conciseness, the values in scientific notation are shown using the exponent "E" where E-xx implies "x 10^{-xx}"

Blank cells indicate no emissions present/characterized for these pollutant-source combinations.

Table A-3: Emission Rates Used in the 1-Hour Startup Modeling Scenario (g/s)
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Source	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(e)pyrene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Biphenyl	Butane	Butyr/Isobutyraldehyde	Carbon Tetrachloride	Chlorobenzene	Chloroethane	Chloroform	Chrysene	Cyclohexane	Cyclopentane	Dibenzo(a,h)anthracene	Dichlorobenzene	Ethane	Ethylbenzene	Ethylene Dibromide	Fluoranthene
CT1																			2.8E-03		
CT2																			4.0E-03		
CT3																			1.5E-03		
CT4																			1.4E-03		
AUXB	9.5E-10	1.4E-09		9.5E-10	1.4E-09		1.7E-03						1.4E-09			9.5E-10	9.5E-07	2.4E-03			2.4E-09
EGEN	4.0E-09	5.9E-09	1.6E-08	1.7E-08	3.0E-09	2.8E-06	3.3E-03	3.0E-04	4.2E-05	3.1E-05		3.3E-05	4.7E-07	2.1E-04	6.6E-05			4.9E-02	7.5E-05	5.1E-05	2.5E-07
HT11	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT12	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT21	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT22	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT31	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT32	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT41	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT42	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
CT12							1.4E-03											2.6E-02			
CT34							1.4E-03											2.6E-02			
TNK1																			8.6E-06		
TNK2																					
UNT1							6.0E-02											1.1E+00			
UNT2							3.0E-02											5.4E-01			
UNT3							6.5E-02											1.2E+00			
UNT4							1.7E-02											3.1E-01			

Table A-3: Emission Rates Used in the 1-Hour Startup Modeling Scenario (g/s)
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Source	Fluorene	Formaldehyde	Hexane (or n-Hexane)	Indeno(1,2,3-c,d)pyrene	Isobutane	IsoPentane	Methane	Methanol	Methylcyclohexane	Methylene Chloride	n-Heptane	n-Nonane	n-Octane	Naphthalene	PAH	Pentane (or n-Pentane)	Perylene	Phenanthrene	Phenol	Propane	Propylene Oxide
CT1		3.2E-01					2.1E+00							1.1E-04	1.9E-04						2.5E-03
CT2		5.9E-01					8.9E+00							1.6E-04	2.7E-04						3.6E-03
CT3		3.9E-01					3.9E+00							6.2E-05	1.1E-04						1.4E-03
CT4		1.5E-01					1.8E+00							5.5E-05	9.4E-05						1.2E-03
AUXB	2.2E-09	5.9E-05	1.4E-03	1.4E-09			1.8E-03							4.8E-07		2.1E-03		1.3E-08		1.3E-03	
EGEN	1.2E-06	3.1E-01	3.1E-04	6.9E-09	2.6E-03		2.4E+00	1.7E-03	2.4E-04	1.0E-04		2.1E-05	5.2E-05	6.7E-05	9.3E-05	1.1E-03	3.5E-09	2.5E-06	2.9E-05	2.0E-02	
HT11	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT12	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT21	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT22	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT31	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT32	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT41	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT42	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
CT12			8.1E-04		1.3E-03	5.1E-04	4.4E-01				1.4E-03					4.7E-04				7.1E-03	
CT34			8.1E-04		1.3E-03	5.1E-04	4.4E-01				1.4E-03					4.7E-04				7.1E-03	
TNK1			8.6E-06																		
TNK2			6.6E-03				1.1E-02														
UNT1			3.4E-02		5.7E-02	2.1E-02	1.9E+01				6.1E-02					2.0E-02				3.0E-01	
UNT2			1.7E-02		2.8E-02	1.1E-02	9.3E+00				3.0E-02					9.8E-03				1.5E-01	
UNT3			3.7E-02		6.1E-02	2.3E-02	2.0E+01				6.6E-02					2.1E-02				3.2E-01	
UNT4			9.9E-03		1.6E-02	6.2E-03	5.4E+00				1.8E-02					5.7E-03				8.6E-02	

Table A-3: Emission Rates Used in the 1-Hour Startup Modeling Scenario (g/s)
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Source	Pyrene	Styrene	Tetrachloroethane	Toluene	Vinyl Chloride	Xylene	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Manganese	Mercury	Molybdenum	Nickel	Selenium	Vanadium	Zinc	Lead
CT1				1.1E-02																	
CT2				1.6E-02																	
CT3				6.2E-03																	
CT4				5.5E-03																	
AUXB	3.9E-09			2.7E-06			1.6E-07	3.5E-06	9.5E-09	8.7E-07	1.1E-06	6.6E-08	6.7E-07	3.0E-07	2.1E-07	8.7E-07	1.7E-06	1.9E-08	1.8E-06	2.3E-05	3.9E-07
EGEN	4.1E-07	3.8E-05		6.7E-04	1.7E-05	1.9E-04															
HT11	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT12	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT21	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT22	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT31	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT32	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT41	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT42	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
CT12																					
CT34																					
TNK1				8.6E-06		8.6E-06															
TNK2																					
UNT1																					
UNT2																					
UNT3																					
UNT4																					

Table A-4: Emission Rates Used in the 1-Hour Shutdown Modeling Scenario (g/s)
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Source	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	1,2,3-Trimethylbenzene	1,2,4-Trimethylbenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3,5-Trimethylbenzene	1,3-Butadiene	1,3-Dichloropropene	2,2,4-Trimethylpentane	2-Methylnaphthalene	3-Methylchloranthrene	7,12-Dimethylbenz(a)anthracene	Acenaphthene	Acenaphthylene	Acetaldehyde	Acrolein	Anthracene	Benz(a)anthracene	Benzene
CT1									2.9E-05								2.7E-03	4.2E-04			8.0E-04
CT2									1.9E-05								1.8E-03	2.8E-04			5.3E-04
CT3									2.9E-05								2.7E-03	4.3E-04			8.1E-04
CT4									9.8E-06								9.1E-04	1.5E-04			2.7E-04
AUXB												1.9E-08	1.4E-09	1.3E-08	1.4E-09	1.4E-09			1.9E-09	1.4E-09	1.7E-06
EGEN	4.6E-05	3.7E-05	2.7E-05	2.5E-05	7.7E-05	2.9E-05	3.1E-05	1.3E-05	5.7E-04	3.1E-05	5.9E-04	1.5E-05			9.3E-07	2.2E-06	5.4E-03	5.4E-03	5.0E-07	2.3E-07	1.4E-03
HT11												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT12												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT21												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT22												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT31												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT32												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT41												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
HT42												3.1E-08	2.4E-09	2.1E-08	2.4E-09	2.4E-09			3.1E-09	2.4E-09	2.8E-06
CT12																					
CT34																					
TNK1											8.6E-06										8.6E-06
TNK2																					
UNT1																					
UNT2																					
UNT3																					
UNT4																					

Notes:

[1] CT1 – CT4 are combustion turbines 1-4, AUXB is the auxiliary boiler, EGEN is the emergency generator, HT11 – HT42 are the line heaters with the first number signifying the heater number and the second the burner per heater, CT12/CT34 are the combustion turbine building vents (volume source, fugitives), TNK is tank (1 is the hydrocarbon waste tank, and 2 is the waste water accumulator tank), UNT1 – UNT4 are the CT vent stacks for blowdown emissions.

* For conciseness, the values in scientific notation are shown using the exponent “E” where E-xx implies “x 10^{-xx}”

Blank cells indicate no emissions present/characterized for these pollutant-source combinations.

Table A-4: Emission Rates Used in the 1-Hour Shutdown Modeling Scenario (g/s)
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Source	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(e)pyrene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Biphenyl	Butane	Butyr/Isobutyraldehyde	Carbon Tetrachloride	Chlorobenzene	Chloroethane	Chloroform	Chrysene	Cyclohexane	Cyclopentane	Dibenzo(a,h)anthracene	Dichlorobenzene	Ethane	Ethylbenzene	Ethylene Dibromide	Fluoranthene
CT1																			2.1E-03		
CT2																			1.4E-03		
CT3																			2.2E-03		
CT4																			7.3E-04		
AUXB	9.5E-10	1.4E-09		9.5E-10	1.4E-09		1.7E-03						1.4E-09			9.5E-10	9.5E-07	2.4E-03			2.4E-09
EGEN	4.0E-09	5.9E-09	1.6E-08	1.7E-08	3.0E-09	2.8E-06	3.3E-03	3.0E-04	4.2E-05	3.1E-05		3.3E-05	4.7E-07	2.1E-04	6.6E-05			4.9E-02	7.5E-05	5.1E-05	2.5E-07
HT11	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT12	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT21	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT22	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT31	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT32	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT41	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
HT42	1.6E-09	2.4E-09		1.6E-09	2.4E-09		2.8E-03						2.4E-09			1.6E-09	1.6E-06	4.1E-03			3.9E-09
CT12							1.4E-03											2.6E-02			
CT34							1.4E-03											2.6E-02			
TNK1																			8.6E-06		
TNK2																					
UNT1							1.9E-01											3.5E+00			
UNT2							8.2E-02											1.5E+00			
UNT3							2.1E-01											3.9E+00			
UNT4							4.2E-02											7.5E-01			

Table A-4: Emission Rates Used in the 1-Hour Shutdown Modeling Scenario (g/s)
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Source	Fluorene	Formaldehyde	Hexane (or n-Hexane)	Indeno(1,2,3-c,d)pyrene	Isobutane	IsoPentane	Methane	Methanol	Methylcyclohexane	Methylene Chloride	n-Heptane	n-Nonane	n-Octane	Naphthalene	PAH	Pentane (or n-Pentane)	Perylene	Phenanthrene	Phenol	Propane	Propylene Oxide
CT1		2.9E-01					2.8E+00							8.6E-05	1.5E-04						1.9E-03
CT2		2.1E-01					4.1E+00							5.7E-05	9.7E-05						1.3E-03
CT3		3.3E-01					4.8E+00							8.8E-05	1.5E-04						2.0E-03
CT4		1.3E-01					2.3E+00							3.0E-05	5.0E-05						6.6E-04
AUXB	2.2E-09	5.9E-05	1.4E-03	1.4E-09			1.8E-03							4.8E-07		2.1E-03		1.3E-08		1.3E-03	
EGEN	1.2E-06	3.1E-01	3.1E-04	6.9E-09	2.6E-03		2.4E+00	1.7E-03	2.4E-04	1.0E-04		2.1E-05	5.2E-05	6.7E-05	9.3E-05	1.1E-03	3.5E-09	2.5E-06	2.9E-05	2.0E-02	
HT11	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT12	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT21	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT22	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT31	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT32	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT41	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
HT42	3.7E-09	9.8E-05	2.4E-03	2.4E-09			3.0E-03							8.0E-07		3.4E-03		2.2E-08		2.1E-03	
CT12			8.1E-04		1.3E-03	5.1E-04	4.4E-01				1.4E-03					4.7E-04				7.1E-03	
CT34			8.1E-04		1.3E-03	5.1E-04	4.4E-01				1.4E-03					4.7E-04				7.1E-03	
TNK1			8.6E-06																		
TNK2			6.6E-03				1.1E-02														
UNT1			1.1E-01		1.8E-01	6.8E-02	6.0E+01				1.9E-01					6.3E-02				9.5E-01	
UNT2			4.6E-02		7.7E-02	2.9E-02	2.5E+01				8.3E-02					2.7E-02				4.1E-01	
UNT3			1.2E-01		2.0E-01	7.6E-02	6.6E+01				2.2E-01					7.0E-02				1.1E+00	
UNT4			2.3E-02		3.9E-02	1.5E-02	1.3E+01				4.2E-02					1.4E-02				2.0E-01	

Table A-4: Emission Rates Used in the 1-Hour Shutdown Modeling Scenario (g/s)
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Source	Pyrene	Styrene	Tetrachloroethane	Toluene	Vinyl Chloride	Xylene	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Manganese	Mercury	Molybdenum	Nickel	Selenium	Vanadium	Zinc	Lead
CT1				8.6E-03																	
CT2				5.7E-03																	
CT3				8.8E-03																	
CT4				3.0E-03																	
AUXB	3.9E-09			2.7E-06			1.6E-07	3.5E-06	9.5E-09	8.7E-07	1.1E-06	6.6E-08	6.7E-07	3.0E-07	2.1E-07	8.7E-07	1.7E-06	1.9E-08	1.8E-06	2.3E-05	3.9E-07
EGEN	4.1E-07	3.8E-05		6.7E-04	1.7E-05	1.9E-04															
HT11	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT12	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT21	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT22	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT31	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT32	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT41	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
HT42	6.6E-09			4.5E-06			2.6E-07	5.8E-06	1.6E-08	1.4E-06	1.8E-06	1.1E-07	1.1E-06	5.0E-07	3.4E-07	1.4E-06	2.8E-06	3.1E-08	3.0E-06	3.8E-05	6.6E-07
CT12																					
CT34																					
TNK1				8.6E-06		8.6E-06															
TNK2																					
UNT1																					
UNT2																					
UNT3																					
UNT4																					

Table A-5: Emission Rates Used in the 1-Hour Capped Emergency Shutdown Valve Testing Modeling Scenario (g/s)
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Source	Butane	Ethane	Hexane (or n-Hexane)	Isobutane	IsoPentane	Methane	n-Heptane	Pentane (or n-Pentane)	Propane
AUXB	1.7E-03	2.4E-03	1.4E-03			1.8E-03		2.1E-03	1.3E-03
EGEN	3.3E-03	4.9E-02	3.1E-04	2.6E-03		2.4E+00		1.1E-03	2.0E-02
HT11	2.8E-03	4.1E-03	2.4E-03			3.0E-03		3.4E-03	2.1E-03
HT12	2.8E-03	4.1E-03	2.4E-03			3.0E-03		3.4E-03	2.1E-03
HT21	2.8E-03	4.1E-03	2.4E-03			3.0E-03		3.4E-03	2.1E-03
HT22	2.8E-03	4.1E-03	2.4E-03			3.0E-03		3.4E-03	2.1E-03
HT31	2.8E-03	4.1E-03	2.4E-03			3.0E-03		3.4E-03	2.1E-03
HT32	2.8E-03	4.1E-03	2.4E-03			3.0E-03		3.4E-03	2.1E-03
HT41	2.8E-03	4.1E-03	2.4E-03			3.0E-03		3.4E-03	2.1E-03
HT42	2.8E-03	4.1E-03	2.4E-03			3.0E-03		3.4E-03	2.1E-03
CT12	1.4E-03	2.6E-02	8.1E-04	1.3E-03	5.1E-04	4.4E-01	1.4E-03	4.7E-04	7.1E-03
CT34	1.4E-03	2.6E-02	8.1E-04	1.3E-03	5.1E-04	4.4E-01	1.4E-03	4.7E-04	7.1E-03
TNK1			8.6E-06						
TNK2			6.6E-03			1.1E-02			
UNT1	8.9E-05	1.6E-03	5.1E-05	8.4E-05	3.2E-05	2.8E-02	9.0E-05	2.9E-05	4.4E-04
UNT2	2.2E-04	4.0E-03	1.3E-04	2.1E-04	7.9E-05	6.9E-02	2.2E-04	7.3E-05	1.1E-03
UNT3	4.9E-04	8.9E-03	2.8E-04	4.6E-04	1.7E-04	1.5E-01	4.9E-04	1.6E-04	2.4E-03
UNT4	5.8E-04	1.0E-02	3.3E-04	5.5E-04	2.1E-04	1.8E-01	5.8E-04	1.9E-04	2.9E-03
STN1	8.5E-04	1.5E-02	4.8E-04	8.0E-04	3.0E-04	2.6E-01	8.5E-04	2.8E-04	4.2E-03
STN2	8.5E-04	1.5E-02	4.8E-04	8.0E-04	3.0E-04	2.6E-01	8.5E-04	2.8E-04	4.2E-03
STN3	6.9E-04	1.2E-02	3.9E-04	6.5E-04	2.5E-04	2.1E-01	7.0E-04	2.3E-04	3.4E-03
STN4	6.9E-04	1.2E-02	3.9E-04	6.5E-04	2.5E-04	2.1E-01	7.0E-04	2.3E-04	3.4E-03

Notes:

[1] CT1 – CT4 are combustion turbines 1-4, AUXB is the auxiliary boiler, EGEN is the emergency generator, HT11 – HT42 are the line heaters with the first number signifying the heater number and the second the burner per heater, CT12/CT34 are the combustion turbine building vents (volume source, fugitives), TNK is tank (1 is the hydrocarbon waste tank, and 2 is the waste water accumulator tank), UNT1 – UNT4 are the CT vent stacks for blowdown emissions, STN1 – STN4 are the station suction and discharge vents.

* For conciseness, the values in scientific notation are shown using the exponent "E" where E-xx implies "x 10^{-xx}"

Blank cells indicate no emissions present/characterized for these pollutant-source combinations.

Table A-6: Emission Rates Used in the 1-Hour Pig Launching Modeling Scenario (g/s)
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Source	Butane	Ethane	Hexane (or n-Hexane)	Isobutane	IsoPentane	Methane	n-Heptane	Pentane (or n-Pentane)	Propane
AUXB	1.7E-03	2.4E-03	1.4E-03			1.8E-03		2.1E-03	1.3E-03
EGEN	3.3E-03	4.9E-02	3.1E-04	2.6E-03		2.4E+00		1.1E-03	2.0E-02
HT11	2.8E-03	4.1E-03	2.4E-03			3.0E-03		3.4E-03	2.1E-03
HT12	2.8E-03	4.1E-03	2.4E-03			3.0E-03		3.4E-03	2.1E-03
HT21	2.8E-03	4.1E-03	2.4E-03			3.0E-03		3.4E-03	2.1E-03
HT22	2.8E-03	4.1E-03	2.4E-03			3.0E-03		3.4E-03	2.1E-03
HT31	2.8E-03	4.1E-03	2.4E-03			3.0E-03		3.4E-03	2.1E-03
HT32	2.8E-03	4.1E-03	2.4E-03			3.0E-03		3.4E-03	2.1E-03
HT41	2.8E-03	4.1E-03	2.4E-03			3.0E-03		3.4E-03	2.1E-03
HT42	2.8E-03	4.1E-03	2.4E-03			3.0E-03		3.4E-03	2.1E-03
CT12	1.4E-03	2.6E-02	8.1E-04	1.3E-03	5.1E-04	4.4E-01	1.4E-03	4.7E-04	7.1E-03
CT34	1.4E-03	2.6E-02	8.1E-04	1.3E-03	5.1E-04	4.4E-01	1.4E-03	4.7E-04	7.1E-03
TNK1			8.6E-06						
TNK2			6.6E-03			1.1E-02			
PIGL	5.6E-01	1.0E+01	3.2E-01	5.3E-01	2.0E-01	1.7E+02	5.6E-01	1.8E-01	2.8E+00

Notes:

[1] CT1 – CT4 are combustion turbines 1-4, AUXB is the auxiliary boiler, EGEN is the emergency generator, HT11 – HT42 are the line heaters with the first number signifying the heater number and the second the burner per heater, CT12/CT34 are the combustion turbine building vents (volume source, fugitives), TNK is tank (1 is the hydrocarbon waste tank, and 2 is the waste water accumulator tank), PIGL is the pigging launching vent.

* For conciseness, the values in scientific notation are shown using the exponent "E" where E-xx implies "x 10^{-xx}"

Blank cells indicate no emissions present/characterized for these pollutant-source combinations.

Table A-7: Emission Rates Used in the 1-Hour Pig Receiving Modeling Scenario (g/s)
Health Screening Assessment
Buckingham Compressor Station, Buckingham County, Virginia

Source	Butane	Ethane	Hexane (or n-Hexane)	Isobutane	IsoPentane	Methane	n-Heptane	Pentane (or n-Pentane)	Propane
AUXB	1.7E-03	2.4E-03	1.4E-03			1.8E-03		2.1E-03	1.3E-03
EGEN	3.3E-03	4.9E-02	3.1E-04	2.6E-03		2.4E+00		1.1E-03	2.0E-02
HT11	2.8E-03	4.1E-03	2.4E-03			3.0E-03		3.4E-03	2.1E-03
HT12	2.8E-03	4.1E-03	2.4E-03			3.0E-03		3.4E-03	2.1E-03
HT21	2.8E-03	4.1E-03	2.4E-03			3.0E-03		3.4E-03	2.1E-03
HT22	2.8E-03	4.1E-03	2.4E-03			3.0E-03		3.4E-03	2.1E-03
HT31	2.8E-03	4.1E-03	2.4E-03			3.0E-03		3.4E-03	2.1E-03
HT32	2.8E-03	4.1E-03	2.4E-03			3.0E-03		3.4E-03	2.1E-03
HT41	2.8E-03	4.1E-03	2.4E-03			3.0E-03		3.4E-03	2.1E-03
HT42	2.8E-03	4.1E-03	2.4E-03			3.0E-03		3.4E-03	2.1E-03
CT12	1.4E-03	2.6E-02	8.1E-04	1.3E-03	5.1E-04	4.4E-01	1.4E-03	4.7E-04	7.1E-03
CT34	1.4E-03	2.6E-02	8.1E-04	1.3E-03	5.1E-04	4.4E-01	1.4E-03	4.7E-04	7.1E-03
TNK1			8.6E-06						
TNK2			6.6E-03			1.1E-02			
PIGR	5.8E-01	1.1E+01	3.3E-01	5.5E-01	2.1E-01	1.8E+02	5.9E-01	1.9E-01	2.9E+00
	1.8E+00	3.2E+01	1.0E+00	1.7E+00	6.3E-01	5.5E+02	1.8E+00	5.8E-01	8.7E+00

Notes:

[1] CT1 – CT4 are combustion turbines 1-4, AUXB is the auxiliary boiler, EGEN is the emergency generator, HT11 – HT42 are the line heaters with the first number signifying the heater number and the second the burner per heater, CT12/CT34 are the combustion turbine building vents (volume source, fugitives), TNK is tank (1 is the hydrocarbon waste tank, and 2 is the waste water accumulator tank), PIGR is the pigging receiving vent.

* For conciseness, the values in scientific notation are shown using the exponent "E" where E-xx implies "x 10^{-xx}"

Blank cells indicate no emissions present/characterized for these pollutant-source combinations.

ATTACHMENT 5

Response to Friends of Buckingham Critique of the VDH Letter Health Consultation

Atlantic Coast Pipeline, LLC (Atlantic) has evaluated the criticisms of the Virginia Department of Health's (VDH) Letter Health Consultation for the Buckingham Compressor Station (BCS) by Dr. Nordgaard on behalf of the Friends of Buckingham. Dr. Noordgaard's criticisms are repeated below followed by Atlantic's responses.

1 The Health Consultation asked an artificially narrow question: In effect, will modeled air quality impacts from the proposed facility exceed air quality limits?

The reason for asking this question is to address a broader concern that the compressor station will have adverse health consequences for nearby residents. That question cannot be answered by the Health Consultation and instead requires a broader study.

The Agency for Toxic Substances and Disease Research describes the Health Consultation as follows: *"A consultation differs from a public health assessment in that the consultation focuses on a specific question and provides a more rapid response...Public health consultations are not medical examinations, community health studies, or public health assessments."*

The real question of interest is whether the proposed facility will impact residents' health. That requires a more extensive public health assessment, not a narrowly focused and rapid health consultation.

Response: Dr. Nordgaard posits that a health consultation focused on air quality was inappropriate to determine the potential adverse health consequences from the proposed compressor station and that instead the Board should have ordered an unprecedented public health assessment for this minor source.

Other than citing to the Agency for Toxic Substances and Disease Research's (ATSDR's) description of a health consultation, Dr. Nordgaard offers no factual or legal support for his position. He does not explain or identify any other potential health impacts the facility could have on residents other than from air emissions, much less provide any data to support the possibility of such health impacts. Nor does he explain why his "broader" question would necessitate a public health assessment, which generally are reserved for hazardous waste sites on the National Priority List, instead of a health consultation. Dr. Nordgaard identifies no regulatory or statutory requirements, or even guidance, to prompt a full-blown health assessment in the case of a minor source of air pollution. Requiring a health assessment for this permit would establish a precedent for DEQ and for the Board that could have broad and unintended consequences in future permitting proceedings.

Director Paylor, at the request of the State Air Pollution Control Board as part of its consideration of Atlantic's application for an air permit, requested VDH to evaluate the potential health impacts associated with the modeled air emissions from the facility. The request appropriately focused on air emission impacts since an air permit is at issue. The Board issues air permits pursuant to regulations authorized by Va. Code § 10.1-1308, which grants the Board "the power to promulgate regulations, including emergency regulations, abating, controlling and prohibiting *air pollution* throughout or in any part of the Commonwealth."[1] Va. Code § 10.1-1308.A (emphasis added).

[1] *See, e.g.*, 9 VAC 5-80-1100 (citing Va. Code § 10.1-1308 as the statutory authority for the regulations requiring minor New Source Review permits).

It is not clear from Dr. Nordgaard's comment what would be gained from a public health assessment as compared to the letter health consultation performed by VDH. According to ATSDR (which he cites),

> A public health assessment (PHA) evaluates a hazardous waste site for hazardous substances, health outcomes, and community concerns. A PHA also looks at whether people could be harmed by coming into contact with site-related substances. Public health assessments are often the evaluation tool of choice when a site contains multiple contaminants and multiple, potential pathways of chemical exposure. ATSDR and other agencies use PHAs to identify whether a health study is appropriate or whether some other public health action is warranted, such as community health education. But for every site that is on or is proposed for the National Priorities List, the Superfund law requires that ATSDR conduct a public health assessment. Public health assessments evaluate.
>
> - Levels (or concentrations) of hazardous substances
> - Whether people might be exposed to contamination and how they may come in contact with it (that is, through "exposure pathways" such as breathing, eating, or skin contact with contaminated air or soils)
> - What levels of a toxic substance might cause harm to people
> - Whether working or living near a hazardous waste site might affect people's health
> - Other dangers to people, such as unsafe buildings, abandoned mine shafts, or other physical hazards.[2]

The proposed facility is neither a hazardous waste site nor is it on the National Priority List. Moreover, the letter health consultation provided by VDH addresses the relevant elements associated with air emissions, the source of hazardous substances from the facility and the only complete exposure pathway identified, that would have been included in a PHA for the facility. Dr. Nordgaard does not identify any other source of hazardous substances or exposure pathway that should have been assessed, nor could he.

Finally, health consultations appear to be the mechanism of choice by both ATSDR and VDH. Of the 28 health analyses conducted in Virginia since 2004, only 5 have been public health assessments with all 5 being for facilities on the National Priority List. The vast majority (23) were health consultations; 15 were performed by VDH and 8 by ATSDR. Outside of Virginia, *none* of the last ten analyses conducted by ATSDR was a public health assessment: nine were health consultations and one was an exposure investigation.

2 The Health Consultation did not evaluate noise impacts of the compressor station.

Noise is well known to adversely affect health and pose a nuisance to the public. The compressor

[2] https://www.atsdr.cdc.gov/hac/products/pha.html

station would be a new source of noise in the area. While compressor stations must adhere to federal and state or local noise guidelines, those guidelines cannot be assumed to represent a current state of knowledge regarding the relationship between noise and public health.

Response: Dr. Nordgaard provides a cursory argument about noise from BCS. He provides no analysis of noise. Moreover, while offering no credentials indicating that he is even qualified to evaluate the health impacts of noise, he ignores the analyses of noise and the measures taken to respond to community noise concerns. Noise has been addressed in great detail by the Federal Energy Regulatory Commission (FERC), Buckingham County via the Special Use Permit (SUP), and by Atlantic in consultation with community members.

As acknowledged by the critique, BCS complies with all federal noise standards. Dr. Nordgaard omits that these standards are health- and safety-based. *See* Final Environmental Impact Statement for Atlantic Coast Pipeline and Supply Header Project at 4-565 (citing EPA's *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*). In accordance with EPA's findings, FERC requires that the sound from the operation of a new compressor station not exceed 55 decibels at any noise sensitive area (NSA), such as a school, hospital or residence, in the vicinity of the station. The 55 decibel limit is required regardless of the equipment inside or outside the facility. FERC guidelines also require that the operation of the compressor station should not result in a perceptible increase in vibration at a nearby NSA. Ambient sound studies and acoustical analyses were completed for all proposed ACP facility sites. These studies evaluate the existing noise conditions and estimate noise produced by equipment at the sites. For the analysis, the existing sound levels are combined with the expected sound contribution at the nearest NSA. Noise mitigation measures are then developed to achieve the desired level. The result of acoustical analysis indicates that, with the specified noise control measures successfully implemented, the continuous sound attributable to the station operating at full-rated load will be lower than the FERC limit of 55 decibels at all identified NSAs. Community Engagement Report at 13 (Oct. 26, 2018).

BCS is designed to include a number of noise control measures. *See id.* For example, a muffler would be installed on the exhaust of each turbine unit. The exhaust pipes and intake ducts of the four turbine units would be acoustically insulated. The intake ducts would also have air cleaners and silencers. The walls and roof panels of the two compressor buildings would be constructed using sound dampening material. The doors of the compressor buildings would be insulated metal utilizing full weather stripping. Air inlet mufflers would be located between the air-handling units and the building walls to reduce sound from turbine units. Ventilation discharge hoods on the compressor building's roof would include air discharge mufflers. All aboveground sections of the unit suction, discharge, and bypass lines would be acoustically insulated.

The SUP includes additional noise-related conditions that were requested by the community. *See* SUP, Conditions 5-6 (Jan. 11, 2017). These condition include that, during construction, activities that produce noise between the hours of 10:00 p.m. and 6:00 a.m. shall not exceed a noise level of 60 decibels at the property line, without prior notification to the County, and noise attenuation measures will be implemented making all reasonable efforts such that noise levels attributable to normal plant operations and during planned blowdown events will be kept to an L90 reading of 55 decibels or less at the property lines with the exception that the front property line (along Route 56, S. James River Hwy) may have reading of 60 decibels. If testing by a

qualified noise consultant shows an exceedance of these levels, Dominion must consult with Buckingham County regarding the reasons for the exceedances and reasonably available noise mitigation measures. Also, noise levels attributable to normal plant operations will be less than 55 decibels at any adjacent existing building that is not on the subject property.

In short, Dr. Nordgaard has done no analysis of the noise levels himself, nor offered any information or data indicating that noise levels would pose a risk to any member of the community. Thus, it is incorrect for him to suggest that noise has not been addressed or that noise poses unacceptable health risks. In any case, noise has been thoroughly addressed, meets all applicable, including health-based, standards and does not impose health risks, unacceptable or otherwise.

3 The Health Consultation appears to have used maximum emissions during routine operation, rather than startup emissions that would likely be higher.

In describing the source of the maximum emissions, the Health Consultation states that "In DEQ's review, the emissions calculations assume operation at 0°F for every hour of the year. This approach determines the maximum amount of emissions allowed during any point in the year."

Project emissions will undoubtedly increase with colder temperatures, as noted. It appears that the cold temperature emissions of the project, *during otherwise routine operation*, were the basis for determining the maximum air quality impact for nearby residents. This approach may have *underestimated* the true maximum air quality impacts under startup conditions.

Emissions Control 4, part h states that:
"Each compressor turbine shall operate in "SoLoNOx mode" at all times except for start-up, shutdown, and when a compressor turbine's inlet air temperature is less than 0°F. Operation not in "SoLoNOx mode" shall not exceed an annual total of 38.4 hours per compressor turbine, calculated as the sum of each consecutive 12-month period."

In other words, the SoLoNOx nitrogen dioxide emissions controls will not be operating during startup for up to 38 hours per year. The one-hour interval containing a startup event will therefore likely produce the maximum impact multiple times in a year, but was not used as the basis for determining the maximum air quality impact (the same rationale may apply to fine particulate matter and formaldehyde emissions as well).

Response: Contrary to Dr. Nordgaard's interpretation, the modeled air concentrations evaluated by VDH in the Health Consultation are the worst-case concentrations taking into consideration emissions from all operating scenarios including startup. Moreover, the 1-hour startup scenario modeling conservatively assumed that a startup occurred during every hour of the year, and not just for the 38.4 hours per turbine allowed for operating without SoLoNOx.

Nowhere in the Health Consultation does VDH state that the air concentrations evaluated were associated with "routine operation" as asserted by Dr. Nordgaard. VDH begins the discussion relating to the use of emissions associated with 0ºF by first stating that the "air quality analysis consists of determining the worst-case operating scenario for each pollutant." Health Consultation at 2. Dr. Nordgaard erroneously concludes from the subsequent discussion of temperature that temperature is the only "scenario" considered. That is not the case as shown upon even a cursory inspection of the modeled concentrations.[3] The discussion of temperature

[3] As a pediatrician, Dr. Nordgaard provides no credentials to show that he is qualified to preform or interpret air quality modeling, which may explain his erroneous understanding of the modeling here.

specifically is because combustion turbine emissions from all operating scenarios, including startup, are impacted by the ambient temperature.

4 The health impacts or health risks associated with many hazardous emissions from the proposed facility were not assessed.

The Health Consultation attachments list a table of hazardous air pollutants that are not including in the Health Consultation because their emission rate is below a regulatory threshold.

Regulatory thresholds may in part attempt to protect human health, but cannot be assumed to be fully protective of human health. To determine whether facility emissions may impact the health of nearby residents, the Consultation should have included modeling of hazardous air pollutants and an evaluation of how those air quality impacts may affect health.

Response: This criticism fails to acknowledge the nature of the regulatory thresholds in question, specifically the pollutant-specific Exempt Emission Rates as defined in 9VAC5-60-300. (Applicability and Designation of Affected Facility), Article 5 (Emission Standards for Toxic Pollutants from New and Modified Sources). The Exempt Emission Rates are a fraction of the published Threshold Limit Values (TLVs) for toxic compounds, which are solely health based. As explained by the ACGIH, the body that develops TLVs,

> Threshold Limit Values (TLVs®) and Biological Exposure Indices (BEIs®) are determinations made by a voluntary body of independent knowledgeable individuals. They represent the opinion of the scientific community that has reviewed the data described in the Documentation, that exposure at or below the level of the TLV® or BEI® does not create an unreasonable risk of disease or injury.
>
> ***
>
> TLVs® and BEIs® are health-based values established by committees that review existing published and peer-reviewed literature in various scientific disciplines (e.g., industrial hygiene, toxicology, occupational medicine, and epidemiology). Since TLVs® and BEIs® are based solely on health factors, there is no consideration given to economic or technical feasibility.[4]

It is appropriate to rely on the TLV-based Exempt Emission Rates as a threshold below which further analysis is not required, given the TLVs themselves are designed to ensure protection of health. Here, the concentrations are a small fraction of the health-based TLVs.

In any case, Atlantic retained Ramboll US Corporation (Ramboll) to perform a health screening assessment for lifetime cancer and non-cancer risks that considered over 80 chemicals.[5] Using a methodology that is accepted by EPA and the Virginial Department of Environmental Quality (DEQ), the assessment concluded: "[m]odeled emissions from normal operations will be below concentrations that might pose a level of health concern, using consistently conservative assumptions." *Assessment* at ES-1. Further, for short-term exposures, the Assessment concluded: "chemical concentrations will be below the concentrations that USEPA and other

[4] https://www.acgih.org/tlv-bei-guidelines/policies-procedures-presentations/overview
[5] Ramboll US Corp., *Health Screening Assessment, Buckingham Compressor Station* (March 12, 2020).

States or the Commonwealth have determined even a sensitive individual can be exposed to without risk for noncancer acute health impacts." *Id.* at ES-2.

5 The National Ambient Air Quality Standards (NAAQS) are not updated regularly, and fail to incorporate recent data showing health effects of emissions that do not otherwise violate the NAAQS.

The Health Consultation states that the "modeled air concentrations...are not a health hazard, because the exposure concentrations are below their respective comparison value." This argument assumes that the "respective comparison value" is fully protective of human health. This is a flawed assumption. For example, the fine particulate matter (PM2.5) and nitrogen dioxide (NO2) NAAQS were last updated in 2010 or 2012[6]. High quality epidemiologic studies since the 2010-2012 NAAQS updates have shown that air pollution concentrations well below the current NAAQS are associated with adverse health outcomes (see Appendix for a partial list of relevant peer-reviewed studies).

Response: This comment fails to acknowledge that the Health Consultation presents total concentrations of both NO_2 and $PM_{2.5}$ (i.e., modeled impacts for the facility and other sources within 25 km of the facility summed with conservative monitored background) that are well below the NAAQS for NO_2 and $PM_{2.5}$ at the five nearest homes.

The total 1-hr NO_2 concentration is less than half of the 1-hr NO_2 NAAQS. The inclusion of a background concentration in this total concentration is a conservative approach since the background was obtained from an air quality monitor in a much more populated area (Harrisonburg, Virginia) and stationary sources within approximately 25 km of the facility were included in the modeling.[6] The modeled concentration due to emissions from the proposed project by itself is only 4.3% of the NAAQS. Additionally, EPA reviewed the 1-hour and annual NO_2 NAAQS in 2018 and decided the current NAAQS were still appropriate:

> On April 6, 2018, based on a review of the full body of scientific evidence, EPA issued a decision to retain the current national ambient air quality standards (NAAQS) for oxides of nitrogen (NOx). The EPA has concluded that the current NAAQS protect the public health, including the at-risk populations of older adults, children and people with asthma, with an adequate margin of safety.[7]

The total $PM_{2.5}$ concentrations are similarly well less than the corresponding NAAQS. The total 24-hr $PM_{2.5}$ concentration is less than half of the 24-hr $PM_{2.5}$ NAAQS, and the total annual $PM_{2.5}$ concentration is approximately 60% of the NAAQS. These total concentrations also conservatively include nearby facilities and a background value obtained from a more populated area (Lynchburg, Virginia).

It should also be noted that the facility's modeled maximum annual $PM_{2.5}$ concentrations are less than EPA's screening level that is considered to be *de minimis*, known as Significant Impact Levels ("SILs"), of 0.2 $\mu g/m^3$ at the five nearest residences.[8] For $PM_{2.5}$ in particular, the SILs

[6] The closest stationary source included in the modeling is 16.4 km from the facility.
[7] https://www.epa.gov/no2-pollution/primary-national-ambient-air-quality-standards-naaqs-nitrogen-dioxide
[8] April 17, 2018 EPA Memorandum, "Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program" from Peter Tsirigotis, Director EPA Office of Air Quality Planning and Standards to Regional Air Division Directors, Regions 1-10.

demonstrate just how insignificant the facility's impact is as they are set at a level at which a proposed source's impact on air quality would not even be detectable. In addition to being below the SIL, the total annual $PM_{2.5}$ concentrations at the five nearest residences are less than the most recent alternative standard levels considered by EPA (8-10 $\mu g/m^3$ for the annual standard and 30 $\mu g/m^3$ for 24-hour standard), as discussed in the recent external review draft of EPA's policy assessment for review of the particulate matter NAAQS.[9]

[9] EPA-452/R-20-002, "Policy Assessment for the Review of the National Ambient Air Quality Standards for Particulate Matter" (January 2020). According to EPA, the annual standard is generally controlling. *Id*. at 3-118. On April 14, 2020, EPA proposed to retain the current $PM_{2.5}$ NAAQS after reviewing thousands of studies, identifying populations at increased risk of pollution-related health effects, and considering analyses by agency experts and input from the Clean Air Act Scientific Advisory Committee. Information regarding EPA's proposal is available at https://www.epa.gov/pm-pollution/national-ambient-air-quality-standards-naaqs-pm.

ATTACHMENT 6

RAMBOLL

ENVIRONMENT
& HEALTH

MEMO

To **Thomas R. Andrake**
From **Debra A. Kaden, PhD, ATS; Elizabeth Miesner, MS; Krish Vijayaraghavan, MS**
Date **March 12, 2020**

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1 Introduction

Atlantic Coast Pipeline, LLC proposes to construct and operate the Atlantic Coast Pipeline (ACP), an approximately 600-mile-long interstate natural gas transmission pipeline system designed to meet growing energy needs in Virginia and North Carolina. The proposed project has the capacity to deliver 1.5 billion standard cubic feet of natural gas per day (bscf/d) from Pennsylvania and West Virginia to power generation facilities and other end-users. To support the transmission of natural gas for the ACP, Dominion Energy Transmission Inc. (DETI), a subsidiary of Dominion Energy, Inc. (Dominion), will contract with ACP, LLC to construct and operate the Buckingham Compressor Station (ACP-2) ("Buckingham Compressor Station") in Buckingham County, Virginia. DETI will operate the Buckingham Compressor Station with the same industrial grouping as an adjacent Woods Corner metering and regulating station (Woods Corner) (together referred to as the Buckingham Compressor Station).

To understand the potential impact of emissions from Buckingham Compressor Station on the residents of Union Hill and surrounding areas, we performed air dispersion modeling on the projected annual emissions from the facility, including scenarios under normal operations, start-up, shut-down, capped emergency shutdown (ESD) system testing, pig launching and pig receiving events. From this modeling that was based on emissions data and control technology specified in the Dominion modeling report dated July 10, 2018, we identified the residential location with the estimated highest potential cumulative risk and determined the annual concentration fine particulate matter ($PM_{2.5}$), formaldehyde, and hexane. We used these concentrations as a point of comparison with exposures that might be encountered in every-day situations.

2 Comparisons

Using the sources references below, we estimated the amount of time engaged in everyday situations that would result in the same average exposures as living near the Buckingham Compressor Station for a year. The concentrations originating from the compressor station are conservatively modelled at distinct geographic locations. All data for comparison were taken from exposure estimates for each pollutant as published in the peer-reviewed scientific literature, using high quality studies where multiple measurements were taken. Situations were selected to be as relevant to Union Hill as possible.

The following sections examine comparisons for formaldehyde, hexane, and $PM_{2.5}$. Each comparison is independent, and it is likely that individuals will do multiple comparable activities, thereby increasing their cumulative exposure from these every-day activities.

Formaldehyde comparisons. A year's exposure to formaldehyde from the compressor station, at the residential location with the highest estimated potential formaldehyde concentration, would be equivalent to spending time in any of the following activities over the course of a year:

- Spending 2 hours mowing the lawn with a gas-fueled riding mower
- Spending 16 minutes mowing a lawn with a gas-fueled push mower
- Spending 10 minutes using a gas-powered chain saw
- Spending less than 10 minutes with a string weed whacker
- Riding in a car for fewer than 7 hours
- Spending 15 minutes in a convenience store at the gas station once or twice a week
- Visiting a gym for 90 minutes three times
- Visiting a hair salon for 90 minutes three times
- Visiting the doctor or dentist for a 1-hour appointment once each month
- Spending time in a grocery store once or twice a month
- Dining at a restaurant once every 1-2 months
- Visiting an office building for the day, 1 day a year
- Spending 9 hours indoors in a private home
- Riding a school bus to a neighboring town, with the windows closed, daily over a 3-month period

Hexane comparisons. A year's exposure to hexane from the compressor station, at the residential location with the highest estimated potential hexane concentration, would be equivalent to spending time in the following activities over the course of a year:

- Visiting a gym for 90 minutes three times a week
- Visiting a doctor or dentist for a 1-hour appointment once a month
- Visiting an office building a few hours each working day for a year
- Spending less than an hour a week indoors in a private home

$PM_{2.5}$ comparisons. A year's exposure to $PM_{2.5}$ from the compressor station, at the residential locations with the highest estimated potential $PM_{2.5}$ concentration, would be equivalent to spending time in the following activities over the course of a year:

- Mowing your lawn with a gas-fueled riding mower for 1½ hour a year
- Mowing your lawn with a gas-fueled push mower for 3 hours a year
- Using a gas-fueled chain saw ½ hour a year
- Spending 5½ hours a year using a gas-fueled string weed whacker
- Spending less than 1% of your time in a private home over the course of a year
- Riding a school bus to a neighboring town between ½ an hour to 2 hours a week during the school year
- Farming tomatoes 11 hours a year

3 Conclusions

These comparisons find that the anticipated exposures to emissions of formaldehyde, hexane, and $PM_{2.5}$ will have minimal impact on the overall exposures of individuals in the community. The exposures from the Buckingham Compressor Station will, in fact, be similar to or much lower than everyday exposures that residents might experience (driving a car, doing grocery shopping, or even just living in their homes).

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ATTACHMENT 7

2/25/2020

Atlantic Coast Pipeline's Buckingham Compressor Station Air Quality Permit:
Considerations related to whether neighboring communities are overburdened based on information reported in the Toxics Release Inventory (TRI)

Introduction

The Toxic Release Inventory (TRI) is a database provided by the U.S. Environmental Protection Agency (EPA)[1] that provides data on toxic chemical releases and pollution prevention activities by industrial and federal facilities throughout the United States. Reporting to the TRI is mandatory for any facility in the U.S. that meets the following three criteria:

- Employs 10 or more full-time equivalent employees
- Manufactures, processes, or otherwise uses a TRI-listed chemical in quantities above threshold levels in a given year.
- Operates in one of several specified industry sectors (see below)

The chemicals covered by the TRI Program are those that cause one or more of the following: cancer or other chronic human health effects, significant adverse acute human health effects, and significant adverse environmental effects. The current TRI toxic chemical list contains 767 individually listed chemicals and 33 chemical categories.

The sectors for which TRI reporting is mandatory cover a wide range of industries and include the following with some exceptions as outlined by EPA[2]: Mining; Utilities; Manufacturing – food production, beverage and tobacco products, textiles, apparel, leather, wood, paper, printing and publishing, petroleum and coal, chemicals, plastics and rubber, non-metallic mineral products, metals, machinery, computers and electronics, electrical equipment, transportation equipment, furniture, miscellaneous manufacturing; Wholesalers; Publishing; and Hazardous waste.

As evident from the wide lists of industry sectors and chemicals above, the TRI provides a rigorous compilation of environmental releases in the region of interest. For this reason, the TRI is commonly used by states, other government agencies and communities to support informed decision-making by tracking toxic chemical releases.

Toxic Releases Reported in the TRI near the Buckingham Compressor Station

The EPA TRI database was analyzed to identify current toxic releases near Union Hill and other nearby communities. First, facilities within 10 km of the proposed Buckingham Compressor Station site, if any, were determined from the EPA database using GIS. The distance of 10 km was selected as it is roughly five times or more the distance of the Union Hill residences from the proposed site. Data were analyzed for the most recent year for which TRI data are available[3], i.e., 2018.

[1] https://www.epa.gov/toxics-release-inventory-tri-program
[2] https://www.epa.gov/toxics-release-inventory-tri-program/tri-covered-industry-sectors
[3] 2018 National Analysis Dataset (released November 12, 2019)

The review of the TRI showed that there are no facilities in the database within 10 km of the compressor station site. Subsequently, the search radius was expanded to 20 km, thus extending into Albemarle, Amherst, Appomattox, and Nelson counties.

There is only one TRI facility within 20 km - the Kyanite Mining Corporation Mullins Plant which is approximately 20 km due east (see Figure 1). The only toxic chemical release reported by this plant is that of Polycyclic Aromatic Compounds (PAHs). These compounds do not include formaldehyde or n-hexane, the two toxic pollutants of potential relevance to Buckingham as identified by the State in the VDH study.

In summary, the existing toxic burden on the communities near the Buckingham Compressor Station due to nearby sources as reported in the TRI is negligible.

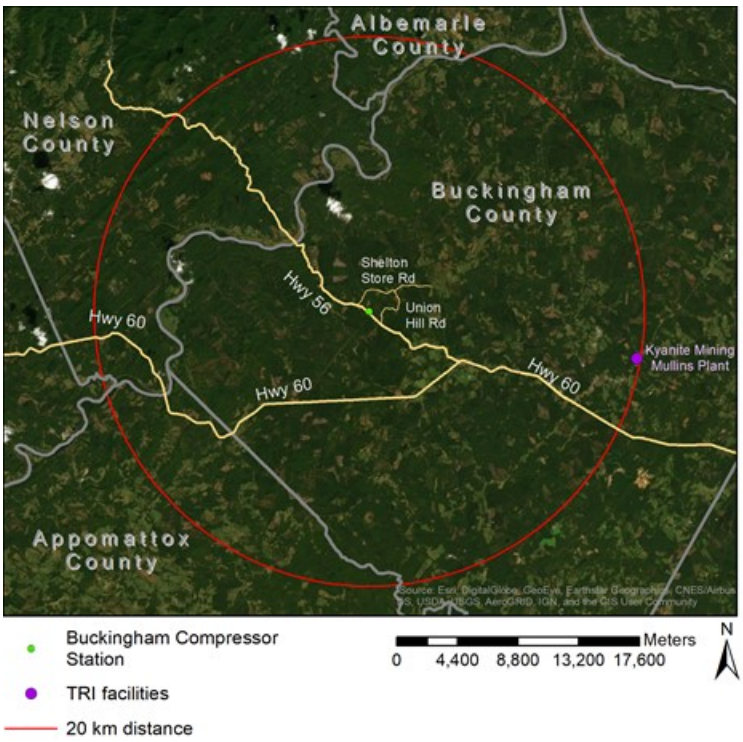

Figure 1. Toxic release facilities within 20 km of the Buckingham Compressor Station as reported by the EPA Toxics Release Inventory.

ATTACHMENT 8

Atlantic Coast Pipeline Project

Summary of Cultural Resource Findings and Recommendations for the Buckingham Compressor Station, Buckingham County, Virginia

ERM

April 22, 2020

The United States Court of Appeals for the Fourth Circuit vacated and remanded the Buckingham Compressor Station (BCS) Air Permit in part based on the site suitability evaluation required by Va. Code 10.1-1307.E.3. *Friends of Buckingham v. State Air Pollution Control Bd.*, 947 F.3d 68 (4th Cir. 2020). Specifically, Section 1307.E.3. requires the Virginia State Air Pollution Control Board (Board) to consider the "suitability of the activity to the area in which it is located." Atlantic Coast Pipeline, LLC (Atlantic) proposes to construct the BCS in Buckingham County, Virginia, in an area that has come to be known as the Union Hill Community. The BCS is part of the Atlantic Coast Pipeline Project (Project), an approximately 600-mile natural gas transmission pipeline in West Virginia, Virginia, and North Carolina, of which approximately 304 miles would be in Virginia. Friends of Buckingham (FOB) has suggested that the BCS location is not a suitable site because of, among other things, the historic cultural resources of the Union Hill Community (e.g., historic African-American churches, marked and unmarked slave burials, slave plantations). *See* Comments from H. Berthoud, FOB Secretary (9/21/2018).

Atlantic previously considered the impact of BCS on historic cultural resources consistent with the requirements of Section 106 of the National Historic Preservation Act (NHPA) as part of the Federal Energy Regulatory Commission (FERC) licensing process. As part of the environmental justice (EJ) analysis and in keeping with the *Environmental Justice Guidelines* from the Virginia Department of Transportation (VDOT) and other agencies such as the U.S. Environmental Protection Agency, Atlantic also considered Project impacts to resources that are especially important to EJ populations, which may go beyond those resources considered under the NHPA, to respond to the concerns raised by FOB.

Based on these analyses, the BCS should not adversely impact any historic cultural resources in the area. The historic resources that were identified as potentially being affected by the Project were either found to be not eligible for the National Register of Historic Places (NRHP), or potentially eligible with no adverse effect. The Virginia Department of Historic Resources (VDHR) concurred with this assessment in their September 11, 2017 review letter. FOB expressed concern about certain resources in the area, but the survey work done under Section 106 of the NHPA found that with one exception, those resources were too far away from the BCS to be affected. The other resource referenced by FOB is a recently proposed historic district, whose NRHP eligibility status has not been determined. Preliminary assessment suggests that the Project would not adversely affect the district, even if it were determined to be eligible for the NRHP.

The findings of the archaeological and historic architectural surveys conducted under the NHPA for the FERC license are summarized in Section I. Section II addresses the historic cultural resources identified as important to the EJ community by FOB and evaluates the potential impact BCS may have on those resources, factoring in the criteria imposed by the Buckingham County Special Use Permit regarding potential impacts from the construction and operation of the BCS on the historic cultural resources of the Union Hill Community (e.g., noise, light

pollution, structure colors, tree screens). Section III contains specific, point-by-point responses to comments previously made by FOB with respect to historic resources.

I. NHPA Cultural Resource Surveys

The cultural resource survey work was carried out in anticipation of licensing by FERC pursuant to Section 106 of the NHPA, which requires that federal agencies take into account potential effects to archaeological and historic resources that are eligible for the NRHP. The principal objectives of a cultural resource survey are to identify archaeological and historic resources that could be affected by a given project using methods endorsed by state and federal reviewers, to evaluate the resources' potential eligibility for the NRHP, and to assess the project's potential effects on any resources deemed eligible for the NRHP. Phase I cultural resource surveys entail two components focusing on archaeological and historic resources located in the applicable Area of Potential Effects (APE). APE is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist" (36 CFR Part 800.16[d]) and is set by the federal agency, in consultation with the State Historic Preservation Office (SHPO), which in Virginia resides in the VDHR. Atlantic engaged ERM to conduct the cultural resource surveys for the Project, a portion of which was completed by ERM's subconsultant, Dovetail Cultural Resource Group. The archaeological and historic architectural surveys in support of the FERC review were limited to the APE as defined above, and the technical reports prepared for the Project cover only those resources deemed to lie within the APE. Any cultural resources beyond the limits of the Project's APE are not germane to the consultation process under Section 106.

All of the cultural resource investigations—archaeological and historic architectural—were guided by the regulatory process set forth in Section 106 of the NHPA and are briefly summarized below along with their findings. No archaeological or historic architectural resources eligible for the NRHP were identified in the APE for the BCS.

A. Archaeological Survey and Findings

Archaeological surveys make use of surface and subsurface methods to locate archaeological remains (e.g., artifacts, structural remains, and other evidence of human activity known as features) within the Project's APE. In the case of archaeological resources, the APE is defined as the area in which ground-disturbing impacts are possible. For BCS, the APE for archaeological resources consists of the 68.5-acre tract proposed for construction, where potential ground-disturbing activities could take place. The archaeological survey methods for the BCS site adhered to standards set by VDHR, the SHPO in Virginia.

ERM conducted archaeological surveys for the proposed BCS on May 21, 2015. The site was systematically surveyed with shovel tests excavated at 15-m intervals, following the protocols established by VDHR for archaeological survey (Figures 1 and 2). No previously recorded archaeological sites occur within the site, and no new archaeological sites, cemeteries, or other cultural resources were identified within the APE. The results were provided in a report titled *Phase I Archaeological Survey for the Atlantic Coast Pipeline Project: Virginia Components* (Stanyard et al. 2016). The revised final report was submitted to the VDHR on April 6, 2016, and a letter from VDHR dated February 1, 2017, indicates concurrence with ERM's findings.

Additionally, FERC issued a Programmatic Agreement for the Project signed by FERC, VDHR, and the Advisory Council on Historic Preservation (ACHP), among others. The purpose of the Programmatic Agreement is to resolve any adverse effects on affected properties that could not be fully determined prior to approval of the Project. Part of the Programmatic Agreement is

an Unanticipated Discoveries Plan for Virginia, which stipulates the procedures to be followed in the unlikely event that unmarked graves or other significant archaeological remains are encountered during construction. The Plan was reviewed by VDHR, ACHP, and FERC and will be used in the training of construction and monitoring crews.

B. Historic Architectural Survey and Findings

Historic architectural surveys focus on buildings and various other structures and elements of landscape architecture (bridges, railroads, and cemeteries, for example) that are 50 years or older, or more recent resources of great historical significance. Under the NHPA, both direct and indirect effects to such resources must be taken into account. Therefore, the APE for historic resources extends beyond the area of proposed construction activities to encompass a larger area where resources could be affected by changes to their viewshed. For historic architectural resources, the APE for the BCS includes the parcel in which the facility will be built, as well as the surrounding area within line of sight of proposed aboveground construction and landscape changes due to clearing of vegetation or other impacts associated with construction. The maximum distance of such potential viewshed changes is estimated to be approximately 0.5 miles, based on the height of the facility to be built (approximately 61 feet, based on stack height) and landscape conditions (topography and tree cover) that terminate sight lines.

The setting of an historic resource can be important and relevant to the qualities that make it eligible for the NRHP, and so resources within line of sight of a proposed project are recorded in historical architectural surveys, evaluated for NRHP eligibility, and project effects are assessed for those resources considered eligible. Each identified historic resource is evaluated with respect to NRHP eligibility criteria, which focus on a resource's potential historical significance, connection to persons of historical importance, and architectural or engineering qualities that might make it an outstanding example of its type. Those resources determined by the SHPO to be eligible for the NRHP are then given further consideration, as the consultant assesses project effects and further consultation takes place between the SHPO and federal agency on whether any NRHP-eligible resources would be adversely affected by the project.

Dovetail Cultural Resource Group conducted initial portions of the historic architectural surveys for the Project, including the initial survey for the BCS site. The initial historic structures survey surrounding the Buckingham Compressor Station was conducted on October 26 and 27, 2015 (Staton et al. 2016). No previously recorded resources were noted within the tract or its viewshed. Two newly identified potential historic resources were evaluated and both were recommended ineligible for the NRHP. Resources 014-5068, a ca.1940 house on South James River Road, and 014-5069, a ca. 1956 house on South James River Road were recommended ineligible for the NRHP in a final report submitted to the VDHR on March 14, 2016. VDHR concurred with that recommendation in a letter dated May 6, 2016.

ERM performed subsequent historic architectural surveys in the area in 2017 and 2018 to respond to an April 11, 2017 FERC data request (FERC 2017). ERM resurveyed the area surrounding BCS (Figure 3) to identify resources that were integral to the development of the area as an African-American community associated with Union Hill and Union Grove Baptist churches in the post-Civil War era (Tucker-Laird et al. 2017). ERM also conducted historical research at local repositories and photographed structures located within a 0.5-mile radius of the proposed compressor station site in order to document the historic character of the surrounding community. Findings indicate that the area is dominated by rural, non-farm residences constructed since World War II, and generally lacks the historic built environment

and agricultural landscape features that would have characterized its late nineteenth and early twentieth century development as a distinct community.

The investigations identified three resources that were not identified during the initial survey: Resource 014-5089, a 1967 Ranch dwelling and outbuildings; Resource 014-5090, a ca. 1945 vernacular dwelling and outbuildings; and Resource 014-5091, a ca. 1940 two-story vernacular structure. These resources are dwellings constructed between 1941 and 1967, and are not considered eligible for listing on the NRHP. In ERM's opinion, the houses do not represent outstanding examples of their style and lack integrity as a result of modifications to their original forms. In addition, the associated landscape of the resources no longer reflects the agricultural character of the late nineteenth and early twentieth century. ERM recommended 014-5090 and 014-5091 not eligible for listing on the NRHP and VDHR concurred with this recommendation in their July 31, 2017 review letter. ERM was not able to access 014-5089 during this survey, but was able to gain access to it in 2018 and recommended the resource not eligible for the NRHP in a report submitted to VDHR on March 14, 2018 (Tucker-Laird et al. 2018). VDHR agreed with this assessment in their March 19, 2018 review letter.

II. Response to Concerns Raised by Friends of Buckingham

In comments submitted to the Board on the BCS air permit, FOB raised concerns regarding the impact of the BCS on the historic cultural resources of the Union Hill Community, some of which were considered in the analyses for FERC and some of which were not as they are outside of the APE. Even if these resources are not eligible for the NRHP and are not located within the Project's APE for the purpose of Section 106 consultation, they are considered further in conjunction with the EJ analysis given FOB's claim of historic cultural importance for the EJ community. Identification of these resources is provided, followed by an assessment of the potential impact BCS may have on these resources. Based on the considerations discussed below, the BCS should not have an adverse impact on these historic cultural resources of importance to the EJ community.

A. Identification of Culturally Significant Resources

The Union Hill Community and its associated cultural features have been the focus of ongoing historical research by Lakshmi Fjord and Preservation Virginia.

Ms. Fjord has interviewed residents and identified a number of resources associated with the community, including Union Grove Baptist Church, Variety Shade Plantation, and Union Hill Baptist Church (http://publichistory.as.virginia.edu/union-hill-history-project). All three of these resources are outside of the Project's APE due to the distance of the resources from the planned BCS and the presence of thick vegetation blocking sight lines to the Project (Figure 4).

- Union Grove Baptist Church is located 1.71 miles to the northeast of the Compressor Station (Figure 4).
- The Variety Shade plantation boundary is noted as a small point on the Virginia Cultural Resource Information System (VCRIS) database, and measurements relative to the Project are made from this point. The historic boundary is not shown in the VCRIS database. Variety Shade plantation was located south of Rte. 649, about 1.6 miles southeast of the Compressor Station (Figure 4). The plantation dwelling burned in the 1960s and the only surviving structure is a nineteenth century tobacco barn. Two cemeteries (one white and one black) and the remains of structures and old roadbeds remain on the property as well.

- Union Hill Church is located on Union Hill Road about 1.19 miles east-northeast of the Buckingham Compressor Station (Figure 4).

In addition to specific architectural resources, Fjord notes that demarcated pastures, agricultural fields, roads, and ponds from the post-Civil War period remain in the area, along with domestic plantation complexes, agricultural buildings, dwellings, churches, schools, cemeteries, and stores. These landscape features she cites are not specifically shown on maps and without a more detailed description, their locations are unknown. Presumably, Fjord is referring to Preservation Virginia's proposed Union Hill/Woods Corner Rural Historic District. As discussed further below, the absence of an intensive survey of the area by Preservation Virginia has resulted in a proposed district with an excess of unidentified resources and agricultural features that lack sufficient information for analysis.

In January of 2017, Preservation Virginia submitted a Preliminary Information Form (PIF) proposing the Union Hill/Woods Corner Rural Historic District, and requesting the VDHR evaluate it for listing in the Virginia Landmarks Register and NRHP (Figure 5). The district boundary includes multiple previously recorded resources, including two NRHP-listed properties. However, Preservation Virginia has not done a full survey to look at the district as a whole in an effort to list all of the contributing or non-contributing structures. Preservation Virginia proposed that the district is significant as an area where newly-freed African-Americans developed a prosperous community in the postbellum period. According to Preservation Virginia, the area originally consisted of plantations, and many of the structures related to these plantations still exist, along with structures built by and related to the formerly enslaved African Americans and their descendants. There are nineteen previously recorded resources located within the proposed boundary for the Union Hill/Woods Corner Rural Historic District, eight of which (the majority of those evaluated) have been previously determined ineligible for the NRHP (Table 1). These resources were included in the table below because they were previously recorded on VCRIS (Virginia Cultural Resource Information System) and located in the district boundary[1]. VDHR has not made a formal determination of the district's eligibility for the NRHP. However, in preliminary review comments and queries on the PIF, VDHR questioned whether the proposed district has sufficient direct material associations—authentic, physical resources that can represent the district's history and convey its potential significance—to constitute a cohesive rural historic district.

Table 1. Architectural Resources in the Union Hill/Woods Corner Rural Historic District

Architectural Resources in the Union Hill/Woods Corner Rural Historic District			
Resource	**Description**	**NRHP Eligibility Status**	**Distance from CS**
014-0010	Col Alto, Greek Revival dwelling and outbuildings, 1849	Eligible	2.9-mi. east-northeast
014-0013	Merry Wood, Greek Revival dwelling and outbuildings, 1857	Potentially Eligible	3.9-mi. northwest
014-0016	Mount Rush, Classical Revival dwelling, 1803	Unevaluated	4.2-mi. south-southeast
014-0019	Perry Hill, Gothic Revival dwelling, 1851	VLR, NRHP Listed	2.04-mi. southwest

[1] 014-0041 is outside of the district, but was included in Table 1 because the Union Hill/Woods Corner Rural Historic District VCRIS form stated that it was inside of the district.

014-0026	Variety Shade, Federal/Adamesque dwelling, 1798	Unevaluated	1.6-mi. southeast
014-0028	Westfield, Georgian dwelling, pre-1776	Unevaluated	2.4-mi. south-southeast
014-0029	Wheatland, Frame dwelling, ca. 1790	Unevaluated	3.07-mi. southeast
014-0041	Woodside, Greek Revival dwelling, ca. 1860	VLR, NRHP Listed	6.3-mi. southeast
014-0042	Afton, Vernacular dwelling and outbuildings, ca. 1850	Eligible	3.16-mi. south-southeast
014-0049	Farview, Greek Revival dwelling, no date	Unevaluated	3.78-mi. southeast
014-0096	Twelve Oaks, Frame dwelling and smokehouse, no date	Unevaluated	3.5-mi. south-southeast
014-5068	Frame dwelling, ca. 1940	Not Eligible	358 ft. west
014-5069	Frame dwelling and outbuildings, ca. 1965	Not Eligible	0.35-mi. south-southeast
014-5089	Ranch dwelling and outbuildings. 1967	Not Eligible	0.25-mi. northwest
014-5090	Vernacular dwelling and outbuildings, ca. 1945	Not Eligible	0.28-mi. northwest
014-5091	Vernacular dwelling and outbuildings, ca. 1940	Not Eligible	864 ft. east
014-5093	Denton's Corner Store, service station, ca. 1965	Not Eligible	4.5-mi. southeast
014-5095	Frame dwelling, ca. 1935	Not Eligible	4.5-mi. southeast
014-5097	Ranch dwelling and outbuilding, ca. 1960	Not Eligible	4.9-mi. southeast

B. BCS will not Adversely Impact Identified Historic Cultural Resources

As explained in Section II A, the BCS will not be visible from the Union Grove Baptist Church, Variety Shade Plantation, or Union Hill Baptist Church due to distance, topography, and existing vegetation. These factors also preclude measurable impacts with regard to aesthetics, light pollution, and other potential indirect effects. The results of a study that focused on Noise Sensitive Areas (NSA's) at nearby local residences indicate the ambient sound levels will be below the FERC limit of 55 decibels at those locations (Table 2). For reference, 55 decibels is the sound commonly produced by a household refrigerator. The Union Grove Baptist Church, Variety Shade Plantation, and Union Hill Baptist Church all exceed the maximum distance of the NSA's in the sound study by a minimum of 2,684 feet, and none of the NSA's for the Project would experience noise greater than 50 decibels when the sound of the Project is added to existing ambient sound levels.

Table 2. Sound Study Results at the Proposed BCS (Excerpted from Resource Report 9: Table 9.2.4-17)

Closest NSAs (Residences)	Distance and Direction to CS 2	Existing Ambient Sound Level Prior to Station Construction (dBA)			Predicted L_{dn} from the Four Gas Turbine Compressor Units and M&R Station (dBA)	Predicted Total L_{dn} (Compressor Units and M&R Station + Existing Ambient L_{dn}) (dBA)	Predicted Noise Increase from Existing Ambient L_{dn} (dBA)
		Measured $L_{eq(d)}$	Measured $L_{eq(n)}$	Calculated L_{dn}			
S1. Residence	2,700 feet WNW	47.5	29.7	45.9	37.4	46.4	0.5
S2. Residence	1,800 feet WNW	47.9	25.3	46.0	42.4	47.6	1.6
S3. Residence	1,450 feet WNW	46.4	25.3	44.6	44.4	47.5	2.9
S4. Residence	1,900 feet NNW	43.9	31.8	43.2	42.4	45.8	2.6
S5. Residence	3,600 feet ENE	39.8	32.9	41.2	35.4	42.2	1.0
S6. Residence	3,000 feet ESE	46.2	35.9	46.1	38.4	46.8	0.7
S7. Residence	3,100 feet ESE	39.7	35.4	42.7	37.4	43.9	1.2
S8. Residence	2,000 feet SE	43.0	33.9	43.4	42.4	45.9	2.5
S9. Residence	2,100 feet SE	43.0	33.9	43.4	41.4	45.5	2.1

NSAs = noise sensitive areas, dBA = A-weighted sound level, $L_{eq\,(d)}$ = daytime equivalent sound levels, $L_{eq\,(n)}$ = nighttime equivalent sound levels, L_{dn} = day-night sound levels, WNW= west-northwest, ENE = east-northeast, SE = southeast, SW = southwest. NNW = north-northwest, and ESE = east-southeast.

While the Union Hill Community includes the BCS location, FOB has not identified any historically significant cultural resources at the BCS location nor within the broader Project APE. As described above, this is consistent with Atlantic's prior comprehensive review of this area, which did not identify significant historical resources in the Project APE. The residences identified in the Compressor Station's APE as part of the historic architectural surveys for the Project date to the period during which the tobacco farming focus of the local residents was waning. These residences were identified as circa 1940 to 1967 mid-century homes that do not reflect the built environment of a late nineteenth-early twentieth century African-American farming community, which has been defined as the proposed Union Hill/Woods Corner Rural Historic District's period of significance.

Surveying the entirety of the proposed Union Hill/Woods Corner Rural Historic District, most of which would be outside any impacts attributable to the Project, was beyond the scope of ERM's survey, which was limited to the APE. However, at a minimum, the portion of the district that lies within the APE lacks integrity because the identified resources are not individually eligible and do not contribute to the historic feeling of the district overall. They also are mid-century resources that do not date to the district's period of significance in the late nineteenth and early twentieth century. It is also the case that the Project would affect a very small portion of the district overall. The Project, including the pipeline right-of-way and compressor station, take up 154.31 acres out of the 12,480 acres (1.24%) proposed for the Union Hill/Woods Corner Rural Historic District. The visual effects from the Project within the district would be limited, either because trees block the view of the centerline tree cut where the line would pass through wooded areas, or the Project goes through agricultural fields, where no trees would be cut, creating no visible change to the landscape beyond small-scale pipeline markers. The compressor station likewise will be bounded by trees and painted to blend into the surrounding area. Thus, if the Union Hill/Woods Corner Rural Historic District were to be determined eligible

for the NRHP by VDHR, it is likely that the SHPO and FERC would not consider the Project effects to be adverse.

III. Point-by-Point Response to Comments Made by Friends of Buckingham

Atlantic has evaluated specific comments made to DEQ by the Friends of Buckingham.[2] Their comments are repeated below followed by Atlantic's responses.

Dominion unfairly singled out Buckingham County from all counties along the three state route of ACP to claim it has "no historic resources" whether archaeological or architectural in that segment. Yet in all other counties, completely similar resources of early and mid-20th Century and 19th Century homes, churches and their cemeteries, bridges, dilapidated farm structures and stores, etc. were listed and photographed for 1674 pages. Alone, Buckingham's history was/is denied and erased.

- In Sept. 18, 2016 ACP filed a 1674 page cultural resource application to FERC. For Buckingham County only, ACP had "no recorded resources identified within the modified project APE" (Appendix D: 31).

***Response**:*

There is no cultural resource application from Sept. 18, 2016 in the Atlantic FERC submittals. However, there was a Cultural Resource Application filed with FERC on September 18, 2015. The quote "no recorded resources identified within the modified project APE" is not in this document. It does state that "there were no previously recorded resources identified within the project APE." The document includes nine new resources that Atlantic's consultants identified within the project APE. Furthermore, as the survey work for the project proceeded, ultimately 25 architectural resources and 45 archaeological resources have been identified in the county as part of the Project (Tables 3 and 4). Out of the 25 architectural resources, 20 are ineligible, two are potentially eligible, and three are eligible for the NRHP. VDHR has concurred that the two potentially eligible resources and three eligible resources will not be adversely affected by the Project (letter from VDHR to Dominion, 11 September 2017). Out of the 45 archaeological resources, 41 are ineligible and four are potentially eligible for the NRHP. The four potentially eligible resources were along an older route. They are no longer in the current route's APE. Project effects were not assessed for the ineligible resources because Project effects are not relevant for resources that are not eligible for the NRHP in the Section 106 compliance process.

- In March 24, 2016, ACP filed their Addendum of cultural resources. In Appendix D on P. 31, for Buckingham ACP reports only "three [total] resources are "documented within the modified project APE include three single-family dwellings that range in date from circa 1940 to circa 1965…They have no known association with a significant event or person and are not associated with any broad patterns in history."

[2] Comments from H. Berthoud, FOB Secretary (9/21/2018).

Pp. 330, 331, and 332 are photos of that list of homes/addresses: 330 & 331 **are the same home/same photo. 332 is not in Union Hill**. L. Fjord identifies 330/331 – the only cultural resources listed for the whole county of Buckingham – as Theo Haskins' on S. James River Highway, an abandoned trailer next to a modular home, without the family cemetery that adjoins it.

***Response**:*

*In the Addendum report filed on March 24, 2016, Atlantic recorded and documented three resources within the modified project APE. The photos on pages 330 and 331 are the same photo, which shows two separate resources (Figure 6). 014-5068 (concrete masonry dwelling) is the dwelling on the left side of the photo, and 014-5069 (the abandoned trailer and modular home) is located on the right side of the photo. . Both resources were re-surveyed and documented in the ACP VA Structures Addendum 6 report, which includes separate photos for each resource (Figures 7 and 8). The architectural surveys for these reports were conducted from the public right-of-way. Because the family cemetery associated with Theo Haskins' property (014-5069) could not be seen from the public right-of-way, its existence was not known and it was not included in the dwelling's resource description. The cemetery (014-5069) was subsequently covered separately in the first addendum report for the Project. The photo on page 332 is 014-5070. 014-5070 is located in Buckingham County, but is in a portion of the Project's APE elsewhere in Buckingham County, not in Union Hill (Figure 9). Finally, the suggestion that 014-5068 and 014-5069 were the "*only cultural resources listed for the whole county of Buckingham*" is not true. As indicated above, 25 historic resources were identified in the Buckingham County portion of the Project's APE (see Table 3).*

Table 3. Architectural Resources in Buckingham County in the APE

Architectural Resources in Buckingham County					
Resource	**Description**	**NRHP Eligibility Status**	**Report**	**In Rev. 8.5**	**In CS APE**
014-5056	Outbuildings, ca. 1910	Ineligible	Original	Yes	No
014-5057	Outbuildings, ca. 1900	Ineligible	Original	Yes	No
014-5059	Second Liberty Baptist Church and Cemetery, ca. 1920	Eligible/No Adverse Effect	Original	Yes	No
014-5060	First Liberty Baptist Church and Cemetery, ca. 1880	Eligible/No Adverse Effect	Original	Yes	No
014-5061	Dwelling, ca. 1935	Ineligible	Original	Yes	No
014-5062	Farm, ca. 1920	Eligible/ No Adverse Effect	Original	Yes	No
014-5063	Dwelling, ca. 1900	Ineligible	Original	Yes	No
014-5065	I-House, ca. 1880	Ineligible	Original, Add. 5	Yes	No

014-5066	Dwelling	Potentially Eligible/No Adverse Effect	Original, Add. 5	Yes	No
014-5068	Dwelling, ca.. 1940	Ineligible	Add. 1, Add. 6	Yes	Yes
014-5069	Dwelling, ca. 1965	Ineligible	Add. 1, Add. 6	Yes	Yes
014-5070	Dwelling, ca. 1960	Ineligible	Add. 1	Yes	No
014-5071/ 44BK0375	Dennis Allen Family Cemetery	Ineligible	Phase I Report Add. 1	Yes	No
014-5072	Anderson Ostrich Ranch, ca. 1950	Ineligible	Add. 2	Yes	No
014-5073	Dwelling, ca. 1960	Ineligible	Add. 2	Yes	No
014-5074	Ranch, ca. 1950	Potentially Eligible/No Adverse Effect	Add. 2, Add. 5	Yes	No
014-5085	Vernacular gable-front and wing house, ca. 1910	Ineligible	Add. 4	Yes	No
014-5086	Vernacular front-gable house, ca. 1930	Ineligible	Add. 4	Yes	No
014-5088	Log Outbuilding	Ineligible	Add. 5	Yes	No
014-5089	Ranch, 1967	Ineligible	Add. 6	Yes	Yes
014-5090	Vernacular Dwelling, 1945	Ineligible	Add. 6	Yes	Yes
014-5091	Dwelling, ca. 1940	Ineligible	Add. 6, Add. 7	Yes	Yes
014-5092/ 44BK0836	Flood Family Cemetery	Ineligible	Historic Cemetery Delineation Report	Yes	No
014-5098/ 44BK0365	Hacket Family Cemetery	Ineligible	Phase I Report Add. 1	Yes	No
014-5106	Dwelling and outbuildings, ca. 1930	Ineligible	Add. 8	Yes	No

Table 4. Archaeological Resources in Buckingham County in the APE

Archaeology Resources in Buckingham County					
Resource	**Description**	**NRHP Eligibility Status**	**Report**	**In Rev 8.5**	**In CS APE**
44BK0358	Historic log structure remains	Ineligible	Phase I Report Rev. 1	Yes	No
44BK0359	Prehistoric lithic scatter	Ineligible	Phase I Report Rev. 1	Yes	No

44BK0360	Prehistoric lithic scatter	Ineligible	Phase I Report Rev. 1	Yes	No
44BK0361	Prehistoric	Ineligible	N/A	No	No
44BK0362	Prehistoric lithic scatter	Ineligible	Phase I Report Rev. 1	Yes	No
44BK0363	Historic outbuilding	Ineligible	Phase I Report Rev. 1	Yes	No
44BK0364	Cemetery	Ineligible	N/A	No	No
44BK0365	Historic Cemetery	Ineligible	Phase I Report Rev. 1	No	No
44BK0366	Historic Cemetery	Ineligible	Phase I Report Rev. 1	Yes	No
44BK0367	Prehistoric lithic scatter	Ineligible	Phase I Report Rev. 1	Yes	No
44BK0368	Prehistoric lithic scatter	Potentially Eligible	Phase I Report Rev. 1	No	No
44BK0369	Prehistoric lithic scatter	Potentially Eligible	Phase I Report Rev. 1	No	No
44BK0370	Prehistoric lithic scatter	Ineligible	Phase I Report Rev. 1	No	No
44BK0371	Prehistoric lithic scatter, artifact scatter	Potentially Eligible	Phase I Report Rev. 1	No	No
44BK0372	Prehistoric lithic scatter	Potentially Eligible	Phase I Report Rev. 1	No	No
44BK0373	Prehistoric lithic scatter	Ineligible	Phase I Report Rev. 1	No	No
44BK0374/ IF-KNW-29	Prehistoric lithic scatter	Ineligible	Phase I Report Rev. 1	Yes	No
44BK0375	Historic Cemetery	Ineligible	Phase I Report Add. 1	No	No
44BK0376	Prehistoric lithic scatter	Ineligible	Phase I Report Add. 1	Yes	No
44BK0377	Prehistoric lithic scatter	Ineligible	Phase I Report Add. 1	Yes	No
44BK0378	Prehistoric lithic scatter	Ineligible	Phase I Report Add. 2	Yes	No
44BK0382	Historic log cabin and features, Prehistoric lithic scatter	Ineligible	Phase I Report Add. 2	Yes	No
44BK0383	Prehistoric lithic scatter	Ineligible	Phase I Report Add. 2	Yes	No
44BK0384	Prehistoric lithic scatter	Ineligible	Phase I Report Add. 2	Yes	No
44BK0385	Prehistoric lithic scatter	Ineligible	Phase I Report Add. 2	Yes	No
44BK0386	Historic Cemetery	Ineligible	Phase I Report Add. 2	Yes	No
44BK0387	Prehistoric lithic scatter	Ineligible	Phase I Report Add. 2	Yes	No
44BK0388	Prehistoric lithic scatter	Ineligible	Phase I Report Add. 5	No	No

44BK0406	Historic structural remains	Ineligible	Phase I Report Add. 8	Yes	No
IF-DB-09	Historic isolated find	Ineligible	Phase I Report Rev. 1	No	No
IF-DB-11	Prehistoric isolated find	Ineligible	Phase I Report Rev. 1	No	No
IF-DB-142	Prehistoric isolated find	Ineligible	Phase I Report Add. 9	No	No
IF-DB-143	Prehistoric isolated find	Ineligible	Phase I Report Add. 9	No	No
IF-DB-.34	Prehistoric isolated find	Ineligible	Phase I Report Add. 1	Yes	No
IF-DB-40	Prehistoric isolated find	Ineligible	Phase I Report Add. 1	Yes	No
IF-DB-45	Prehistoric isolated find	Ineligible	Phase I Report Add. 2	Yes	No
IF-DB-65	Prehistoric isolated find	Ineligible	Phase I Report Add. 2	No	No
IF-DB-66a and 66b	Prehistoric/Historic isolated find	Ineligible	Phase I Report Add. 2	No	No
IF-DB-70	Prehistoric isolated find	Ineligible	Phase I Report Add. 2	Yes	No
IF-KNE-07	Prehistoric isolated find	Ineligible	N/A	No	No
IF-KNE-17	Prehistoric isolated find	Ineligible	Phase I Report Rev. 1	Yes	No
IF-KNE-25	Prehistoric isolated find	Ineligible	Phase I Report Rev. 1	Yes	No
IF-KNE-27	Prehistoric isolated find	Ineligible	Phase I Report Rev. 1	Yes	No
IF-KNE-28	Prehistoric isolated find	Ineligible	Phase I Report Rev. 1	Yes	No
IF-MT-48	Prehistoric Isolated Find	Ineligible	Phase I Report Add. 1	Yes	No

- That is, Dominion's contractors had to visibly ignore 99 homes on all sides of the CS 2 site, 2 historic black churches and their cemeteries (Union Hill Baptist est. 1868; Union Grove Missionary Baptist est. circa 1920); 1 historic white church and cemetery est. 1831, 2 historic black school sites, the 1880s Freedman home place of the Harper family next to the proposed CS site, no photos of the Variety Shade tobacco barn or of Shelton Store, which is visible from the road in Union Hill.

***Response**:*

The APE for the Buckingham Compressor Station includes the parcel in which the facility will be built, and an area within line of sight of the proposed aboveground construction and the landscape changes due to vegetation clearing or other impacts associated with construction. ACP contractors estimated the maximum distance of the potential viewshed changes to be 0.5 miles and conducted their survey within this 0.5-mile APE. Only structures that were 50 years of age or older, and located within the visual APE were surveyed. The above referenced resources were not surveyed because they were not located within the visual APE, either because of

distance (greater than 0.5 miles), or because there would be no view to the proposed compressor station based on intervening tree cover or topography. For the resources of concern noted by the Friends of Buckingham, the following distances from the proposed compressor station site are provided:

- *Union Hill Baptist Church: located 1.19 miles to the northeast of the proposed compressor station*
- *Union Grove Missionary Baptist Church: located 1.71 miles to the northeast of the proposed compressor station*
- *The Variety Shade plantation boundary is noted as a small point on the Virginia Cultural Resource Information System (VCRIS) database, and measurements relative to the Project are made from this point. The historic boundary for the entire plantation is not shown in the VCRIS database. Variety Shade plantation was located south of Rte. 649, about 1.6 miles southeast of the proposed compressor station. The plantation dwelling burned in the 1960s and the only surviving structure is a nineteenth century tobacco barn, which was not located within the 0.5-mile visual APE.*
- *The historic white church and cemetery, the two historic black school sites, the 1880s Freedman home place of the Harper family next to the proposed CS site, and the Shelton Store are not shown on topographic maps to measure their distance and were not identified during the survey of the Project's direct or visual APEs.*

❖ May 3, 2016, "Union Hill/Woods Corner Rural Historic District" Buckingham, VA was listed by Preservation Virginia as a "Most Endangered Historic Place" in Virginia. Notification of that listing and its complex of historic resources, marked and unmarked slave burials, churches, cemeteries, former plantation sites, farm structures, homes, photographs, and slave plantation neighborhood history have been part of public record of comments made to the Buckingham Planning Commission, the Buckingham Board of Supervisors, to FERC, by Dr. Lakshmi Fjord, Justin Sarafin and Sonja Ingram of Preservation Virginia since August 2016.

***Response**:*

Preservation Virginia listed the Union Hill/Woods Corner Rural Historic District as a "Most Endangered Historic Place" on May 3, 2016. Preservation Virginia surveyed the Union Hill/Woods Corner Rural Historic District (014-5087) in January of 2017 and recommended it for further study. The Virginia Department of Historic Resources (VDHR) has not made any formal determination as to its eligibility for the National Register of Historic Places (NRHP). However, VDHR did provide comments on Preservation Virginia's PIF. VDHR questions whether the proposed district lacks sufficient "physical material to represent the history." VDHR expressed concern that are not enough existing historic structures in the district to reflect the history referenced in the VCRIS form. In addition, VDHR noted that the setting has been heavily altered by logging and deforestation, which likely destroyed many of the surrounding archaeological sites. Finally, VDHR questioned whether the district was exceptional and distinctive enough within the context of Buckingham County overall to warrant designation as a district. Although Preservation Virginia completed the

*initial survey, they did not do an in-depth survey to investigate the district as a whole in order to list all of the contributing and non-contributing resources in the district. However, the proposed Project encompasses a very small part of the proposed district, and those resources identified in the APE in the vicinity of the BCS do not appear to date to the period of significance. The survey form for Union Hill/Woods Corner Rural Historic District submitted to VDHR by Preservation Virginia in 2017 states, "*In response to a decided lack of cultural and historic resource survey in the area, we are seeking this designation as a way of raising awareness of the threat of erasure of this landscape that will occur with the construction of the proposed Atlantic Coast Pipeline and related Compressor Station." *Historic preservation and EJ are serious considerations in the siting of the Project, and with respect to the Union Hill/Woods Corner Rural Historic District, it does not appear that the Project would adversely affect the historic district or the contemporary community's experience of their cultural heritage.*

Conclusion

Atlantic takes seriously the concerns of stakeholder groups like FOB in the context of Project planning. While it is clear that Buckingham County has a rich history, BCS won't have a material impact on any historic cultural resources identified by FOB and others. Therefore, the BCS site is suitable from a historic cultural resources standpoint.

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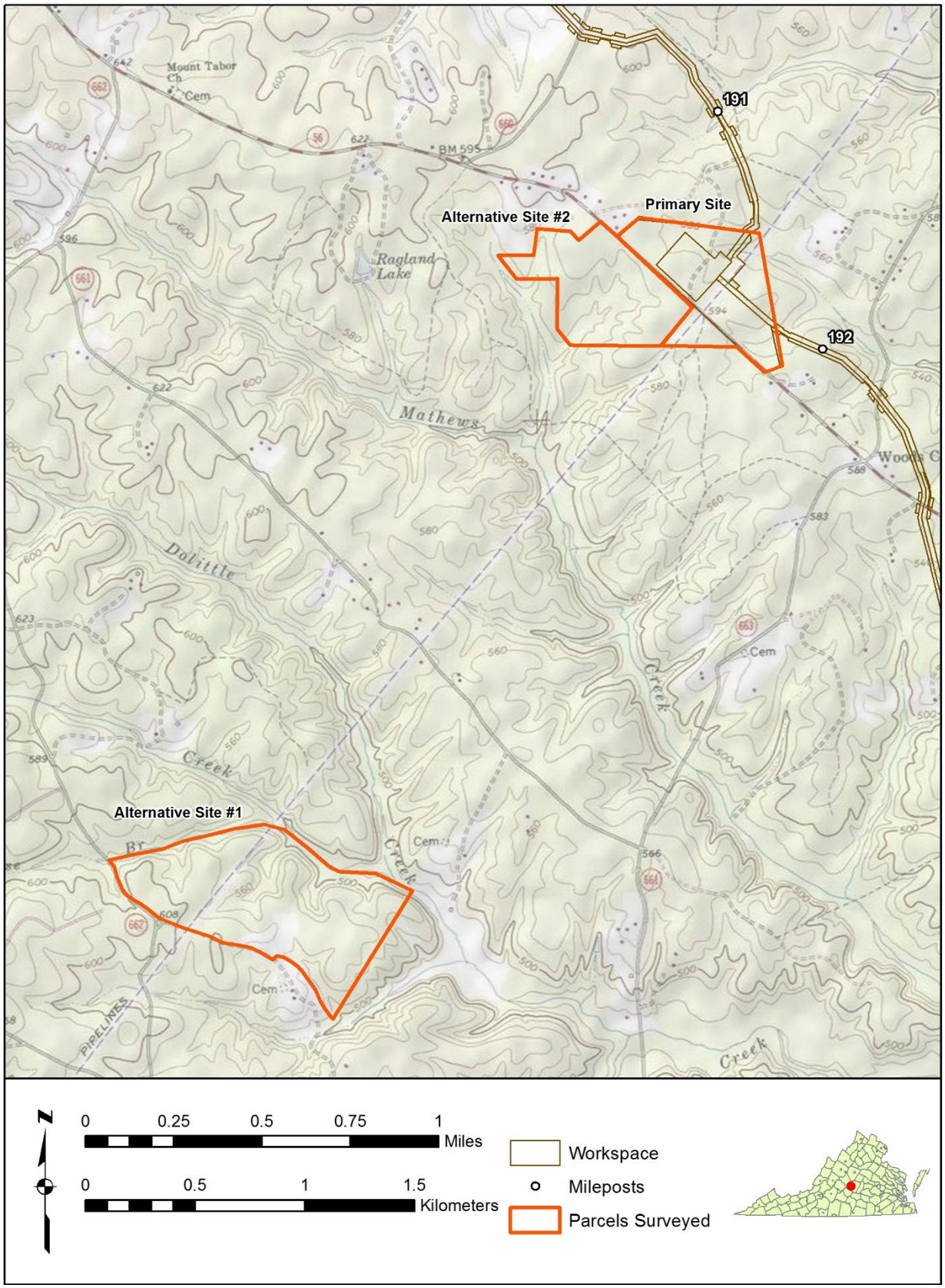

Figure 1. Buckingham Compressor Station Archaeological Survey Areas.

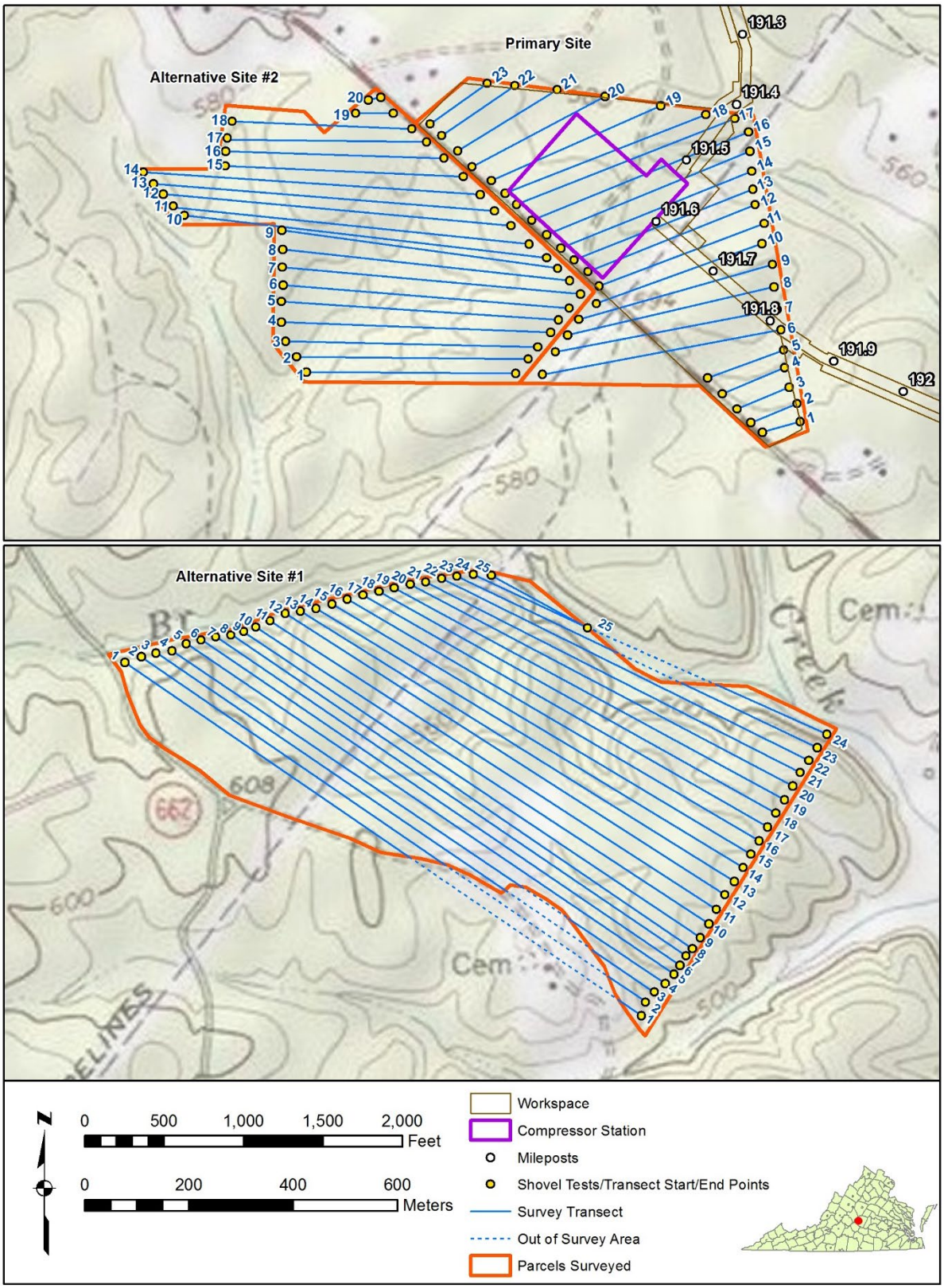

Figure 2. Buckingham Compressor Station Archaeological Survey Areas with Shovel Test Transects.

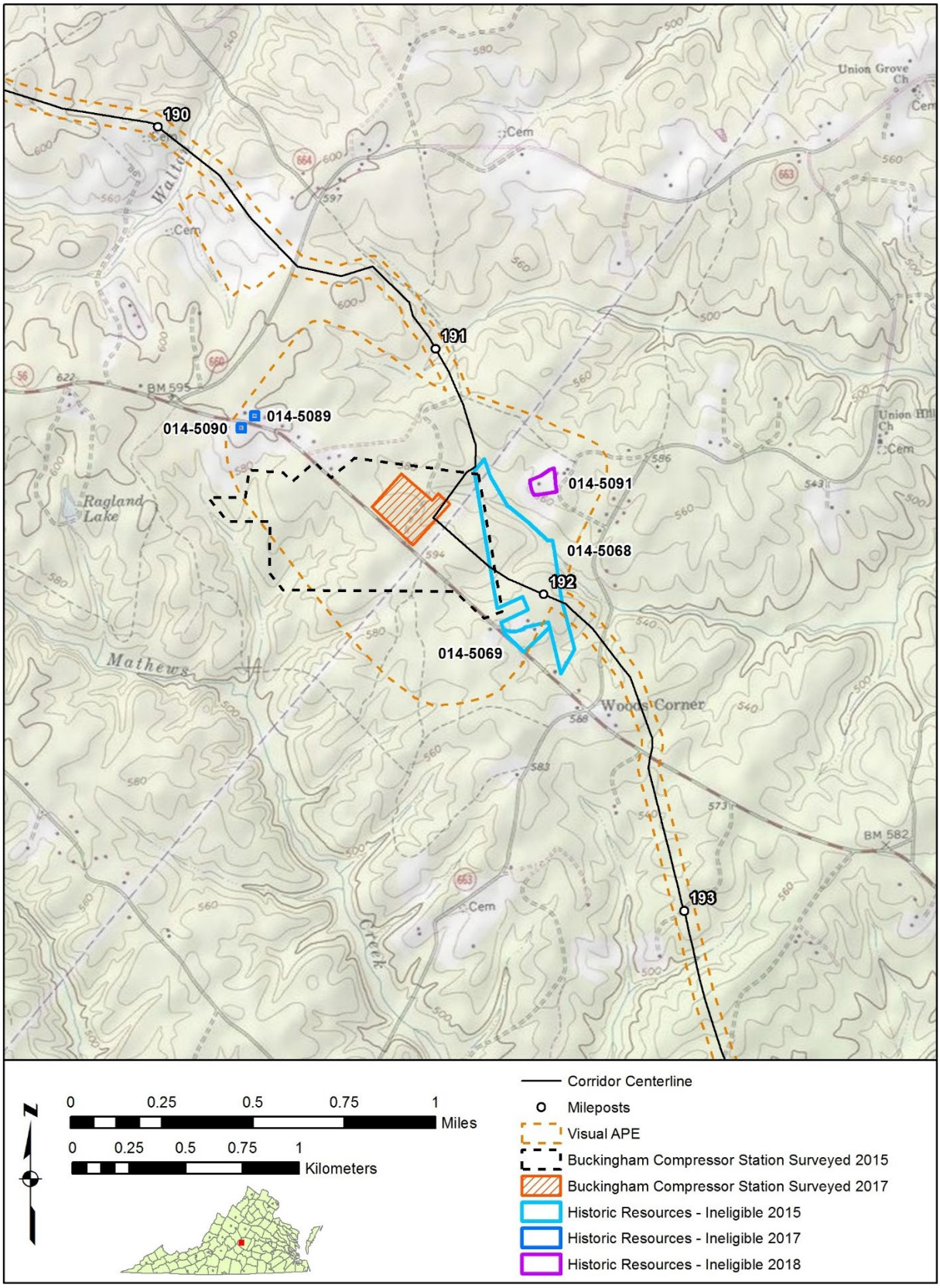

Figure 3. Buckingham Compressor Station Architectural Survey Areas.

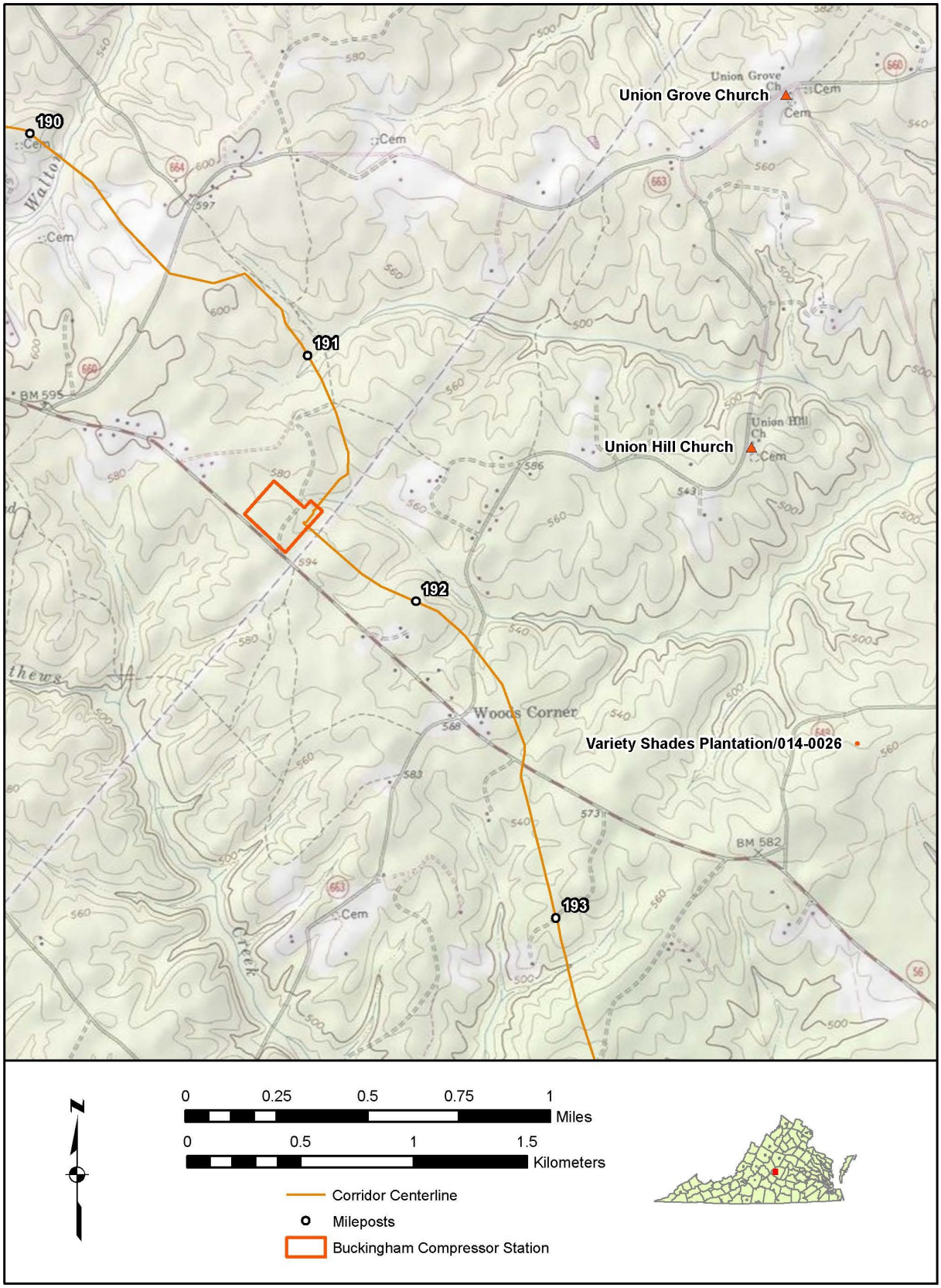

Figure 4: Buckingham Compressor Station in relation to Union Hill Church and 014-0026.

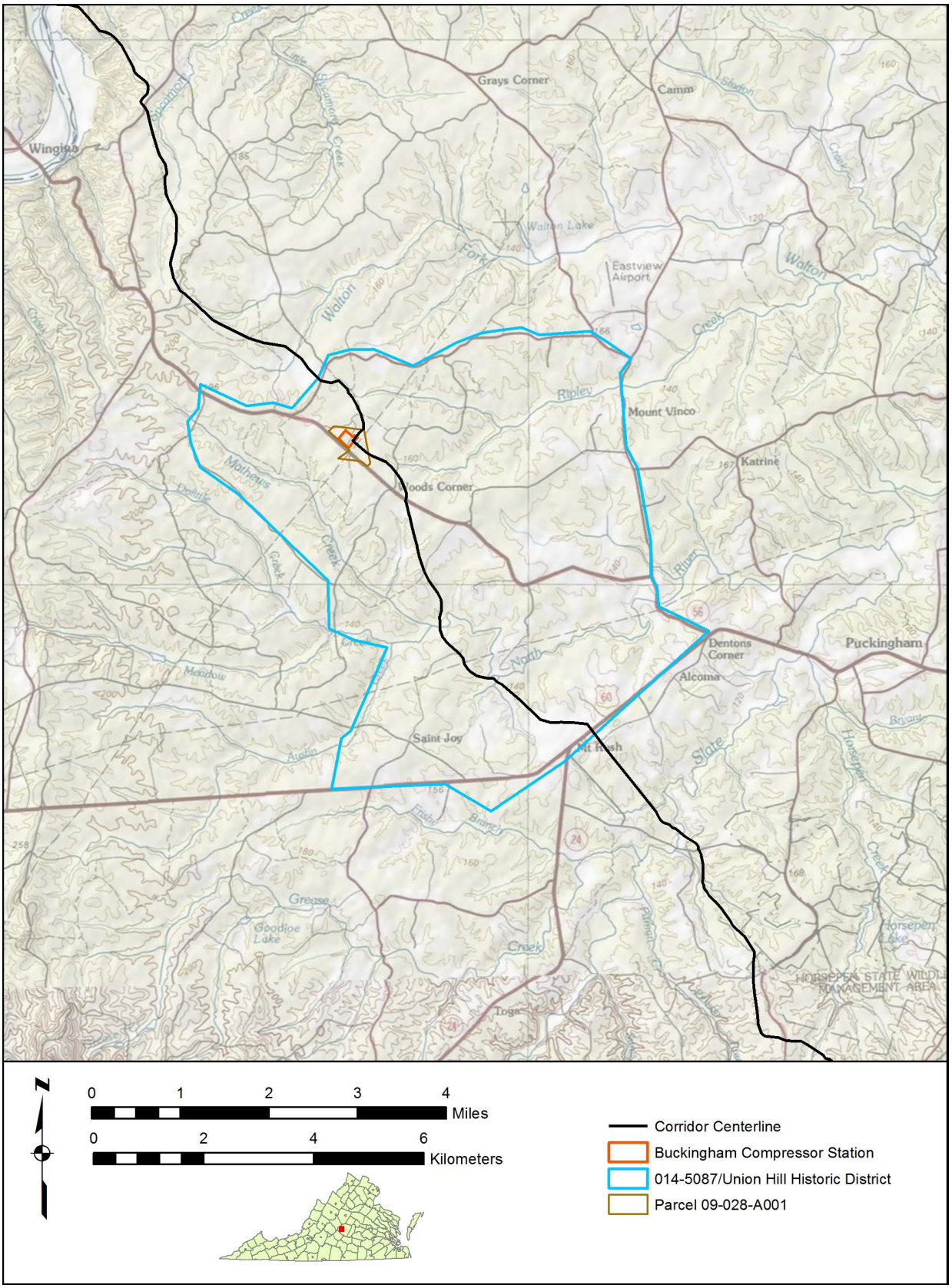

Figure 5. Union Hill/Woods Corner Historic District.

Figure 6. Photo of 014-5068 (concrete masonry unit dwelling on left side of photo) and 014-5069 (modular home and trailer on right side of photo) shown in the Addendum 1 report (Staton 2016).

Figure 7. Photo showing 014-5068 in Addendum 6 (Tucker-Laird et al. 2017c).

Figure 8. Photo showing 014-5069 in Addendum 6 (Tucker-Laird et al. 2017c).

Figure 9. Photo showing 014-5070 in the Addendum 1 report (Staton 2016).