STATE OF VERMONT
PUBLIC UTILITY COMMISSION

Investigation pursuant to 30 V.S.A. §§ 30 and 209 regarding the alleged failure of Vermont Gas Systems, Inc. to comply with the certificate of public good in Docket 7970 by burying the pipeline at less than required depth in New Haven, Vermont	)	Case No. 17-3550-INV

Affidavit of Jeffrey A. Nelson

I, Jeffrey A. Nelson, being duly sworn, hereby depose and state as follows:

Background

1. I am the Director of Energy and Environmental Services for the Vermont office of Vanasse Hangen Brustlin, Inc. ("VHB"). I have worked as a consulting hydrologist and hydrogeologist in Vermont since 1982. I have a Bachelor of Science degree in Geology and a Master of Science degree in Civil Engineering, both from the University of Vermont. My educational training includes extensive scientific coursework, with a specialization in surface water hydrology and groundwater hydrogeology. My professional background includes the direction, completion, and presentation of technical studies, evaluation and review of scientific data pertaining to water resources, determination of compliance with various State and Federal regulatory requirements and application for various permits and authorizations. Specific areas of expertise include stormwater treatment and control; erosion prevention and sediment control planning and design; and wetland and stream assessment, impact assessment, restoration and mitigation. I have designed and implemented a large number of projects in Vermont and the northeastern United States involving water resources assessment, planning, impact analysis, permitting and monitoring. I am a Certified Professional in Erosion and Sediment Control and am Certified Professional in Storm Water Quality.

2. In Docket 7970, I prepared testimony and sponsored the Section 248 Natural Resources Report and related impact assessments prepared by VHB in connection with the Vermont Gas Systems, Inc. ("Vermont Gas" or "VGS") Addison Natural Gas Project ("ANGP" or "Project").

3. My testimony was included in: Vermont Gas Systems, Inc. Addison Natural Gas Project Certificate of Public Good – Section 248 Petition dated December 20, 2012; the Docket 7970 Vermont Gas Systems, Inc. – Addison Natural Gas Project 2-28-13 Amended and Supplemented Section 248 Filing dated February 28, 2013; and the Public Service Board ("PSB") Docket 7970, Vermont Gas Systems, Inc. Supplemental and Rebuttal Prefiled Testimony and Exhibits dated June 28, 2013 ("6/28/13 Alignment"). I also provided additional testimony, memoranda and exhibits in five Non-Substantial Change ("NSC") filings in Docket 7970, to include: NSC 1 submitted on April 3, 2015, NSC 2 submitted on July 9, 2015, NSC 3 submitted on August 25, 2015, NSC 4 submitted on November 5, 2015, and NSC 5 submitted on March 25, 2016.

4. I will refer herein primarily to the 6/28/13 Alignment, as this was the basis for the Certificate of Public Good ("CPG") issued by the PSB in Docket 7970 on December 23, 2013.

5. VHB was also responsible for the preparation of application materials for the following collateral permits that were required for Project construction or operations. These "Collateral Permits" included:

- Vermont Individual Wetland Permit #2012-184. Issued June 9, 2014 ("VWP").
- Vermont Individual Stream Alteration Permit #SA-5-9029. Issued June 9, 2014 ("SAP"). (Provided here as Attachment A)
- Vermont Individual Clean Water Act Section 401 Water Quality Certification for ANGP Phase 1. Issued June 9, 2014 ("401 WQC").
- Vermont Individual Construction Stormwater Discharge Permit #6949-INDC. Issued June 9, 2014 ("INDC").

- US Army Corps of Engineers Section 404 and Section 10 Permit #NAE-2012-0123. Issued June 23, 2014 ("404").

6. All of the above Collateral Permits were issued for the Project in 2014.

7. During the course of the PSB Project review process, as a result of stakeholder input and involvement prior to construction as well as further project planning/design, VGS made certain modifications to the Project alignment and design. As necessary, amendments to the Collateral Permits were sought and obtained.

Stream Crossings

8. As presented in the 6/28/13 filing, the Project involved a total of 47 perennial or intermittent stream crossings (Supp. JAN-7, at 5)(Provided here as Attachment B). Of these, 21 occurred at larger streams or rivers with greater than one square mile of upstream drainage area, the jurisdictional threshold at which a Stream Alteration Permit would typically be required by VT DEC pursuant to 10 V.S.A. Chapter 41 (Supp. JAN-7, at 2, Board Finding 368) (Provided here as Attachment B).

9. For these larger streams, DEC also typically defined a "Fluvial Erosion Hazard" or FEH zone, which was intended to represent the potential area of lateral stream channel migration over time (Supp. JAN-7, at 3, Board finding 377) (Provided here as Attachment B). FEH zones for each of the larger streams were delineated by DEC and further refined by VHB in collaboration with the DEC using the Step 1 corridor delineation methodology outlined in the Vermont River Corridor Protection Guide Technical Appendix (DEC, 2008). The delineated FEH Zones associated with the larger streams are shown on the Attachment to Supp. JAN-7.

10. To protect existing and designated uses pursuant to the Vermont Water Quality Standards (ANR, 2011) associated with these jurisdictional streams, a tiered approach to stream crossing design was undertaken. First, for all river crossings, and where feasible for larger

streams, installation of the transmission line was proposed to occur using Horizontal Directional Drilling ("HDD"). A typical detail depicting how and where HDD would be used was prepared by CHA (See Supp. JAN-9, Attachment 1, Drawing ANGP-T-G-020, Detail 5) (Provided here as Attachment C).

11. Second, where HDD was determined not to be feasible, open trench excavation would be used for crossing these larger streams. A typical detail depicting how and where open trenching would be used was prepared by CHA (See Supp. JAN-9, Attachment 1, Drawing ANGP-T-G-020, Detail 6) (Provided here as Attachment C). It should be noted that two additional crossing locations, along the built portion of the Chittenden County Circumferential Highway (VT Route 289), were designed over existing culverted segments of Alder Brook and are not included in Detail 6 or the Stream Alteration Permit. These two crossings were not subject to SAP jurisdiction as they did not involve any proposed modification of the stream channel or FEH zone.

Depth of Cover at Stream Crossings

12. Within these two construction details (5 and 6 above), specific practices were described for the subject crossing locations to avoid or minimize impacts at the specified stream or river crossing locations. These measures included, for example, a proposed minimum vertical separation of seven feet between the channel bottom and the top of the pipeline (Note 4), and a top of pipe elevation equal to or deeper than the channel bottom throughout the entire FEH zone (Note 2). These criteria were proposed by VGS to prevent exposure of the transmission line over time due to either vertical downcutting of the stream channel or horizontal channel movement within the FEH zone.

13. The stream crossing locations of the HDD and open trench crossings indicated in Details 5 and 6 are indicated by Mile Post "MP" distance along the transmission line. These represent the entirety of the stream crossing locations that were jurisdictional under the SAP requirements, and at which these details were intended to be applicable to Project construction activities.

14. Construction Type 7 also depicts a typical open trench stream crossing (See Supp. JAN-9, Attachment 1, Drawing ANGP-T-G-006) (Provided here as Attachment D). Construction Type 7 is called out at the specified MP locations of non-HDD stream crossings including the stream crossings specified Drawing ANGP-T-G-020, Detail 6. (See Supp. JAN-9, Attachment 1, Drawings ANGP-T-C-001 through ANGP-T-C-085).

15. At the time of the 6/28/13 filing, no specific minimum depth of cover representation was presented to the PSB for streams with upstream drainage areas of less than one square mile not jurisdictional under DEC stream alteration review ("smaller streams" or "non-jurisdictional streams"). Likewise, in the materials submitted to ANR in support of applications for the Collateral Permits, no minimum depth criterion was proposed or required for the smaller streams.

16. The transmission line crossings of smaller streams, which are not jurisdictional under the DEC stream alteration program, pose a considerably lower likelihood of either vertical channel downcutting or horizontal movement of the stream channel over time, given the lesser flows, velocities and stream energy associated with these features. Therefore, these features correspondingly present a much lesser risk of the transmission line becoming exposed over time.

17. However, a discrepancy in the 6/28/13 EPSC plans is noted, in that Construction Type 7 depicts 84" minimum cover at stream crossing locations where Type 7 is indicated on the

EPSC plans. These crossing locations included certain smaller non-jurisdictional streams, which is incorrect.

18. The actual intended depth of cover for the smaller stream locations was not clearly identified in the 6/28/13 plan set.

Final Design Alignment and Depth of Cover Requirements

19. The Amendment to the SAP No. SA-5-9029 issued January 15, 2016 permits 19 jurisdictional stream crossings on the ANGP Transmission mainline as shown in the December 15, 2015 ANGP EPSC Plan Set. The permitted crossings include 10 stream locations to be crossed by HDD and 9 to be crossed by open trench. The depths for each stream crossing are included in the HDD Stream Crossing – Typical Section detail (Detail 4) and the Open Trench Stream Crossing – Typical Section detail (Detail 8) included on Sheet ANGP-T-G-017 (Provided here as Attachment E).

20. Ultimately, to provide clarity to the construction contractor regarding the original intent of the design, project engineering firm CHA included a Table on the updated EPSC Plan Set included in the NSC 3 filing with the PSB on August 25, 2015 (See Drawing ANGP-T-G-015, Detail 7) (Provided here as Attachment F). This detail specified a 5-foot depth of cover unless otherwise noted by the two details that I describe above which are applicable to the specified list of jurisdictional streams/rivers.

Conclusions

21. Depth of cover requirements for larger SAP jurisdictional streams are specified at a minimum of seven feet consistently through the project record to include Docket 7970 application materials, issued CPG, and non-substantial change filings as well as the issued Stream Alteration Permit and application materials.

22. The final ANGP alignment, as depicted on the December 2015 plan Sheet ANGP-T-G-017 included in the Stream Alteration Permit No. SA-5-9029 amendment request for the SAP Amendment issued January 15, 2016 includes 19 SAP jurisdictional stream crossings, ten to be constructed by HDD and nine by open trench, with minimum depth requirements of seven feet under the stream channel and equal to the bottom channel elevation throughout the FEH zone. These depth criteria are protective of the stream, stream corridor and transmission line over time due to either vertical downcutting of the stream channel or horizontal channel movement within the FEH zone.

23. The ANR did not review or specify depth of cover for the smaller streams on the project. The depth of cover for smaller streams was not specified by VGS in Docket 7970 prior to the August 25, 2015 NSC 3 filing. This filing clarified that, unless otherwise specified, the depth of cover requirements for a stream crossing is five feet.

24. The 5-foot depth of cover for the smaller streams, compared to the depth requirements for the larger streams, is appropriate and protective, given the limited potential for stream channel downcutting or lateral migration associated with these features.

Dated at Burlington, Vermont this 4th day of August, 2017.

Jeffrey A. Nelson

Subscribed and sworn to before me this 4th day of August, 2017.

Digitally signed with approval from Jeffrey A. Nelson

Notary Public
My commission expires: 2/10/2019