STATE OF VERMONT
PUBLIC SERVICE BOARD

Petition of Vermont Gas Systems, Inc., requesting	**)**
a Certificate of Public Good pursuant to 30 V.S.A	**)**
§ 248, authorizing the construction of the "Addison	**)**
'Natural' Gas Project" consisting of approximately	**)**
43 miles of new "natural" gas transmission pipeline	**)**
in Chittenden and Addison Counties, approximately	**)**
5 miles of new distribution mainlines in Addison	**)**
County, together with three new gate stations in	**)**
Williston, New Haven, and Middlebury, Vermont	**)**

RESPONSE TO PETITIONER'S

DISCOVERY REQUESTS BY

CURT FREEDMAN

ON BEHALF OF NATHAN PALMER

LAUGHING TREE FARM

July 12,2013

Q.PET:Palmer.1-12. Admit that you do not have prior experience with the design and construction of natural gas pipelines, for both transmission and distribution systems.

A. PET:Palmer.1-12 Yes, although I do have experience designing and directing the construction of natural gas distribution systems in private buildings, I do not have professional experience in the design or construction of high pressure natural gas distribution systems.

Q.PET:Palmer.1-13. If the above answer is anything other than an admission, identify and describe your experience and specific engineering role and responsibility with the design and construction of natural gas pipelines, for both transmission and distribution systems.. Produce a list of each project and contact information for the companies with whom you worked.

A.PET:Palmer.1-13 N/A

Q.PET:Palmer.1-14. With respect to A5 of your testimony, identify and describe the investigation experience you reference, specifically listing each investigation, its date, location, for whom you conducted the investigation, your specific role and responsibility within the investigation and produce your reports and all related documents.

A.PET:Palmer.1-14 There was a natural gas explosion on 1/25/09 at 76 Eastern Avenue, in Gloucester, MA. I worked as an engineering investigator representing an abutter to the subject property. I participated in the testing and laboratory evaluation of the subject natural gas service main piping as well as other piping components. The report concluded that the origin and cause of the explosion involved a fractured 6" low pressure cast iron natural gas line.

"***The State Fire Marshall's Office and the Gloucester Police and Fire Departments determined that the explosion was caused by escaping gas from the leak on the six inch gas main entering***

the structure at 76 Eastern Avenue, and the source of the ignition was unknown."

-Page 2 of the DPU report (8/2/2010)

The facts surrounding this case documented the subject 6" cast iron line was installed in 1911 and had an operating pressure of approximately 9.5 inches of water column (approximately 1/3 of a psi {lb/ft^2}). The report concluded (on page 15) that the specific cause of the leak in the 6" main was caused by: "***a combination of graphitic corrosion at the service tap location, combined with the effect of differential frost heaves between the pipe and the tap are reasonable, and based upon substantial and specific evidence***…"

Testing was completed at Massachusetts Materials Research, on Century Drive, in West Boylston, MA.

My report for the abutter is confidential; I do not have authority to release it.

The DPU report is public information and can be downloaded at:

http://www.mass.gov/eea/docs/dpu/pipeline/incident-reports/1-25-09-gloucester.pdf

Q.PET:Palmer.1-15. Regarding. A5 of your testimony, admit that you are being paid by the Palmers to provide your testimony in this proceeding.

A. PET:Palmer.1-15 I have received no financial compensation.

Q.PET:Palmer.1-16. Prior to providing your testimony in this matter, identify each federal and state pipeline safety regulation and code reviewed by you in forming your opinion.

A. PET:Palmer.1-16 Pipeline codes I have reviewed:

49 CFR Part 192 - TRANSPORTATION OF NATURAL AND OTHER GAS BY PIPELINE: MINIMUM FEDERAL SAFETY STANDARDS

I have reviewed the Report by Dr. Charles Roads, January 2010 (see attached)

I have reviewed the Australian guidelines (see attached)

The recommended standards for pipeline setbacks standards from Great Britain, the United States, and Canada are contained in the attached document (see attached)

Q.PET:Palmer.1-17. Prior to providing your testimony in this proceeding, identify each member of the Vermont Department of Public Service or Pipeline and Hazardous Materials Safety Administration ("PHMSA") consulted by you in forming your opinion. If not, why not?
A.PET:Palmer.1-17 I have not previously contacted any member of the VDPS or PHMSA.

Q.PET:Palmer.1-18. Admit that you have never been employed by any department of the U.S. government involved in the regulation of gas system and hazardous liquid infrastructure, security, and safety. If the answer is anything other than an admission, identify each such position and the dates held.
A.PET:Palmer.1-18 I have never been employed by any department of the U.S. government involving the regulation of gas systems or pipeline safety.

Q.PET:Palmer.1-19. Admit that you have never been employed by any company engaged in the design, construction or operation of a natural gas pipeline. If the answer is anything other than an admission, identify each such position and the dates held.
A.PET:Palmer.1-19 I have never been employed by any company involved with the design or construction of natural gas pipelines.

Q.PET:Palmer.1-20. Identify and describe your education, training and experience in the area of natural gas transmission system design, construction and operation. Please be specific with reference to natural gas transmission.

A.PET:Palmer.1-20 I do not have specific professional training in the area of high pressure natural gas transmission lines.

Q.PET:Palmer.1-21. Are you a member of the American Institute of Chemical Engineers or the National Association of Corrosion Engineers?

A.PET:Palmer.1-21 No.

Q.PET:Palmer.1-22. Have you ever attended any PHMS workshop, meeting or training? If so, identify and describe each, including topic and dates.

A.PET:Palmer.1-22. No.

Q.PET:Palmer.1-23. With respect to your resume, produce all forensic engineering reports and testimony referenced on page 2 thereof.

A.PET:PAlmer.1-23. Answered in 1-14

Q.PET:Palmer.1-24. Admit that the natural gas pipeline safety is regulated by the Office of Pipeline Safety ("OPS"), within the U.S. Department of Transportation ("DOT"), Pipeline and Hazardous Materials Safety Administration ("PHMSA").

Q.PET:Palmer.1-24. Yes, I generally agree.

Q.PET:Palmer.1-25. Admit that the natural gas pipeline safety regulations governing design, construction and inspection of natural gas pipelines are codified at 49 CFR Parts 192, 193, and 195.

A.PET:Palmer.1-25 Yes, I generally agree.

Q.PET:Palmer.1-26. Admit that 49 CFR Part 192 references the following standards which relate to the construction and operation of gas pipelines:

• American Society of Mechanical Engineers (ASME) Standards B31.8 and 16 B31.8S, 178

• American Petroleum Institute (API) Standards 5L and 1104, and 18

• NACE International (NACE) standards for cathodic protection and corrosion control.

A.PET:Palmer.1-26 Yes, I generally agree.

Q.PET:Palmer.1-27. Admit that neither 49 CFR Part 192 or the standards referenced therein as set forth in the previous question require or recommend the setback you reference in A6 of your testimony. If denied, identify and produce each such regulation and standard.

A.PET:Palmer.1-27 Yes, the set-backs from the Rhodes equations that I am calling for may likely exceed the present patterns of practice.

Q.PET:Palmer.1-28. Identify all federal and state safety regulations that support the statements in your A5 and A6 regarding proximity to homes/structures.

A.PET:Palmer.1-28 Yes, the set-backs from the Rhodes equations that I am calling for may likely exceed the present patterns of practice.

Q.PET:Palmer.1-29. Produce the report referenced at A6 of your testimony.

A.PET:Palmer.1-29 The Rhodes Report (see attached)

Q.PET:Palmer.1-30. Identify each jurisdiction and each gas pipeline safety code or regulation that, to your knowledge, has adopted the set-back approach stated in A6 of your testimony. Produce all documents supporting same.

A.PET:Palmer.1-30 The following districts in Canada have adopted 2/3 of the set-back recommended in my report.

Q.PET:Palmer.1-31. Admit that neither 49 CFR Part 192 or the standards referenced therein as set forth in the previous question require or recommend the setback you reference in A6 of your testimony. If denied, identify and produce each such regulation and standard.

A.PET:Palmer.1-31 Yes, the set-backs from the Rhodes equations that I am calling for may likely exceed the present patterns of practice.

Q.PET:Palmer.1-32. Produce the calculations supporting the distances recommend in A6 of your testimony.

A.PET:Palmer.1-32 Please reference the following:

Example Calculation:

Service pressure 600 psi

Diameter: 12 inch

Set-back standards utilizing the modeling methods documented by Dr. Charles Rhodes

P2 = External atmospheric pressure: 1 atmosphere = 101,000 Pa (N/m^2)

P1 = Internal pressure: 600 psi x 6870 Pa/psi = 4,122,449 Pa

P2 – P1 = 4,122,448-101,000 = 4,021,449 Pa

Pipe Diameter: 12” x 1meter/39.37” = .3048 meter

= **17.71 Dp (Pa - Pb)^0.25 kg^-0.25 m^.25 s ^0.5**

Let Rs = radius to experience an irradiance from a gas flame of less than 1365 w/m^2

Let Rz = Rs/2 =radius from the center of the flame to a surface subject to radiation damage.

Rs = [(2 Fm Ec Fr) / (4 Pi X 1365 watts / m^2)]^0.5

Rs= [(2 Pi (Dp / 2)^2 [2 (Pa - Pb) Rmb]^0.5 Ec Fr) / (4 Pi X 1365 watts / m^2)]^0.5

Rs = Dp (Pa - Pb)^0.25 [([2 Rmb]^0.5 Ec Fr) / (8 X 1365 watts / m^2)]^0.5

Given:

Fr = **.0547 (No Units)**

Gas Density = Rmb=**.714 kg / m^3**

Ec = **52437 kJ / kg**

Rs=**17.71 Dp (Pa - Pb)$^{0.25}$ meteres**

Rs = 17.71(.3048 meter)(4,021,449 Pa)$^{.25}$ = 241.7 meters = 793.1 feet

Note: At Rs/2 combustible surfaces would be expected to spontaneously ignite.

In Ontario, the governmental regulatory authority TSSA (Technical Standards and Safety Authority) has recently a recommended minimum setback of (2 / 3) (Rs / 2) to Ontario municipalities.