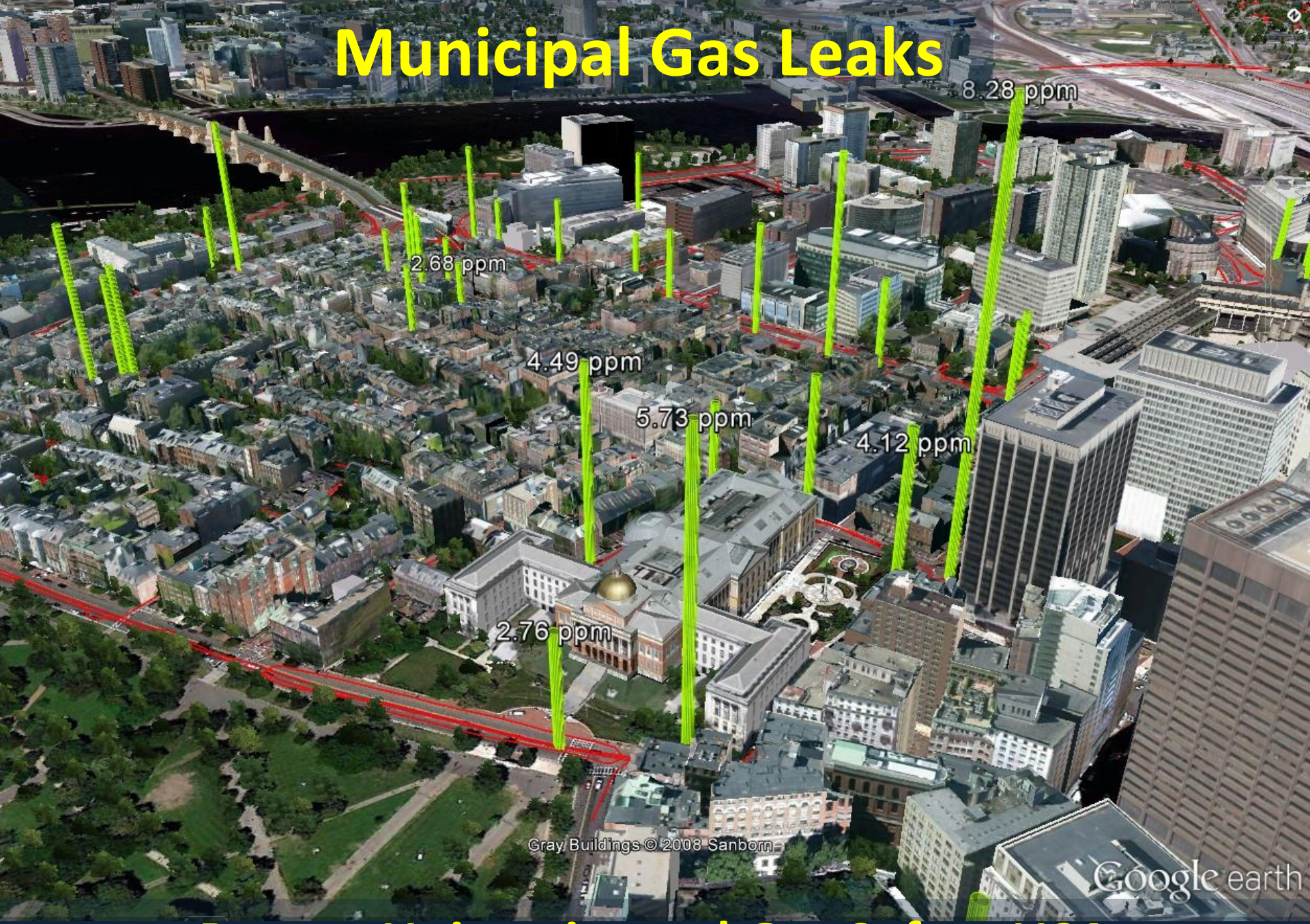
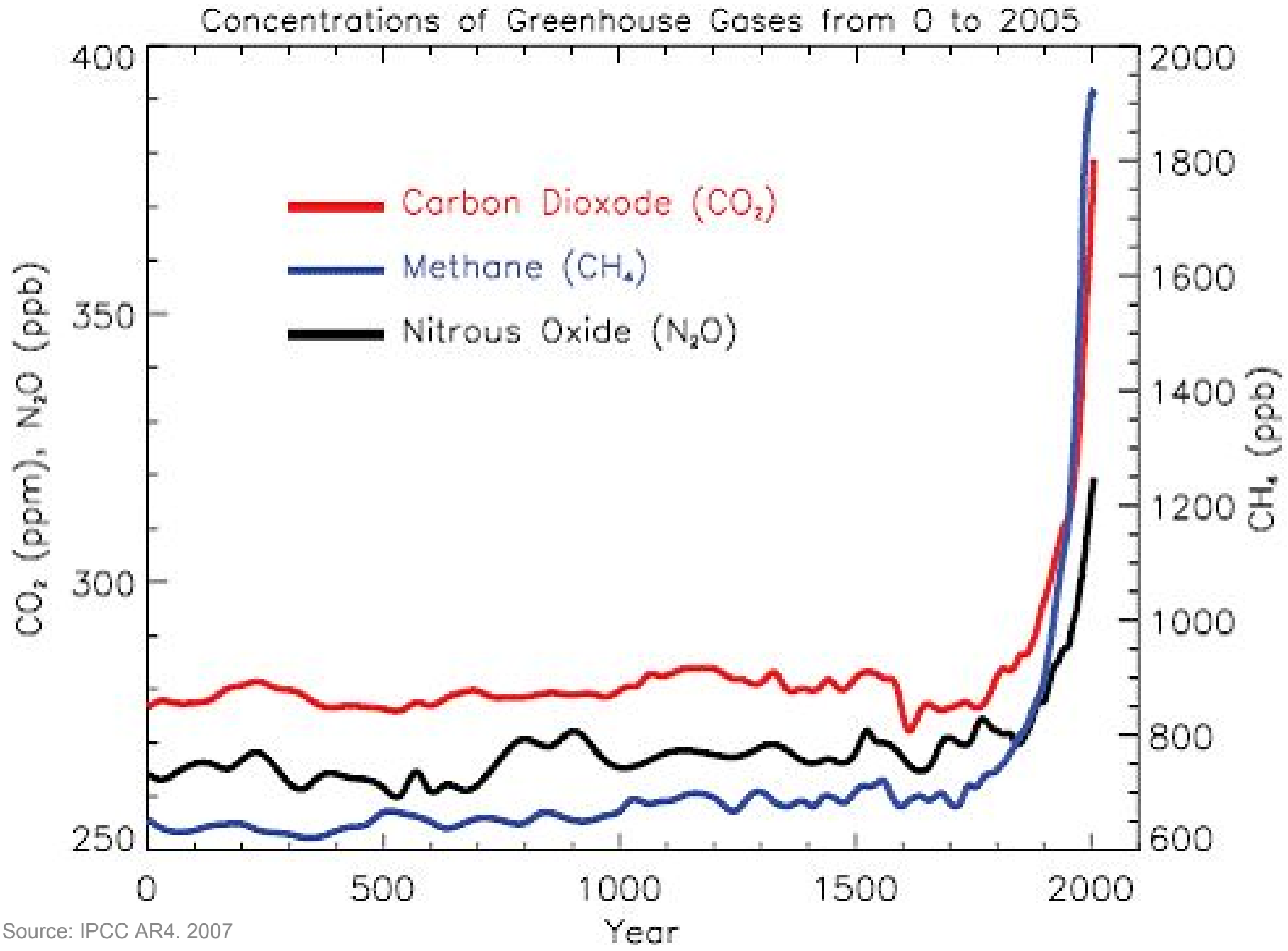
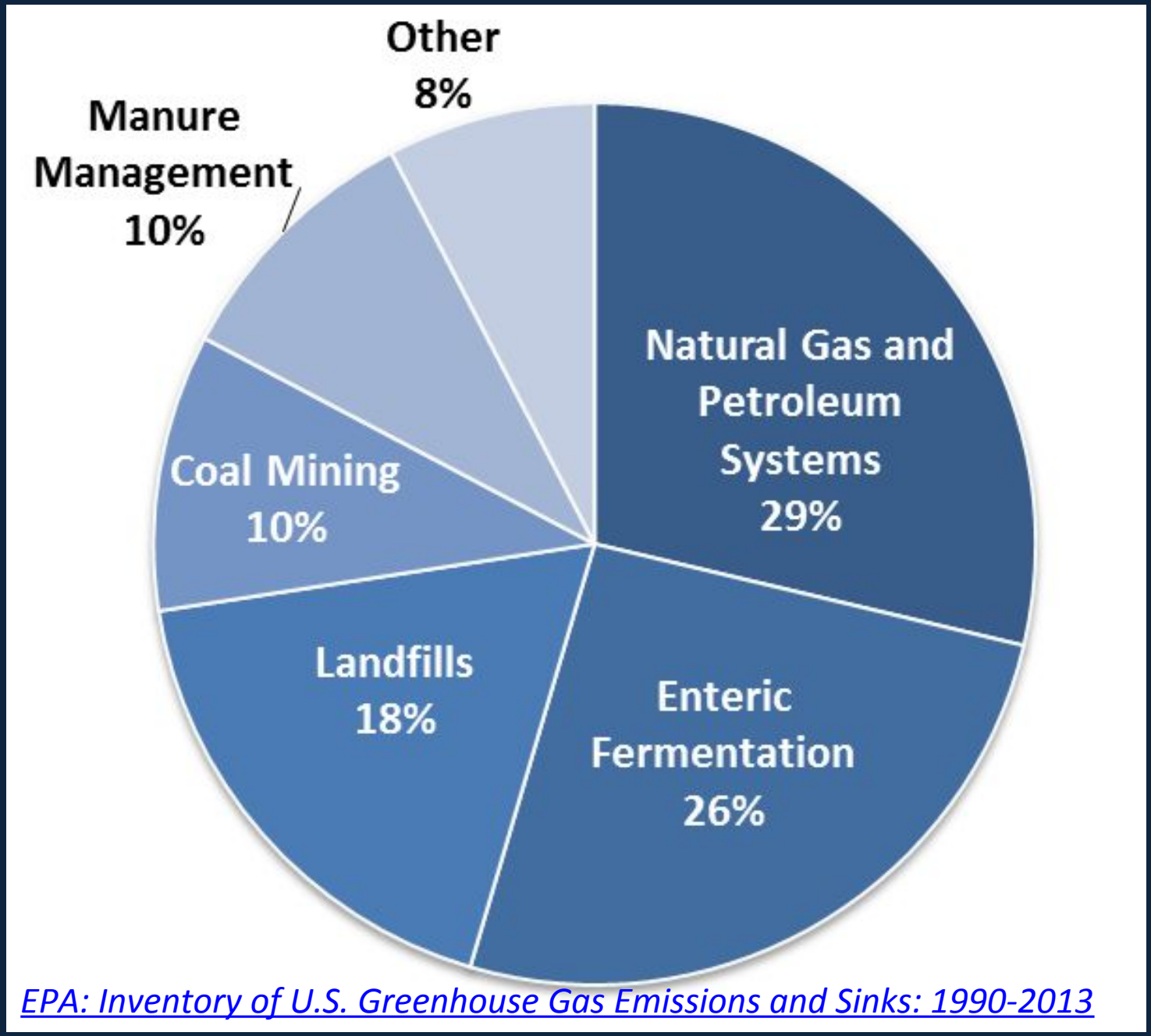

Municipal Gas Leaks
8.28 ppm
2.68 ppm
4.49 ppm
5.73 ppm
4.12 ppm
2.76 ppm
Gray Buildings © 2008 Sanborn
Google earth
Boston University and Gas Safety USA



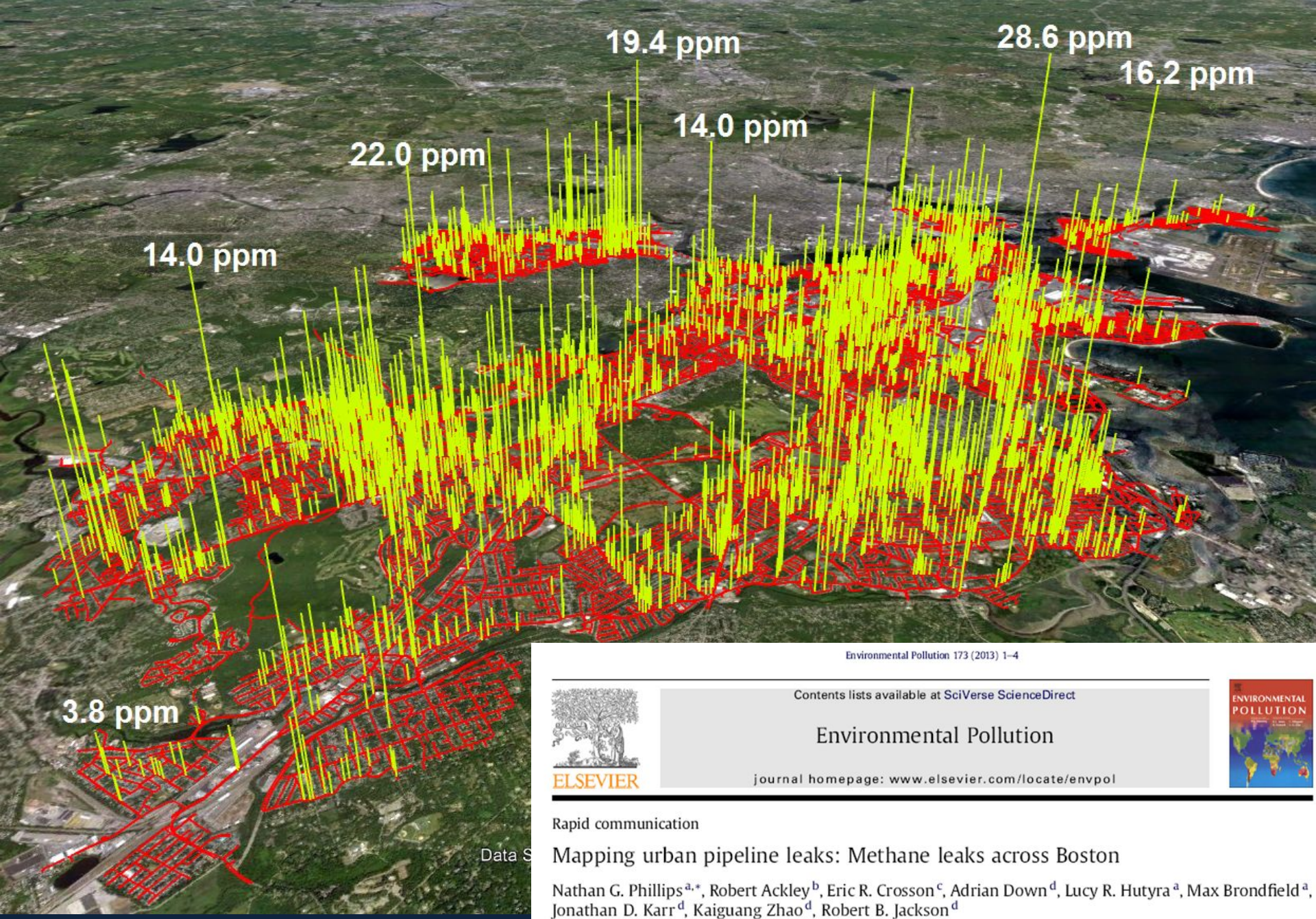
Source: IPCC AR4. 2007



EPA: Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2013

Gas Leaks

- Scope of Problem
- Climate Impact
- Impact on trees



Environmental Pollution 173 (2013) 1–4

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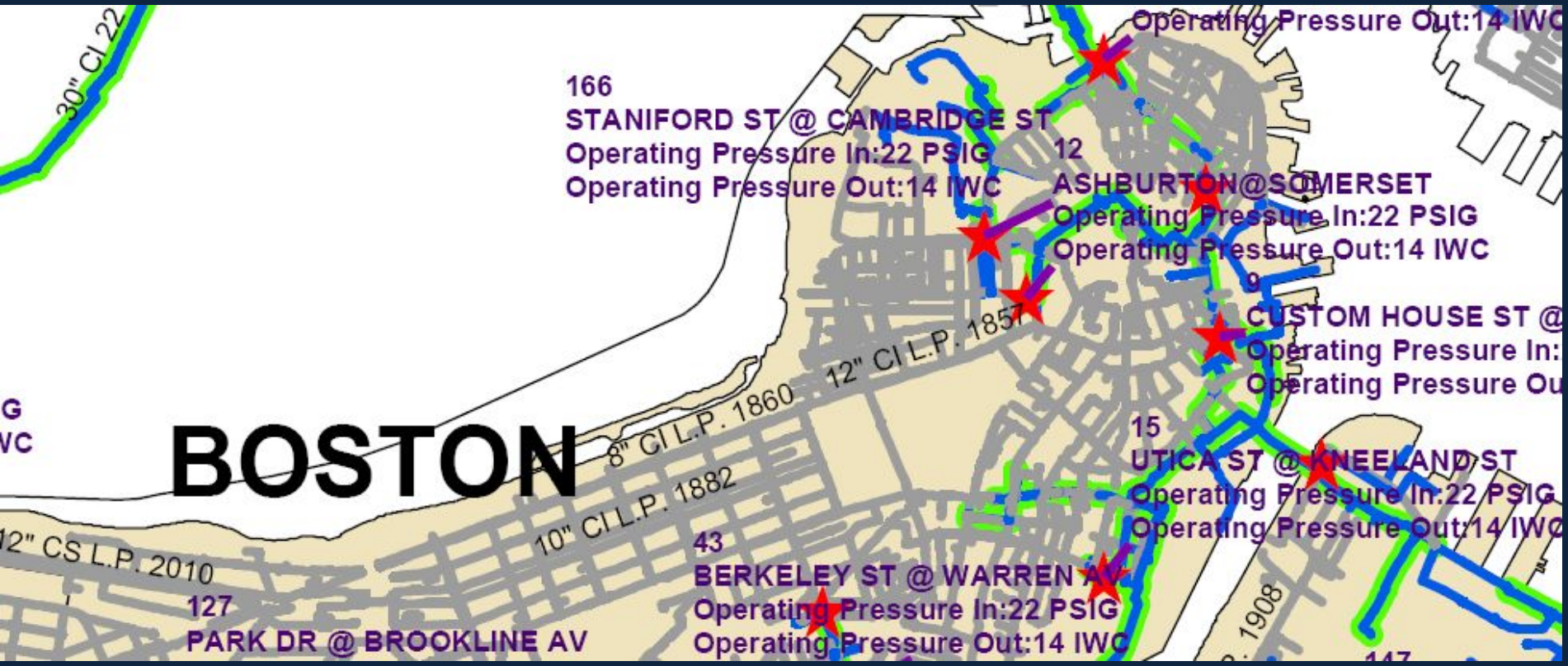
Rapid communication

Mapping urban pipeline leaks: Methane leaks across Boston

Nathan G. Phillips[a,*], Robert Ackley[b], Eric R. Crosson[c], Adrian Down[d], Lucy R. Hutyra[a], Max Brondfield[a], Jonathan D. Karr[d], Kaiguang Zhao[d], Robert B. Jackson[d]

[a] Boston University, Department of Earth and Environment, 675 Commonwealth Avenue, Boston, MA 02215, USA
[b] Gas Safety, Inc., Southborough, MA 01772, USA
[c] Picarro, Inc., Santa Clara, CA 95054, USA
[d] Duke University, Nicholas School of the Environment and Center on Global Change, Durham, NC 27708, USA

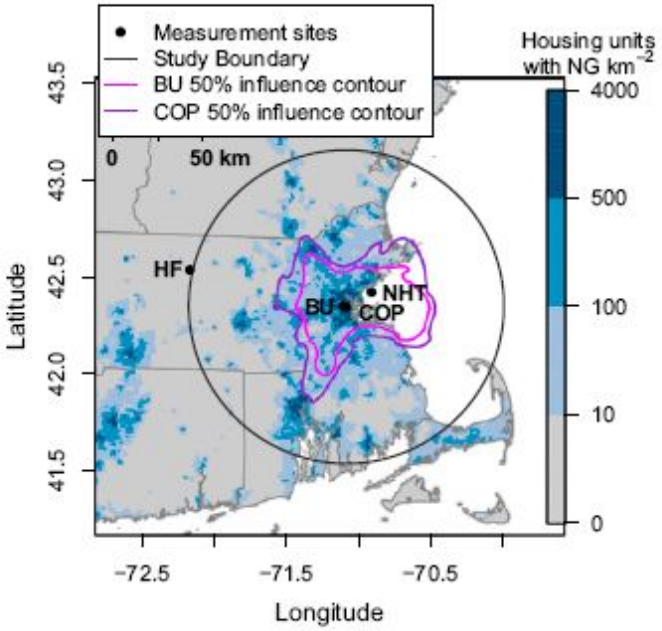

Operating Pressure Out:14 IWC
166
STANIFORD ST @ CAMBRIDGE ST
Operating Pressure In:22 PSIG
Operating Pressure Out:14 IWC
12
ASHBURTON@SOMERSET
Operating Pressure In:22 PSIG
Operating Pressure Out:14 IWC
9
CUSTOM HOUSE ST @
Operating Pressure In:
Operating Pressure Ou
15
UTICA ST @ KNEELAND ST
Operating Pressure In:22 PSIG
Operating Pressure Out:14 IWC
BOSTON
8" CI L.P. 1860
12" CI L.P. 1857
10" CI L.P. 1882
12" CS L.P. 2010
43
BERKELEY ST @ WARREN AV
Operating Pressure In:22 PSIG
Operating Pressure Out:14 IWC
127
PARK DR @ BROOKLINE AV
1908

Methane emissions from natural gas infrastructure and use in the urban region of Boston, Massachusetts

Kathryn McKain[a,b,1], Adrian Down[c,d], Steve M. Raciti[e,f], John Budney[a], Lucy R. Hutyra[e], Cody Floerchinger[g], Scott C. Herndon[g], Thomas Nehrkorn[h], Mark S. Zahniser[g], Robert B. Jackson[c,d,i,j,k], Nathan Phillips[e], and Steven C. Wofsy[a,b]

[a]School of Engineering and Applied Sciences and [b]Department of Earth and Planetary Sciences, Harvard University, Cambridge, MA 02138; [c]Nicholas School of the Environment and [d]Center on Global Change, Duke University, Durham, NC 27708; [e]Department of Earth and Environment, Boston University, Boston, MA 02215; [f]Department of Biology, Hofstra University, Hempstead, NY 11549; [g]Aerodyne Research, Inc., Billerica, MA 01821; [h]Atmospheric and Environmental Research, Inc., Lexington, MA 02421; and [i]School of Earth Sciences, [j]Stanford Woods Institute for the Environment, and [k]Precourt Institute for Energy, Stanford University, Stanford, CA 94305

Edited by A. R. Ravishankara, Colorado State University, Fort Collins, CO, and approved December 12, 2014 (received for review August 24, 2014)



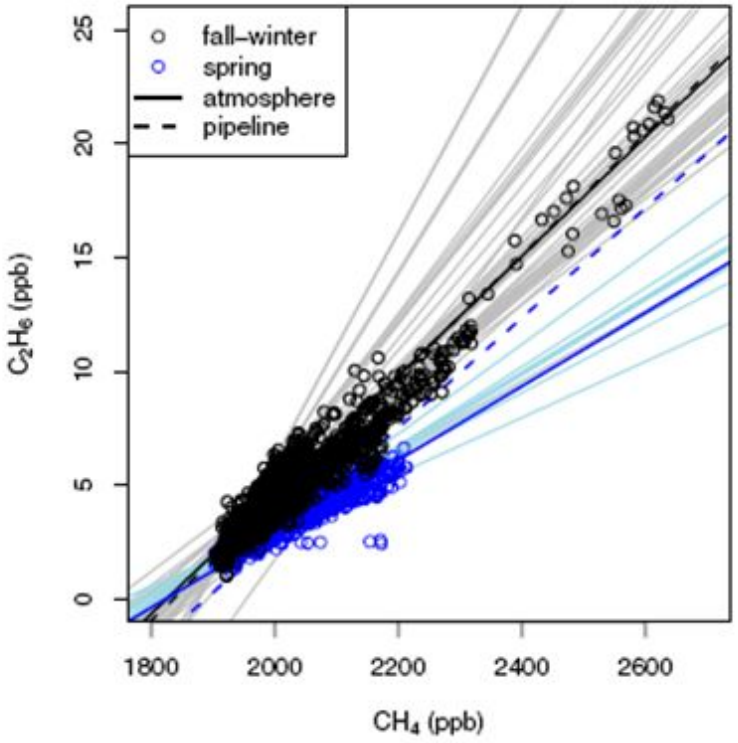


Fig. 1. Location of two city [Boston University (BU), 29-m height; Copley Square (COP), 215-m height] and two peripheral [Harvard Forest (HF); Nahant (NHT)] measurement stations (black points) in Boston, and the sur-

Environmental Pollution 213 (2016) 710–716

Contents lists available at ScienceDirect

Environmental Pollution

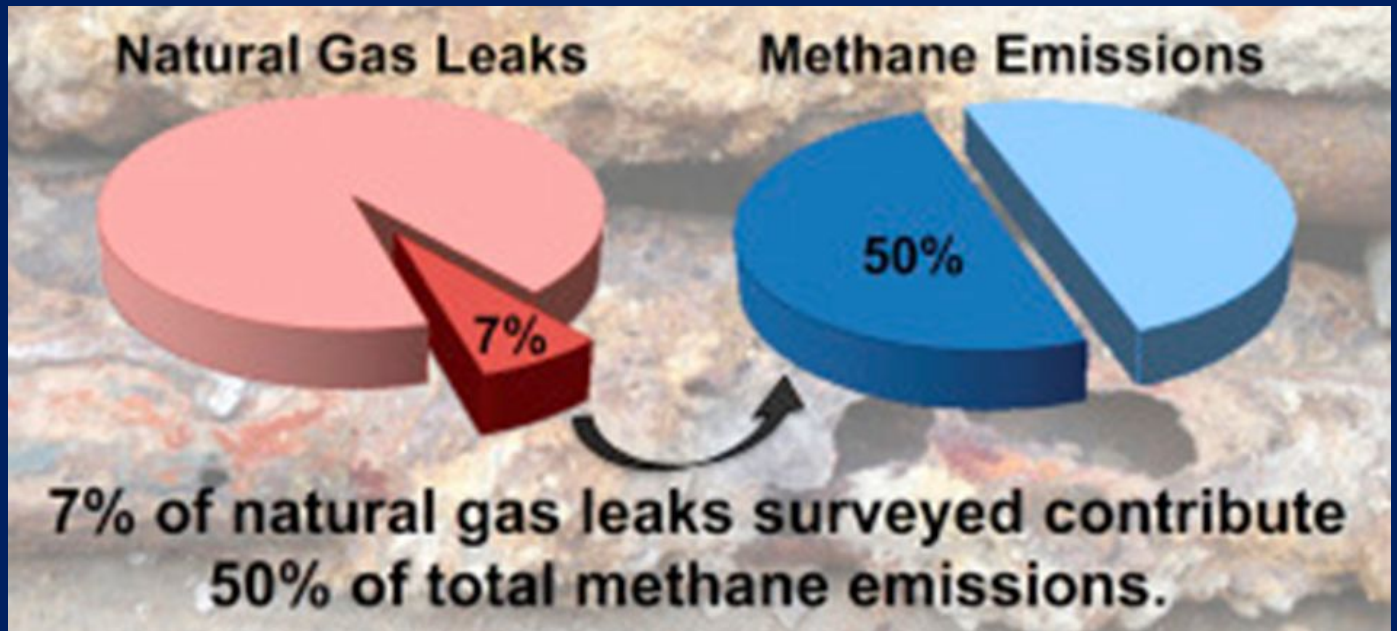
journal homepage: www.elsevier.com/locate/envpol

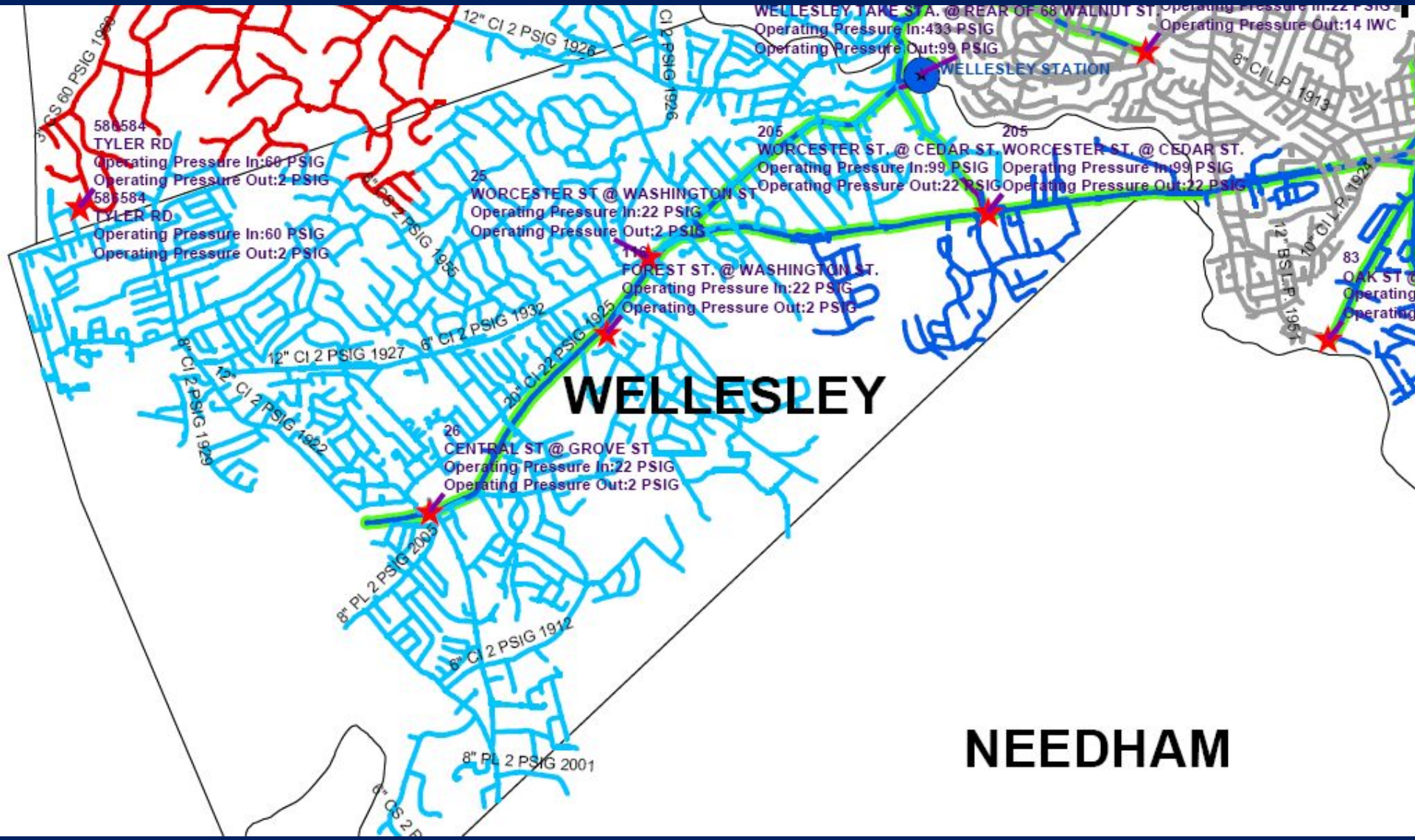
Short communication

Fugitive methane emissions from leak-prone natural gas distribution infrastructure in urban environments☆

Margaret F. Hendrick [a, *], Robert Ackley [b], Bahare Sanaie-Movahed [a, 1], Xiaojing Tang [a], Nathan G. Phillips [a]

[a] Boston University, Department of Earth and Environment, 685 Commonwealth Avenue, Boston, MA, 02215, USA
[b] Gas Safety, Inc., Southborough, MA, 01172, USA




WELLESLEY TAKE STA. @ REAR OF 68 WALNUT ST.
Operating Pressure In:433 PSIG
Operating Pressure Out:99 PSIG
Operating Pressure Out:14 IWC
WELLESLEY STATION
8" CI LP 1913
12" CI 2 PSIG 1926
CI 2 PSIG 1926
3" GS 60 PSIG 1968
586584
TYLER RD
Operating Pressure In:60 PSIG
Operating Pressure Out:2 PSIG
586584
TYLER RD
Operating Pressure In:60 PSIG
Operating Pressure Out:2 PSIG
25
WORCESTER ST @ WASHINGTON ST
Operating Pressure In:22 PSIG
Operating Pressure Out:2 PSIG
205
WORCESTER ST. @ CEDAR ST.
Operating Pressure In:99 PSIG
Operating Pressure Out:22 PSIG
205
WORCESTER ST. @ CEDAR ST.
Operating Pressure In:99 PSIG
Operating Pressure Out:22 PSIG
10" CI LP 1923
12" BSL P 1967
83
OAK ST @
Operating
Operating
6" CI 2 PSIG 1935
FOREST ST. @ WASHINGTON ST.
Operating Pressure In:22 PSIG
Operating Pressure Out:2 PSIG
6" CI 2 PSIG 1932
20" CI 22 PSIG 1925
12" CI 2 PSIG 1927
8" CI 2 PSIG 1929
12" CI 2 PSIG 1922
WELLESLEY
26
CENTRAL ST @ GROVE ST
Operating Pressure In:22 PSIG
Operating Pressure Out:2 PSIG
8" PL 2 PSIG 2005
8" CI 2 PSIG 1912
8" PL 2 PSIG 2001
6" CS 2
NEEDHAM

BULLETIN OF THE TORREY BOTANICAL CLUB
VOL. 84, NO. 6, PP. 424–428 DECEMBER, 1957

GANODERMA LUCIDUM, A PARASITE OF SHADE TREES

P. P. PIRONE[1]

Some investigators believe that *Ganoderma lucidum* (Leys.) Karst. (*Polyporous lucidus*) is a saprophyte of hardwood and coniferous trees (Boyce 1938). This conclusion is based largely on the fact that the reddish, varnish- or lacquer-like coated conks are commonly observed on dead trees and timber. However, a number of reports have appeared in the literature (Reichert & Avizohar 1939, Bagchee & Bakshi 1950, Lohway 1942, Urquart 1945) which suggest that Ganodermas are parasites. The most recent one (Nickell 1952) suggests that a species of *Ganoderma* was involved in the death of a large sassafras at the Brooklyn Botanic Garden.

During the 1956 growing season the author had occasion to examine more than three hundred dead or dying shade trees, principally Norway maples (*Acer platanoides*), planted along New York City streets. All these trees were alleged to have been killed or damaged by natural gas escaping from leaking mains.

During the late summer of 1957 he examined 40 additional shade trees, mostly Norway maples and red or swamp maples (*A. rubrum*), growing along the streets in Atlantic Highlands, New Jersey. All of these trees were also alleged to have been killed or damaged by escaping gas.

In the course of diagnosing for the cause of the trees' death, on nearly 20 per cent of the trees the author observed the typical fruiting bodies of *Ganoderma lucidum* emerging either from the trunk base of affected trees or from their roots.

The majority of the trees exhibiting this fungus had been dead anywhere from a few weeks to two years or more.

Ganoderma conks were observed, however, on a considerable number of trees which were still alive. In the New Jersey survey involving 40 trees,

Gas Emergencies

If you smell gas anywhere, including in your home, go outside and call 1-800-233-5325 or 911 immediately.

Do not assume that someone else has already reported the emergency. Help us keep your community safe! We consider all of the below a gas emergency:

- You smell gas or suspect a gas leak
- There is abnormal pressure (high/low flame) or no gas in all your gas appliances
- Gas to an appliance or heating unit stays on and cannot be shut off
- There is a continuous flow of water leaking from your gas heating unit or water heater
- Gas pipes are making unusual noises like roaring, hissing or whistling
- You notice dead vegetation that does not have a cause to be there

Report a Gas Emergency:

1-800-233-5325 or 911

Assistance is available 24 hours a day, every day.

Did You Know?

We add a sulfur-smelling chemical called mercaptan to our natural gas to help you recognize a leak immediately. Natural gas is naturally tasteless, colorless, and odorless.


NO
PARKING
ONE
WAY
DO NOT
ENTER

Conclusions

- Gas leaks: Safety, GHG, $, Trees, Air Q.

- Near-term Solution: Coordination/Infrastructure Ecology

Thanks

Adrian Down, Rob Jackson, Suchi Gopal, Shanna Cleveland, Audrey Schulman, Ania Camargo
Mothers out Front
350MA
Sierra Club
Home Energy Efficiency Team
Clean Water Action
Boston Climate Action Network
Barr Foundation
Conservation Law Foundation
NSF ULTRA-ex
NSF CHN
Picarro Inc.