

Environmental Impact Shale Gas

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Fracking Pond Fire – Hopewell Township, PA – reported by Post Gazette April 1, 2010

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Blowouts and Well Fires



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Faucets on Fire



Lets look at two issues:

1) Water well Contamination

2) Atmospheric Emissions



WHAT DO OPPONENTS SAY ABOUT CONTAMINATION OF GROUNDWATER?

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“Shale gas development clearly has the potential to contaminate surficial groundwater with methane, as shown by the large number of incidences of explosions and contaminated wells in Pennsylvania, Wyoming, and Ohio in recent years”

Robert Howarth, the David R. Atkinson Professor of Ecology & Environmental Biology at Cornell University, in a formal written submission to the EPA, 2010



“... shale gas development has clearly contaminated groundwater and drinking water wells with methane...”

Robert Howarth, the David R. Atkinson Professor of Ecology & Environmental Biology at Cornell University, in a formal written submission to the EPA, 2010



“there is considerable anecdotal evidence from the US that contamination of both ground and surface water has occurred in a range of cases”

Wood et al (2011) Tyndall Center at the University of Newcastle



WHAT DOES INDUSTRY SAY?

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“there have been over a million wells hydraulically fractured in the history of the industry.... not one reported case of a freshwater aquifer ever having been contaminated from hydraulic fracturing”

**Rex Tillerson Chairman of Exxon Mobil
Congressional Testimony, 2010**

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“the hydraulic fracturing process is safe, already well regulated by the various States” and that “the hysterical outcry over this process is completely unjustified”

Michael Economides, Professor of Chemical and Biomolecular Engineering, University of Houston, Congressional Testimony



Economides has also referred to arguments made by the environmentalists as “two huge lies” and another of their concerns as “preposterous”.

Michael Economides, Professor of Chemical and Biomolecular Engineering, University of Houston, Congressional Testimony



WHAT DO WE REALLY KNOW ABOUT GROUNDWATER CONTAMINATION ASSOCIATED WITH SHALE GAS EXPLOITATION?

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Groundwater saturated in Methane is in a significant number of water wells overlying the Marcellus Shale and the Barnett Shale

Gas accumulations coincident with Shale gas drilling led to an explosion in Dimock PA



**Occurrence of high methane in Dimock
water wells documented by PA DEP
(state regulators)**

**High methane later confirmed by Duke
study (Osborne et al. 2011)**



Widespread methane contamination of groundwater has been known above Marcellus and Barnett shales for decades prior to shale gas drilling

PA DEP has investigated ~ 70 “stray gas” incidents over last 20 years as well as a number of explosions, most not near shale gas wells.



CONCLUSIONS

Causation of groundwater contamination by shale gas activity has not been demonstrated

Focus on implausible water well contamination issues has diverted attention from other issues that may require attention.



WHAT ABOUT ATMOSPHERIC EMISSIONS?

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“widespread air pollution with compounds such as the carcinogen benzene is prevalent in both Texas and Pennsylvania”

Robert Howarth, the David R. Atkinson Professor of Ecology & Environmental Biology at Cornell University, Article in Yale-Environment-360



1200 HP Compressor

NO_x 16 T/Y, CO – 18 T/Y; VOCs – 3 T/Y; HAPs – 0.5 T/Y



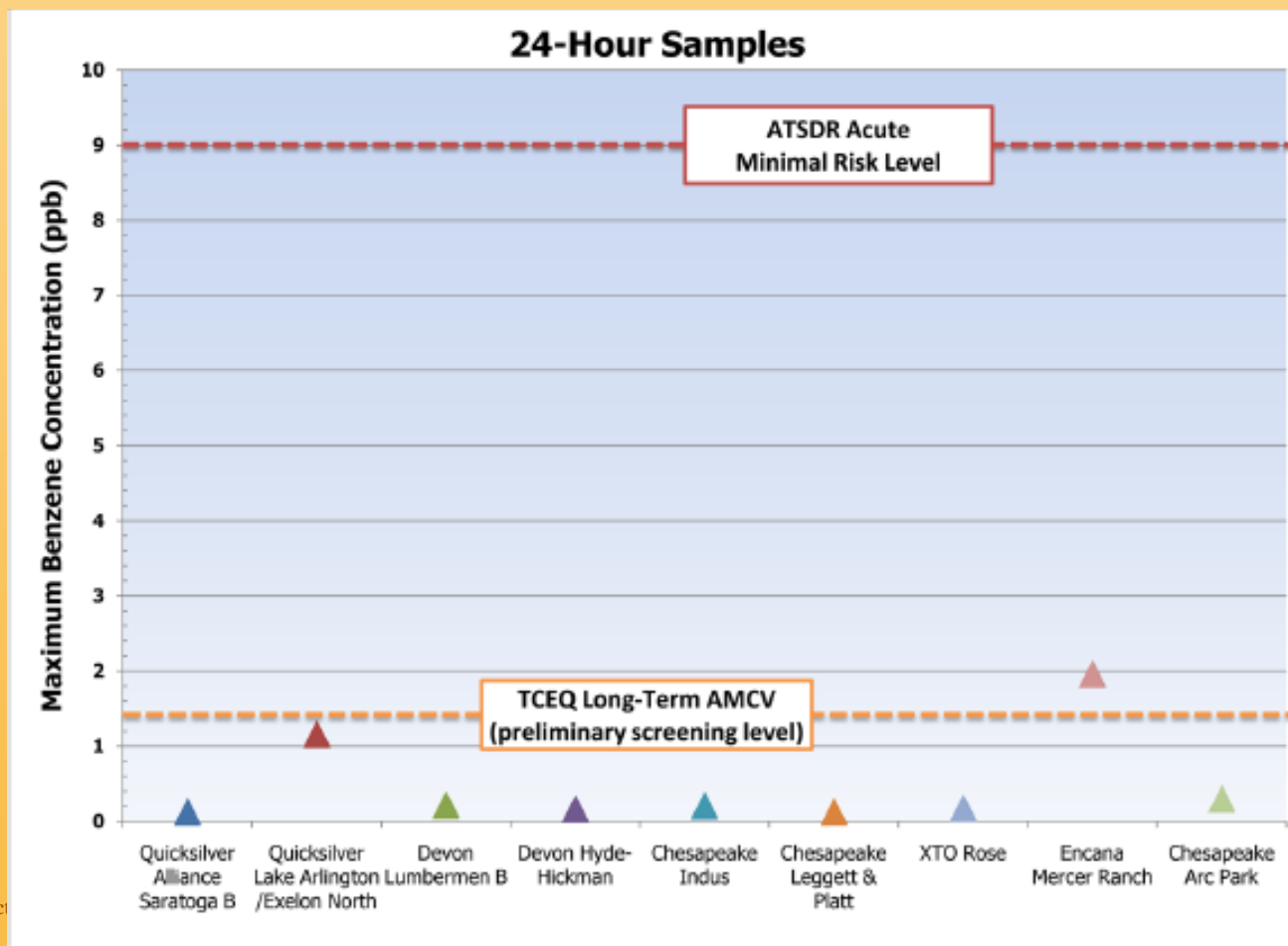
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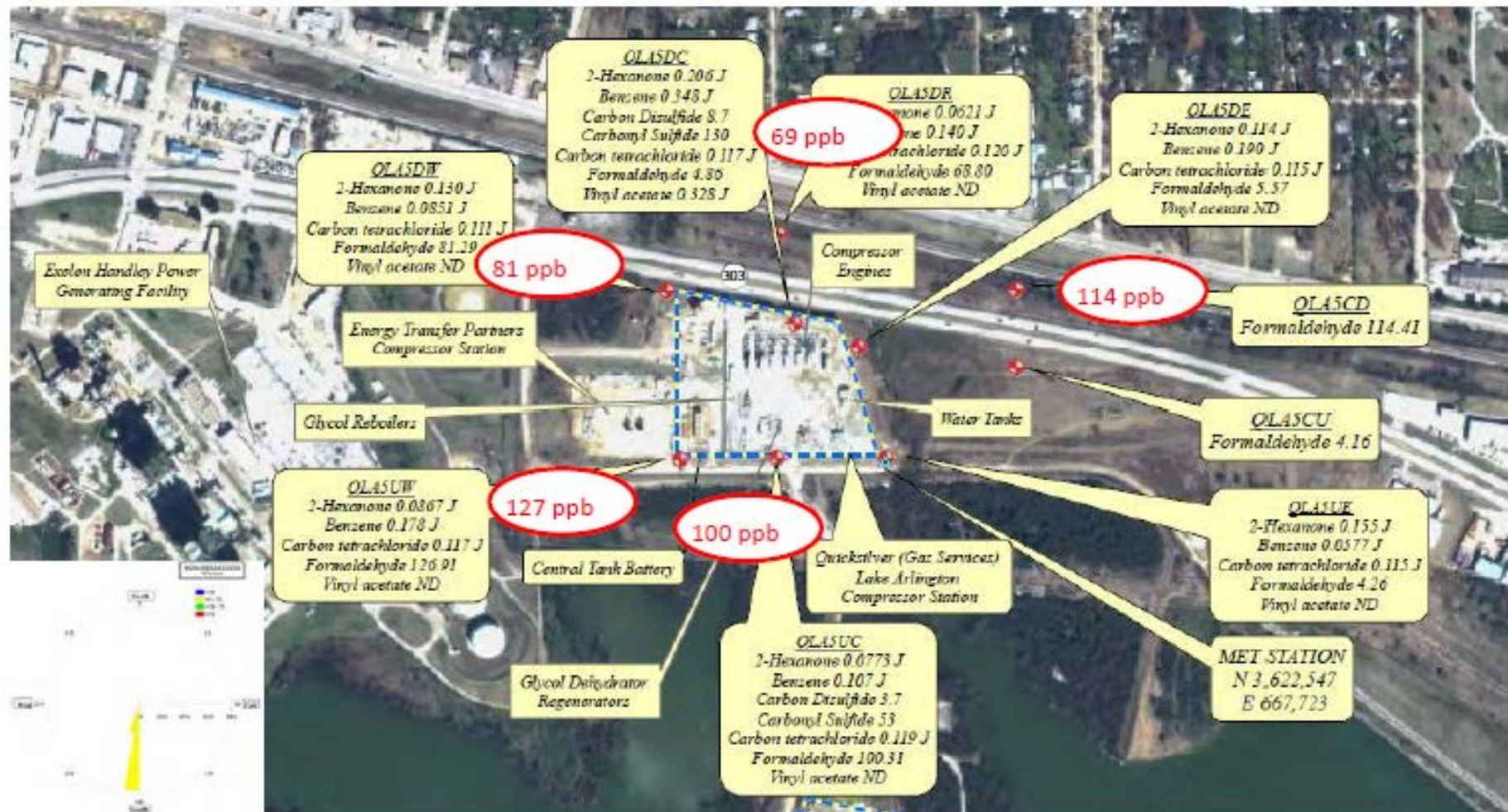
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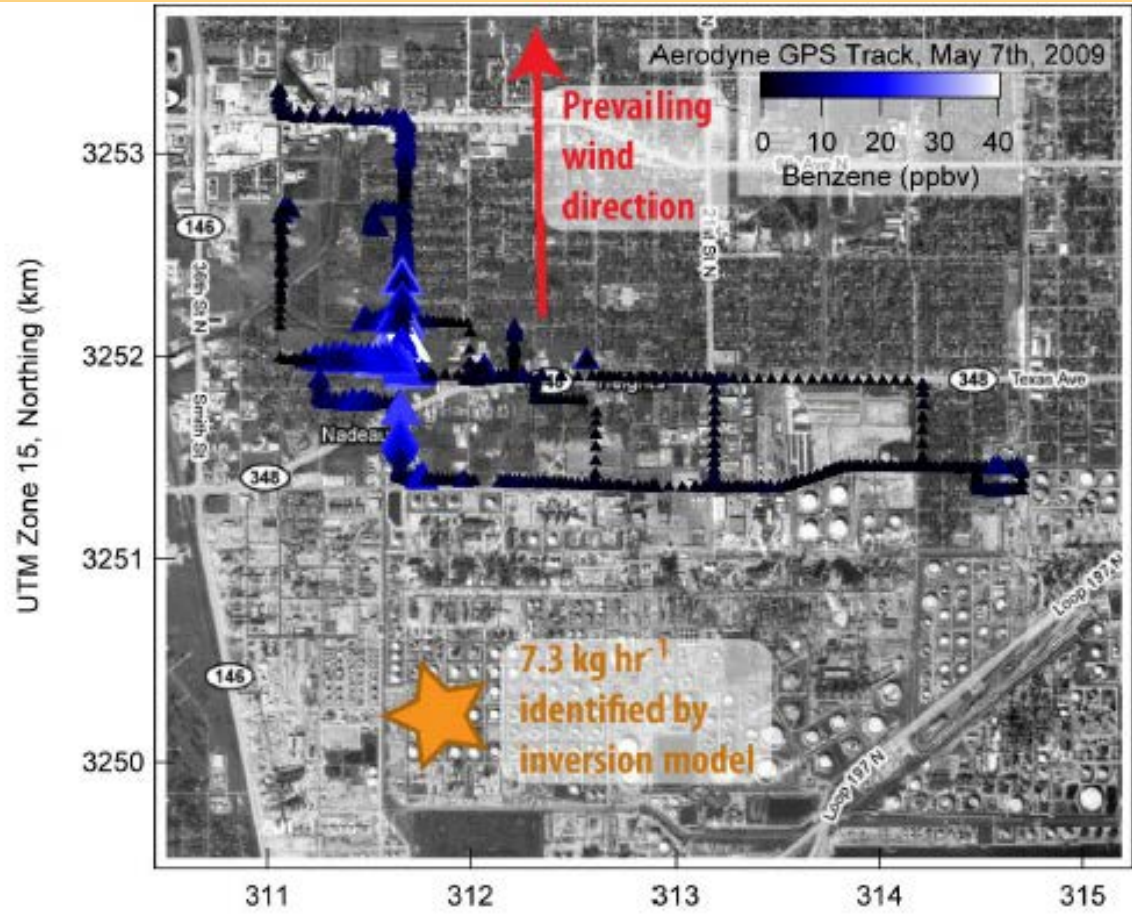
Titan Engineering Study Barnett Benzene Emissions Gas Processing Plants



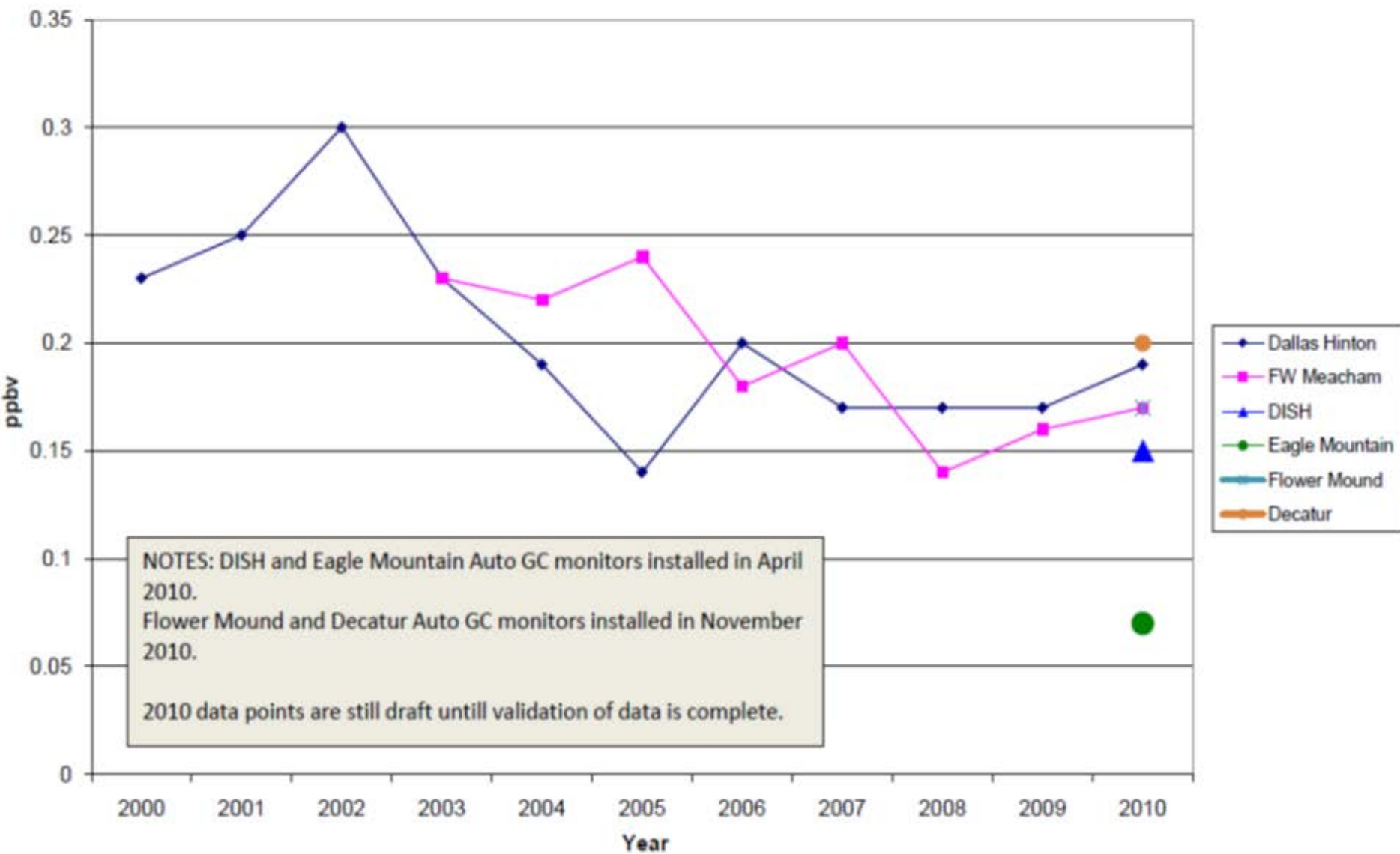
BSEEC (2010) Study by Titan Engineering Quicksilver Lake Arlington



Tracking Benzene Plumes



Auto GC Benzene Annual Averages part per billion - by volume (ppbv)



CONCLUSIONS

“Widespread” air pollution by benzene is not being caused by shale gas activity

Locally elevated emissions are a concern but can be remediated readily



“The fracking industry should prepare to **be blamed for a myriad of environmental problems** until scientists and geologist are better able to **define and evaluate the risk and/or extent of contamination caused by fracking fluids**”.

J. R. Gilbert, 2011 (Mo Law Review)



Thanks

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