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Addressing the Impacts of Oil & Gas Development on Texas Roads

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Members of the Committee, thank you for affording me the opportunity to (1) share analysis on how oil & gas activity is impacting state and county roads across Texas and (2) offer recommendations on how to improve road quality and safety in areas impacted by these activities. Sections **A, B**, and **C** of my testimony explain the sheer scale of freight movement volumes needed to support intensifying oil & gas development activity, and how this affects roads, particularly in the Permian Basin. Section **D** outlines six policy response options the Committee should consider.

A. Unconventional Oil & Gas Development is Dramatically More Transportation-Intensive than Prior Hydrocarbon Development Models

Unconventional oil & gas development is enormously material-intensive. Drilling a single horizontal long-lateral well can now require more than 500 tonnes of steel pipe, a string of sand-carrying railcars 14 football fields long, and enough water to fill more than 35 Olympic-size swimming pools.[2]

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[1] The opinions and assessments in this testimony are the author's alone and do not reflect the views or positions of the Baker Institute for Public Policy or Rice University.

[2] TMK Capital Markets Day Investor Presentation, TMK Group, 30 October 2017, https://www.tmk-group.com/media_en/texts/382/TMK_CMD_Presentation_30102017.pdf (Slide 45) (Oilfield tubular goods use per well); William Vantuono, "BNSF, Union Pacific move massive frac sand trains," Railway Age, 14 October 2015, https://www.railwayage.com/safety/bnsf-biggest-frac-sand-train-to-date/, Pete Cook, "Insights Into The Largest Frac Sand Unit Train On Record," Petroleum Connection, 1 December 2015, http://www.petroleumconnection.com/blog/insights-into-the-largest-frac-sand-unit-train-on-record, Gabriel Collins. "Oilfield Produced Water Ownership in Texas: Balancing Surface Owners' Rights and Mineral Owners' Commercial Objectives." (2017) https://www.bakerinstitute.org/media/files/files/23bd889f/CES-pub-ProdWaterTX-020817.pdf ; FracFocus data for SCREAMING EAGLE UNIT 3802H (COG Operating, LLC) and ROGERS 6 UNIT 4WA (Diamondback E&P, LLC), Olympic swimming pool volume assumed to be 2 million liters or approx.

Historically in the oilfield, materials intensity correlates strongly with trucking activity. Large tractor-trailers are a prime mover of pipe, sand, chemicals, and also water. Translated into truckloads, the well data shown above—which come from actual FracFocus disclosures by two large Permian-focused independent operators—present an impressive picture.

A well the size of the examples we cite above requires approximately 365 truckloads of sand to complete. The water volumes used in these large new frac completions (475,000 barrels) are equivalent to more than 3,600 truckloads.[3] The more than 1.5 million barrels of produced water that such a well could yield over its lifetime could require over 10,000 truckloads of hauling work.[4] And the crude oil a well produces—the main reason it was drilled—also often begins its journey to market in a truck. Tanker trucks hauling crude oil generally carry around 185 barrels per trip.[5] As such, a well that produces 500,000 barrels of crude over its lifetime could ultimately generate 2,700 truck trips just to move the oil.

In mass terms, the combined weight of the pipe goods, 90-plus railcars' worth of sand, two million barrels of total water, and half a million barrels of crude from ***a single*** long-lateral horizontal well exceeds that of the Empire State Building.[6] The cumulative physical effects of moving so much mass over a concentrated set of asphalt roads in 50,000 pound (or heavier) truckloads are, to say the least, destructive.

B. Higher Transportation Intensity Wears Out Roads—And Makes Them Dangerous

Heavy trucks both accelerate road wear and contribute to growing challenges with safety. Other factors are at play as well—such as driver fatigue and poor decisionmaking by oilfield workers seeking to get to the jobsite as quickly as possible using excessive speeds, unsafe passing, and

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530,000 gallons ("Units of Water," Coliban Water, https://www.coliban.com.au/site/root/about/media_and_public_affairs/education/documents/Unitsofwater_21February2012.pdf)

[3] Assuming 130 barrels of water per truckload. Trent Jacobs, "More Oil, More Water: How Produced Water Will Create Big Cost Problems for Shale Operators," JPT, 30 November 2016, https://www.spe.org/en/jpt/jpt-article-detail/?art=2503

[4] This assumes 500,000 barrels of oil produced, with a water-to-oil ratio of 3:1. In many cases, wells will ultimately produce more oil and at a higher water cut.

[5] David Sheppard and Bruce Nichols, "Insight: Oil convoy blues: trucking game foils crude traders," Reuters, 14 October 2011, https://www.reuters.com/article/us-cushing-trucks/insight-oil-convoy-blues-trucking-game-foils-crude-traders-idUSTRE79D0OP20111014

[6] "Empire State Building Fact Sheet," Empire State Realty Trust, https://www.esbnyc.com/sites/default/files/esb_fact_sheet_4_9_14_4.pdf (accessed 16 April 2018). The water mass calculation assumes 42 gallons per barrel and a mass of 9.0 lbs per gallon, since produced water is often much heavier than the standard 8.3 lbs per gallon owing to substantial quantities of dissolved minerals. See, for instance "For Weighting up Fresh Water or Field Salt Water," TexasBrine.com, http://www.texasbrine.com/tables/weightingUpBrine.html

the like. But crowding rural oilfield roads with large trucks complicates the environment and in many cases, magnifies the impact of other independently dangerous driving behaviors.

In the core counties of the Permian Basin, the road death rate in 2016 was nearly 20 per 100,000 persons.[7] This is approximately twice the average United States road fatality rate and actually worse than the estimated road traffic death rate in Russia during 2013, the latest year for which World Health Organization data are available for that country.[8] And statistically speaking, Russia is among the world's most dangerous industrialized countries to drive in.[9]

C. Oil & Gas-Producing Counties Are Often Undercompensated for Damage to Roads

Many of the counties such as Loving, Martin, Pecos, Reagan, Reeves, Ward, and Winkler that are at the epicenter of the unconventional drilling and production boom are also among the least populated in the state. Their historical political weight in the Legislature has thus generally disproportionately trailed that of Dallas, Houston, San Antonio, and other highly populous Texas metro areas when it comes to funding for roads and other infrastructure. As Howard County Judge Kathryn Wiseman recently told the Midland Reporter Telegram, between 2011 and 2013 roads in her county suffered an estimated $30 million in damage from oilfield traffic, but the county only received $3.8 million in repair funds from the state.[10]

Local representatives and residents will very likely view it as deeply unfair if the overall Texas economy reaps the gains fueled by hydrocarbons extracted in this handful of rural counties, but they are left with a legacy of potholed, damaged roads that they must either tolerate to their detriment or somehow find the funds to pay for.

D. Potential Policy Solutions

An increasing proportion of operators are obtaining their frac water via pipelines and are evacuating flowback and formation water and also moving crude oil directly from the wellhead by pipe. For instance, Laredo Petroleum has successively invested in crude oil and water pipeline

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[7] Core counties are: Andrews, Culberson, Ector, Howard, Loving, Martin, Midland, Pecos, Reagan, Reeves, Upton, Ward, and Winkler. Data from TX DOT show 86 crash fatalities in these counties during 2016 ("Fatal Crashes and Fatalities by County and Road Type," http://ftp.dot.state.tx.us/pub/txdot-info/trf/crash_statistics/2016/11.pdf). These counties population as of 1 July 2016 was estimated at a combined 440,194 persons (data from "Population Estimates of Texas Counties, 2010-2016: Arranged in Alphabetical Order," https://www.tsl.texas.gov/ref/abouttx/popcnty2010-11.html.)

[8] "Road Traffic Deaths: Data by Country," World Health Organization, http://apps.who.int/gho/data/node.main.A997

[9] For a brief anecdotal taste of the mayhem prevalent on Russian roads, see "Russian Car Crashes 2018 Compilation," YouTube, https://www.youtube.com/watch?v=iRDqXpetwR8 (accessed 16 April 2018).

[10] Alex Samuels, "Counties seek legislative fix to roads problem," Texas Tribune (via Midland Reporter Telegram), 14 April 2018, https://www.mrt.com/news/article/Counties-seek-legislative-fix-to-roads-problem-12830026.php?utm_campaign=email-desktop&utm_source=CMS%20Sharing%20Button&utm_medium=social

systems, and reports that in 2017, its pipelines transported 185,000 truckloads' worth of oil and water.[11] Moving more liquids into pipelines is a fundamentally economic decision, but its second-order positive impacts on road wear and safety are significant and will grow as more operators emphasize pipelines over trucking.

Greater use of pipelines for moving water and for gathering crude oil and delivering it to trunk pipeline injection points is a welcome development, but does not entirely mitigate the road damage and safety issues caused by heavy truck traffic. For frac sand, the "last mile" continues to occur in the back of a heavy truck. Thus, even as more operators put their oil and water on pipe, truck-related problems will continue to affect state and county roads in and near the oilfield.

There are a number of potential policy measures to help alleviate the pressure on roads in the Texas oilfield, as well as to reduce the disproportionate repair cost burden currently borne by local governments. Some of these options may have been considered in the past and deserve re-consideration now, or are being presently contemplated by the Committee. They are broadly intended to function in conjunction with each other, not as "single point solutions."

Option 1: Nickels for Safety—Raise Texas motor fuel excise taxes to $0.25 per gallon.

Texas motor fuel taxes have been held steady since 1991 at $0.20 per gallon.[12] Inflation has thus eroded the purchasing power of the tax revenues collected, while the state's population has grown by nearly 2/3 and its economy has quadrupled in size, with commensurate increases in demands on road infrastructure.[13] Raising taxes on gasoline and diesel by just a nickel per gallon would not burden consumers, and would boost funds for road repair by 25%. The Legislature would need to ensure that such funds are actually used to improve the state's roads, not to plug gaps elsewhere in the budget. Furthermore, the Legislature would need to earmark a portion of the funds for road repairs and improvements in the state's core oil & gas producing areas, whose hydrocarbon bounty has benefitted the entire Texas economy. The Texas Department of

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[11] "Corporate Presentation—April 2018," Laredo Petroleum, http://investor.laredopetro.com/phoenix.zhtml?c=244116&p=irol-IRHome

[12] John Heleman and Bruce Wright, "Texas' Motor Fuels Taxes," February 2016, Comptroller of Texas, https://comptroller.texas.gov/economy/fiscal-notes/2016/february/fuels.php

[13] Texas Population, 1991, Texas Department of State Health Services, https://www.dshs.texas.gov/chs/popdat/ST1991.shtm ; Texas Population, 2017 (Projections), Texas Department of State Health Services, https://www.dshs.texas.gov/chs/popdat/ST2017.shtm; "Regional Data," U.S. Bureau of Economic Analysis, https://www.bea.gov/iTable/iTable.cfm?reqid=70&step=10&isuri=1&7003=200&7035=-1&7004=sic&7005=1&7006=xx&7036=-1&7001=1200&7002=1&7090=70&7007=-1&7093=levels#reqid=70&step=10&isuri=1&7003=200&7004=sic&7035=-1&7005=1&7006=xx&7001=1200&7036=-1&7002=1&7090=70&7007=-1&7093=levels (Texas 1991 GDP), "Total Gross Domestic Product for Texas," Federal Reserve Bank of St. Louis, https://fred.stlouisfed.org/series/TXNGSP (Texas 2016 GDP data).

Transportation (TXDOT) is already investing in a set of projects aimed at several key road arteries in the Delaware Basin, including U.S. Highway 285, State Highway 302, and Ranch to Market Road 652.[14] Greater motor fuel tax revenues could support additional road investments in the Permian Basin, Eagle Ford, and other oil & gas producing regions.

Option 2: Impose a surtax on oil and gas production, with proceeds earmarked for road repairs and improvements.

Such a tax should be "sunsetted" and only exist for so long as oil & gas production exceeds certain baseline levels in the counties of interest. I suggest making the level of production in 2007—the nadir for crude oil output in Texas—the baseline. Once production declines back to or falls below that level, the surtaxes could be automatically rescinded by statute. Rates would be determined through political negotiation.

Option 3: Impose a "Truck Tax."

TXDOT could mandate that trucks operating in pre-defined "oilfield counties" install RFID or transponder tags similar to those used in the "EZ Pass"-type toll systems. Tag readers could then be placed at various points along state and county roads in the area. Funds collected would then be earmarked for road repair and improvement projects. This approach would also provide granular data on where the highest truck traffic activity is occurring in a county, which could in turn guide project planning and help prioritize the allocation of funds.

Option 4: Give production tax breaks to oil & gas operators who can demonstrate that they are moving 70% or more of their liquids and water by pipeline.

The rates would be open to negotiation, but the Legislature could consider a tiered structure in which companies moving between 70% and 79% of their liquids and water by pipeline get a certain discount, those moving 80% to 89% get a deeper discount, and those moving 90% or more get the largest potential discount. Companies would have to report on an annual calendar-year basis frac water use, crude oil and water production and data on how much of their own crude oil and water (all forms) they transported by pipeline during that tax year. As in the other cases, the tax would need to be time limited.

Option 5: Make investments in crude oil gathering systems that connect "directly to the wellhead or central battery" and water movement pipelines tax deductible.

The Legislature could make investments in crude oil and water pipelines that will reduce truck traffic deductible against state taxes on oil & gas production. The precise taxes and the degree of

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[14] "Delaware Basin Projects," Texas DOT, https://www.txdot.gov/inside-txdot/projects/studies/odessa/us-285.html

deductability would ultimately be the product of political negotiation. The effective severance tax rate for oil & gas production in Texas was reported to be 4.2% in Fiscal Year 2017, compared to 7.9% in New Mexico and 4.8% in Oklahoma. New Mexico is the most relevant jurisdiction that potentially competes for capital investment dollars with the Texas Permian Basin.[15] Accordingly, the current spread between effective tax take in Texas and New Mexico likely provides a solid proxy for how much maneuvering room the Legislature has to raise certain taxes to fund road repairs in oilfield areas without disadvantaging Texas as an investment destination, at least from a tax perspective.

Option 6: Encourage the General Land Office and other custodians of public lands in Texas to develop incentive structures that encourage oil & gas operators to maximize pipeline transportation of crude oil and water and minimize trucking.

The GLO manages a total of 13 million acres of state lands and mineral rights, a meaningful portion of which lies in active oil & gas producing areas. Ownership of such large surface and mineral tracts confers enormous leverage, should the GLO choose to "nudge" operators toward infrastructure solutions that minimize the use of heavy trucks in the oilfield. The November 2017 deal under which the GLO leased brackish water rights to Layne Water Midstream, LLC offers a powerful and recent precedent for how the agency can use the size and advantaged location of its landholdings to steer industry actions.[16]

Under the terms of this deal, Layne was granted the exclusive right to develop and produce brackish groundwater (total dissolved solids of 1,250 parts per million or higher) under 88,000 acres of GLO land in Reeves County. The lease offers the State substantial royalties from water sales, but crucially, also contains clauses that severely penalize Layne for the production of any groundwater with a TDS content less than 1,250 PPM.[17] Using this precedent, this author thinks it would be reasonable for future leases to oil & gas producers by the State of Texas to include conditions that reward movement of water and produced liquids by pipeline and penalize lessees for trucking commodities that could practicably be moved by pipeline.

This concludes my written testimony. I thank the Committee members for their time and attention and would be happy to provide additional information either in writing and/or via oral testimony, as the Committee prefers.

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[15] "Oklahoma Oil and Gas Industry Taxation: Comparative Effective Tax Rates in the Major Producing States," RegionTrack, 11 January 2018, https://www.regiontrack.com/www/wp-content/uploads/RegionTrack-OK-Oil-Gas-Taxation-20180121.pdf

[16] Groundwater lease between the State of Texas (through the GLO) and Layne Water Midstream, LLC, November 2017. Copy on file with author.

[17] Ibid.