Appendix G

A technical assessment of the forgone methane emissions reductions as a result of EPA's proposed reconsideration of the 2016 NSPS fugitive emissions requirements for oil and gas production sites

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Introduction

EPA's proposed reconsideration of the 2016 NSPS OOOOa fugitive emissions requirements for oil and gas production sites includes revising the leak detection and repair (LDAR) frequency for both low production and non-low production sites. The 2016 NSPS OOOOa requires semi-annual LDAR at all new, modified, or reconstructed sites. EPA's proposal would revise these requirements as follows: (i) annual LDAR for non-low production sites and (ii) biennial (once every other year) LDAR for low production sites. These changes to the LDAR frequencies are expected to yield substantial increases in CH_4 emissions over the next several years. By EPA's own analysis of the 2018 proposal (henceforth, "TSD"), the changes to the LDAR frequencies will increase CH_4 emissions from NSPS affected sources by 56,000 tons in 2025. However, as we describe in greater detail below, EPA's CH_4 emission factors for both the low and non-low production sites, which are based in part on data collected in the mid-1990s, underestimate site-level fugitive CH_4 emissions, often by more than a factor of two. We find that the forgone CH_4 emissions reductions (i.e., increase in CH_4 emissions as a result of the proposed changes in LDAR frequencies) are 3× higher than EPA's estimate in 2025. This substantial tonnage increase in CH_4 emissions from affected sources underscores the impact of less-frequent LDAR requirements, such as those proposed in the 2018 NSPS reconsideration for new, modified, and reconstructed oil and gas production sites.

Below, we describe the data sources and methods that support the above results.

Baseline activity data and projections to 2025

To determine the number of new sources subject to the proposed reconsideration, we used Drillinginfo data[1] to assess the number of new oil and gas production sites in 2014 (we started off with this year because it is the baseline year EPA used for its own analysis). Wells were considered newly drilled in 2014 if they reported their spud dates in 2014 or they reported blank spud dates and first production dates in 2015. For these new/modified wells, their monthly production from January 2014 through December 2015 were downloaded from Drillinginfo to allow for the estimation of the well's practical initial oil and gas production, using the second month of reported production (in 2014) as proxy for the first month of full production. This is equivalent to Drillinginfo's BOE_PRAC_IP feature, with the exception that the practical initial oil and gas production for modified wells are specific to the year in which modification took place (2014).

We used geospatial analysis with ArcGIS to determine the total number of sites in the baseline year. Data for wells with known location were aggregated into site-level information, assuming wells on a given site cluster within 50 m of each other. Thus, the site's total oil and gas production, total number of production days in 2014, and practical initial production were calculated. The practical initial production was used to determine if a well site was low-producing ($<$ 15 barrels of oil equivalent per day, boed) or non-low producing ($\geq$ 15 boed). Following the EPA definition, each category of site was further grouped into (i) gas well site (gas-to-oil (GOR) ratio of $>$ 100 Mcf/barrel), (ii) oil well site with associated gas production (0.3 Mcf/barrel $<$ GOR $<$ 100 Mcf/barrel), and (iii) oil well site (GOR $<$ 0.3 Mcf/barrel). Table 1 below shows the total number of new sources in 2014.

There were slight differences in the total number of sites compared with EPA's estimate for both low and non-low production sites (Table 1). EPA's methodology differs from our approach in that the new wells are first categorized as low production or non-low production wells based on Drillinginfo's BOE_PRAC_IP values, and then classified as oil, gas, or oil with associated gas based on its GOR. Then, the number of new wells in each category is divided by two (2) to

[1] Drillinginfo DI Desktop application (www.drillinginfo.com)

estimate the number of new well sites. Thus, EPA's estimate is based on the production characteristics of the well (as opposed to well site) and an assumption that each well site has two (2) wells per site. However, a low production well may be a part of a non-low production site if that well site has two or more wells such that their combined site-level production is >15 boed.

Nevertheless, our estimate of the total number of new sites in 2014 were comparable to EPA's estimates (17,048 new sites in 2014 versus 16,839 new sites for the EPA TSD, Table 1). We projected this baseline activity to 2025 using data from EIA's Annual Energy Outlook (2016 – 2018)[2] to estimate the number of new well sites drilled in 2015 through 2025. The annual percent increase (or decrease) in the number of new wells drilled was applied to activity data in 2014 to project to 2025. As Table 1 shows, the total number of new sources in 2015 to 2025 are comparable to EPA's estimate of affected sources in the TSD. We note, however, that for 2015, we used Drillinginfo data to assess the number of new sites that came online between September 2015 and December 2015, as the 2016 NSPS affected new sources starting in September 2015. As a result, our estimate of the total number of affected sites in 2015 (~5,000 sites) is smaller than EPA's estimate of 11,400 sites, which includes all new sites from January to December 2015.

Table 1. Comparison of baseline activity and emission factors for affected sources

	2014 # of sites		**Baseline activity: (2025)**		**Emission factors (tpy CH4)**	
	EDF analysis	TSD	EDF analysis	TSD	EDF analysis	TSD
non-low Prod: Gas	1,019	2,001	5,974	12,219	15.5	5.9
non-low Prod: Oil > 300 GOR	9,736	9,190	54,945	56,115	11.8	3.0
non-low Prod: Oil < 300 GOR	2,492	1,848	14,211	11,282	10.4	2.1
low Prod Sites: Gas	251	409	1,546	2,494	6.1	4.8
low Prod Sites: Oil > 300 GOR	1,309	1,222	7,471	7,462	4.7	2.6
low Prod Sites: Oil < 300 GOR	2,241	2,171	13,038	13,254	1.8[a]	1.8
Total	**17,048**	**16,839**	**97,185**	**102,826**	**---**	**---**

[2] U.S. Energy and Information Administration. Annual Energy Outlook. Available online at: https://www.eia.gov/outlooks/aeo/data/browser/#/?id=14-AEO2018&cases=ref2018&sourcekey=0

[a] Based on EPA's TSD estimate (see Main Text).

More broadly, while both EPA's and our approach yield similar activity data based on the 2014 information and EIA projections, we note that the relative proportion of the number of gas versus oil well sites drilled is highly sensitive to future resource prices. Accordingly, while 2014 activity data suggest far more oil wells will be drilled, the activity projection methodology, which considers only the total number of wells drilled, does not predict future development shifts related to gas versus oil well sites. Because site-level emissions are generally higher at gas producing sites (i.e, GOR > 0.3 Mcf/barrels) than at oil sites (Table 1), future variability in the proportion of the number of new gas sites versus oil sites—or, a divergence from such ratios in 2014—are expected to affect both the overall emissions reductions and the cost-effectiveness of the EPA's program. Preliminary data from Drillinginfo suggest that the proportion of the number of higher emitting gas producing sites versus oil sites have increased between 2014 and 2017 (Figure 1). We encourage the agency to, at a minimum, evaluate the most recent full year of data available to assess whether these activity mixes have changed.

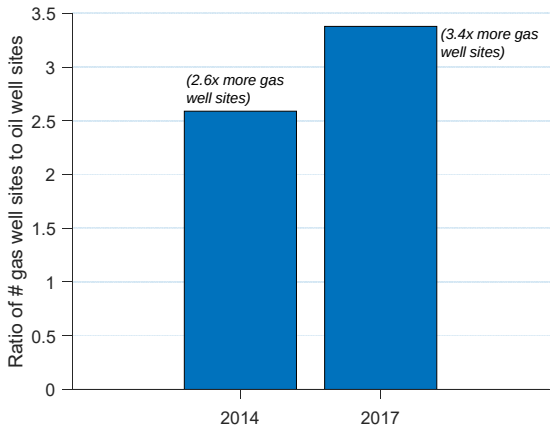

Figure 1. Ratio of the number of new gas producing well sites (i.e., sites with GOR > 0.3 Mcf/barrel) to the number of oil sites for the year 2014 and 2017. Drillinginfo data for 2017 was accessed December 2018, but may be incomplete for a few states. Well sites were grouped as low production or non-low production (oil, gas, and oil with associated gas) following the methodology described on Page 2.

Methane emission factors for low and non-low production sites

Our estimate of the site-level CH_4 emission factors for low production and non-low production sites is based on site-level measurement data from over 1,000 sites in eight U.S. basins. These

data were obtained in eight independent site-level CH_4 emissions measurement studies and are described in detail by Omara et al. (2018). Although each study reported site-level gas production, not all of the studies reported *both* oil and gas production for the sampled sites, which allow for the grouping of sampled sites as low production or non-low production. Table 2 below shows the average CH_4 emission for a subset of the sites (*n* = 497) for which both oil and gas production data were available, allowing us to isolate wells that fall into the six model facility types EPA has identified. The sites' oil and gas production are reported typically for the month in which measurement occurred. The measured CH_4 emissions in Table 2 are scaled by roughly 50% to estimate the portion of total site level emissions that are fugitives (additional details below). For these subset of sites, the empirical data indicates a wide range in fugitive CH_4 emissions at both low and non-low production sites, and shows the importance of high emitting sites (e.g., sites with higher than average to maximum CH_4) at both the low and non-low production subcategories.

Table 2: Average site-level CH_4 emission for a subset of measured sites that reported both oil and gas production data.[a]

	# of sampled sites	**Average (min – max) CH4 (tpy)**
non-low Prod: Gas	256	21.1 (~0 – 430)
non-low Prod: Oil >300 GOR	101	29.2 (~0 – 650)
non-low Prod: Oil <300 GOR	5	3.4 (0.4 – 9.8)
Low Prod Sites: Gas	58	6.8 (0.08 – 40)
Low Prod Sites: Oil >300 GOR	77	6.4 (0.09 – 35)
Low Prod Sites: Oil <300 GOR	0	N/A

[a] Operating time of 8,760 hours a year was assumed.

Data for the full population of sampled sites are plotted in Figure 2 below, highlighting the low production and non-low production sites. The figure shows a modest positive trend of absolute CH_4 emissions with site-level production rates, though this trend is more evident at the highest levels of production (for instance, there is little correlation at sites below 100 Mcfd production). However, there is a clear and significant declining trend of production-normalized CH_4 emissions (i.e., CH_4 emitted as a fraction of a site's CH_4 production) with site-level production rates. That is, on average, low production sites emit a far higher fraction of their CH_4 production

than non-low production sites (also see Table 3). We use this robust trend in production-normalized CH_4 emission rates, which vary over at least three orders of magnitude, to estimate the mean site-level CH_4 emissions for low and non-low production sites in the baseline year using a non-parametric bootstrap approach. That is, the fugitive CH_4 emission factors are developed based on site-level measurement data for 1,009 sites, applied to oil and gas production sites in 2014. A detailed description of the CH_4 extrapolation approach is provided by Omara et al. (2018) and is only briefly presented here.

Briefly, the 1,009 measured production-normalized CH_4 emissions data were grouped into ten bins based on the deciles of site-level gas production rates (Figure 2). Then, for each active U.S.

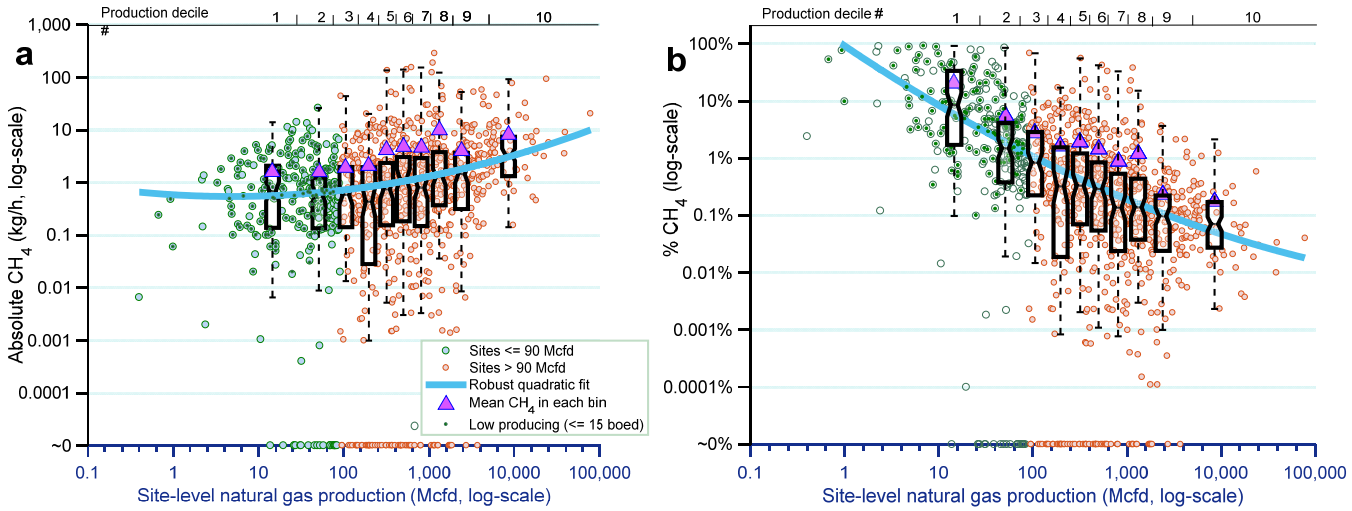

Figure 2. Scatter plots of site-level CH_4 measurements as functions of site-level natural gas production, adapted from Omara et al. (2018). The cyan line is a robust weighted least squares fit to the entire dataset performed in such a way that it downweights the contribution of extreme CH_4 outliers. The 1,009 measurements were grouped into 10 bins based on the deciles of gas production rates (numbered sequentially on the top). The data in each bin are then overlaid on the scatter plots as box and whisker plots, where the horizontal line in each box shows the median while the pink triangles show the mean CH_4 emission rate in each bin. Not all studies reported both oil and gas production. For sites with reported oil and gas production, low-production sites are identified with filled green dots. The site-level measurement data were obtained in the Barnett (Brantley et al. (2014), Lan et al. (2015), Rella et al. (2015), Yacovitch et al. (2015), ERG (2011)), Marcellus (Goetz et al. (2015), Omara et al. (2016, 2018)), Pinedale and Eagle Ford (Brantley et al. (2014)), Uinta (Robertson et al. (2017), Omara et al. (2018)), Fayetteville, Upper Green River, and Denver-Julesburg (Robertson et al. (2017)).

oil and gas production site with non-zero gas production rate in 2014, a production-normalized CH_4 emission rate was randomly sampled, with replacement, from the bin-specific empirical distribution and multiplied with its site-level CH_4 production rate. This was performed for all sites in each production bin and the results summed to give the total U.S. CH_4 emissions. This process was repeated 5,000 times and the mean obtained. The 2.5th and the 97.5th percentiles were then used to characterize the 95% confidence interval on the mean.

For purposes of developing emission factors, we considered sites that produced an average of $<$ 15 boed in all of 2014 to be low production and $\geq$ 15 boed to be non-low production. Then, based on the site's reported oil and gas production, mean CH_4 emission rates were calculated for each subcategory of low and non-low production sites in Table 1. Because site-level measurements include emissions from all sources (i.e., both vented and fugitive sources), we scaled the estimated emissions by ~50% based on an analysis of the fraction of fugitive emissions from 300 measured sites with fugitive emissions data in Fort Worth (ERG, City of Fort Worth Study)[3]. The distribution of the mean percent of fugitive CH_4 emissions relative to total site-level CH_4, developed using a non-parametric bootstrap resampling approach, is shown below and was similar for both the low production and the non-low production sites.

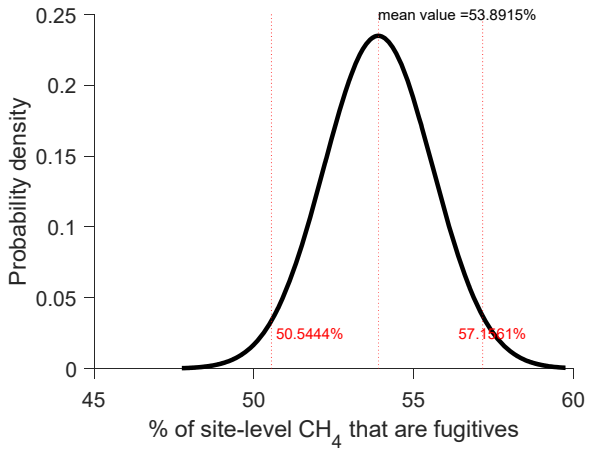

Figure 3. Distribution of the mean percent of site-level CH_4 emissions that are attributable to fugitive sources (e.g., valves, connectors, flanges, PRV, thief hatches on storage vessels, etc.)

[3] Natural Gas Air Quality Study, City of Fort Worth. Available online at: http://fortworthtexas.gov/gaswells/air-quality-study/final/

Our analysis indicated that the vast majority of the ~2,200 new low production oil sites with GOR < 0.3 Mcf/barrel (Table 1) also had zero gas production rates. For these oil-only sites, CH_4 emissions may occur as a result of dissolved gas in the hydrocarbon liquids which may get vented when brought to atmospheric pressure. Because we lacked specific measurement data for these oil-only sites (Table 2), and for the purposes of this analysis, we use, as a default, EPA's estimated emission factor for this subcategory of sites.

The modeled mean CH_4 emission factors are shown in Table 1 and in Table 3 below, with an overall uncertainty of +33%/-27%, representing the 95% confidence interval on the mean. Table 3 highlights the differences in the estimated mean production-normalized methane emissions at low production and non-low production sites, modeled for sites in the baseline year (2014).

Table 3. Differences in methane emissions at low production and non-low production sites (2014).

	Low Prod.	Non-low Prod.
Mean production-normalized methane emissions (%)	11%	0.94%

Overall, we find significant differences in the fugitive CH_4 emission factors as compared with the EPA's estimate, which are generally 2× to 5× lower than our estimate (Table 1). The discrepancies here are likely attributable to the influence of high emitting sources, which are likely not adequately accounted for in EPA's emission factors (Alvarez et al. (2018); Omara et al. (2018)). Our analysis indicates that the highest emitting low and non-low production sites emitted more than 23 tpy and 48 tpy CH_4, respectively, in 2014 (Figure 4). These sites account for 5% of the total number of sites but over 50% of cumulative CH_4 emissions. The high CH_4 emissions from such sites may be a result of abnormal process conditions (e.g., Zavala Araiza et al. (2017)) which may include equipment malfunctions and operator error and may be persistent or episodic but can be repaired through frequent leak inspection and repair programs. Additionally, EPA's model plant emission factors incorporate emissions from one storage vessel with one thief hatch and an estimated thief hatch CH_4 emission factor of 0.87 tpy, based on a minimum detection limit from a recent helicopter site survey study (Lyon et al. (2016)). Lyon et al. concluded that the fugitive emissions from storage vessels dominate site-

level emissions; thus, with the low emission factor for thief hatches and the exclusion of emissions from PRVs on storage vessels, the EPA's estimated CH_4 emission factor is likely a significant underestimate for these sources.

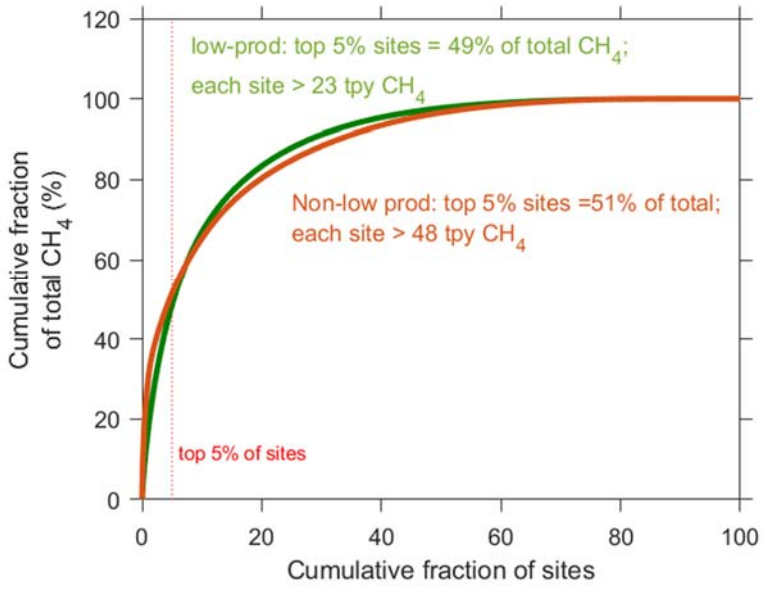

Figure 4. Distribution of site-level CH_4 emissions for low and non-low oil and gas production sites in 2014. The top 5% of sites in each group dominate total CH_4 emissions, accounting for ~50% of total CH_4 emissions.

Baseline methane emissions and forgone emission reductions

The baseline CH_4 emissions assume all affected sources (between 2015 and 2025) are complying with the 2016 NSPS OOOOa requirements for fugitive CH_4 emissions sources. That is, each new site, whether low production or not, is expected to undergo semi-annual LDAR, with emissions reduction efficiency of 60%. As Table 4 shows, our baseline CH_4 emissions estimate (383,000 tpy) is 3× higher than EPA's estimate, a result of a likely underestimate in EPA's CH_4 emission factors for non-low production sites, as previously discussed.

Other than updating emissions factors and activity counts, we otherwise used EPA's assumptions to calculate the impacts of the proposal (notwithstanding the fact that our separately-filed comments critique several of these assumptions). In particular, the EPA's proposed reconsideration of the 2016 NSPS includes reducing the LDAR frequency for low production sites from semi-annually to biennially, with an estimated reduction efficiency of

Table 4. Baseline fugitive CH_4 emissions and forgone emission reductions in 2025

	Baseline CH4 emissions (tons)		CH4 emissions from NSPS recon. (tons)		Forgone emission reductions in 2025 (tons)	
	EDF analysis	TSD	EDF analysis	TSD	EDF analysis	TSD
non-low Prod: Gas	37,046	26,687	51,443	N/A	14,398	43,708
non-low Prod: Oil > 300 GOR	259,664	67,612	374,794	N/A	115,130	
non-low Prod: Oil < 300 GOR	58,950	8,553	76,989	N/A	18,038	
low Prod Sites: Gas	3,780	4,599	6,115	N/A	2,335	12,242
low Prod Sites: Oil > 300 GOR	13,982	6,990	20,841	N/A	6,860	
low Prod Sites: Oil < 300 GOR	9,544	8,668	14,417	N/A	4,873	
Total	**382,965**	**123,109**	**544,599**	**179,059**	**161,634**	**55,950**

30%. For non-low production sites, EPA is proposing to reduce LDAR frequency from semi-annually to annually, with estimated reduction efficiency of 40%. Here, we use the same reduction efficiency of 30% and 40% for biennial and annual LDAR, respectively. For new sources in the Alaskan North Slope, we apply an LDAR frequency of 1× a year, as required based on EPA's amended standards for this region. For new sites in California, we apply the specific LDAR requirements for this state (quarterly monitoring using Method 21 (beginning in 2018)) with reduction efficacy of 60% between 2015 and 2017, 67% between 2018 and 2019, and 82% between 2020 and 2025). For affected sites in Colorado and Utah, we assume that the state-specific regulations achieve reductions that are equivalent to the 2016 NSPS OOOOa requirements, i.e., 60% for a semi-annual LDAR. For Ohio, we assume the sate-specific LDAR requirements for new unconventional well sites are equivalent to the 2016 NSPS requirements, with reduction efficiency of 60%. We assume new unconventional sites account for 80% of new sources and that the remaining sources are subject to the EPA's proposed requirements. For Pennsylvania, we apply 80% reduction for quarterly LDAR at new unconventional well sites, based on the state's General Permit requirements which went into effect in August 2018. The remaining affected sources in Pennsylvania and all other states are assumed to follow EPA's proposed reconsideration, i.e., 1× LDAR for non-low production sites and once every 2 years for low production sites, performed using OGI technologies (option 1a for non-low production sites and 1e for low production sites).

Our analysis indicates that the EPA's proposal will result in an increase of ~162,000 tons of CH_4 emissions in 2025, or a 42% increase from the baseline emissions (Table 4). The tonnage increase is 2.9× higher than EPA's estimate. On average, CH_4 emissions for low production sites increase by 52%, while emissions for non-low production sites increase by 41%.

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Appendix A – site-level methane emissions data for 1,009 sites in eight U.S. basins, as consolidated by Zavala-Araiza et al. (2015) for measurements by Rella et al. (2015), Yacovitch et al. (2015) and Lan et al. (2015) and as reported by Robertson et al. (2017), Omara et al. (2016), Omara et al. (2018), ERG (2011), Goetz et al. (2015), and Brantley et al. (2014). Additional data descriptions can be found in Omara et al. (2018). Operating hours of 8,760 hours a year was assumed.

Region/Study	Site-level NG Production (Mcfd)	Site-level methane emissions (tpy)	Mean Production-normalized Emissions (%)
Barnett - Rella et al	13.8	0.0	0.00
Barnett - Rella et al	19.6	0.0	0.00
Barnett - Rella et al	26.3	0.0	0.00
Barnett - Rella et al	26.4	0.0	0.00
Barnett - Rella et al	27.3	0.0	0.00
Barnett - Rella et al	31.0	0.0	0.00
Barnett - Rella et al	31.6	0.0	0.00
Barnett - Rella et al	38.7	0.0	0.00
Barnett - Rella et al	45.7	0.0	0.00
Barnett - Rella et al	49.1	0.0	0.00
Barnett - Rella et al	52.8	0.0	0.00
Barnett - Rella et al	57.9	0.0	0.00
Barnett - Rella et al	69.1	0.0	0.00
Barnett - Rella et al	69.2	0.0	0.00
Barnett - Rella et al	69.9	0.0	0.00
Barnett - Rella et al	77.2	0.0	0.00
Barnett - Rella et al	77.8	0.0	0.00
Barnett - Rella et al	78.5	0.0	0.00
Barnett - Rella et al	79.8	0.0	0.00
Barnett - Rella et al	80.9	0.0	0.00
Barnett - Rella et al	83.3	0.0	0.00
Barnett - Rella et al	95.7	0.0	0.00
Barnett - Rella et al	115.0	0.0	0.00
Barnett - Rella et al	142.0	0.0	0.00

Barnett - Rella et al	144.7	0.0	0.00
Barnett - Rella et al	148.1	0.0	0.00
Barnett - Rella et al	163.4	0.0	0.00
Barnett - Rella et al	165.3	0.0	0.00
Barnett - Rella et al	182.8	0.0	0.00
Barnett - Rella et al	186.7	0.0	0.00
Barnett - Rella et al	194.0	0.0	0.00
Barnett - Rella et al	197.3	0.0	0.00
Barnett - Rella et al	198.2	0.0	0.00
Barnett - Rella et al	202.4	0.0	0.00
Barnett - Rella et al	205.0	0.0	0.00
Barnett - Rella et al	215.7	0.0	0.00
Barnett - Rella et al	218.1	0.0	0.00
Barnett - Rella et al	234.9	0.0	0.00
Barnett - Rella et al	250.7	0.0	0.00
Barnett - Rella et al	267.0	0.0	0.00
Barnett - Rella et al	281.4	0.0	0.00
Barnett - Rella et al	313.3	0.0	0.00
Barnett - Rella et al	316.0	0.0	0.00
Barnett - Rella et al	343.8	0.0	0.00
Barnett - Rella et al	362.5	0.0	0.00
Barnett - Rella et al	366.6	0.0	0.00
Barnett - Rella et al	372.9	0.0	0.00
Barnett - Rella et al	399.2	0.0	0.00
Barnett - Rella et al	461.4	0.0	0.00
Barnett - Rella et al	467.7	0.0	0.00
Barnett - Rella et al	467.7	0.0	0.00
Barnett - Rella et al	493.9	0.0	0.00
Barnett - Rella et al	531.0	0.0	0.00
Barnett - Rella et al	552.8	0.0	0.00
Barnett - Rella et al	579.9	0.0	0.00
Barnett - Rella et al	607.9	0.0	0.00
Barnett - Rella et al	618.6	0.0	0.00
Barnett - Rella et al	681.4	0.0	0.00
Barnett - Rella et al	793.1	0.0	0.00
Barnett - Rella et al	802.2	0.0	0.00
Barnett - Rella et al	1130.7	0.0	0.00
Barnett - Rella et al	1150.8	0.0	0.00
Barnett - Rella et al	1262.6	0.0	0.00
Barnett - Rella et al	1283.0	0.0	0.00
Barnett - Rella et al	1715.0	0.0	0.00
Barnett - Rella et al	1743.0	0.0	0.00
Barnett - Rella et al	1775.0	0.0	0.00

Barnett - Rella et al	1811.0	0.0	0.00
Barnett - Rella et al	1857.0	0.0	0.00
Barnett - Rella et al	2737.0	0.0	0.00
Fayetteville - Robertson et al	74.0	0.0	0.00
Fayetteville - Robertson et al	95.8	0.0	0.00
Fayetteville - Robertson et al	120.4	0.0	0.00
Fayetteville - Robertson et al	126.6	0.0	0.00
Fayetteville - Robertson et al	139.1	0.0	0.00
Fayetteville - Robertson et al	440.6	0.0	0.00
Fayetteville - Robertson et al	475.0	0.0	0.00
Fayetteville - Robertson et al	591.6	0.0	0.00
Fayetteville - Robertson et al	1065.6	0.0	0.00
Fayetteville - Robertson et al	1174.0	0.0	0.00
Fayetteville - Robertson et al	3707.8	0.0	0.00
Barnett - ERG	32.0	0.0	0.00
Barnett - ERG	52.3	0.0	0.00
Barnett - ERG	172.2	0.0	0.00
Barnett - ERG	99.7	0.0	0.00
Barnett - ERG	10.6	0.0	0.01
Barnett - ERG	1784.1	0.0	0.00
Barnett - ERG	92.1	0.0	0.00
Barnett - ERG	363.4	0.0	0.00
Barnett - ERG	371.4	0.0	0.00
Barnett - ERG	1442.2	0.0	0.00
Barnett - ERG	2113.1	0.0	0.00
Barnett - ERG	415.1	0.0	0.00
Barnett - ERG	2.4	0.0	0.12
Barnett - ERG	157.0	0.0	0.00
Barnett - ERG	164.3	0.0	0.00
Barnett - ERG	1075.2	0.0	0.00
Barnett - ERG	404.0	0.0	0.00
Barnett - ERG	622.2	0.0	0.00
Barnett - ERG	1313.9	0.0	0.00
Fayetteville - Robertson et al	178.4	0.0	0.00
Barnett - ERG	370.9	0.0	0.00
Barnett - ERG	380.5	0.1	0.00
Barnett - ERG	2674.0	0.1	0.00
Barnett - ERG	0.4	0.1	2.40
Barnett - ERG	844.7	0.1	0.00
Barnett - ERG	1016.7	0.1	0.00
Barnett - ERG	446.7	0.1	0.00
Barnett - ERG	168.4	0.1	0.01
Barnett - ERG	239.4	0.1	0.00

Barnett - ERG	2095.8	0.1	0.00
Barnett - ERG	67.4	0.1	0.02
Barnett - ERG	1426.9	0.1	0.00
Barnett - Lan et al	218.0	0.1	0.01
Barnett - ERG	657.4	0.1	0.00
Barnett - ERG	625.5	0.1	0.00
Barnett - ERG	708.0	0.1	0.00
Fayetteville - Robertson et al	2092.2	0.1	0.00
Barnett - ERG	342.0	0.1	0.01
Barnett - ERG	985.2	0.1	0.00
Barnett - ERG	132.8	0.1	0.01
Barnett - ERG	918.0	0.1	0.00
Fayetteville - Robertson et al	394.7	0.1	0.01
Barnett - ERG	171.2	0.1	0.01
Barnett - ERG	771.6	0.2	0.00
Fayetteville - Robertson et al	25.0	0.2	0.10
Barnett - ERG	586.6	0.2	0.00
Barnett - ERG	1011.4	0.2	0.00
Marcellus - SWPA - Omara et al	8.7	0.2	0.34
Barnett - ERG	90.8	0.2	0.03
Barnett - ERG	112.9	0.2	0.03
Barnett - ERG	952.1	0.2	0.00
Barnett - ERG	173.1	0.2	0.02
Barnett - ERG	175.2	0.2	0.02
Barnett - ERG	312.9	0.2	0.01
Barnett - ERG	1826.5	0.2	0.00
Barnett - Rella et al	16.0	0.2	0.26
Barnett - ERG	2576.5	0.2	0.00
Barnett - ERG	254.2	0.2	0.02
Barnett - ERG	237.9	0.2	0.02
Barnett - ERG	436.2	0.3	0.01
Barnett - ERG	715.4	0.3	0.01
Fayetteville - Robertson et al	40.0	0.3	0.13
Barnett - ERG	615.5	0.3	0.01
Fayetteville - Robertson et al	1547.6	0.3	0.00
Barnett - ERG	340.1	0.3	0.02
Fayetteville - Robertson et al	455.6	0.3	0.01
Fayetteville - Robertson et al	2123.2	0.3	0.00
Fayetteville - Robertson et al	3050.9	0.3	0.00
Barnett - Rella et al	31.0	0.4	0.26
Barnett - Rella et al	110.0	0.4	0.05
Barnett - Rella et al	9.2	0.4	0.62
Barnett - ERG	2347.0	0.4	0.00

Barnett - ERG	340.8	0.4	0.02
Barnett - ERG	1042.9	0.4	0.01
DJB - Brantley et al	16.0	0.4	0.48
Barnett - Rella et al	370.0	0.4	0.02
Barnett - Rella et al	250.0	0.4	0.03
Fayetteville - Robertson et al	123.1	0.4	0.04
Barnett - Rella et al	220.0	0.4	0.03
Barnett - ERG	620.3	0.5	0.01
DJB - Robertson et al	39.4	0.5	0.22
DJB - Brantley et al	16.1	0.5	0.57
DJB - Brantley et al	41.5	0.5	0.23
Barnett - Lan et al	256.0	0.5	0.04
DJB - Omara et al	1.0	0.5	9.73
Marcellus - SWPA - Omara et al	13.8	0.5	0.60
Barnett - ERG	690.4	0.5	0.01
Barnett - ERG	1444.3	0.6	0.01
Barnett - ERG	1020.8	0.6	0.01
Barnett - ERG	73.3	0.6	0.13
DJB - Brantley et al	16.1	0.7	0.75
Barnett - ERG	110.1	0.8	0.12
Barnett - Rella et al	300.0	0.8	0.05
DJB - Brantley et al	188.5	0.8	0.08
Fayetteville - Robertson et al	46.3	0.8	0.26
Fayetteville - Robertson et al	879.9	0.8	0.01
Uintah - Robertson et al	9.8	0.8	1.31
Barnett - Rella et al	410.0	0.8	0.03
Barnett - ERG	1725.9	0.8	0.01
DJB - Robertson et al	5.0	0.9	3.13
DJB - Robertson et al	13.2	0.9	1.19
Barnett - ERG	2707.2	0.9	0.01
DJB - Brantley et al	40.6	0.9	0.39
Fayetteville - Robertson et al	689.1	0.9	0.02
Barnett - Rella et al	200.0	0.9	0.07
Barnett - ERG	1244.2	0.9	0.01
DJB - Brantley et al	9.4	0.9	1.77
DJB - Brantley et al	12.3	0.9	1.37
Barnett - Rella et al	350.0	0.9	0.04
DJB - Brantley et al	45.9	1.0	0.38
Barnett - Rella et al	330.0	1.0	0.04
Barnett - Rella et al	72.0	1.0	0.21
DJB - Omara et al	14.4	1.0	1.24
Barnett - ERG	188.0	1.0	0.09
Barnett - Rella et al	590.0	1.0	0.03

Fayetteville - Robertson et al	662.9	1.0	0.02
Barnett - ERG	950.0	1.0	0.02
Marcellus - NEPA - Omara et al	1393.0	1.1	0.01
Barnett - ERG	738.1	1.1	0.02
Barnett - Brantley et al	84.9	1.1	0.22
Barnett - ERG	1135.9	1.1	0.02
Barnett - ERG	1590.0	1.1	0.01
Barnett - Rella et al	54.0	1.1	0.31
Barnett - ERG	467.5	1.1	0.04
DJB - Brantley et al	56.7	1.1	0.36
Barnett - Brantley et al	87.6	1.1	0.23
Barnett - ERG	1338.5	1.1	0.01
Barnett - Rella et al	330.0	1.1	0.05
Pinedale - Brantley et al	13.7	1.1	1.54
Upper Green River - Robertson et al	34.7	1.2	0.53
DJB - Brantley et al	8.3	1.2	2.61
Barnett - ERG	240.9	1.2	0.08
Barnett - Rella et al	62.0	1.2	0.29
Barnett - Rella et al	53.0	1.2	0.34
Barnett - Rella et al	540.0	1.2	0.04
Marcellus - SWPA - Omara et al	6.1	1.2	3.43
Barnett - ERG	306.6	1.2	0.07
Pinedale - Brantley et al	3841.5	1.2	0.01
Barnett - Brantley et al	329.3	1.2	0.07
DJB - Robertson et al	29.4	1.3	0.78
Fayetteville - Robertson et al	2611.7	1.3	0.01
Uintah - Robertson et al	2.2	1.3	8.89
Upper Green River - Robertson et al	75.4	1.3	0.27
Barnett - Rella et al	250.0	1.3	0.08
Barnett - Rella et al	220.0	1.3	0.11
DJB - Brantley et al	7.5	1.3	3.29
DJB - Brantley et al	169.9	1.3	0.14
Barnett - ERG	1142.0	1.3	0.02
Barnett - Rella et al	180.0	1.3	0.12
Barnett - Rella et al	1800.0	1.3	0.01
Barnett - ERG	321.2	1.4	0.07
Barnett - ERG	9676.0	1.4	0.00
Upper Green River - Robertson et al	276.9	1.4	0.08
Barnett - ERG	317.9	1.4	0.07
Pinedale - Brantley et al	1739.4	1.4	0.01
Barnett - ERG	994.4	1.4	0.02
DJB - Brantley et al	5.8	1.4	4.44
Barnett - Rella et al	310.0	1.4	0.07

DJB - Brantley et al	30.4	1.4	0.86
Barnett - ERG	4373.1	1.4	0.01
Fayetteville - Robertson et al	522.9	1.5	0.04
Barnett - Rella et al	140.0	1.5	0.16
Barnett - ERG	1116.9	1.5	0.02
DJB - Brantley et al	10.6	1.5	2.68
Barnett - Rella et al	99.0	1.6	0.24
Uintah - Omara et al	3577.0	1.6	0.01
DJB - Brantley et al	126.6	1.6	0.23
Barnett - Brantley et al	85.1	1.6	0.33
Barnett - ERG	241.1	1.6	0.11
Barnett - ERG	463.1	1.7	0.06
Barnett - Rella et al	160.0	1.7	0.16
Barnett - Rella et al	150.0	1.7	0.20
Pinedale - Brantley et al	25.3	1.7	1.26
Barnett - Rella et al	2900.0	1.7	0.01
DJB - Robertson et al	51.4	1.8	0.65
Fayetteville - Robertson et al	265.1	1.8	0.10
Barnett - Rella et al	73.0	1.8	0.37
Marcellus - SWPA - Omara et al	21.3	1.8	1.48
DJB - Brantley et al	127.7	1.9	0.27
Pinedale - Brantley et al	763.2	1.9	0.04
Pinedale - Brantley et al	64.5	1.9	0.53
DJB - Brantley et al	68.5	1.9	0.51
Barnett - ERG	130.6	1.9	0.24
DJB - Brantley et al	102.5	1.9	0.34
Barnett - Rella et al	280.0	1.9	0.10
Barnett - Rella et al	7.9	2.0	4.35
DJB - Brantley et al	78.6	2.0	0.46
Barnett - Brantley et al	478.3	2.0	0.07
DJB - Brantley et al	38.0	2.0	0.97
Fayetteville - Robertson et al	817.4	2.0	0.04
DJB - Robertson et al	45.9	2.0	0.82
Barnett - ERG	471.5	2.1	0.07
Barnett - ERG	3140.5	2.1	0.01
Marcellus - SWPA - Omara et al	0.7	2.1	52.70
Barnett - Brantley et al	123.1	2.1	0.31
Pinedale - Brantley et al	220.4	2.1	0.18
DJB - Brantley et al	44.0	2.2	0.90
Uintah - Robertson et al	155.4	2.2	0.22
DJB - Brantley et al	4.9	2.2	8.19
Marcellus - SWPA - Omara et al	11.4	2.2	3.35
Barnett - Rella et al	83.0	2.2	0.40

Barnett - ERG	531.7	2.2	0.07
Barnett - ERG	707.0	2.2	0.05
Fayetteville - Robertson et al	939.8	2.3	0.04
Barnett - ERG	1887.7	2.3	0.02
Barnett - Lan et al	59.0	2.4	0.62
Barnett - ERG	1309.0	2.4	0.03
Barnett - ERG	310.1	2.4	0.13
Pinedale - Brantley et al	1837.5	2.5	0.02
Barnett - Rella et al	150.0	2.5	0.25
DJB - Brantley et al	30.6	2.5	1.49
DJB - Brantley et al	80.0	2.5	0.57
Barnett - Rella et al	19.0	2.5	1.99
Uintah - Omara et al	50.0	2.5	0.83
DJB - Brantley et al	33.3	2.5	1.41
Barnett - ERG	413.1	2.5	0.10
Barnett - Rella et al	550.0	2.5	0.08
Barnett - ERG	1882.0	2.6	0.02
Pinedale - Brantley et al	1245.0	2.6	0.04
Fayetteville - Robertson et al	157.0	2.6	0.24
Fayetteville - Robertson et al	1189.1	2.6	0.03
Uintah - Robertson et al	281.0	2.6	0.15
Barnett - Rella et al	920.0	2.6	0.04
Upper Green River - Robertson et al	735.1	2.6	0.06
Barnett - Rella et al	730.0	2.7	0.06
Barnett - Lan et al	65.0	2.7	0.73
Fayetteville - Robertson et al	1320.5	2.7	0.03
DJB - Brantley et al	76.2	2.7	0.66
Barnett - ERG	822.4	2.7	0.06
DJB - Brantley et al	57.0	2.8	0.91
Barnett - Brantley et al	178.5	2.8	0.28
Pinedale - Brantley et al	3155.2	2.8	0.02
Fayetteville - Robertson et al	450.8	2.9	0.09
Fayetteville - Robertson et al	1473.4	2.9	0.03
Barnett - ERG	732.2	2.9	0.07
Barnett - Rella et al	230.0	3.0	0.19
Barnett - Rella et al	210.0	3.0	0.26
Barnett - ERG	54.0	3.0	0.93
Barnett - ERG	126.4	3.0	0.40
DJB - Robertson et al	70.6	3.1	0.80
DJB - Omara et al	533.0	3.1	0.11
Marcellus - SWPA - Omara et al	4.8	3.1	10.94
Barnett - ERG	673.8	3.1	0.08
DJB - Brantley et al	8.6	3.1	6.61

Upper Green River - Robertson et al	150.8	3.1	0.32
Barnett - ERG	251.8	3.1	0.21
DJB - Brantley et al	84.9	3.1	0.68
Barnett - Rella et al	300.0	3.2	0.16
Barnett - ERG	775.9	3.4	0.07
DJB - Brantley et al	43.1	3.4	1.43
Barnett - Rella et al	230.0	3.4	0.26
Barnett - ERG	1502.0	3.4	0.04
Uintah - Robertson et al	102.2	3.5	0.54
Barnett - Rella et al	77.0	3.5	0.79
DJB - Brantley et al	131.3	3.5	0.49
Barnett - ERG	739.8	3.5	0.08
Uintah - Robertson et al	181.7	3.5	0.31
Barnett - Brantley et al	348.9	3.6	0.18
Barnett - Rella et al	370.0	3.6	0.15
Barnett - Brantley et al	340.6	3.6	0.19
Barnett - ERG	590.3	3.6	0.10
Barnett - Rella et al	130.0	3.6	0.43
DJB - Brantley et al	25.3	3.7	2.71
Barnett - Rella et al	260.0	3.8	0.22
Barnett - ERG	175.0	3.8	0.36
Barnett - ERG	1251.8	3.8	0.05
Barnett - Rella et al	180.0	3.8	0.36
Barnett - Rella et al	440.0	3.9	0.14
Uintah - Robertson et al	46.5	3.9	1.32
Upper Green River - Robertson et al	54.9	3.9	1.09
Pinedale - Brantley et al	320.4	3.9	0.22
Barnett - Rella et al	63.0	3.9	1.08
Barnett - ERG	1744.3	3.9	0.04
Barnett - ERG	81.7	4.0	0.81
Barnett - ERG	215.1	4.0	0.31
Barnett - ERG	17926.4	4.0	0.00
Fayetteville - Robertson et al	262.0	4.0	0.17
Barnett - Rella et al	86.0	4.0	0.72
Barnett - Rella et al	270.0	4.0	0.23
Eagle Ford - Brantley et al	2000.6	4.0	0.03
Barnett - Rella et al	100.0	4.1	0.61
Pinedale - Brantley et al	3704.6	4.1	0.02
Upper Green River - Robertson et al	1925.0	4.2	0.03
Barnett - ERG	542.1	4.2	0.13
Marcellus - SWPA - Omara et al	0.9	4.2	76.06
Barnett - Brantley et al	15.4	4.3	4.92
Barnett - ERG	1022.2	4.3	0.07

Barnett - ERG	2067.5	4.3	0.03
Barnett - Rella et al	310.0	4.3	0.21
Pinedale - Brantley et al	4.6	4.3	17.33
Barnett - ERG	688.7	4.3	0.10
Pinedale - Brantley et al	1119.5	4.4	0.07
DJB - Brantley et al	14.9	4.4	5.46
Upper Green River - Robertson et al	70.7	4.5	0.99
Uintah - Robertson et al	48.7	4.6	1.49
Uintah - Robertson et al	202.9	4.6	0.36
Barnett - ERG	86.3	4.6	0.88
Upper Green River - Robertson et al	456.3	4.6	0.16
Pinedale - Brantley et al	277.4	4.6	0.31
Marcellus - NEPA - Omara et al	16519.0	4.6	0.00
Barnett - ERG	1092.3	4.7	0.07
DJB - Brantley et al	1831.4	4.7	0.05
DJB - Brantley et al	403.5	4.7	0.22
Upper Green River - Robertson et al	87.6	4.8	0.85
Barnett - ERG	151.0	4.8	0.53
Barnett - Rella et al	53.0	4.8	1.36
Barnett - ERG	725.3	4.8	0.11
Barnett - ERG	335.2	4.8	0.24
Barnett - Lan et al	954.0	4.8	0.09
Uintah - Omara et al	6.7	4.8	11.70
Upper Green River - Robertson et al	179.4	4.8	0.42
DJB - Brantley et al	73.5	4.8	1.21
DJB - Brantley et al	43.7	4.8	2.03
Barnett - ERG	231.6	4.9	0.35
DJB - Brantley et al	26.6	4.9	3.42
Fayetteville - Robertson et al	728.5	5.0	0.10
Barnett - ERG	177.8	5.0	0.47
Barnett - ERG	2207.7	5.0	0.04
DJB - Brantley et al	18.9	5.0	4.86
DJB - Brantley et al	47.8	5.0	1.93
Fayetteville - Robertson et al	2444.9	5.1	0.03
Barnett - ERG	1384.8	5.1	0.06
Upper Green River - Robertson et al	126.3	5.1	0.63
Barnett - ERG	4260.0	5.2	0.02
Barnett - Rella et al	210.0	5.3	0.38
DJB - Brantley et al	33.7	5.3	2.90
Barnett - ERG	3631.2	5.3	0.02
Barnett - Rella et al	590.0	5.3	0.16
Barnett - ERG	66.1	5.3	1.34
Barnett - ERG	180.1	5.3	0.49

Barnett - ERG	1243.8	5.4	0.07
Barnett - Rella et al	330.0	5.4	0.25
Upper Green River - Robertson et al	70.0	5.4	1.19
Barnett - ERG	873.9	5.4	0.10
Upper Green River - Robertson et al	1542.7	5.5	0.06
Barnett - Rella et al	1000.0	5.5	0.08
Barnett - Rella et al	100.0	5.5	0.83
Barnett - Rella et al	130.0	5.5	0.74
Upper Green River - Robertson et al	59.6	5.6	1.45
Pinedale - Brantley et al	7617.3	5.6	0.01
DJB - Brantley et al	40.6	5.6	2.53
DJB - Brantley et al	128.9	5.7	0.81
Barnett - ERG	355.0	5.7	0.27
Pinedale - Brantley et al	530.8	5.7	0.20
DJB - Brantley et al	38.5	5.8	2.75
Barnett - Rella et al	600.0	5.8	0.17
Marcellus - NEPA - Omara et al	3690.0	5.8	0.02
Barnett - ERG	317.0	5.8	0.30
Uintah - Robertson et al	76.1	5.8	1.21
Barnett - Brantley et al	322.9	5.8	0.32
DJB - Robertson et al	65.5	5.8	1.64
Barnett - ERG	519.7	5.9	0.19
Fayetteville - Robertson et al	4353.2	5.9	0.02
Barnett - ERG	616.2	5.9	0.16
Barnett - Lan et al	4.5	6.0	20.40
Barnett - ERG	9914.0	6.0	0.01
Barnett - Brantley et al	56.5	6.0	1.89
Marcellus - SWPA - Omara et al	11.1	6.0	9.34
Barnett - Rella et al	760.0	6.1	0.12
Barnett - ERG	305.4	6.1	0.33
Upper Green River - Robertson et al	747.2	6.1	0.13
Barnett - ERG	2113.1	6.1	0.05
Uintah - Robertson et al	63.5	6.1	1.54
Pinedale - Brantley et al	172.9	6.3	0.67
Barnett - ERG	2745.5	6.3	0.04
Barnett - ERG	795.3	6.4	0.13
DJB - Brantley et al	31.4	6.4	3.74
Barnett - ERG	1357.5	6.4	0.08
DJB - Brantley et al	331.7	6.4	0.35
Barnett - ERG	3892.0	6.5	0.03
Barnett - Brantley et al	327.2	6.5	0.35
DJB - Brantley et al	374.3	6.5	0.32
Pinedale - Brantley et al	19.8	6.5	6.07

Barnett - ERG	4.4	6.6	24.79
Barnett - ERG	362.0	6.6	0.30
DJB - Brantley et al	56.2	6.6	2.16
Barnett - ERG	499.5	6.6	0.22
Uintah - Robertson et al	40.0	6.7	2.63
Barnett - Lan et al	42.9	6.7	2.33
DJB - Brantley et al	473.7	6.7	0.26
Uintah - Robertson et al	124.9	6.7	0.85
Barnett - ERG	667.6	6.7	0.17
Upper Green River - Robertson et al	3394.0	6.8	0.03
DJB - Robertson et al	140.2	6.8	0.90
Barnett - Brantley et al	626.6	6.9	0.20
Barnett - Brantley et al	386.9	7.0	0.32
Barnett - Brantley et al	112.7	7.0	1.10
Uintah - Omara et al	12.0	7.0	9.52
Barnett - ERG	1626.4	7.0	0.07
Barnett - Rella et al	960.0	7.0	0.11
Barnett - Brantley et al	14.8	7.1	8.48
Marcellus - SWPA - Omara et al	8.3	7.1	14.63
Marcellus - SWPA - Omara et al	19.1	7.1	6.35
Pinedale - Brantley et al	1463.1	7.1	0.09
Barnett - ERG	878.0	7.2	0.14
Pinedale - Brantley et al	71.2	7.2	1.87
Barnett - Brantley et al	134.0	7.3	0.97
Barnett - Rella et al	190.0	7.3	0.59
Barnett - ERG	1982.7	7.3	0.06
Pinedale - Brantley et al	5020.7	7.4	0.03
Upper Green River - Robertson et al	79.2	7.4	1.45
Barnett - Rella et al	930.0	7.4	0.12
Marcellus - SWPA -UNG - Omara et al	1404.4	7.4	0.09
Pinedale - Brantley et al	1451.9	7.5	0.09
Pinedale - Brantley et al	2594.1	7.5	0.05
Barnett - ERG	1910.3	7.5	0.07
Barnett - Lan et al	1166.0	7.5	0.11
Upper Green River - Robertson et al	70.1	7.7	1.70
Barnett - ERG	557.1	7.7	0.23
Barnett - Rella et al	1300.0	7.7	0.09
Barnett - ERG	1822.5	7.9	0.07
Barnett - Rella et al	290.0	7.9	0.41
Upper Green River - Robertson et al	557.1	7.9	0.22
DJB - Robertson et al	213.0	8.0	0.69
DJB - Brantley et al	30.9	8.0	4.77

Pinedale - Brantley et al	8750.2	8.1	0.02
Barnett - ERG	1545.3	8.1	0.09
Barnett - Rella et al	1100.0	8.1	0.11
DJB - Brantley et al	139.7	8.1	1.07
Barnett - ERG	166.7	8.1	0.81
Pinedale - Brantley et al	1168.6	8.2	0.13
Barnett - Rella et al	130.0	8.3	0.96
Pinedale - Brantley et al	2892.3	8.3	0.05
Uintah - Omara et al	13.6	8.3	9.97
Barnett - Rella et al	310.0	8.4	0.41
Barnett - ERG	872.0	8.4	0.16
Barnett - ERG	89.3	8.4	1.57
Upper Green River - Robertson et al	67.9	8.5	1.94
Pinedale - Brantley et al	1051.1	8.5	0.15
Barnett - Rella et al	500.0	8.5	0.26
Uintah - Robertson et al	3.3	8.6	40.92
Upper Green River - Robertson et al	53.1	8.6	2.51
Barnett - ERG	265.0	8.7	0.55
Barnett - ERG	1662.6	8.7	0.09
Barnett - ERG	765.8	8.8	0.19
Barnett - Rella et al	48.0	8.8	3.21
Uintah - Robertson et al	79.1	8.9	1.78
Barnett - ERG	78.6	8.9	1.88
DJB - Brantley et al	168.1	8.9	0.97
Pinedale - Brantley et al	1257.4	8.9	0.13
Barnett - ERG	6069.0	8.9	0.02
Barnett - ERG	521.5	9.0	0.29
DJB - Brantley et al	34.1	9.0	4.84
Pinedale - Brantley et al	1653.4	9.1	0.10
Barnett - Lan et al	40.4	9.1	3.93
Barnett - ERG	1197.9	9.2	0.13
Barnett - Lan et al	34.4	9.5	4.18
DJB - Omara et al	779.0	9.5	0.23
Barnett - Brantley et al	124.7	9.6	1.36
DJB - Brantley et al	267.1	9.6	0.66
Barnett - Rella et al	390.0	9.6	0.43
Barnett - Brantley et al	52.6	9.7	3.29
DJB - Brantley et al	37.9	9.7	4.73
Barnett - ERG	1177.3	9.8	0.14
Barnett - Brantley et al	265.2	9.8	0.66
Uintah - Robertson et al	2.2	9.8	71.17
Upper Green River - Robertson et al	3876.5	9.8	0.04
Eagle Ford - Brantley et al	200.1	9.9	0.79

DJB - Omara et al	51.8	10.0	3.57
Marcellus - SWPA - Omara et al	11.6	10.0	14.62
Barnett - ERG	610.8	10.1	0.27
Barnett - ERG	3034.8	10.1	0.06
Barnett - ERG	435.1	10.1	0.39
Upper Green River - Robertson et al	542.7	10.2	0.29
Barnett - Rella et al	460.0	10.2	0.40
Marcellus - NEPA - Omara et al	1539.0	10.2	0.10
Barnett - Brantley et al	52.8	10.3	3.45
Barnett - ERG	2117.4	10.3	0.08
Pinedale - Brantley et al	3185.8	10.3	0.06
Upper Green River - Robertson et al	8293.7	10.4	0.02
Barnett - Rella et al	23.0	10.4	7.93
Barnett - Rella et al	400.0	10.4	0.39
Barnett - Rella et al	580.0	10.4	0.31
Pinedale - Brantley et al	2542.6	10.4	0.08
Barnett - ERG	14415.9	10.5	0.01
DJB - Robertson et al	326.8	10.6	0.60
Fayetteville - Robertson et al	21.3	10.6	7.30
Barnett - ERG	881.1	10.6	0.20
DJB - Brantley et al	27.3	10.7	7.17
Barnett - Lan et al	305.0	10.7	0.61
Barnett - Lan et al	1134.0	10.7	0.16
Barnett - ERG	1846.0	10.7	0.10
Fayetteville - Robertson et al	199.0	10.8	0.80
Pinedale - Brantley et al	42.6	10.8	4.66
Pinedale - Brantley et al	403.6	10.9	0.50
Barnett - ERG	1437.2	10.9	0.13
Marcellus - NEPA - Omara et al	4129.0	11.0	0.04
Barnett - ERG	847.2	11.0	0.22
Barnett - Lan et al	60.5	11.2	2.79
Pinedale - Brantley et al	3864.7	11.2	0.05
Barnett - ERG	4346.7	11.3	0.04
Fayetteville - Robertson et al	1056.3	11.3	0.16
Barnett - ERG	1763.3	11.3	0.11
Barnett - ERG	666.4	11.4	0.28
Barnett - Lan et al	26.4	11.4	7.52
Barnett - Lan et al	460.0	11.5	0.38
Barnett - Rella et al	1200.0	11.6	0.15
Upper Green River - Robertson et al	126.9	11.6	1.42
Marcellus - SWPA - Omara et al	5.8	11.7	34.43
Barnett - ERG	1264.0	11.7	0.15
Barnett - ERG	3250.7	11.7	0.06

Barnett - Rella et al	200.0	11.8	0.91
Barnett - ERG	35.3	11.8	5.58
Barnett - ERG	1842.7	11.8	0.11
Barnett - ERG	541.4	11.9	0.37
Pinedale - Brantley et al	834.8	11.9	0.26
Pinedale - Brantley et al	113.4	11.9	1.93
Barnett - ERG	382.0	11.9	0.52
Barnett - Rella et al	2.3	11.9	89.90
DJB - Omara et al	288.0	11.9	0.77
DJB - Brantley et al	533.6	11.9	0.41
Fayetteville - Robertson et al	4303.0	12.0	0.04
Barnett - Brantley et al	328.6	12.0	0.65
Barnett - Rella et al	240.0	12.1	0.78
Barnett - ERG	6.5	12.1	31.02
Barnett - Rella et al	1600.0	12.2	0.12
Barnett - Rella et al	4800.0	12.3	0.04
Pinedale - Brantley et al	863.8	12.3	0.26
Barnett - ERG	3305.3	12.5	0.06
Barnett - ERG	1764.0	12.6	0.12
Barnett - Rella et al	1500.0	12.6	0.13
Marcellus - NEPA - Omara et al	108.0	12.7	1.77
Marcellus - NEPA - Omara et al	1311.0	12.7	0.15
Pinedale - Brantley et al	1974.3	12.7	0.12
Barnett - ERG	442.0	12.9	0.49
Barnett - Lan et al	925.0	13.0	0.24
Pinedale - Brantley et al	239.7	13.2	1.01
Barnett - Rella et al	270.0	13.2	0.85
DJB - Omara et al	19.5	13.2	12.56
Barnett - Lan et al	286.0	13.3	0.81
DJB - Brantley et al	278.9	13.4	0.88
Barnett - Rella et al	590.0	13.5	0.35
Marcellus - NEPA - Omara et al	2600.0	13.5	0.08
Barnett - ERG	7507.3	13.6	0.03
Barnett - Rella et al	220.0	13.8	0.96
Barnett - ERG	2241.0	13.8	0.10
Pinedale - Brantley et al	2201.1	13.9	0.12
Uintah - Robertson et al	124.4	13.9	1.77
Fayetteville - Robertson et al	832.2	14.0	0.25
Barnett - Rella et al	160.0	14.0	1.32
Barnett - ERG	5453.6	14.1	0.04
Barnett - ERG	443.8	14.2	0.53
Barnett - ERG	1465.0	14.3	0.16
Barnett - Brantley et al	166.8	14.5	1.54

Barnett - ERG	606.4	14.5	0.40
Pinedale - Brantley et al	2507.4	14.6	0.11
Upper Green River - Robertson et al	363.4	14.6	0.62
Fayetteville - Robertson et al	1390.8	14.7	0.16
Marcellus - SWPA - Omara et al	33.5	14.7	7.48
Pinedale - Brantley et al	65.6	14.7	4.14
Barnett - Lan et al	2619.0	14.8	0.09
Fayetteville - Robertson et al	1759.7	14.9	0.12
DJB - Robertson et al	181.6	15.0	1.52
Uintah - Robertson et al	91.7	15.1	2.60
Barnett - Brantley et al	85.7	15.1	3.13
Barnett - ERG	2322.1	15.1	0.11
Marcellus - SWPA - Omara et al	43.9	15.2	5.89
Marcellus - SWPA -UNG - Omara et al	10797.6	15.2	0.02
Uintah - Robertson et al	69.3	15.3	3.50
Pinedale - Brantley et al	590.1	15.3	0.48
Barnett - Rella et al	1000.0	15.4	0.23
Barnett - ERG	1678.0	15.4	0.15
Barnett - Brantley et al	3.7	15.6	75.60
Barnett - Brantley et al	2638.8	15.7	0.11
Barnett - Brantley et al	67.2	15.7	4.16
DJB - Brantley et al	103.4	15.7	2.80
Barnett - Rella et al	300.0	15.8	0.79
Marcellus - NEPA - Omara et al	282.0	15.8	0.84
Uintah - Omara et al	163.0	15.9	1.59
DJB - Brantley et al	118.1	15.9	2.47
Pinedale - Brantley et al	5.8	15.9	50.63
Uintah - Robertson et al	61.3	15.9	4.11
Barnett - Rella et al	63.0	15.9	3.81
Upper Green River - Robertson et al	10399.8	16.0	0.02
Pinedale - Brantley et al	153.1	16.2	1.95
Pinedale - Brantley et al	140.9	16.3	2.12
Barnett - Rella et al	530.0	16.3	0.53
Barnett - ERG	1025.6	16.4	0.27
Barnett - ERG	1084.4	16.5	0.25
DJB - Brantley et al	17.4	16.5	17.48
Barnett - Brantley et al	463.8	16.5	0.63
Barnett - ERG	1060.0	16.6	0.26
Barnett - Brantley et al	3247.9	16.8	0.09
Barnett - ERG	13385.4	16.9	0.02
Barnett - Brantley et al	88.5	17.0	3.41
Uintah - Robertson et al	999.7	17.1	0.27

Pinedale - Brantley et al	1783.8	17.2	0.18
Barnett - ERG	1837.3	17.3	0.16
Pinedale - Brantley et al	255.2	17.4	1.25
Barnett - Brantley et al	963.2	17.7	0.33
Barnett - ERG	5765.0	17.8	0.05
Upper Green River - Robertson et al	408.5	17.8	0.68
Uintah - Robertson et al	27.7	17.8	10.20
Upper Green River - Robertson et al	558.1	17.9	0.50
Marcellus - SWPA -UNG - Omara et al	456.1	18.0	0.67
Barnett - ERG	835.0	18.0	0.36
Barnett - ERG	4824.0	18.2	0.06
DJB - Brantley et al	23.5	18.3	14.33
Barnett - Rella et al	86.0	18.4	3.23
Uintah - Robertson et al	8.8	18.5	33.19
Barnett - ERG	6402.1	18.7	0.05
Barnett - Rella et al	790.0	18.7	0.37
Marcellus - NEPA - Omara et al	2741.0	18.7	0.10
Pinedale - Brantley et al	1210.4	18.9	0.29
Pinedale - Brantley et al	49.1	19.1	7.17
Barnett - ERG	4379.0	19.2	0.07
Barnett - Brantley et al	284.6	19.3	1.20
Pinedale - Brantley et al	271.3	19.4	1.32
Barnett - ERG	279.8	19.5	1.16
Upper Green River - Robertson et al	92.2	19.5	3.29
Pinedale - Brantley et al	75.9	19.5	4.73
Barnett - Rella et al	380.0	19.5	0.88
Barnett - Rella et al	470.0	19.7	0.63
Barnett - ERG	859.7	19.8	0.38
Pinedale - Brantley et al	7.6	19.9	48.16
Uintah - Robertson et al	130.9	20.0	2.42
Marcellus - NEPA - Omara et al	3412.0	20.1	0.09
Pinedale - Brantley et al	4325.4	20.1	0.09
Barnett - Rella et al	1200.0	20.1	0.26
Marcellus - NEPA - Omara et al	3134.0	20.2	0.10
Pinedale - Brantley et al	2363.7	20.2	0.16
Upper Green River - Robertson et al	616.1	20.6	0.52
Marcellus - NEPA - Omara et al	405.0	20.6	0.76
Uintah - Robertson et al	247.8	20.6	1.32
Barnett - Brantley et al	256.0	20.7	1.44
Barnett - ERG	148.9	20.8	2.33
DJB - Omara et al	6.2	20.9	62.38
Barnett - ERG	367.9	20.9	0.94

Upper Green River - Robertson et al	495.1	20.9	0.66
DJB - Brantley et al	25.6	21.0	15.05
DJB - Brantley et al	25.6	21.0	15.07
Pinedale - Brantley et al	1225.5	21.1	0.32
Barnett - ERG	1608.8	21.2	0.22
Barnett - ERG	853.1	21.2	0.41
Barnett - ERG	239.7	21.4	1.49
Barnett - ERG	217.0	21.4	1.64
Uintah - Omara et al	294.0	21.5	1.19
Fayetteville - Robertson et al	626.8	21.7	0.51
Marcellus - NEPA - Omara et al	3372.0	21.9	0.10
Pinedale - Brantley et al	254.0	22.0	1.59
Upper Green River - Robertson et al	353.0	22.0	0.97
Barnett - Rella et al	1200.0	22.2	0.28
Barnett - ERG	5360.0	22.2	0.07
Upper Green River - Robertson et al	2177.2	22.4	0.16
Barnett - ERG	5069.4	22.6	0.07
Barnett - Brantley et al	503.1	22.7	0.80
Barnett - Brantley et al	3243.4	22.8	0.12
Barnett - ERG	1340.8	22.9	0.28
Barnett - Lan et al	73.1	23.0	4.75
Upper Green River - Robertson et al	3862.1	23.1	0.09
Barnett - Lan et al	27.2	23.1	14.80
Barnett - Rella et al	860.0	23.1	0.41
Barnett - ERG	2132.1	23.3	0.18
Barnett - ERG	7635.4	23.3	0.05
Pinedale - Brantley et al	306.8	23.4	1.41
Barnett - ERG	144.1	23.9	2.76
Barnett - Rella et al	3800.0	23.9	0.11
Barnett - Brantley et al	5156.7	24.1	0.08
Pinedale - Brantley et al	3738.8	24.5	0.12
Marcellus - SWPA - Omara et al	11.6	24.5	35.86
Barnett - ERG	6809.2	24.8	0.06
Marcellus - NEPA - Omara et al	97.0	24.9	3.86
Barnett - ERG	1247.3	25.0	0.33
Marcellus - SWPA - Omara et al	4.8	25.0	87.91
Uintah - Omara et al	416.0	25.0	0.98
Upper Green River - Robertson et al	223.0	25.1	1.74
Marcellus - NEPA - Omara et al	3838.0	25.2	0.10
Barnett - ERG	1377.3	25.2	0.30
Marcellus - NEPA - Omara et al	2072.0	25.2	0.18
DJB - Brantley et al	10.7	25.3	43.33
Barnett - Rella et al	700.0	25.3	0.63

Upper Green River - Robertson et al	2080.8	25.3	0.19
Barnett - ERG	640.1	25.6	0.67
Barnett - ERG	221.8	25.7	1.93
Uintah - Omara et al	40.5	25.8	10.36
Barnett - ERG	866.2	25.8	0.50
Fayetteville - Robertson et al	3001.9	26.0	0.13
DJB - Brantley et al	135.5	26.1	3.54
Pinedale - Brantley et al	1140.6	26.1	0.42
Uintah - Omara et al	76.9	26.3	5.57
Upper Green River - Robertson et al	99.8	26.5	4.12
Barnett - ERG	1839.0	26.5	0.24
Barnett - Rella et al	410.0	26.5	0.98
Uintah - Omara et al	128.0	26.9	3.42
Fayetteville - Robertson et al	635.8	27.2	0.63
Marcellus - NEPA - Omara et al	938.0	27.4	0.44
Marcellus - NEPA - Omara et al	22241.0	27.6	0.02
Pinedale - Brantley et al	809.1	27.8	0.63
Upper Green River - Robertson et al	551.7	28.0	0.79
Pinedale - Brantley et al	600.9	28.0	0.86
Pinedale - Brantley et al	1688.0	28.2	0.31
Pinedale - Brantley et al	694.0	28.4	0.75
Barnett - Rella et al	110.0	28.6	3.99
Upper Green River - Robertson et al	455.2	28.6	0.97
Barnett - Lan et al	183.0	28.6	2.36
Pinedale - Brantley et al	22.6	28.8	23.39
Barnett - ERG	646.3	28.8	0.74
Barnett - Lan et al	598.0	28.8	0.84
Pinedale - Brantley et al	136.6	29.0	3.91
Barnett - Lan et al	32.1	29.4	16.00
Marcellus - SWPA -UNG - Goetz et al	8358.9	29.6	0.06
Pinedale - Brantley et al	165.6	29.7	3.30
Barnett - ERG	4473.0	29.7	0.11
Barnett - ERG	3929.9	29.8	0.13
Barnett - ERG	2759.0	30.0	0.18
Barnett - ERG	1220.0	30.4	0.41
Upper Green River - Robertson et al	3774.9	30.5	0.13
Barnett - ERG	111.0	30.8	4.62
Barnett - ERG	1572.5	30.9	0.33
Barnett - Brantley et al	27.5	31.0	19.96
Marcellus - SWPA -UNG - Omara et al	38644.9	31.2	0.01
DJB - Brantley et al	18.3	31.2	31.40

Barnett - ERG	734.6	31.3	0.71
Marcellus - SWPA -UNG - Omara et al	4120.9	31.4	0.13
Pinedale - Brantley et al	2018.6	31.4	0.29
Marcellus - NEPA - Omara et al	17697.0	31.6	0.03
Marcellus - SWPA -UNG - Omara et al	5281.2	31.7	0.10
Pinedale - Brantley et al	1213.7	31.8	0.48
Marcellus - SWPA -UNG - Omara et al	5877.7	32.0	0.09
Marcellus - NEPA - Omara et al	5958.0	32.1	0.08
Barnett - ERG	2739.0	32.2	0.20
Barnett - ERG	1252.4	32.4	0.43
Pinedale - Brantley et al	2446.2	32.5	0.24
Barnett - ERG	1083.9	32.8	0.50
Pinedale - Brantley et al	5416.8	32.9	0.11
Barnett - ERG	204.3	33.1	2.70
Marcellus - SWPA -UNG - Omara et al	2556.0	33.2	0.22
Pinedale - Brantley et al	48.8	33.5	12.64
Marcellus - NEPA - Omara et al	2212.0	33.8	0.23
Uintah - Robertson et al	116.2	34.0	4.64
DJB - Robertson et al	6.9	34.2	91.49
Uintah - Omara et al	13.3	34.4	42.11
Marcellus - NEPA - Omara et al	8930.0	34.8	0.06
Barnett - ERG	1582.5	35.0	0.37
Uintah - Omara et al	79.4	35.3	7.24
Marcellus - NEPA - Omara et al	2588.0	35.8	0.21
DJB - Brantley et al	31.9	35.9	20.66
DJB - Robertson et al	9.9	35.9	66.72
Barnett - ERG	2231.8	36.1	0.27
Upper Green River - Robertson et al	1480.8	36.1	0.38
Barnett - Rella et al	580.0	36.8	1.13
Pinedale - Brantley et al	286.1	36.9	2.37
Uintah - Omara et al	657.0	37.0	0.92
Barnett - ERG	1122.0	37.5	0.56
Barnett - Rella et al	1200.0	37.8	0.49
Pinedale - Brantley et al	346.1	38.0	2.02
Pinedale - Brantley et al	354.0	38.3	1.99
Marcellus - SWPA -UNG - Omara et al	5616.3	38.8	0.12
DJB - Robertson et al	160.1	39.0	4.50
Marcellus - SWPA - Omara et al	22.3	39.2	30.05
Marcellus - NEPA - Omara et al	365.0	39.6	1.63

Pinedale - Brantley et al	1060.2	40.6	0.70
Uintah - Robertson et al	13.7	40.6	46.98
Marcellus - NEPA - Omara et al	844.0	40.8	0.73
Barnett - Rella et al	1400.0	41.4	0.46
DJB - Omara et al	50.3	41.8	15.38
Barnett - ERG	1496.6	41.9	0.47
Upper Green River - Robertson et al	3422.6	41.9	0.19
Upper Green River - Robertson et al	379.1	42.4	1.73
Eagle Ford - Brantley et al	78.1	42.4	8.72
Barnett - ERG	3427.1	43.0	0.21
Pinedale - Brantley et al	700.7	43.4	1.14
Barnett - ERG	796.7	43.4	0.91
Barnett - ERG	2850.3	43.7	0.26
Pinedale - Brantley et al	3924.1	43.8	0.21
Upper Green River - Robertson et al	104.2	43.8	6.53
Barnett - Rella et al	760.0	44.2	1.04
Pinedale - Brantley et al	290.1	44.3	2.81
Barnett - Lan et al	14.5	44.4	46.20
Pinedale - Brantley et al	46.8	44.5	17.48
Barnett - Rella et al	460.0	44.9	1.50
DJB - Brantley et al	9.5	45.0	87.52
Pinedale - Brantley et al	464.4	45.6	1.80
Barnett - Rella et al	6000.0	46.0	0.12
Pinedale - Brantley et al	2276.6	46.1	0.37
Barnett - ERG	5164.7	46.4	0.15
Uintah - Omara et al	63.2	46.4	11.98
Barnett - ERG	791.1	46.7	0.98
Barnett - ERG	659.7	47.0	1.19
Marcellus - SWPA -UNG - Omara et al	3165.1	47.2	0.25
Marcellus - NEPA - Omara et al	450.0	47.3	1.58
Barnett - Rella et al	1200.0	47.7	0.69
DJB - Omara et al	396.0	48.0	2.24
Barnett - ERG	1275.2	48.0	0.63
Barnett - ERG	1067.8	48.1	0.75
Pinedale - Brantley et al	42.5	48.2	20.86
Pinedale - Brantley et al	308.2	49.4	2.95
Marcellus - NEPA - Omara et al	2811.0	49.4	0.26
Barnett - ERG	2714.5	50.2	0.31
Upper Green River - Robertson et al	5525.4	50.4	0.14
Marcellus - NEPA - Omara et al	25209.0	50.4	0.03
Upper Green River - Robertson et al	16532.4	51.2	0.05
Barnett - ERG	4808.5	51.2	0.18

Barnett - ERG	2514.0	51.9	0.34
Barnett - Yacovitch et al	23.0	52.6	34.40
Barnett - ERG	469.4	52.7	1.87
Pinedale - Brantley et al	129.2	53.6	7.63
Uintah - Omara et al	238.0	54.5	3.73
Pinedale - Brantley et al	9021.4	54.6	0.11
DJB - Brantley et al	33.1	54.6	30.33
Barnett - ERG	6675.1	54.6	0.14
Barnett - ERG	913.9	54.7	1.00
Pinedale - Brantley et al	368.1	55.2	2.76
Fayetteville - Robertson et al	154.4	55.6	5.29
DJB - Omara et al	5470.0	55.6	0.19
Pinedale - Brantley et al	2548.1	56.0	0.40
Uintah - Omara et al	537.0	56.3	1.71
Uintah - Omara et al	23.8	56.7	38.82
Uintah - Omara et al	87.8	57.6	10.68
Marcellus - NEPA - Omara et al	507.0	59.9	1.78
Barnett - Brantley et al	550.6	60.0	1.94
Barnett - Rella et al	1100.0	61.8	0.98
Uintah - Omara et al	82.8	62.5	12.30
Marcellus - NEPA - Omara et al	13818.0	63.2	0.07
Barnett - ERG	179.1	63.4	5.90
Upper Green River - Robertson et al	1515.8	63.6	0.65
Pinedale - Brantley et al	141.2	63.8	8.31
Pinedale - Brantley et al	346.2	64.3	3.41
Upper Green River - Robertson et al	5683.7	65.0	0.18
Marcellus - NEPA - Omara et al	15943.0	65.1	0.06
Uintah - Robertson et al	37.8	65.5	27.45
Pinedale - Brantley et al	207.5	67.5	5.98
Marcellus - NEPA - Omara et al	3872.0	67.5	0.26
DJB - Omara et al	172.0	67.6	7.28
DJB - Brantley et al	502.4	68.5	2.51
Pinedale - Brantley et al	383.5	68.7	3.30
Barnett - Brantley et al	1469.6	72.4	0.87
Pinedale - Brantley et al	147.4	72.8	9.09
Pinedale - Brantley et al	976.5	73.4	1.38
Marcellus - SWPA -UNG - Goetz et al	4668.5	74.5	0.27
Uintah - Omara et al	263.0	74.5	4.62
Barnett - ERG	7510.4	74.6	0.17
Marcellus - NEPA - Omara et al	1996.0	74.8	0.56
Uintah - Omara et al	147.0	76.4	8.47
Marcellus - NEPA - Omara et al	764.0	76.5	1.51

Eagle Ford - Brantley et al	189.6	77.7	6.59
Upper Green River - Robertson et al	5777.7	78.1	0.21
Pinedale - Brantley et al	24.9	78.6	58.11
Barnett - ERG	39334.4	79.0	0.03
Uintah - Omara et al	3153.0	79.2	0.41
Pinedale - Brantley et al	308.0	81.2	4.85
Pinedale - Brantley et al	2564.5	81.2	0.58
Barnett - ERG	392.4	81.5	3.46
Marcellus - NEPA - Omara et al	18296.0	82.1	0.07
Marcellus - NEPA - Omara et al	1318.0	82.4	0.94
DJB - Omara et al	43.1	85.1	36.56
Uintah - Omara et al	102.0	86.6	13.83
Barnett - ERG	454.7	87.0	3.18
Uintah - Omara et al	25.3	87.0	56.07
Pinedale - Brantley et al	293.1	88.3	5.54
Pinedale - Brantley et al	301.8	91.4	5.57
Barnett - Lan et al	40.4	92.9	40.00
Uintah - Omara et al	666.0	95.0	2.33
Pinedale - Brantley et al	232.1	95.4	7.56
Marcellus - NEPA - Omara et al	3212.0	95.6	0.45
Barnett - ERG	206.2	95.7	7.73
Barnett - ERG	2835.9	96.1	0.56
Uintah - Omara et al	269.0	97.2	5.89
Barnett - ERG	2528.6	97.6	0.64
Barnett - ERG	5139.4	98.4	0.32
Barnett - Rella et al	22.0	99.0	78.50
Pinedale - Brantley et al	243.5	100.8	7.61
Uintah - Omara et al	97.2	101.1	16.95
Marcellus - NEPA - Omara et al	6552.0	101.6	0.23
Barnett - ERG	550.7	104.2	3.15
DJB - Omara et al	196.0	106.4	10.05
Barnett - ERG	2775.9	106.6	0.64
Barnett - Lan et al	2664.0	106.9	0.61
Barnett - ERG	3265.3	107.3	0.55
Pinedale - Brantley et al	205.3	108.3	9.70
Pinedale - Brantley et al	5170.4	110.3	0.39
Barnett - ERG	421.6	110.4	4.36
Barnett - ERG	3441.0	110.7	0.54
Uintah - Robertson et al	1157.5	115.1	1.58
Barnett - Brantley et al	292.1	115.4	7.01
Barnett - Lan et al	37.2	117.4	47.70
Barnett - ERG	611.7	117.5	3.20
Barnett - ERG	375.3	118.6	5.26

Barnett - ERG	5789.8	120.1	0.35
Barnett - ERG	448.1	123.2	4.58
Barnett - Rella et al	28.0	123.5	76.60
Marcellus - SWPA -UNG - Goetz et al	8339.7	124.4	0.26
Barnett - ERG	2296.2	125.6	0.91
Barnett - ERG	829.7	127.7	2.56
Barnett - Brantley et al	581.3	130.3	3.98
Barnett - ERG	6166.9	133.0	0.36
Pinedale - Brantley et al	393.5	134.2	6.27
Pinedale - Brantley et al	223.1	134.8	11.12
Barnett - ERG	360.7	141.3	6.52
Marcellus - NEPA - Omara et al	737.0	146.9	3.00
Marcellus - NEPA - Omara et al	13747.0	148.9	0.16
Barnett - Lan et al	1273.0	155.1	1.84
Barnett - Rella et al	1200.0	159.4	2.32
Barnett - ERG	11331.0	167.1	0.25
Barnett - ERG	1378.8	172.2	2.08
Barnett - ERG	1019.6	175.0	2.86
Barnett - Brantley et al	184.8	177.8	17.08
Marcellus - SWPA -UNG - Omara et al	78024.1	179.6	0.04
Barnett - ERG	1206.6	212.8	2.94
Barnett - Lan et al	266.0	227.8	14.90
DJB - Brantley et al	50.0	229.8	84.50
Barnett - ERG	5035.0	247.7	0.82
Marcellus - NEPA - Omara et al	926.0	259.7	4.22
Barnett - ERG	969.6	262.2	4.50
Barnett - ERG	4323.5	268.0	1.03
Marcellus - NEPA - Omara et al	13372.0	283.7	0.32
Barnett - ERG	1451.5	334.2	3.83
Marcellus - NEPA - Omara et al	4381.0	370.3	1.27
Uintah - Omara et al	92.5	386.5	68.11
Barnett - ERG	2273.4	387.0	2.83
Marcellus - NEPA - Omara et al	1443.0	392.1	4.09
Barnett - ERG	6228.3	403.3	1.08
Barnett - Rella et al	410.0	417.0	15.60
DJB - Omara et al	360.0	460.2	23.67
DJB - Omara et al	2335.0	461.7	3.66
Barnett - Lan et al	3335.0	464.3	2.10
Barnett - Lan et al	627.0	484.4	11.60
Barnett - Lan et al	4154.0	509.0	2.13
Barnett - Yacovitch et al	597.0	543.1	15.80

DJB - Omara et al	1405.0	590.4	7.78
Marcellus - SWPA -UNG - Omara et al	9414.0	676.4	1.22
Marcellus - SWPA -UNG - Omara et al	23749.2	813.5	0.58
Barnett - Yacovitch et al	1081.0	1086.2	15.10
Barnett - Yacovitch et al	324.0	1191.4	55.40
DJB - Omara et al	545.0	1235.2	41.97
Barnett - Yacovitch et al	621.0	1357.8	32.90
Barnett - Yacovitch et al	1107.0	1655.6	22.50
Barnett - Yacovitch et al	1159.0	2514.1	37.80