IDAHO OIL AND GAS CONSERVATION COMMISSION May 29, 2019 Information Agenda

SUBJECT

Update on the ongoing Allocation Investigation for hydrocarbons from wells in Payette County operated by Alta Mesa Services. A glossary of capitalized terms follows this memo.

BACKGROUND

The wells produce two hydrocarbon streams generically referred to as gas and condensate. The two streams are processed into three marketable products: Residue Gas, Natural Gas Plant Liquids, and Plant Condensate. The volumes of these three products are then allocated back to each well completion.

In 2018, the Idaho Oil and Gas Conservation Commission (Commission) noted discrepancies in reported volumes for Residue Gas and Plant Condensate. Residue Gas is derived from Rich Gas. Rich Gas is transported from wellheads through the Little Willow Gathering Facility (Little Willow Facility), through the 11-mile long gas pipeline, and through the Northwest Gas Processing Highway 30 Plant (Highway 30 Plant). The Highway 30 Plant extracts Natural Gas Plant Liquids from Rich Gas. The remaining processed gas at the outlet of the Highway 30 Plant is Residue Gas. Plant Condensate is derived from Well Condensate. Well Condensate is transported from wellheads through the Little Willow Facility, through the 11-mile long condensate pipeline, and through the Highway 30 Plant. The remaining processed condensate at the outlet of the Highway 30 Plant is Plant Condensate.

Alta Mesa was informed of the discrepancies. They discovered a systematic error in an equation used in some steps of the allocation process. The error affected the volumes of Plant Condensate allocated to the gas and liquid streams leaving the Little Willow Facility and entering the Highway 30 Plant. Allocations of Natural Gas Plant Liquids were not affected by the error.

The error was a mismatched stream analysis reference within an equation.

- The incorrect reference applied the equivalent <u>liquid volume percentage</u> of each individual hydrocarbon component derived from each individual laboratory analysis.
- The correct reference applied the <u>molecular percentage</u> of each individual hydrocarbon component derived from each individual laboratory analysis.

Table 1 is a textbook example laboratory hydrocarbon analysis data table of chromatographic results using test method GPA 2186M. It lists the "Mole %" (molecular %) and the "Liq. Vol. %" (liquid volume percent) for 21 components. Highlighted in yellow are the Mole % and the Liq. Vol. % for methane. Note the difference in percentages for methane. Differences also occur for the other individual components.

Components	Mole %	Weight %	Liq. Vol. %
Carbon Dioxide	0.0853	0.1450	0.0687
Nitrogen	0.0281	0.0304	0.0146
Methane	64.2964	39.8359	51.4398
Ethane	14.4191	16.7445	18.1980
Propane	11.9911	20.4207	15.5901
iso-Butane	2.5568	5.7392	3.9483
n-Butane	3.8382	8.6156	5.7104
iso-Pentane	0.9367	2.6100	1.6166
n-Pentane	0.9036	2.5178	1.5457
Cyclopentane	0.0519	0.1405	0.0725
n-Hexane	0.2551	0.8490	0.4950
Cyclohexane	0.0463	0.1505	0.0743
Other Hexanes	0.2743	0.9130	0.5324
Heptanes	0.0865	0.3347	0.1883
Methylcyclohexane	0.0301	0.1141	0.0571
2,2,4-Trimethylpentane	0.0951	0.4195	0.2332
Benzene	0.0247	0.0745	0.0326
Toluene	0.0104	0.0370	0.0164
Ethylbenzene	0.0007	0.0029	0.0013
Xylenes	0.0062	0.0254	0.0113
C8+ Heavies	0.0634	0.2797	0.1533
Totals	100.0000	100.0000	100.0000

GENERAL ALLOCATION METHOD

The individual well completions are allocated their shares of hydrocarbon products (Plant Condensate, Residue Gas, and Natural Gas Plant Liquids) produced by the Highway 30 Plant by a one-, two-, or three-step allocation method. The allocation methods differ in the number of steps because of various technical, operational, or financial constraints associated primarily with the location of each well in relation to the production process. Each individual step uses the component volumes derived from the laboratory analyses that are used to scale the contribution of each well completion to the total of each product.

- One Step Allocation. Only well completion DJS 1-15 uses a one-step allocation process. The fluid stream from DJS 1-15 undergo three-phase gravity separation and metering at the well pad. The two liquid hydrocarbon streams from DJS 1-15 go into the two separate pipelines that transport Well Condensate and Rich Gas from the Little Willow Facility to the Highway 30 Plant. Therefore, the Highway 30 Plant totals are allocated *to* DJS 1-15 in one step.
- <u>Two Step Allocation</u>. Seven well completions (Kauffman 1-9 LT ("lower tube"), Kauffman 1-9 UT ("upper tube"), ML 1-10, ML 1-11 UT, ML 1-11 LT, ML 2-10, and ML 3-10) use a two-step allocation process.
 - Step 1: Highway 30 Plant totals to Little Willow Facility totals;

- Step 2: Little Willow Facility totals (minus totals from the "multi wells" discussed below) to these individual well completions.
- Three Step Allocation. The three wells with partial federal mineral ownership (ML 1-3, ML 2-3, and Kauffman 1-34) use a three step allocation process.
 - Step 1: Highway 30 Plant totals to Little Willow Facility totals;
 - Step 2: Little Willow Facility totals to the "multi well" totals. For well completions K 1-34, ML 1-3, and ML 2-3, each well fluid stream undergoes three-phase gravity separation and metering for each well at each well pad, and not at the Little Willow Facility. Then, the three fluid streams (water, hydrocarbon liquids, and hydrocarbon gases) from the three wells (nine total fluid streams) are combined into one gathering line, which runs to the multi-well three-phase separator located at the Little Willow Facility. The multi-well separator creates three fluid streams (water, hydrocarbon liquids, and hydrocarbon gases), each individually metered.
 - Step 3: The multi-well hydrocarbon stream totals are allocated to individual well completions.

<u>DISCUSSION</u>

Attachment 1 (McFarland datasets) comprises several allocation datasets produced for Alta Mesa by contract petroleum engineer S. McFarland. The Oil and Gas Division received these datasets on April 1, 2019. The McFarland datasets contain the monthly results and yearly summations of the original ("old") allocation method (2015-2018), the results of the corrected ("new") allocation method (2016-2018), and the differences between the two methods (2016-2018).

Attachment 2 (IDL Review datasets) is a year-by-year summary of the McFarland datasets. It is color-coded for ease of review. The IDL Review datasets also include a summary of Plant Condensate volumes and Residue Gas volumes using both allocation methods (new and old), as well as the difference and percent difference between these methods.

The bottom of the IDL Review dataset includes the 2016-2018 grand totals of volumes for all well completions for Plant Condensate (new, old, difference) and for Residue Gas (new, old, difference). The grand totals of volumes for new versus old are equal. In addition, the IDL Review datasets suggest that the new corrected allocation has reasonable variances of plus or minus five percent by well completion as shown by the percent differences to the old allocation results. The exception is the Kauffman 1-9 LT, which shows a negative 28 percent difference in Plant Condensate. At this point in our investigation, the variances in percent differences, including Kauffman 1-9 LT, are presumed to be related to the allocation error summarized above.

GLOSSARY

Allocation is a term used to describe the system by which ownership of oil, gas, and produced water is determined and tracked from the point of production to a point of sale or discharge. Allocation is also known as hydrocarbon accounting, hydrocarbon value realization, product measurement and allocation, and production management and reporting. Although the principles of allocation are straightforward, the details are highly complex.

Natural Gas Plant Liquids means hydrocarbon compounds in Rich Gas that are extracted as liquids at processing plants, gas processing plants, gas plants, gasoline processing plants, fractionating plants, cryogenic plants, and cycling plants. Natural Gas Plant Liquids may include ethane, propane, the butanes, the pentanes, and hydrocarbon compounds of higher molecular weight. Hydrocarbon components may be fractionated and sold as an individual hydrocarbon (such as propane), or mixed together (referred to as Y-grade or raw mix) and sold, depending on the purchaser's sales agreement.

Plant Condensate is also referred to as stabilized condensate and means the processed liquid hydrocarbon product from a processing plant. The processing decreases the quantity of methane and ethane, which reduces the vapor pressure of the liquid, thereby preventing the production of vapor phase upon flashing the liquid, which ensures safe storage in atmospheric transportation and storage tanks.

Residue Gas is also referred to as tailgate gas, burner gas, or pipeline-quality natural gas and means 87.0 - 97.0 molecular percentage of methane that is merchantable and marketable, and meets an interstate or intrastate transmission company's minimum specifications per American Gas Association Bulletin No. 36.

Rich Gas means all hydrocarbon compounds and gaseous substances in a raw, unprocessed liquids-rich gas (minus formation water) that is gaseous at the conditions under which its volume is measured or estimated. Rich Gas is typically recovered from the wellhead or at the surface by use of a gravity separator or similar equipment. Rich Gas typically consists mostly of methane, ethane, propane, the butanes, and minor amounts of the pentanes plus hydrocarbon compounds of higher molecular weight.

Well Condensate means undifferentiated crude oil or condensate as a mixture of raw liquid hydrocarbon components, the majority of which range from pentanes and hydrocarbon compounds of higher molecular weight recovered after the wellhead by gravity separation or a similar process, and is liquid at the conditions under which its volume is measured or estimated. Well Condensate (also called lease condensate) can be derived directly after the wellhead with no separation (historically called casinghead gasoline). Well Condensate is typically unstable for truck transport and must be processed at a specialized facility to remove specific hydrocarbon compounds or various impurities; it is then referred to as Plant Condensate.

ATTACHMENTS

- 1. McFarland Allocation Datasets
- 2. IDL Review Datasets
- 3. PowerPoint "Allocation Investigation"

	Meter Name Prod Allo appro 1-3 Condensate Cond New	each 8/1/15 9/1/15 10/1/15	11/1/15 12/1/15 2015 To	1/1/16 2/1/16 - 58.82	2/1/16 1.743.97	4/1/16 5/1/1 1097.64 1284	73 135183	7/1/16 8/1/ 1.663.22 1.12	16 8/1/1 16.17 2.57	16 10/1/16 4.83 2.421.60	2.220.20	2.125.08	2016 Total **		792 1.05		5/1/17 6/1, 2017			9/1/17 10/1 254	707 873	12/1/17 26		1/1/18 2/1/18	3/1/18			/1/18 7/1, 17	/18 8/1/18 23 27		. 250	12/1/18 2018 Total ##
	Condensate Cond diff			57.42 1.40	1,677.22	(179.15) (1.616	34) (85.28)	1,747.82 1,13 184.601 1	15.76 (28)	9.491 57.43	191.93	11.771	(1.927.90)	1260	462 57	969	1281	913 784	900	92 362	555 567	72	8.498	(21)	ón :	27 (85)	(44)	(30)	G08 (18)	101	- 150 - (108)	59 (343)
	Condensate Gas New Condensate Gas Old			- 19.04 - 19.87	977.37 1,052.04	817.71 1,088	.61 876.66	705.67 81 774.99 81	19.15 1,19	r.so 972.03 4.36 966.89	1,125.71	1,359.37	10,085.16	843 2,358	345 68 1,115 1,65	1,254	1,219 3,172	453 2,531	621 2,063	803	ees 295 1,439 1,036	176	21,898	27 85	1 :	342 545	135	20 27	66 28	0	199	2 387 62 1,168
	Gas Cond New			- 10.61 - 186.19	1 174.671	114.121 (30 1.163.33 913	58) (22.11) 83 1.929.99	(9.32) 1.245.00 1.92	(9.15) 2 (4.08 2.6%	2.69 5.15 2.53 1.609.12	12.07 2.911.08	14.44 3.891.68	19.530.59	3.210	1.724 2.27	1 (1.044) 1 (1.669		464) (1.754) 010 2.177	1.766			(105) 91	19.794	(48) 50	III - 12 1	(303) 77		1271 21	(52) (23) 109 63	101	- (167) - 91	
	Gas Cond Old			- 209.23 - 123.04	1 1:169.32 11 HS.571	1297.97 983 (124.64) 660	25 2.153.42 421 (223.43)	1.323.21 1.89 (78.20) 2	7.80 2.61 16.28 1	3.28 1.615.86 9.25 (6.74)	2.861.63 49.44	4 208 56 (216 88)		4.940 (1.630)	2.076 3.63 (352) (1.36	1 2.872 0 (1.205)	2.019 (1.271) (.092 2.904 .093) (737)	2.870 (1.104)	553 (266)	L596 1.290 (489) (492)	215 (124)	29,979 (10,193)	72 23	7 0	173 95		59 29	55 21			
	Gas Gas New Gas Gas Old			- 5.917.18 - 5.925.68	93.976.86 I 93.898.27 1	87.027.61 130.396 90.048.60 134.653	27 128.019.59	125.607.85 133.22 126.601.84 134.36	14.27 235.89 15.46 231.77	6.48 149.682.59 6.89 148.754.03	256.127.98 253.596.11	261,570,90 1	1.609.613.55	207.992 7	77.980 341.90 77.575 128.26	127.882	116.985 14 114.979 14	218 544.635 558 543.507	145.525	47.453 71 46.717 71	0.680 56.806 0.917 56.155	12.076 1	201.124	2,682 S	85 29 75 28	29.304 28.627	7.584 7.366	2.070	8594 3.782 8478 3.721		- 10.727 - 10.579	2.609 60.634 2.657 59.468
	Cas Gas dff in 1-9 LT Oil Cond New			- 850	79.59	13.020.998 84.253	741 (3.263.09)	1994.001 (1.14	11.190 4.11	9.58 928.56	2531.07	2 162 97	(2.859.92)	2.147	406 154	4.589	2.006	659 1.128	1.862	727	764 650	220	19.711	. E	9 1	476	1.838	1,667	116 61 1.163 601	- 13	148	12 1.167
	n 1-9 LT OIL Cond Old			1 : :								- 1										- :	1		928		1241	1.114	724 417	9		- 6.454 - (2.042)
	n 1-9 LT OI Gas New											-	-										-		656		1,302	1,370	817 321	2		4,468
	1917OI Gas diff											-										- 1			1528		(1.195)	(1.059)	1908) (296)	in .	1. 1	(4.092)
	n 1-9 LT Gas Cond Old			- 20.27	99.83	99.01 166 89.32 165	73 441.58	449.89	16.41 2	0.77 292.04	- 1	0.32	1511.17	- :		- 1				- :					57		129	70	59 42	2		- 369
	n 1-9 LT Gas Gas New			- 3,161,60		6.589.67 8.853				3.75 15.260.30	- 1	30.49		- 1					- 1	- 1		- 1			2415		8,595	5.569	2796 2.023	75	13 -	- 22.485
	in 1-9 LT Gas Gld in 1-9 LT Gas Glff			- 1.165.48 - 14.88	1 6.329.47 11 7.14	6.458.42 R.617 131.25 230	63 25.080.14 63 679.33	\$3,806.11 2.03 295.55 2	19.79 3.10 12.68 17	8.70 15.376.54 6.951 (116.24)		30.92 10.441	124.012.66									- 1					8.470 125	5.483 86	1.717 2.050 60 1271	76 (1)	13 -	· 22.210
	in 1-9 UT Condensate Cond New in 1-9 UT Condensate Cond Old	325 349 -		- 75.54 204 - 74.65	40.56	21.03 57	.13 -	56.85 S	8.09 24 7.07 20	6.45 78.12 4.82 84.28	- 1	58.51 58.90	729.68 648.99	491 351	78 - 57 -	18 16		1 1	- :	1		540 356	1.128 792	897 1.3 628 8		1.386	- 1		1 1	- :		- 4.656 - 3.183
	an 1-9 UT Condensate Cond diff an 1-9 UT Condensate Gas New			- 0.89	1.89	2.93 64 5.03 8	46 -	4.48 15.60 1	103 4	1.63 (6.16) 6.62 25.47		(2.48)	90.69	140	21 -	2 11		. 0		0		184 348	346 588	(269) (4 623 5	92) (231) 99 549	(482) 3.288						· (1,473) · 5,009
	nan 1-9 UT Condensate Gas Old nan 1-9 UT Condensate Gas diff	602 203 -		D4 - 4.81 - 12.08	1 11.25	4.98 S	.12 -	15.34 1 0.27	6.59 2 0.27 8	5.55 25.63 0.93) (0.16)		24.36	146.63		64 - (92) -	18 (7)		- 2 - (1)		2 (1)		650 (901)	1.115	1147 1.0 (524) (5	94 991 96) (442)	5.153 (1.865)						· 8.286 · (2.277)
	man 1-9 UT Gas Cond New	124 447		- 128.22			.27 -					42.56	741.34	171	59 -	6	-	- 11	-	28		254	725	627 7	11 3	40						- 1.182
State Stat		AN AN .		16.12	(12.23)	7.16 5	21	2.24	0.07	1.43 0.15			1.20		gs -	(III)		. (9)		(25)		000	(245)	297 4	54 2	- 53						
State Stat	man 1-9 UT Gas Gas Old	35.044 15.896 -	- 50.0	HO - 8,140,06	13.597.28	12.436.57 8.066 12.170.36 7.827	.00 -	4.729.09 5.03 4.694.91 4.96	15.30 8.52 19.80 8.74	8.22 3.363.52	- 1	4.122.53		15.158	4.543 -	7,630	- 1	- 1.539 - 1.537	- 1	6.775		29.240	64.422	53.357 46.9 52.702 46.4	78 202 59 200	12.971	- 1			- 1		
Column	man 1-9 UT Gas Gas diff 10 Condensate Cond New				11.64	266.21 216	26 .	34.18 5	5.49 (21)	0.61) (25.51)	- :	(59.78)	291.36 517.97	113	26			. 22	- 1	- 73		238	531	655 5	19 1	225		- :				1.411
	-10 Condensate Cond Old -10 Condensate Cond diff	608 1,057 647	209 739 3,2	507.84 - 10.13 -								: [507.84 10.13																			
	-10 Condensate Gas New -10 Condensate Gas Old	964 556 540	200 451 2.7	313.72 - 911 268.17 -		-						- : [212.72 268.17	- 1	1 1										-		-	-		-		1 1
	I-10 Condensate Gas dET I-10 Gas Cond New			45.55 - 234.24 -									45.55 334.24									- :	- 1									
State Stat		360 658 444	121 428 1.5	349.11 ·	- :	1			:		- 1	- 1	349.11 (14.97)			- 1	- 1		- :	- :	: :		- :		-	- :	- :		1 1	- 1	1 1	- :
State Stat		mm 1249	22.00	39,997.71 -		-					-		29.997.71				-								-			-				
See 19 19 19 19 19 19 19 19 19 19 19 19 19	1-10 Gas Gas diff	60.424 52.446 62.983	486 30.304 253.3										(73.06)				-		-			-		-			-	-		-	1 1	
See 19 19 19 19 19 19 19 19 19 19 19 19 19	1-11 UT Condensate Cond New 1-11 UT Condensate Cond Old	625 766 667	685 1.174 2.5	1.706.31 1.208.74 1.663.68 1.170.93	1.062.42	1355.26 1.143	12 1068.94 86 942.31	525.49 SS	MAG 122 IS-96 111	0.50 260.57	1179.00	952.41 884.49	11.979.34	1.238 992	582 S0	511 471	641		774 438								416 259		239 258		316 544 318 429	462 7,022 462 4,645
See 19 19 19 19 19 19 19 19 19 19 19 19 19	1-11 UT Condensate Cond diff 1-11 UT Condensate Gas New			42.63 27.81 1,544.93 609.19	41.71 9 869.84	192.75 285 783.95 947	26 126.62 94 424.35	51.17 588.36 44	(2.31) 12 (4.93 72	5.05 (22.07) 7.44 81.03	(116.60) 508.78	68.93 422.79	924.97 7,953.32	340	227 13 470 35	401	298 499	430 293	212 213	215	179 168	241 195	2.693 3,661			(51) 174	190				(176) (115) 156 82	(225) (2.289) 291 2,590
See 19 19 19 19 19 19 19 19 19 19 19 19 19	I-11UT Condensate Gas Old I-11UT Condensate Gas diff	1.174 1.361 833	990 1.064 \$.4	22 1.322.41 535.50 222.52 73.69	927.62 57.781	776.05 916 7.89 31	12 411.56 82 12.79	579.66 43 8.50	7.23 (2)	8.09 81.57 0.651 (0.54)	517.56 (8.79)	431.34 (8.55)	7.685.18 268.14	784 6440	788 61 (318) (25	618 n (216)	909 (310)	677 629 (247) (436)	677 (464)	653 (428)	554 580 (375) (412)	513 (318)	7.892 (4.230)	613 S (292) (2	55 587 711 (376)	258 (284)	418 (228)	503 (253)	544 722 (324) (334)	607 (282)	643 246 (287) (164)	625 6.222 (235) (2,622)
State Stat	1-11 UT Gas Cond New 1-11 UT Gas Cond Old	177 450 228	367 517 1.3	767.46 754.12 789.95 802.16	813.89 856.63	784.86 760 728.59 693	73 777.80 05 684.81	545.81 48 514.64 46	19.80 68 15.79 66	0.17 832.41 1.86 828.86	789.35 810.86	999.09 876.37	8,995.50 8.741.77	738 1.041	583 95 895 1.17	574 726	922 1226		811 1.091		455 579	637 911	7,672 10.695	432 9 720 1.4	\$1 1,147 \$1 1,621	296 221	560 904		532 440 818 674	499 726	356 335 505 513	429 6,194 691 9,569
State Stat	I-II UT Gas Cond dff			(21.49) (48.24	0 60 250 41 4	56.27 68 68.433.30 83.923	67 93.00 53 6619631	21.17 I	15.990 11 10.49 22.511	9.21 2.56 9.09 20.722.64	(21.51) 75.559.82	122.72 20.754.86	253.73	(303) 63.3M 6	(313) (22 M one 68 95	n (153) 1 71 797	G06 62421 3		(290)	(349)	(348)	(275) 58 278	721 620			202	264	262 40 555 A	286 234 6880 43.846			
State Stat	I-11 UT Gas Gas Old	52.928 53.509 40.095	51.310 58.796 256.6	20 80.924.96 65.562.29	68.206.60	66.990.49 81.674	91 64.455.18	63.646.30 41.25	740 7430	6.21 71.279.19	76.665.57	71.783.10		62.772 6	68.40 403	70.749	63.114 2	492 54.929	62.219	55.792 GI	0.716 58.581	57.927	716.022	50.651 52.6	29 62.389	49.536	50.091		6341 43.297		36.973 42.926	
State Stat				1.469.31 1.307.92	1.452.97	1143.26 2.255	66 1073.72	783.17 43	13.27 79	9.00 409.20	264.93	96.61	11 558.95	1	264 9	25	-	532 898	806		406 442	326	4.140	193 2	17 61	4	-			-	- 704	- 1.180
State Stat	1-11LT Condensate Cond Old 1-11LT Condensate Cond diff	521 1.439 629	637 1.206 4.4	27.69 29.43	1.400.52	136.46 849	.16 859.01 .50 214.72	712.43 42 70.74 1	10.05 60 13.22 18	9.66 (24.98)	(23.09)	(2.60)	1,543.29	0	186 7 78 2	6		185 615 147 283	471 335	223 124	272 283 134 158	211 114	1,299	(65)	22 42 84) (18)	2 (2)					- 498 - (206)	- 805 - (274)
State Stat	I-11LT Condensate Gas New I-11LT Condensate Gas Old	940 1,040 618	721 894 4.3	1.067.82 1.279.94 H2 913.85 1.126.26	923.73	634.75 674 677.44 651	.04 435.33 .72 422.38	512.15 26 505.05 28	12.21 19 18.63 22	9.96 94.15 5.74 94.71	67.73 68.95	25.90 26.38	6.202.97 5.914.83	0	45 2 148 5	1 7	- 1	106 612 106 1.340	1242	963 494	123 88 381 298	84 229	1.870 4.512	43 132	26 12 21 24	4 2		- :	1 1	- 1	- 239 - 510	- 226 - 776
State Stat	I-11LT Condensate Gas dff I-11LT Gas Cond New			153.98 153.68 672.71 281.45	1.129.07	7.31 22 804.30 643	22 12.95 24 579.12	7.09	4.58 (18.96 29	5.78) (0.56) 9.48 248.48	(1.22) 159.58	97.58	288.14 6.027.29	(3) 17	317 16	21		(728) (728) 238 592	(622) 537	(221)	(257) (209) 646 318	(145)	2,642)	136 2		(4)	. 0			-	. (271)	- (451) - 536
State Stat		128 463 199	242 599 1.6	21 701.49 825.15 COR.770 (42.71	1.203.00	749.24 588	24 511.83	320.38 31	250 25	0.96 347.04	163.94	87.32	5.960.29	21	454 18	22		279 912	858	422	567 487	288	4.591	204 3	90 167	23	0	0				- 725
State Stat	1-11LTGss Gss New	47.007 27.003 40.003	F1 000 (F 001 NO.	69.317.84 81.471.05	92.459.03	69.020.56 71.603	75 49.586.50	40.022.83 24.32	10.99 26.32	8.49 29.964.96	13.199.77	7.597.99	554.890.77	1100 3	0.155 9.01	1.729	- 1	095 65.754	55.277	41.531 2	7.274 30.186	26.523	214.652	13.571 11.5	77 5.888	2.644	7	34				
State Stat	1-111TGm Gm dff	45.005 55.024 41.517	51360 65.601 2663	(133.13) (124.66	0 60.68	1460.50 1.898	73 1302.42	293.75 26	20 20 00 00	1.90) (152.25)	(193.35)	(329.74)	3.929.84	8 8	207 4	1.718		72 870	616	41.180 A 252	257 216	197	2.042	102	20 57	2102		0	1 1	- 1	1 1	259
State Stat	\$1-15-Condensate Cond New \$1-15-Condensate Cond Old			1 1		- 1		- :			- 1	- 1			111 21	122	136	114 80 114 80	90	54 54	70 71	Ω Ω	1.228	34	21 87 27 59	29 23	80 66	23	62 62 49 45	70 45	27 20	92 988 35 581
State Stat	5 1-15 Condensate Cond diff 5 1-15 Condensate Gas New			1 1					1		- 1				80 18	85	72	63 69	72	75	66 54	54	0 871	(41)	9 43	(17)	(13) 48	(13) 36	(13) (18) 41 42	(25) 41	(36) (56) 31 18	(58) (401) 44 482
State Stat	S 1-15 Condensate Gas Old S 1-15 Condensate Gas diff													1 1	6,306 7,09 (6,227) (6.90	7,651	6,300 (6,228) (307 6,181 246) (6,113)	6,127 (6,055)	5,819 S	5,633 5,346 5,567) (5,292)	5,258 (5,204)	68,018	5,235 5,0 (5,190) (4,5	33 5,023 54) (4,980)	4,740 (4,695)	4,968	4,860 (4,826) (4,750 4,951 4,709 (4,909)	4,717	4,882 4,959 (4,851) (4,941)	5,235 59,323 (5,292) (59,840)
Section Sect	\$1-15 Gas Cond New \$1-15 Gas Cond Old			1 1	- 1			- 1						- 1	101 12	65	81 81	90 46 90 46	51 51	15 15	49 25 49 25	30	690	75 1	97 59 21 87	22	66 80	53 66	49 45 62 62	45 70	27 30 62 86	35 501 92 903
Section Sect	1-15 Gas Cond dff														0 (0	101 0	(D)	121	(0) 0	0	0	41	14 28	17	13	13	13 18	25	36 56	50 401
Section Sect	51-15 Gat Old			1 1											80 18	85						54	971									
Section Sect	offman 1-34 Condensate Cond New			- 802.50	688.19	1556.48 1.265	22 1793.30	2.055.15 79	14.97 70	2.60 1.136.68	2,056,59	3 208.55	17.061.22	645	145 2.68	2.254	3	- 0	1	6	- 1	2	5.728	- 2	34 76	4.86	114	11	- 58	46/6	- 0	- 492
Section Sect	iffman 1-34 Condensate Cond Old iffman 1-34 Condensate Cond diff	2.192	1.856 98 4.1	A7 - 775.17 - 27.42	671.83 16.36	1796.06 1.432	.54 2.055.80 .921 (262.50)	2.184.51 RS (129.36) R	6.40 71 11.530 8	2.44 1.002.70 8.84) 25.98	2.909.60 147.99	130.93	17.571.26 (510.04)	328 317	81 153	1.122	2	. 0		3	1 1	1	2.674		22 44 201 (22)		52 (62)	5 (6)	- 24 - (35)		- 101	- 228 - (265)
Section Sect	umman 1-98 Condensate Gas New uffman 1-34 Condensate Gas Old			- 535.99	527.42 569.62	1,219.91 2,887	1,697.42 25 1,740.73	1,335.51 53 1.351.88 53	12.94 76 19.25 74	z.zs 937.99 7.38 932.82	2,226.08	2,753.41	15,426.05 15.550.27	1,205	141 1,31 260 4.19	1,904	6	- 0	1 2	9 25	. 1	1	3,942 11.256		97 16 23 61		68 224	20	- 20		- 0	- 179 - 604
Section Sect	offman 1-34 Condensate Gas diff offman 1-34 Gas Cond New			- 29.41 - 206.35	H2.201 252.18	715.430 (120 365.16 729	12) (43.31) 88 1,201.16	(16.37) 1 762.44 42	16.301 5 12.38 24	8.64 388.34	24.07 638.71	36.00 1,409.59	6,524.82	1641) 298	(129) (2.87 151 1,71	n (3.746) I 833	2	- m	(1) 42	(16) 4	- (1) - 21	121	3,074	- 0	361 (462 57 28		(156) 91	(22) 36	- 1661	-	- 0	· (425)
Section Sect	ffman 1-34 Gas Cond Old ffman 1-34 Gas Cond Aff	- 78	121 5 2										6.831.82	329 (30)	137 2.02 14 (30	1.578	2 (1)	. 8	70	7 (3)	- 24 50	1	4.177		29 40 22 13		132	23 7	- 52 13		. 0	- 227 - 106
Section Sect							04 55.113.63	47.743.86 15.34	627 1886	7.15 22.348.47	53,437.90 52,921.15	66 956 99	407.499.72				82		2.247	542 543	- 890	47	142.906	- 26	61 873 60 663		5.712	1.372	- 2.190		. 14	· 12.823
Section Sect	Mrsan 1-34 Gas diff			2151	11 29.90	(1248.61) (1.53)	#21 (1.372.72)	(292.89) (16	6.921 23	6.90 149.84	516.75	667.03		(210)	(103) (1.02	1 202	(1)	- (4)	(21)	(1)	- (15)	101	(1.179)		2 20		52	(1)	. (7)		- 80	. 65
Section Sect	1-2 Condensate Cond Old				909.61	830.99 791	49 604.54	945.90 48	16.73 1.09	6.36 870.35	2.10	52.72	6.441.81	11	423 21	202	224 207	105 -	168	51	- 16	268	1.498		21 -		5	0	0 1	1	- 16	- 227
Section Sect	2-a concensate Cond diff 2-3 Condensate Gas New			1 1	31.29 598.72	499.15 1.130	.121 (71.81) .72 410.68	(20.52) 279.99 42	11.14 52	2.251 33.18 0.45 443.70	0.12 1.28	0.25 28.59	6.442.44	12 14	529 17 525 26	162		242 -	390 314	96 299	- 29 - 17	171	2.023	(142) (1 65 1	22		(S) R	0	1 1	0	- (11)	- (351) - 213
Section Sect	2-3 Condensate Gas Old 2-3 Condensate Gas diff				637.28 (38.66)	508.92 1.181 (9.77) (42	87 421.32 15) (10.64)	(4.62) 41	(4.79) 51	0.56 441.25 9.89 2.46	1.27 0.01	28.22 0.37	4.540.34 (97.90)	32 (18)	1.195 65 (670) (29) 797 (519)	974 (513)	540 - (298) -	989 (675)	506 (307)	- 57 - (41)	421 (250)	(3,681)	212 2 (247) (2	12) -		25 (17)	(0)	2 4 (2)	(S)	· 21	- 725 - (512)
Section Sect	2-3 Gas Cond New 2-3 Gas Cond Old			1 1	546.07 572.53	377.45 1.464 411.54 1.607	13 673.84 56 748.06	445.27 52 474.21 51	11.39 76 16.58 77	9.83 468.65 8.80 470.94	0.97	41.39 43.19	5.309.88 5.620.28	6 14	1.681 55 2.293 1.01	339 574	599 857	156 -	276 505		2 34 2 40	161 286	4.092 6.204	222 3 286 6		0	9	5 9	- 6	52 54	· 15	- 681 1.172
Section Sect	2-3 Gas Cond diff 2-3 Gas Gas New						43) (74.21)	(28.94)	4.80 (9.98) (2.30)	0.01	(1.80) 4 515 37			(612) (66	(235)			(229)	(72)	(1) (7)	(125)	(2,123)	20.000 34.0	00 - 51		6	4 568	. 3	2 203	- 13	- 491
Section Sect	2-3 Gas Old				36.821.28	14.565.17 49.225	83 49.323.18	44.656.30 38.89	15.17 S8.24	0.59 45.061.23	82.11		351.449.57	660 9	0.365 40.32	23.785	29.767 2	. 100	25.869	12.595	143 1.623	15.016	260.154	20.649 21.1	17 -	1	645	559	- 282	2.205	1.500	
Section Sect				2.251.67 1.660.56	1.710.07	1788.72 2.655	42 134159	1.432.46 120	983 193	4.44 1.622.66	1,929,13	1.717.93	21.143.49	2.137	1.703 1.37	1.352	1671	348 1.083	971	592	970 1.323	1144	15.668	968 7	65 199	234	663	220	229 423	485	498 599	533 5.845
Section Sect	2-10 Condensate Cond Old 2-10 Condensate Cond diff	25 1.472 1.728	1.149 1.523 5.8	2.225.43 1.602.54 25.24 57.72	1.673.36	15/7.08 1.905 211.64 745	99 121.48	1.279.25 1.15 154.21 5	a.ed 199 i135 (7	N.14 1.694.44 2.69) (71.78)	2.016.03 (187.90)	1782.33	1.010.57	1.546 591	1.218 1.02 485 24	1.195	1.147 525	U14 678 236 404	590 281	295 297	674 BS2 297 471	749 295	4.597	(267) (2	57 141 781 (58)	70 (22)	(159)	(102)	199 251 (140) (153)	(188)	Jeni 487 (150) (112)	167 2,940 (266) (1,906)
Second Control Contr	-10 Condensate Gas New -10 Condensate Gas Old	36 955 1,158	883 706 3,3	1.052.55 1.188.11 98 902.63 1,048.76	1,036.56	1,060.44 1,177	32 894.98 58 868.69	927.51 83 924.41 81	12.64 89 19.85 91	1.40 899.62 7.13 905.42	816.13 830.33	1,015.15	11,583.78	1,014	829 76 1,506 1,27	1,077	729 1,285	675 500 196 1,257	1,248	1,096	517 585 1,169 1,287	1,127	7.772 15,297	483 3 945 5	56 88 29 170	342 516	541 868	507 800	401 377 721 700	431 808	331 218 688 454	473 6.449 928 8,138
Section Sect	1-10 Condensate Gas diff 1-10 Gas Cond New			149.92 139.36 849.94 791.73	80.821 1.158.49	1164 40	75 26.29 .06 1.134.31	13.10 1 664.04 90	12.78 (2 05.01 1.20	5.72) (5.80) 3.82 504.49	(14.20) 1.323.01	1.407.11	246.56 12.080.24	(859) 911	(667) (51 1.129 1.41	n (555) I 1,377	1299	521) (756) 064 1.004	(672) 1.336	962	651) (701) L203 717	(567) 783	17.6253 13.219	1073 6	121 (92) 74 258	(174) 61		12961	(320) (324) 237 223	(277) 250	(257) (236) 168 122	(455) (3,689) 219 3,697
Second Control Contr	-10 Gas Cond Old	13 513 492	376 519 1,6	H2 890.50 833.33	1,206.20	1,038.31 923	53 991.22 54 143.00	624.14 91	15.35 1,18	2.16 510.65	1,360.13	1,268.18	11,764.71	1,529	1,601 1,82	1,490	1,756	,648 1,445 (204) (43)	1,716	1,081	(227) (721)	1,181	17,750	1,265 1,6	12 386	152	558 786	330 182	497 429 260 20"		319 288	469 6,128
Section Sect	2-10 Gat Cond Off			111.936.18 90.965.35	94.604.25 10	0138293 108.632	06 B2.424.59	73.598.07 74.34	M.11 111.19	7.36 69.462.38	120.334.90	116.644.08 1	1.155.526.17	109.515 10	M.527 113.86	114.001	100 02 1 10	510 99.340	95.370	88.382 St	0021 83.873	79.292 1	.179.820	67.367 27.2	129 12 15.458	21.336	25.478	25.429 2	2452 31.645	20.888 2		21.528 287.240
Stock Stoc	r-10 Gas Old 2-10 Gas diff	3.334 60.216 76.569	su.906 72.178 273.3	112.146.24 91.305.21 (210.06) (129.85	94.524.50 1 1 79.75	2143.97 2.870	04 2.165.53	74.056.75 73.51 541.32 82	14.23 12.75	0.34 69.993.36 2.88) (530.99)	(1.762.31)	118 333 36 1	1.548.58	108.356 10 1.160	703 S2	113.278 723	99.372 10 648	879 98,239 631 1,001	94.799 571	17.997 St 285	556 268	77.888 1 505	8.580	67.107 37.0 260 3	15.301 57 157	20.977 360	34.952 526	7003 3	1M3 31199 528 446	40.515 I	29.608 224 299	41.309 382.976 429 4.364
1200 1200	a-su-condensate Cond New 3-10 Condensate Cond Old											- 1											- 1		18 2.259 75 1.598	297 295	741 470	426	152 290	863 532	660 723	1.027 10.914 667 7.287
1200 1200	3-10 Condensate Cond diff 3-10 Condensate Gas New				- :																	- :	- 1	- 10	(2) (661) 84 1.124	(1021) 774	(271) 706	969	(257) (236) 706 589	(222) 626		(361) (3.627) 297 7.525
150 150	9-10 Condensate Gas Old 9-10 Condensate Gas APP			1 : :																			1	- 2.0	71 2.091 861 (967)	1.179	1.192 HBG	1.516	1279 1101 (576) (517)	1.243		600 13.014 (601) (6.200
15 15 15 15 15 15 15 15	9-10 Gas Cond New			1 1	- :	- :			:		- :			- :			- :		- :			- :	1	- 3	90 1,264	235	535	377 638	443 316 941 611			591 5,824 990 10.000
15 15 15 15 15 15 15 15	3-10 Gat Cond diff			1 1								- 1										- : [. 14	36 876	274	481	462	200 200	227	224 290	229 4.775
(DNIO OI AND GAS CONSERVATION COMMISSION	-10 Gas Gas Old					-			-			- 1										- 1	-	- 66.5	17 95.313	66.960	62,935	67.112 S	2,890 45,703	54.454 5		57,829 683,209
	-sucus Gas diff																					. [-	- 1,0	1,477	1,153	1,001	1,119	947 731	663	IDAHO OIL AND	

NOTE: THIS SHEET USES A DIFFERENT ORDER OF WELLS, VERSUS ORIGINAL, AND ONLY SHOWS YEARLY SUMMARIES OF ORIGINAL (hidden monthly columns)
PLANATION TO COLORS OF FONTS AND HIGHLIGHTS
Plant Condensate
Residue Gas % = 10.3642 vs Liquid Volume % = 3.410.

2016 - 2018 Totals by Well Completion

Plant Condensate (BBL) Residue Gas (MMBtu) re not affected by the alle 2016-2018 Meter Name 2015 Total 2016 Total 2017 Total 2018 Total New (1+7) Old (2+8) New (4+10) Old (5+11) Total by W Cond Old FE-1030 ML 1-3 Condensate Gas Gas New Old 18,488 33,152 1,168 71,791 20,324 28,978 50,314 1.013 76,285 Gas Gas Old 1,612,473 1,301,134 1,281,423 2,986,516 it Total Allocati Old diff 17,061 17,571 5,738 2,674 493 228 23,292 20,473 4,147 Cond FE-134C Kauffman 1-34 Cond on (=>) by 3 Steps: Plant e Willow Total => Multi-Separator => Well 15,550 27,510 Old 6,525 3,074 4,177 9,830 11,345 31,819 Kauffman 1-34 Gas FE-1340 Gas Gas 582,775 Old 144,085 567,379 594,889 12,757 Allocation (=>) by 3 Steps: man => Little Willow Total => Multi Separator => Well 6,054 6,442 237 Cond Old diff 1,498 8,177 11,328 Cond New Old 4,082 6,204 1,172 12,997 21,173 FE-203G ML 2-3 Gas 676,762 679.869 nt Total ti-Well 1,729 FE-1150 DJS 1-15 Condensat No cation (=>) by One Step: Plant Total => DJS 1-15 Gas Old 68,018 59,323 127,342 Old 1,192 3,322 FE-1150 DJS 1-15 Gas 128,696 Gas Gas 1,354 128,696 Cond Cond Old diff 6,496 4,454 6,496 4,454 FF-109A Kauffman 1-9 LT Oil 1,834 1,627 Old Kauffman 1-9 LT Gas FE-109/ Gas Gas 125,289 124,013 Old 22,485 146,222 154,783 Old diff 3,183 4,614 1,115 2,648 3,688 Old 323 740 1,978 8,302 Cond 970 FE-109B Kauffman 1-9 UT Gas 252,190 New Old 67,976 67,695 246,449 64,964 113,509 50,940 253,873 FE-1100 ML 1-10 Condensate Gas Gas 314 268 New Old 2,711 Old 1,930 ML 1-10 Gas 40,311 Gas Gas 39,998 40,071 New Old 253,771 40.339 New Old diff Cond 28,645 22,738 12,804 11,979 3,907 6,114 4,645 FE-111AC ML 1-11 UT Condensat 7,953 7,685 14,204 21,798 7,892 6,222 5,423 Cond 1,739 FE-111A ML 1-11 UT Gas 256,638 2,118,941 Old 10,016 4,431 2,741 13,562 FE-111E ML 1-11 LT Conden 4,213 otal) => Well 6,027 5,960 534 735 Old 24,849 1,631 Cond 4,591 11,287 FE-111BG ML 1-11 LT Gas 911,640 Gas Gas New Old 311,809 33,701 33,442 896,213 260,992 907,414 42,657 35,154 Old diff FE-2100 ML 2-10 Condensati 24,052 35,119 11,584 4,449 8,138 3,738 Cond Old 11,745 17,750 35,632 1,912 6,138 70,786 FE-210 ML 2-10 Gas 2,745,748 2,742,323 Gas Gas Old 1,153,978 1,170,250 382,976 273,202 2,707,204 New Old 10,914 7,287 FE-310C ML 3-10 Condensati 13,814 13,814 Cond Cond Gas Gas FE-310G ML 3-10 Gas 697,023

	2015 Total	2016 Total	2017 Total	2018 Total
	Total B	y Year All Wells	Plant Condensa	te (BBL)
New		149,827	105,109	58,421
Old	30,067	149,827	105,109	58,421
diff		0	(0)	0
	To	tal All Wells Res	sidue Gas (MMB	tu)
New		5,203,712	4,085,300	2,015,653
Old	1,112,433	5,203,714	4,085,300	2,015,653
diff		(2)	(0)	^

| 2016-2018 Totals All Wells of Plant Condensate (IBBL) | 2016-2018 Totals All Wells of Residue Gas (MMBtu) | New | Old | Difference | New | Old | Difference | 11,304,665 | 13,305.75 | (2) |

ALLOCATION INVESTIGATION



May 29, 2019
DAVE SCHWARZ
OIL & GAS FIELD INSPECTOR
IDAHO DEPARTMENT OF LANDS

GENERAL BACKGROUND

Wells produce

2 hydrocarbon streams generically referred to as gas & condensate

2 streams are processed into 3 marketable products:

Residue Gas

Natural Gas Plant Liquids

Plant Condensate

Volumes of these 3 products are then **ALLOCATED** back to each well completion

ALLOCATION: The system by which ownership of oil, gas, & produced water is determined & tracked from point of production to a point of sale or discharge

Although the principles of allocation are straightforward, the details are highly complex

equivalent volume of source x attributable to the inlet of tier K delivered to sink y on the outlet of tier K: $V_{x_{K-1} \to y_K} = \sum_{i=1}^{I} \frac{V_{x_{K-1},i}}{\sum_{x_{K-1}=1}^{X_{K-1}} V_{x_{K-1},i}} \cdot V_{y_K,i}$

In 2018, OGCC noted discrepancies in reported volumes of Residue Gas & Plant Condensate

Residue Gas: derived from Rich Gas

Rich Gas: transported <u>from</u> wellheads <u>thru</u> Little Willow Gathering Facility, <u>thru</u> the 11 mile long gas pipeline, <u>to</u> Hwy 30 Plant

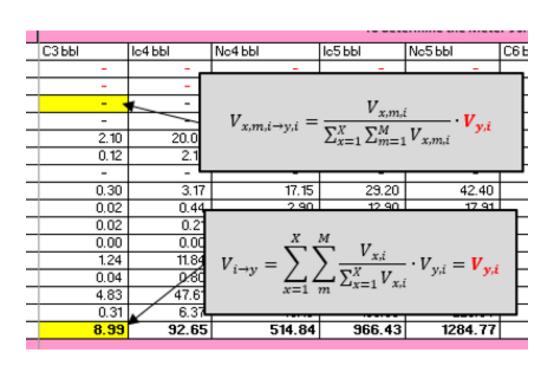
Hwy 30 Plant extracts *Natural Gas Plant Liquids* from *Rich Gas*, & delivers <u>Residue Gas</u> at outlet

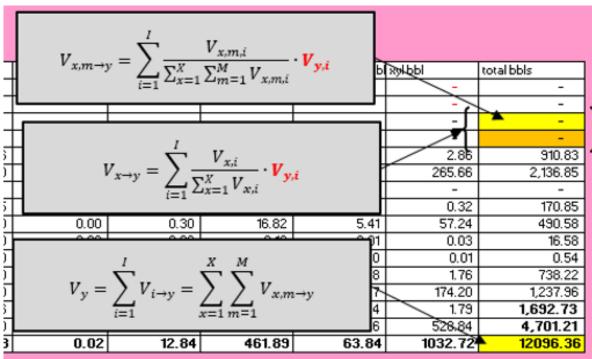
Plant Condensate: derived from Well Condensate

Well Condensate: transported from wellheads thru Little Willow Facility, thru 11 mile long condensate pipeline, thru Hwy 30 Plant

Alta Mesa discovered a systematic error in an equation used in some steps of allocation process

- Eq. scales vols of Plant Condensate allocated to gas & liquid streams leaving Little Willow Facility & entering Hwy 30 Plant
- Allocations of Natural Gas Plant Liquids not affected by error





Error = Mismatched Stream Analysis Reference of Components From Lab Analyses

Example	Hydrocarbon
Analysis	

closeup next slide

Components	Mole %	Weight %	Liq. Vol. %
Carbon Dioxide	0.0853	0.1450	0.0687
Nitrogen	0.0281	0.0304	0.0146
Methane	64.2964	39.8359	51.4398
Ethane	14.4191	16.7445	18.1980
Propane	11.9911	20.4207	15.5901
iso-Butane	2.5568	5.7392	3.9483
n-Butane	3.8382	8.6156	5.7104
iso-Pentane	0.9367	2.6100	1.6166
n-Pentane	0.9036	2.5178	1.5457
Cyclopentane	0.0519	0.1405	0.0725
n-Hexane	0.2551	0.8490	0.4950
Cyclohexane	0.0463	0.1505	0.0743
Other Hexanes	0.2743	0.9130	0.5324
Heptanes	0.0865	0.3347	0.1883
Methylcyclohexane	0.0301	0.1141	0.0571
2,2,4-Trimethylpentane	0.0951	0.4195	0.2332
Benzene	0.0247	0.0745	0.0326
Toluene	0.0104	0.0370	0.0164
Ethylbenzene	0.0007	0.0029	0.0013
Xylenes	0.0062	0.0254	0.0113
C8+ Heavies	0.0634	0.2797	0.1533
Totals	100.0000	100.0000	100.0000

Error = Mismatched Stream Analysis Reference of Components From Lab Analyses

Incorrect Allocation: applied equiv. Liq. Vol. %

Components	Mole %	Weight %	:	Liq. Vol. %
Carbon Dioxide	0.0853	0.1450		0.0687
Nitrogen	0.0281	0.0304	:	0.0146
Methane	64.2964	39.8359	:	51.4398

Correct Allocation: applied Mole %

GENERAL ALLOCATION METHOD

Individual well completions are allocated their shares of products (Plant Cond, Residue Gas, & NGPL) produced by Hwy 30 Plant by a 1-, 2-, or 3-step allocation method

Methods differ in # of steps because of technical, operational, or financial constraints assoc. with location of each well in relation to production process

Each step uses component volumes derived from lab analyses that are used to scale the contribution of each well completion to total of each product

One Step Allocation = DJS 1-15

Hwy 30 Plant totals are allocated **to** DJS 1-15 in a one-step process

Fluid stream from DJS 1-15 undergo 3-phase gravity separation & metering at the well pad

The 2 liquid hydrocarbon streams do not go to Little Willow

But directly into the 2 separate pipelines that transport Well Condensate & Rich Gas from Little Willow to Hwy 30 Plant

Two Step Allocation: Kauffman 1-9 LT, Kauffman 1-9 UT, ML 1-10, ML 1-11 UT, ML 1-11 LT, ML 2-10 & ML 3-10

Step 1: Hwy 30 Plant totals *to* Little Willow Facility totals

Step 2: Little Willow Facility totals (minus totals from the

"multi wells" discussed next) to these individual well

completions

3 Step Allocation. 3 wells with partial federal mineral ownership: ML 1-3, ML 2-3, & Kauffman 1-34

Step 1: Hwy 30 Plant totals to Little Willow Facility totals

Step 2: Little Willow totals *to* "multi well" totals. Each well fluid stream undergoes 3-phase grav. sep. & metering for each well at each well pad -- not at Little Willow Facility. Then, the 3 streams (water, HC liquids, & HC gases) from the 3 wells (9 total fluid streams) are combined into 1 gathering line, which runs to the Multi-Well (MW) 3-phase sep. located at Little Willow Facility. MW separator creates 3 fluid streams (water, HC liquids, & HC gases), each individually metered.

Step 3: The MW HC stream totals are allocated *to* individual well completions

Attachment 1 ("McFarland datasets")

Allocation datasets produced for Alta Mesa by petroleum engineer S. McFarland. Received on Apr 1, 2019 by O & G Div

McFarland datasets contain:

Monthly results & yearly summations of:

- original ("old") allocation method (2015-18)
- corrected ("new") allocation method (2016-18)
- differences between the two methods (2016-18)

Attachment 2 ("IDL Review datasets")

- Only the yearly summations of the McFarland datasets
- color-coding of datasets for ease of review,

Meter No. ▽	Meter Name	Product >	Allocation Metho 🚚	2016 Total	2017 Total	2018 Total	row	2016-2018 Total by We
FE-111AC	ML 1-11 UT Condensate	Cond	New	12,804	8,807	7,033	1	28,645
FE-111AC	ML 1-11 UT Condensate	Cond	Old	11,979	6,114	4,645	2	22,738
FE-111AC	ML 1-11 UT Condensate	Cond	diff	825	2,693	(2,389)	3	1,130
FE-111AC	ML 1-11 UT Condensate	Gas	New	7,953	3,661	2,590	4	14,204
FE-111AC	ML 1-11 UT Condensate	Gas	Old	7,685	7,892	6,222	5	21,798
FE-111AC	ML 1-11 UT Condensate	Gas	diff	268	(4,230)	(3,632)	6	(7,594)
FE-111AG	ML 1-11 UT Gas	Cond	New	8,996	7,672	6,194	7	22,861
FE-111AG	ML 1-11 UT Gas	Cond	Old	8,742	10,695	9,569	8	29,006
FE-111AG	ML 1-11 UT Gas	Cond	diff	254	(3,024)	3,376	9	606
FE-111AG	ML 1-11 UT Gas	Gas	New	828,451	721,620	559,782	10	2,109,853
FE-111AG	ML 1-11 UT Gas	Gas	Old	826,762	716,022	554,359	11	2,097,143
FE-111AG	ML 1-11 UT Gas	Gas	diff	1,689	5,598	5,423	12	12,710

Attach. 2 ("IDL Review datasets")

additional summations by Plant Condensate & Residue Gas new, old, difference, % difference

		2016	- 2018 Totals b	y Well Complet	ion		
	Plant Conde	ensate (BBL)			Residue Gas (N	/IMBtu)	
New (1+7)	Old (2+8)	Difference (3+9)	% Difference	New (4+10)	Old (5+11)	Difference (6+12)	% Difference
51,506							
	51,744						
		1,735	3%				
				2,124,058			
					2,118,941		
						5,116	0%

Bottom of Attach. 2 shows 2016-18 grand totals of all wells for:

2016-2018 Totals All Wells of Plant Condensate (BBL)									
New	Old	Difference							
313,357	313,357	0							

2016-2018 Totals All Wells of Residue Gas (MMBtu)									
New	Old	Difference							
11,304,665	11,304,667	(2)							

Attach. 2: new corrected allocation shows reasonable variances by well completion in % differences to old allocation results

Except for Kauffman 1-9 LT: -28 % difference in Plant Condensate

	Plant Conde	ensate (BBL)	
New (1+7)	Old (2+8)	Difference (3+9)	% Difference
0 220			
8,330	6,335		
		(1,765)	-28%

At this point in our investigation, the variances in % differences, including Kauffman 1-9 LT, are presumed to be related to the allocation error

QUESTIONS?

THANK YOU



$$V_{x} = \sum_{m=1}^{M} \sum_{i=1}^{I} V_{x,m,i} = \sum_{i=1}^{I} V_{x,i} = \sum_{i=1}^{I} V_{x,i} \cdot \frac{V_{i}}{V_{i}} = \sum_{i=1}^{I} V_{x,i} \cdot \frac{\sum_{y=1}^{Y} V_{y,i}}{\sum_{x=1}^{X} V_{x,i}}$$

$$V_{x} = \sum_{i=1}^{I} \frac{V_{x,i}}{\sum_{x=1}^{X} V_{x,i}} \cdot \sum_{y=1}^{Y} V_{y,i}$$

The equivalent volume contributed by source x is equal to the contribution of component i from source x relative to the contributions of component i from all sources, multiplied by the receipts of component i by all sinks, summed over all stream components.