

7/11/17

Mr. Mitch Little
Hellman & Associates
11913 W Interstate 70 Frontage Rd N
Wheat Ridge, CO 80033

H2S Analysis by GC-FPD

Dear Mr. Little,

APT Laboratory Services was delivered two gas phase samples in foil lined Tedlar bags on July 7, 2017. An H2S analysis was performed by APT on July 10, 2017, utilizing a modified ASTM Method D5504. A three-point calibration was performed on a HP 5890 gas chromatograph equipped with a flame photometric detector. Samples were analyzed in triplicate for hydrogen sulfide and a post calibration check was performed to show the stability of the instrument. All calibrations and sample results are enclosed. A summary of the results is shown below.

Hellman & Associates – H2S by GC-FPD, September 15, 2015	
Sample	H2S Conc. (ppm)
Razor 12G-WH1309-170706	53.4
Razor 12G-WH1310-170706	63.6
Razor 12H-North FWKO-170706	31.9
Razor 12H-South FWKO-170706	27.8

Modified ASTM D5504 Results

We look forward to being of service to Hellman & Associates in the future. Please call me with any questions or comments at (303) 420-5949 or (800) 268-6213.

Regards,



Daniel Williams
Asst Director of Laboratory Services

APT Project: LWTO7099

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Wheat Ridge, CO
7/10/2017

Modified ASTM D5504: Determination of Gaseous Reduced Sulfur Compounds using Gas Chromatography

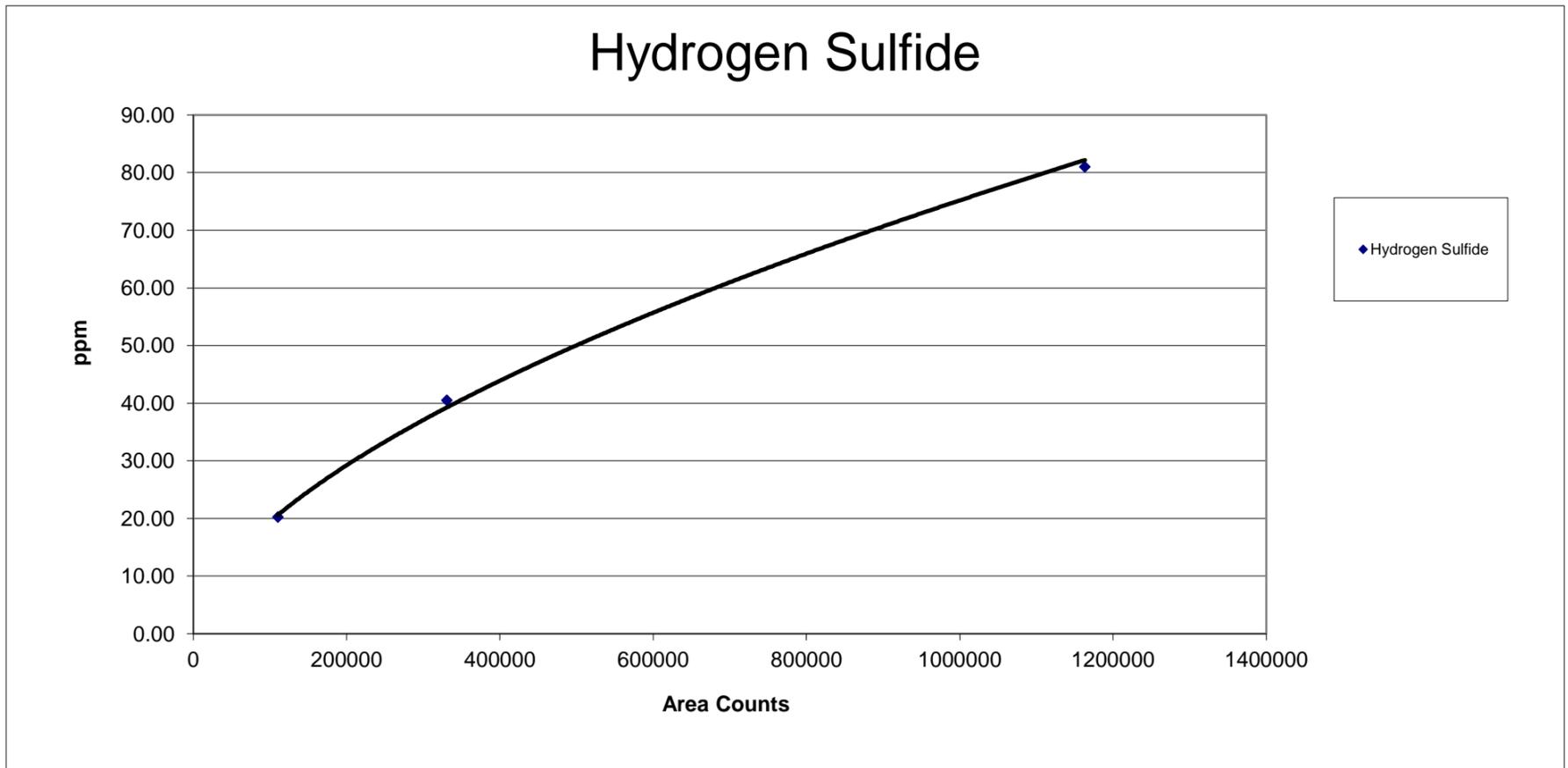
Initial Three-Point Calibration										
Low Level Calibration Standard										
Cpd ID	Conc. (ppm)	Inj. 1		Inj. 2		Inj. 3		Average		OK?
		RT	AC	RT	AC	RT	AC	RT	AC	
Hydrogen Sulfide	20.25	2.212	110882.2	2.212	110021.5	2.212	109506.8	2.212	110137	Y
Mid Level Calibration Standard										
Cpd ID	Conc. (ppm)	Inj. 1		Inj. 2		Inj. 3		Average		OK?
		RT	AC	RT	AC	RT	AC	RT	AC	
Hydrogen Sulfide	40.50	2.213	342006.4	2.212	324115.1	2.212	326407.3	2.212	330843	Y
High Level Calibration Standard										
Cpd ID	Conc. (ppm)	Inj. 1		Inj. 2		Inj. 3		Average		OK?
		RT	AC	RT	AC	RT	AC	RT	AC	
Hydrogen Sulfide	81.00	2.212	1160219.7	2.212	1136289	2.211	1193660.0	2.212	1163389	Y

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Power Regression Calculations
conc= A*area^B

Hydrogen Sulfide					
Certified ppm	Average AC	Power Regression Statistics			ppm from curve
		R ²	A	B	
20.25	110137	0.9989	0.022541	0.587194	20.59
40.50	330843				39.27
81.00	1163389				82.17





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Sample Analysis									
Razor 12G-WH1309-170706									
Cpd ID	Inj. 1		Inj. 2		Inj. 3		Average		
	RT	AC	RT	AC	RT	AC	RT	AC	OK? ppm
Hydrogen Sulfide	2.211	583249.9	2.21	548955.5	2.211	542244.1	2.211	558150	Y 53.39
Razor 12G-WH1310-170706									
Cpd ID	Inj. 1		Inj. 2		Inj. 3		Average		
	RT	AC	RT	AC	RT	AC	RT	AC	OK? ppm
Hydrogen Sulfide	2.213	763916.1	2.213	758317.1	2.214	730844.8	2.213	751026	Y 63.55
Razor 12H-North FWKO-170706									
Cpd ID	Inj. 1		Inj. 2		Inj. 3		Average		
	RT	AC	RT	AC	RT	AC	RT	AC	OK? ppm
Hydrogen Sulfide	2.213	229697.2	2.213	223369.1	2.213	242941	2.213	232002	Y 31.88
Razor 12H-South FWKO-170706									
Cpd ID	Inj. 1		Inj. 2		Inj. 3		Average		
	RT	AC	RT	AC	RT	AC	RT	AC	OK? ppm
Hydrogen Sulfide	2.212	180093.1	2.212	185237.7	2.211	187097.5	2.212	184143	Y 27.84



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Quality Assurance													
Recovery / Spike (mid-level calibration gas to the sample probe)													
Cpd ID	Conc. (ppm)	Inj. 1		Inj. 2		Inj. 3		Average			TriPLICATE OK?	Recovery OK?	Audit OK?
		RT	AC	RT	AC	RT	AC	RT	AC	ppm			
Hydrogen Sulfide	81.00	2.212	1182584	2.213	1157932	2.213	1150429	2.213	1163648	82.18	Y	Y	Y

