



07/05/18

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

### H2S Analysis by GC-FPD

Dear Mr. Little,

Alliance Source Testing was delivered nineteen gas phase samples in foil lined Tedlar bags on June 26, 2018. An H2S analysis was performed by AST on June 28, 2018, 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, June 28, 2018	
Sample	H2S Conc. (ppm)
Horsetail 30 CPB South Test Separator 180625	41.2
Horsetail 30 CPB North Production E&F Separator 180625	50.5
Horsetail 30 CPB South Production Separator 180625	42.4
Horsetail 30 CPB North Test E&F Separator 180625	39.9
Horsetail 30 CPB North Test Separator 180625	33.1
Horsetail 30G WH 3112 180625	32.1
Horsetail 30G WH 1911 180625	34.7
Horsetail 30G WH 1943 180625	30.6
Horsetail 30E WH 3135 180625	17.8
Razor 30J WH 3143 180625	17.9
Horsetail 30G WH 3143 180625	28.0
Horsetail 30G WH 1912 180625	20.6
Horsetail 30G WH 3111 180625	34.3
Horsetail 30 CPB North Production G&H Separator 180625	36.8
Horsetail 30E WH 3104 180625	26.8
Razor 25 CPB O&P Test Separator 180625	20.6
Horsetail 30H WH 1916 180625	15.7
Horsetail 30E WH 3103 180625	17.6
Razor 25 CPB O&P Production Separator 180625	30.3

*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,

A handwritten signature in black ink, appearing to read "Daniel Williams". The signature is fluid and cursive, with a large loop at the end.

Daniel Williams  
Asst Director of Laboratory Services

AST Project: HMA-8-60



Hellman & Associates

Wheat Ridge, CO

6/26/2018

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		
		RT	AC	RT	AC	RT	AC	RT	AC	OK?
Hydrogen Sulfide	5.06	1.89	20806.3	1.887	20034.7	1.887	19575.8	1.888	20139	Y
Mid Level Calibration Standard										
Cpd ID	Conc. (ppm)	Inj. 1		Inj. 2		Inj. 3		Average		
		RT	AC	RT	AC	RT	AC	RT	AC	OK?
Hydrogen Sulfide	20.25	1.888	137305.7	1.888	137849.3	1.887	133336.5	1.888	136164	Y
High Level Calibration Standard										
Cpd ID	Conc. (ppm)	Inj. 1		Inj. 2		Inj. 3		Average		
		RT	AC	RT	AC	RT	AC	RT	AC	OK?
Hydrogen Sulfide	81.00	1.887	1460923.9	1.887	1548291	1.887	1546535.5	1.887	1518583	Y



Hellman & Associates

Wheat Ridge, CO

6/26/2018

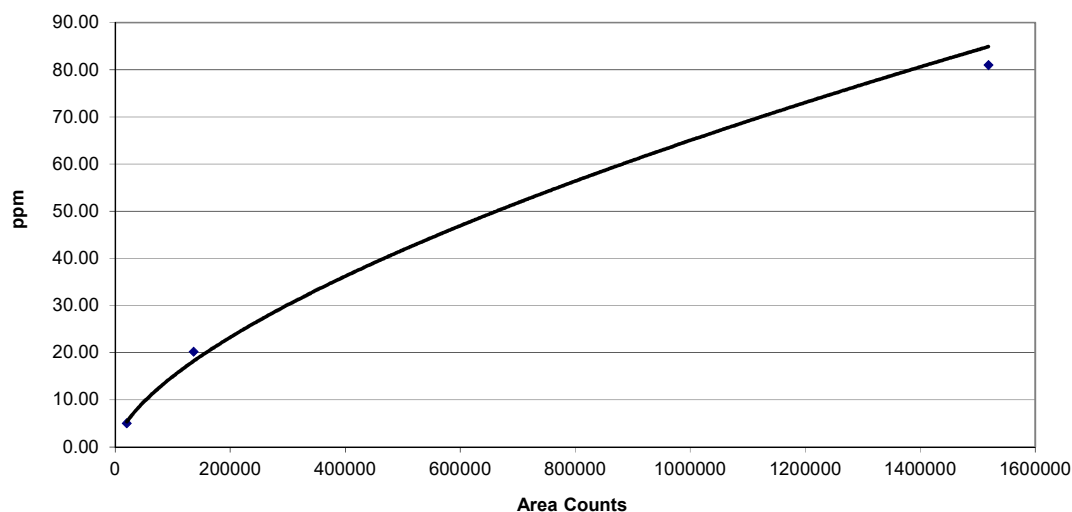
Modified ASTM D5504: Determination of Gaseous Reduced Sulfur Compounds using Gas Chromatography

Power Regression Calculations

$$\text{conc} = A \cdot \text{area}^B$$

Hydrogen Sulfide					
Certified ppm	Average AC	Power Regression Statistics			ppm from curve
		R <sup>2</sup>	A	B	
5.06	20139	0.9985	0.009593	0.638523	5.37
20.25	136164				18.20
81.00	1518583				84.91

## Hydrogen Sulfide





Hellman & Associates

Wheat Ridge, CO

6/26/2018

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

Sample Analysis									
Horsetail 30 CPB South Test Separator 180625									
Cpd ID	Inj. 1		Inj. 2		Inj. 3		Average		
	RT	AC	RT	AC	RT	AC	RT	AC	OK? ppm
Hydrogen Sulfide	1.886	498318.4	1.885	480858.1	1.884	491251.1	1.885	490143	Y 41.24
Horsetail 30 CPB North Production E&F Separator 180625									
Cpd ID	Inj. 1		Inj. 2		Inj. 3		Average		
	RT	AC	RT	AC	RT	AC	RT	AC	OK? ppm
Hydrogen Sulfide	1.883	687404.8	1.883	665985.8	1.883	666416.3	1.883	673269	Y 50.51
Horsetail 30 CPB South Production Separator 180625									
Cpd ID	Inj. 1		Inj. 2		Inj. 3		Average		
	RT	AC	RT	AC	RT	AC	RT	AC	OK? ppm
Hydrogen Sulfide	1.882	526230.1	1.883	507899.2	1.882	501679.7	1.882	511936	Y 42.40
Horsetail 30 CPB North Test E&F Separator 180625									
Cpd ID	Inj. 1		Inj. 2		Inj. 3		Average		
	RT	AC	RT	AC	RT	AC	RT	AC	OK? ppm
Hydrogen Sulfide	1.882	475496	1.882	451861.8	1.881	469851.4	1.882	465736	Y 39.92
Horsetail 30 CPB North Test Separator 180625									
Cpd ID	Inj. 1		Inj. 2		Inj. 3		Average		
	RT	AC	RT	AC	RT	AC	RT	AC	OK? ppm
Hydrogen Sulfide	1.881	340114.1	1.881	346357.8	1.881	353829.2	1.881	346767	Y 33.07
Horsetail 30G WH 3112 180625									
Cpd ID	Inj. 1		Inj. 2		Inj. 3		Average		
	RT	AC	RT	AC	RT	AC	RT	AC	OK? ppm
Hydrogen Sulfide	1.881	324572.2	1.881	341635.3	1.881	326208	1.881	330805	Y 32.09
Horsetail 30G WH 1911 180625									
Cpd ID	Inj. 1		Inj. 2		Inj. 3		Average		
	RT	AC	RT	AC	RT	AC	RT	AC	OK? ppm
Hydrogen Sulfide	1.881	361536.6	1.881	377762.9	1.881	380718.3	1.881	373339	Y 34.66
Horsetail 30G WH 1943 180625									
Cpd ID	Inj. 1		Inj. 2		Inj. 3		Average		
	RT	AC	RT	AC	RT	AC	RT	AC	OK? ppm
Hydrogen Sulfide	1.880	313172.9	1.88	302915.3	1.88	304747	1.880	306945	Y 30.59
Horsetail 30E WH 3135 180625									
Cpd ID	Inj. 1		Inj. 2		Inj. 3		Average		
	RT	AC	RT	AC	RT	AC	RT	AC	OK? ppm
Hydrogen Sulfide	1.877	128673.9	1.878	132403.1	1.877	132671.2	1.877	131249	Y 17.78
Razor 30J WH 3143 180625									
Cpd ID	Inj. 1		Inj. 2		Inj. 3		Average		
	RT	AC	RT	AC	RT	AC	RT	AC	OK? ppm
Hydrogen Sulfide	1.877	131137.6	1.877	134329.3	1.877	131864	1.877	132444	Y 17.88



Hellman & Associates

Wheat Ridge, CO

6/26/2018

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

Sample Analysis									
Horsetail 30G WH 3143 180625									
Cpd ID	Inj. 1		Inj. 2		Inj. 3		Average		
	RT	AC	RT	AC	RT	AC	RT	AC	OK? ppm
Hydrogen Sulfide	1.880	266553.2	1.88	261916.4	1.88	272286.7	1.880	266919	Y 27.98
Horsetail 30G WH 1912 180625									
Cpd ID	Inj. 1		Inj. 2		Inj. 3		Average		
	RT	AC	RT	AC	RT	AC	RT	AC	OK? ppm
Hydrogen Sulfide	1.880	161300.5	1.879	170931.7	1.879	163715.6	1.879	165316	Y 20.60
Horsetail 30G WH 3111 180625									
Cpd ID	Inj. 1		Inj. 2		Inj. 3		Average		
	RT	AC	RT	AC	RT	AC	RT	AC	OK? ppm
Hydrogen Sulfide	1.879	358156	1.879	367006.7	1.879	378033.8	1.879	367732	Y 34.33
Horsetail 30 CPB North Production G&H Separator 180625									
Cpd ID	Inj. 1		Inj. 2		Inj. 3		Average		
	RT	AC	RT	AC	RT	AC	RT	AC	OK? ppm
Hydrogen Sulfide	1.879	404504.4	1.88	414011.2	1.879	410410.9	1.879	409642	Y 36.78
Horsetail 30E WH 3104 180625									
Cpd ID	Inj. 1		Inj. 2		Inj. 3		Average		
	RT	AC	RT	AC	RT	AC	RT	AC	OK? ppm
Hydrogen Sulfide	1.879	250881	1.879	240197.2	1.878	258172.4	1.879	249750	Y 26.82
Razor 25 CPB O&P Test Separator 180625									
Cpd ID	Inj. 1		Inj. 2		Inj. 3		Average		
	RT	AC	RT	AC	RT	AC	RT	AC	OK? ppm
Hydrogen Sulfide	1.878	166030.3	1.879	166920	1.878	164214.8	1.878	165722	Y 20.64
Horsetail 30H WH 1916 180625									
Cpd ID	Inj. 1		Inj. 2		Inj. 3		Average		
	RT	AC	RT	AC	RT	AC	RT	AC	OK? ppm
Hydrogen Sulfide	1.878	109748	1.878	107196	1.878	107392	1.878	108112	Y 15.71
Horsetail 30E WH 3103 180625									
Cpd ID	Inj. 1		Inj. 2		Inj. 3		Average		
	RT	AC	RT	AC	RT	AC	RT	AC	OK? ppm
Hydrogen Sulfide	1.878	129457.5	1.878	127477	1.878	130396	1.878	129110	Y 17.60
Razor 25 CPB O&P Production Separator 180625									
Cpd ID	Inj. 1		Inj. 2		Inj. 3		Average		
	RT	AC	RT	AC	RT	AC	RT	AC	OK? ppm
Hydrogen Sulfide	1.878	302271.9	1.877	305404	1.877	297326.8	1.877	301668	Y 30.25



Hellman & Associates

Wheat Ridge, CO

6/26/2018

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

Quality Assurance													
Mid Level Post Calibration Check													
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	20.25	1.877	143241	1.878	140739	1.878	135785	1.878	139922	18.52	Y	Y	Y





## CHAIN OF CUSTODY RECORD - Shipping Receipt

Temperature on Receipt \_\_\_\_\_

AIR POLLUTION TESTING  
5530 MARSHALL ST.  
ARVADA, CO 80002  
T: (303) 420-5949  
F: (303) 420-5929

Record all of the unit temperatures, unit pressures, collection dates and ambient conditions.

PROJECT CODE			Project Manager			CHAIN OF CUSTODY #							
CLIENT NAME			TELEPHONE # / FAX #			Page 2 of 2							
ADDRESS			DATE			CONTRACT/PURCHASE/QUOTE #							
CITY	STATE	ZIP CODE	SITE CONTACT	LAB CONTACT Mike Pearson	LAB NUMBER 303-420-5949 x 22	CARRIER / WAYBILL #							
SITE NAME			WELL ID & SAMPLE			Cylinder #	Unit Temperature (°F)	Unit Pressure (psi)	Ambient T (°F)	Ambient P (psi)	Date Collected	Sampler's Initials	Analysis Method
Culinary Oil			Horsefai 30 CPB										
			North Production G3H Separator			180625							
			Horsefai 30 CPB										
			North Test G3H Separator			180625							
			Horsefai 30 CPB										
			North Production E3F Separator			180625							
			Horsefai 30 CPB										
			North Test E3F Separator			180625							
			Horsefai 30 CPB										
			South Test Separator			180625							
			Horsefai 30 CPB										
			South Production Separator			180625							
			Razor 25 CPB										
			O3P Production Separator			180625							
			Razor 25 CPB										
			O3P Test Separator			180625							
Notes:													
1. Relinquished By Mitch Little Day 06/26/18 Time													
2. Relinquished By 1. Received By Daniel Williams 6/26/18													
3. Relinquished By 2. Received By 3. Received By													
Comments:													