AIR POLLUTION TESTING, INC.
DENVER, SALT LAKE CITY

9/12/17

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 six gas phase samples in foil lined Tedlar bags on September 8, 2017. An H2S analysis was performed by APT on September 11, 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 11, 2017	
Sample	***H2S Conc. (ppm)***
Horsetail 07E-WH-0611-170908	28.2
Horsetail 07E-WH-0634-170908	76.1
Horsetail 07W-NorthESeparator-170908	40.4
Horsetail 07W-SouthESeparator-170908	41.6
Horsetail 07W-SouthETreater-170908	63.0
Horsetail 07W-NorthFSeparator-170908	26.2

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: LWTO7117

DENVER OFFICE
5530 Marshall Street
Arvada, CO 80002
(303) 420-5949
FAX (303) 420-5920
(800) 268-6213

AIR POLLUTION TESTING, INC.
DENVER, SALT LAKE CITY

Hellman & Associates
Wheat Ridge, CO
9/11/2017
Modified ASTM D5504: Determination of Gaseous Reduced Sulfur Compounds using Gas Chromatography

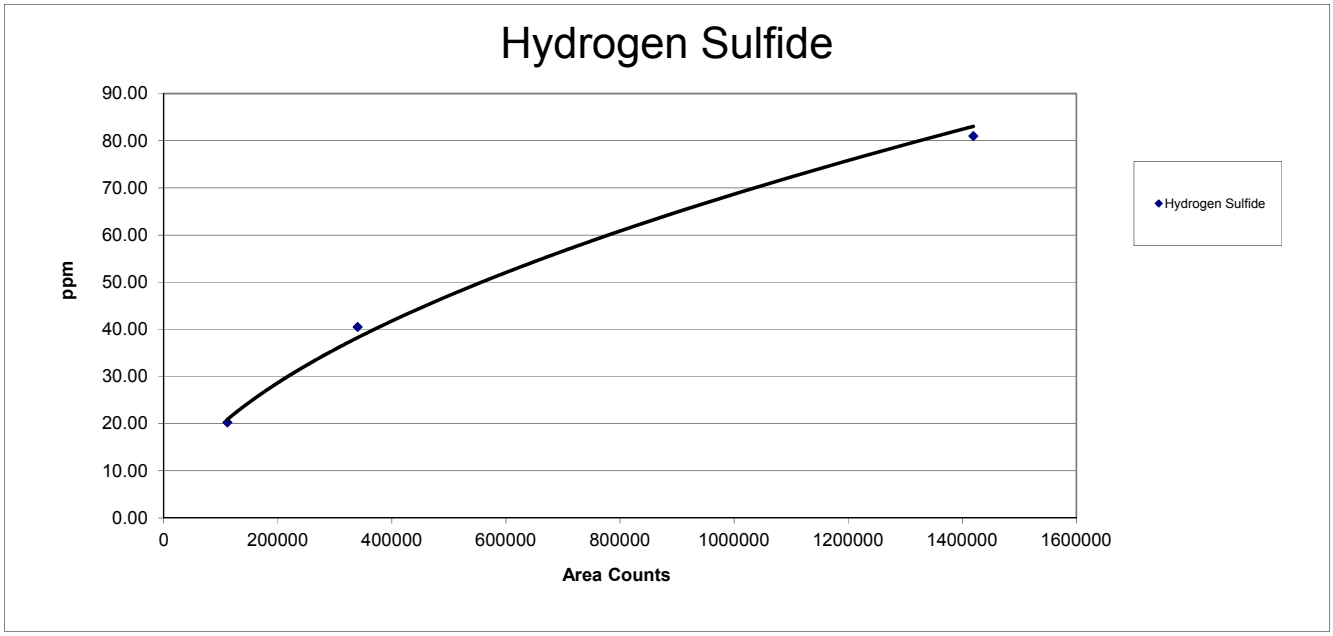
Initial Three-Point Calibration										
Low Level Calibration Standard										
Cpd	**Conc.**	**Inj. 1**		**Inj. 2**		**Inj. 3**		**Average**		
ID	**(ppm)**	**RT**	**AC**	**RT**	**AC**	**RT**	**AC**	**RT**	**AC**	**OK?**
Hydrogen Sulfide	**20.25**	2.014	108115.1	2.013	112767.9	2.012	114154.9	2.013	111679	Y
Mid Level Calibration Standard										
Cpd	**Conc.**	**Inj. 1**		**Inj. 2**		**Inj. 3**		**Average**		
ID	**(ppm)**	**RT**	**AC**	**RT**	**AC**	**RT**	**AC**	**RT**	**AC**	**OK?**
Hydrogen Sulfide	**40.50**	2.012	328349.2	2.012	338058.4	2.012	353522.3	2.012	339977	Y
High Level Calibration Standard										
Cpd	**Conc.**	**Inj. 1**		**Inj. 2**		**Inj. 3**		**Average**		
ID	**(ppm)**	**RT**	**AC**	**RT**	**AC**	**RT**	**AC**	**RT**	**AC**	**OK?**
Hydrogen Sulfide	**81.00**	2.012	1424823.7	2.012	1394280	2.012	1438843.6	2.012	1419316	Y

AIR POLLUTION TESTING, INC.
DENVER, SALT LAKE CITY

Hellman & Associates
Wheat Ridge, CO
9/11/2017
Modified ASTM D5504: Determination of Gaseous Reduced Sulfur Compounds using Gas Chromatography

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	111679	0.9964	0.03818	0.542501	20.91
40.50	339977				38.25
81.00	1419316				83.05



AIR POLLUTION TESTING, INC.
DENVER, SALT LAKE CITY

Hellman & Associates
Wheat Ridge, CO
9/11/2017
Modified ASTM D5504: Determination of Gaseous Reduced Sulfur Compounds using Gas Chromatography

Sample Analysis											
Horsetail 07E-WH-0611-170908											
Cpd	**Inj. 1**		**Inj. 2**		**Inj. 3**		**Average**				
ID	**RT**	**AC**	**RT**	**AC**	**RT**	**AC**	**RT**	**AC**	**OK?**	**ppm**
Hydrogen Sulfide	2.011	190912.7	2.012	197814.8	2.011	192280.6	2.011	193669	Y	28.19
Horsetail 07E-WH-0634-170908											
Cpd	**Inj. 1**		**Inj. 2**		**Inj. 3**		**Average**				
ID	**RT**	**AC**	**RT**	**AC**	**RT**	**AC**	**RT**	**AC**	**OK?**	**ppm**
Hydrogen Sulfide	2.011	1192008.6	2.011	1226338	2.011	1203401	2.011	1207249	Y	76.07
Horsetail 07W-NorthESeparator-170908											
Cpd	**Inj. 1**		**Inj. 2**		**Inj. 3**		**Average**				
ID	**RT**	**AC**	**RT**	**AC**	**RT**	**AC**	**RT**	**AC**	**OK?**	**ppm**
Hydrogen Sulfide	2.011	373873.1	2.011	381089	2.01	370302.1	2.011	375088	Y	40.35
Horsetail 07W-SouthESeparator-170908											
Cpd	**Inj. 1**		**Inj. 2**		**Inj. 3**		**Average**				
ID	**RT**	**AC**	**RT**	**AC**	**RT**	**AC**	**RT**	**AC**	**OK?**	**ppm**
Hydrogen Sulfide	2.011	390672.8	2.011	409241.1	2.011	392597.2	2.011	397504	Y	41.64
Horsetail 07W-SouthETreater-170908											
Cpd	**Inj. 1**		**Inj. 2**		**Inj. 3**		**Average**				
ID	**RT**	**AC**	**RT**	**AC**	**RT**	**AC**	**RT**	**AC**	**OK?**	**ppm**
Hydrogen Sulfide	2.011	879117.3	2.01	852951.9	2.011	822498.6	2.011	851523	Y	62.95
Horsetail 07W-NorthFSeparator-170908											
Cpd	**Inj. 1**		**Inj. 2**		**Inj. 3**		**Average**				
ID	**RT**	**AC**	**RT**	**AC**	**RT**	**AC**	**RT**	**AC**	**OK?**	**ppm**
Hydrogen Sulfide	2.011	169513.7	2.01	167598.7	2.01	171100.4	2.010	169404	Y	26.21

AIR POLLUTION TESTING, INC.
DENVER, SALT LAKE CITY

Hellman & Associates
Wheat Ridge, CO
9/11/2017
Modified ASTM D5504: Determination of Gaseous Reduced Sulfur Compounds using Gas Chromatography

Quality Assurance													
Recovery / Spike (mid-level calibration gas to the sample probe)													
Cpd	Conc.	Inj. 1		Inj. 2		Inj. 3		Average			Triplicate	Recovery	Audit
ID	(ppm)	RT	AC	RT	AC	RT	AC	RT	AC	ppm	OK?	OK?	OK?
Hydrogen Sulfide	40.50	2.011	360649.2	2.011	376633.4	2.012	374382.8	2.011	370555	40.08	Y	Y	Y

CHAIN OF CUSTODY RECORD - Shipping Receipt

Temperature on Receipt _____

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

AIR POLLUTION TESTING
5530 MARSHALL ST.
ARVADA, CO 80002
T: (303) 420-5949
F: (303) 420-5925

PROJECT CODE	Project Manager Mitch Little	CHAIN OF CUSTODY #
CLIENT NAME Hellman & Assoc./Whiting Oil	TELEPHONE # / FAX #	Page 1 of 1
ADDRESS 11913 W. I-70 Frontage Rd. North	DATE 9/08/17	CONTRACT/PURCHASE/QUOTE #
CITY Wheat Ridge STATE CO ZIP CODE 80033	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
	Horsetail 07E-WH-0611-170908							ML	ASTM D5504 H_2S
	Horsetail 07E-WH-0634-170908								
	Horsetail 07W-North E Separator-170908								
	Horsetail 07W-South E Separator-170908								
	Horsetail 07W-South E Treater-170908								
	Horsetail 07W-North F Separator-170908								

Notes:

1. Relinquished By	Date 9/8/17	Time 1015	1. Received By		Date 9/8/17	Time 1015
2. Relinquished By	Date	Time	2. Received By		Date	Time
3. Relinquished By	Date	Time	3. Received By		Date	Time

Comments: