Summary of ASARCO LLC - Hayden Operations
Particulate Emission Data
Scrubber #3
11/06/17

EPA Method 5 Particulates				
Run	**Time**	**gr/dscf**	**lb/hr**	**g/dscm**
1	14:19-15:35	0.0044	1.42	0.0100
2	16:24-17:27	0.0031	0.99	0.0070
3	18:05-19:10	0.0160	5.25	0.0366
Mean		**0.0078**	**2.55**	**0.0179**

Process Rate
TPH[1]
906.6
794.4
901.0
867.3

Example Calculation:
1 gram (g) = 15.43 grains (gr)
1 dry standard cubic meter (dscm) = 35.31467 dry standard cubic feet (dscf)
g/dscm = [(0.0044 gr/dscf)(1 g/15.43 gr)]/(1 dscm/35.31467 dscf) = 0.0100 g/dscm

EPA Methods 1-4 Gas Stream Characteristics							Ambient air	
Run	**Time**	**AWCFM**	**ADCFM**	**DSCFM**	**Ts °F**	**%H_2O**	**CO_2**	**O_2**
						%v	**%vd**	
1	14:19-15:35	41,205.5	40,278.4	37,627.5	69.4	2.25	0.0	20.9
2	16:24-17:27	41,682.9	40,595.0	37,606.7	72.2	2.61	0.0	20.9
3	18:05-19:10	41,993.8	41,040.5	38,322.3	67.9	2.27	0.0	20.9
Mean		**41,627.4**	**40,638.0**	**37,852.2**	**69.8**	**2.38**	**0.0**	**20.9**

[1] Production Data provided by ASARCO LLC - Hayden Operations

Summary of ASARCO LLC - Hayden Operations
Particulate Emission Data
Scrubber #4
11/07-08/17

EPA Method 5 Particulates				
Run	**Time**	**gr/dscf**	**lb/hr**	**g/dscm**
4	*09:21-11:32	0.0028	0.92	0.0065
5	12:28-13:40	0.0020	0.63	0.0045
6	08:10-09:24	0.0058	1.89	0.0133
Mean		**0.0035**	**1.14**	**0.0081**

Process Rate
TPH[1]
803.7
792.6
755.0
783.8

Example Calculation:
1 gram (g) = 15.43 grains (gr)
1 dry standard cubic meter (dscm) = 35.31467 dry standard cubic feet (dscf)
g/dscm = [(0.0028 gr/dscf)(1 g/15.43 gr)]/(1 dscm/35.31467 dscf) = 0.0065 g/dscm

EPA Methods 1-4 Gas Stream Characteristics							Ambient air	
Run	**Time**	**AWCFM**	**ADCFM**	**DSCFM**	**Ts °F**	**%H_2O**	**CO_2**	**O_2**
						%v	**%vd**	
4	*09:21-11:32	41,117.9	40,164.0	37,759.6	66.5	2.32	0.0	20.9
5	12:28-13:40	40,655.5	39,618.8	37,034.1	69.0	2.55	0.0	20.9
6	08:10-09:24	42,549.0	41,583.1	37,804.3	82.5	2.27	0.0	20.9
Mean		**41,440.8**	**40,455.3**	**37,532.6**	**72.7**	**2.38**	**0.0**	**20.9**

[1] Production Data provided by ASARCO LLC - Hayden Operations

* Run 4 interupted 09:21-10:42, 11:11-11:32

Summary of ASARCO LLC - Hayden Operations
Particulate Emission Data
Scrubber #5
11/07-08/17

EPA Method 5 Particulates				
Run	**Time**	**gr/dscf**	**lb/hr**	**g/dscm**
7	*09:21-11:32	0.0140	4.49	0.0320
8	12:28-13:40	0.0160	5.06	0.0366
9	08:10-09:24	0.0049	1.54	0.0112
Mean		**0.0116**	**3.70**	**0.0266**

Process Rate
TPH[1]
803.7
792.6
755.0
783.8

Example Calculation:
1 gram (g) = 15.43 grains (gr)
1 dry standard cubic meter (dscm) = 35.31467 dry standard cubic feet (dscf)
g/dscm = [(0.0140 gr/dscf)(1 g/15.43 gr)]/(1 dscm/35.31467 dscf) = 0.0320 g/dscm

EPA Methods 1-4 Gas Stream Characteristics							Ambient air	
Run	**Time**	**AWCFM**	**ADCFM**	**DSCFM**	**Ts °F**	**%H_2O**	**CO_2**	**O_2**
						%v	**%vd**	
7	*09:21-11:32	40,161.7	39,354.4	37,330.4	62.1	2.01	0.0	20.9
8	12:28-13:40	40,050.7	39,177.6	36,945.1	64.5	2.18	0.0	20.9
9	08:10-09:24	39,706.5	38,864.7	36,579.8	64.1	2.12	0.0	20.9
Mean		**39,973.0**	**39,132.2**	**36,951.8**	**63.6**	**2.10**	**0.0**	**20.9**

[1] Production Data provided by ASARCO LLC - Hayden Operations

* Run 4 interupted 09:21-10:42, 11:11-11:32

Summary of ASARCO LLC - Hayden Operations
Particulate Emission Data
Scrubber #1
11/08-09/17

EPA Method 5 Particulates				
Run	**Time**	**gr/dscf**	**lb/hr**	**g/dscm**
10	12:46-14:06	0.0060	2.00	0.0137
11	15:15-16:45	0.0025	0.84	0.0057
12	09:15-10:28	0.0031	1.04	0.0072
Mean		**0.0039**	**1.29**	**0.0089**

Process Rate
TPH[1]
759.2
793.7
786.3
779.7

Example Calculation:
1 gram (g) = 15.43 grains (gr)
1 dry standard cubic meter (dscm) = 35.31467 dry standard cubic feet (dscf)
g/dscm = [(0.006 gr/dscf)(1 g/15.43 gr)]/(1 dscm/35.31467 dscf) = 0.0137 g/dscm

EPA Methods 1-4 Gas Stream Characteristics							Ambient air	
Run	**Time**	**AWCFM**	**ADCFM**	**DSCFM**	**Ts °F**	**%H_2O**	**CO_2**	**O_2**
						%v	**%vd**	
10	12:46-14:06	42,360.2	41,398.6	38,942.6	65.6	2.27	0.0	20.9
11	15:15-16:45	42,460.2	41,538.8	39,100.4	65.4	2.17	0.0	20.9
12	09:15-10:28	41,705.1	40,879.3	38,610.1	62.3	1.98	0.0	20.9
Mean		**42,175.2**	**41,272.2**	**38,884.4**	**64.4**	**2.14**	**0.0**	**20.9**

[1] Production Data provided by ASARCO LLC - Hayden Operations

Summary of ASARCO LLC - Hayden Operations
Particulate Emission Data
Scrubber #2
11/08-09/17

EPA Method 5 Particulates				
Run	**Time**	**gr/dscf**	**lb/hr**	**g/dscm**
13	12:46-14:06	0.0012	0.43	0.0028
14	15:15-16:45	0.0014	0.47	0.0031
15	09:15-10:28	0.0056	1.95	0.0128
Mean		**0.0027**	**0.95**	**0.0062**

Process Rate
TPH[1]
759.2
793.7
786.3
779.7

Example Calculation:
1 gram (g) = 15.43 grains (gr)
1 dry standard cubic meter (dscm) = 35.31467 dry standard cubic feet (dscf)
g/dscm = [(0.0012 gr/dscf)(1 g/15.43 gr)]/(1 dscm/35.31467 dscf) = 0.0028 g/dscm

EPA Methods 1-4 Gas Stream Characteristics							Ambient air	
Run	**Time**	**AWCFM**	**ADCFM**	**DSCFM**	**Ts °F**	**%H_2O**	**CO_2**	**O_2**
						%v	**%vd**	
13	12:46-14:06	45,236.1	44,164.0	41,345.7	68.1	2.37	0.0	20.9
14	15:15-16:45	44,014.7	42,923.1	40,169.2	68.2	2.48	0.0	20.9
15	09:15-10:28	44,214.5	43,374.4	40,760.8	65.2	1.90	0.0	20.9
Mean		**44,488.4**	**43,487.2**	**40,758.6**	**67.2**	**2.25**	**0.0**	**20.9**

[1] Production Data provided by ASARCO LLC - Hayden Operations

Summary of ASARCO LLC - Hayden Operations
Particulate Emission Data
Scrubber #6
11/09/17

EPA Method 5 Particulates				
Run	**Time**	**gr/dscf**	**lb/hr**	**g/dscm**
16	13:06-14:08	0.0033	0.62	0.0076
17	*15:04-16:19	0.0024	0.44	0.0055
18	17:29-18:30	0.0119	2.36	0.0272
Mean		**0.0059**	**1.14**	**0.0134**

Process Rate
TPH[1]
748.4
729.9
787.9
755.4

Example Calculation:
1 gram (g) = 15.43 grains (gr)
1 dry standard cubic meter (dscm) = 35.31467 dry standard cubic feet (dscf)
g/dscm = [(0.0140 gr/dscf)(1 g/15.43 gr)]/(1 dscm/35.31467 dscf) = 0.0320 g/dscm

EPA Methods 1-4 Gas Stream Characteristics							Ambient air	
Run	**Time**	**AWCFM**	**ADCFM**	**DSCFM**	**Ts °F**	**%H_2O**	**CO_2**	**O_2**
						%v	**%vd**	
16	13:06-14:08	24,028.2	23,535.6	21,891.6	69.1	2.05	0.0	20.9
17	*15:04-16:19	23,350.9	22,932.9	21,298.8	69.9	1.79	0.0	20.9
18	17:29-18:30	25,205.2	24,854.8	23,146.7	67.7	1.39	0.0	20.9
Mean		**24,194.8**	**23,774.4**	**22,112.4**	**68.9**	**1.74**	**0.0**	**20.9**

[1] Production Data provided by ASARCO LLC - Hayden Operations

* Run 17 interupted 15:04-15:43, 15:57-16:19

Summary of ASARCO LLC - Hayden Operations
Particulate Emission Data
Scrubber #7
11/10,13/2017

EPA Method 5 Particulates				
Run	**Time**	**gr/dscf**	**lb/hr**	**g/dscm**
19	10:43-11:44	0.0038	0.67	0.0087
20	12:26-13:27	0.0039	0.68	0.0089
21	09:10-10:10	0.0008	0.14	0.0018
Mean		**0.0028**	**0.50**	**0.0065**

Process Rate
TPH[1]
812.8
793.9
672.1
759.6

Example Calculation:
1 gram (g) = 15.43 grains (gr)
1 dry standard cubic meter (dscm) = 35.31467 dry standard cubic feet (dscf)
g/dscm = [(0.0038 gr/dscf)(1 g/15.43 gr)]/(1 dscm/35.31467 dscf) = 0.0087 g/dscm

EPA Methods 1-4 Gas Stream Characteristics							Ambient air	
Run	**Time**	**AWCFM**	**ADCFM**	**DSCFM**	**Ts °F**	**%H_2O**	**CO_2**	**O_2**
						%v	**%vd**	
19	10:43-11:44	22,473.7	21,990.5	20,697.2	64.0	2.15	0.0	20.9
20	12:26-13:27	22,307.1	21,800.7	20,411.2	65.4	2.27	0.0	20.9
21	09:10-10:10	21,030.2	20,639.0	19,670.6	60.0	1.86	0.0	20.9
Mean		**21,937.0**	**21,476.7**	**20,259.7**	**63.1**	**2.09**	**0.0**	**20.9**

[1] Production Data provided by ASARCO LLC - Hayden Operations

Summary of ASARCO LLC - Hayden Operations
Particulate Emission Data
Scrubber #10
11/13-14/2017

EPA Method 5 Particulates				
Run	**Time**	**gr/dscf**	**lb/hr**	**g/dscm**
22	13:34-14:35	0.0016	0.20	0.0037
23	15:17-16:18	0.0028	0.33	0.0064
24	09:21-10:22	0.0010	0.12	0.0023
Mean		**0.0018**	**0.22**	**0.0041**

Process Rate
TPH[1]
675.9
684.3
698.9
686.4

Example Calculation:
1 gram (g) = 15.43 grains (gr)
1 dry standard cubic meter (dscm) = 35.31467 dry standard cubic feet (dscf)
g/dscm = [(0.0140 gr/dscf)(1 g/15.43 gr)]/(1 dscm/35.31467 dscf) = 0.0320 g/dscm

EPA Methods 1-4 Gas Stream Characteristics							Ambient air	
Run	**Time**	**AWCFM**	**ADCFM**	**DSCFM**	**Ts °F**	**%H_2O**	**CO_2**	**O_2**
						%v	**%vd**	
22	13:34-14:35	15,607.0	15,480.6	14,401.2	68.4	0.81	0.0	20.9
23	15:17-16:18	15,207.4	14,847.0	13,833.4	67.5	2.37	0.0	20.9
24	09:21-10:22	15,094.3	14,780.3	13,919.7	63.0	2.08	0.0	20.9
Mean		**15,302.9**	**15,036.0**	**14,051.4**	**66.3**	**1.75**	**0.0**	**20.9**

[1] Production Data provided by ASARCO LLC - Hayden Operations

Summary of ASARCO LLC - Hayden Operations
Particulate Emission Data
Scrubber #9
11/13-14/2017

EPA Method 5 Particulates				
Run	**Time**	**gr/dscf**	**lb/hr**	**g/dscm**
25	13:34-14:35	0.0011	0.35	0.0025
26	15:17-16:18	0.0012	0.36	0.0027
27	09:21-10:22	0.0019	0.61	0.0043
Mean		**0.0014**	**0.44**	**0.0032**

Process Rate
TPH[1]
675.9
684.3
698.9
686.4

Example Calculation:
1 gram (g) = 15.43 grains (gr)
1 dry standard cubic meter (dscm) = 35.31467 dry standard cubic feet (dscf)
g/dscm = [(0.0140 gr/dscf)(1 g/15.43 gr)]/(1 dscm/35.31467 dscf) = 0.0320 g/dscm

EPA Methods 1-4 Gas Stream Characteristics							Ambient air	
Run	**Time**	**AWCFM**	**ADCFM**	**DSCFM**	**Ts °F**	**%H_2O**	**CO_2**	**O_2**
						%v	**%vd**	
25	13:34-14:35	39,086.0	39,086.0	36,505.0	66.2	0.00	0.0	20.9
26	15:17-16:18	37,576.1	36,783.2	34,352.8	65.6	2.11	0.0	20.9
27	09:21-10:22	40,612.8	39,804.6	37,576.2	61.7	1.99	0.0	20.9
Mean		**39,091.6**	**38,557.9**	**36,144.7**	**64.5**	**1.37**	**0.0**	**20.9**

[1] Production Data provided by ASARCO LLC - Hayden Operations

Summary of ASARCO LLC - Hayden Operations
Particulate Emission Data
Scrubber #8
11/14-15/2017

EPA Method 5 Particulates				
Run	**Time**	**gr/dscf**	**lb/hr**	**g/dscm**
28	13:12-14:48	0.0010	0.19	0.0023
29	07:51-09:28	0.0009	0.18	0.0021
30	09:49-11:29	0.0016	0.33	0.0037
Mean		**0.0012**	**0.23**	**0.0027**

Process Rate
TPH[1]
713.8
720.5
719.4
717.9

Example Calculation:
1 gram (g) = 15.43 grains (gr)
1 dry standard cubic meter (dscm) = 35.31467 dry standard cubic feet (dscf)
g/dscm = [(0.0140 gr/dscf)(1 g/15.43 gr)]/(1 dscm/35.31467 dscf) = 0.0320 g/dscm

EPA Methods 1-4 Gas Stream Characteristics							Ambient air	
Run	**Time**	**AWCFM**	**ADCFM**	**DSCFM**	**Ts °F**	**%H_2O**	**CO_2**	**O_2**
						%v	**%vd**	
28	13:12-14:48	24,491.0	23,996.3	22,527.2	62.0	2.02	0.0	20.9
29	07:51-09:28	25,724.3	25,315.3	24,136.5	55.4	1.59	0.0	20.9
30	09:49-11:29	25,495.1	25,143.3	23,873.5	57.5	1.38	0.0	20.9
Mean		**25,236.8**	**24,818.3**	**23,512.4**	**58.3**	**1.66**	**0.0**	**20.9**

[1] Production Data provided by ASARCO LLC - Hayden Operations