

Commonwealth of Pennsylvania  
Department of Environmental Protection  
Southcentral Regional Office  
September 21, 2017

Subject: Sunoco Pipeline LP/Mount Union Station/Mariner East  
Addendum Memo  
Shirley Township, Huntingdon County  
Permit No. 31-03036

To: William Weaver *WVW 9/21/17*  
Regional Manager  
Air Quality Program

Thru: Thomas Hanlon, Chief *TJH 9/21/17*  
East Permitting Section  
Air Quality Program

From: Darrell Hartline *DH 9/21/17*  
East Permitting Section  
Air Quality Program

**Comment Period**

Copies of the proposed permit were submitted to Mr. Matthew Kraus of Tetra Tech Inc. representing Sunoco Pipeline LP (SPLP) on December 18, 2014. Mr. Kraus did not have any comments.

Notice of the Department's intent to issue the operating permit was published in the Pennsylvania Bulletin on 1/3/15. In response to the posting, DEP received, during the comment period until 2/2/15, 439 form letter emails. 11 similar emails were also received after the end of the comment period, some of them from persons who had earlier commented.

The emails generally addressed the following items:

**Comment 1:** *requested that DEP reject the Sunoco applications for Shirley Township (Huntingdon County), Londonderry Township (Dauphin County), and Toboyne Township (Perry County) as they would increase local air emissions and set a dangerous precedent for NGL transport through the corridor.*

**DEP Response:** The air emissions from this facility were determined by DEP to be de minimis, and as such are not expected to result in any measurable health or environmental issues. Furthermore, the permit action under consideration is for an air quality permit for the new pump station, and does not concern the pipeline that runs between the stations.

**Comment 2:** *requested that DEP hold public hearings on each of these three applications.*

**DEP Response:** In March of 2015, DEP informed the commenters that “*After considering the public hearing requests received, DEP has concluded that there is not sufficient local interest in any of the three applications to merit holding public hearings. Nevertheless, we are in receipt of your emailed comments, and will consider them prior to taking final action on the affected permits.*”

**Comment 3:** *requested that DEP conduct a cumulative air quality impact and public safety analysis of the entire Sunoco Mariner East NGL pipeline project, including emissions from the 18 proposed pumping stations, the hydraulically fractured wells at the point of extraction, the MarkWest gas processing facility, the Marcus Hook fractionation and shipping facility, and the fugitive emissions from the entire 350-mile pipeline route.*

**DEP Response:** DEP believes that it is contrary to law and to recent court decisions, to aggregate, for air permitting purposes, this pump station with other pump stations or facilities on, or connected with the Mariner East pipeline. This facility is neither contiguous with nor adjacent to the other pump stations. Furthermore, the aggregation of this facility with the other pump stations would not meet the common sense notion of a plant.

Copies of a representative example of the form letters received, plus a list of commenters, are included as attachments to this memo. A complete collection of the form letters received can be found in the DEP permit file for the Sunoco Doylesburg permit in Toboyne Township, Perry County.

### **Addendum Submittal**

A permit application addendum was submitted by SPLP on August 29, 2016 (and revised on September 9, 2016) because the emissions associated with the Mount Union Station were recalculated based on:

- Updated equipment information including flare pilot gas flow rate,
- More detailed information regarding maintenance activities,
- As-built Piping and Instrumentation Diagrams (P&IDs),
- Current equipment specific emission factors, and
- A more conservative flare emission estimate utilizing the manufacturer’s guaranteed design destruction and removal efficiency of 98%.

Also on December 14, 2016, the Environmental Protection Agency issued minor revisions to AP-42 Section 13.5: Industrial Flares. As a result, the VOC emissions from the flare pilot gas increased by 0.02 tpy.

The revised potential emissions estimates based on the summer 2016 submissions and the 12/14/16 AP-42 change are 0.06 tpy of NO<sub>x</sub>, 0.25 tpy of CO, 0.82 tpy of VOCs, 0.01 tpy of Methane and 112 tpy of GHGs.

On August 31, 2016 the Department received a Request for Determination (RFD) for the additional equipment and modifications required for the installation of the Mariner East II pipeline. The equipment includes a pig launcher and receiver and flare knockout tank. On March 22, 2017 the Department approved an exemption from plan approval for the RFD. The potential to emit from the Mariner II modifications is 0.01 tpy NO<sub>x</sub>, 0.05 tpy CO, 0.26 tpy VOCs, 0.02 tpy HAPs and 25 tpy GHGs.

The total site potential to emit (Mariner I plus Mariner II) is 0.07 tpy NO<sub>x</sub>, 0.30 tpy CO, 1.08 tpy VOCs, 0.02 tpy HAPs, 0.01 tpy Methane and 137 tpy of GHGs.

It should be noted that, per an email from Sunoco dated 9/20/17, all of the Mariner II equipment at the affected pump stations *“is installed, but will not be in service until the MEII system is put in service.”*

As part of the ongoing review of this permit, the Department has looked further into the issue of aggregation of the facility with other nearby sources owned by SPLP. They provided supplemental information to their aggregation analysis on 2/16/16. The closest facility identified was the Shade Valley Road/Highway 35 Block Valve located approximately 6.3 miles away. There is no interdependence between operation of the Block Valve and the Mount Union Station. As a result the Department has determined that no emissions need to be aggregated with those of the Mount Union Station. Sunoco also included an aggregation analysis in the 8/29/16 application update. This was identical to the 2/16/16 submission.

There is no confidential documentation in the updated application and supporting emails.

**Revisions to Draft Permit:**

In order to promote regional consistency and consistent permit conditions between the various similar Sunoco sites, the permit conditions for Mount Union have been revised to be like those for the recently issued Sunoco West Cornwall permit. The West Cornwall permit was re-drafted for consistency with two Sunoco permits in DEP's Southeast Region. Please refer to the attached addendum memo for West Cornwall, which describes the changes.

Also, the West Cornwall permit was revised to include a minor significance determination for fugitive emissions under 25 Pa. Code Section 123.1. Please refer to the attached second addendum memo for West Cornwall, which describes this determination. Consistent with that action, DEP is also formalizing its determination that the air emissions expected from the Mount Union Station, including both stack and fugitive emissions are of minor significance with regard to causing air pollution, and will not, on their own merits, prevent or interfere with the attainment or maintenance of an ambient air quality standard. A condition will be placed in the operating permit to this effect. DEP makes this determination because the post-control emissions from the site:

- 1.) do not meet the criteria for needing an air quality permit and
- 2.) are much smaller than the emissions from many other legally operating sources in the Commonwealth.

3.) have not been shown to cause any environmental problems during normal operation.

Huntingdon County is currently designated as attainment for the 2008 ozone NAAQS. Also, since Huntingdon County is located within the Ozone Transport Region, it is treated as moderate nonattainment for emission offset purposes. With regard to particulate pollution, Huntingdon County is currently designated as attainment for the 2012 annual PM2.5 NAAQS. As a minor source with post-control emissions below air permit thresholds, the Sunoco Mount Union facility is not expected to meaningfully affect local or regional compliance with ambient air quality standards.

The following condition will be placed in Section C of the permit, *“The potential fugitive plus stack emissions from this facility, after appropriate control as prescribed in this permit, have been estimated as follows: 0.07 tpy of NOx, 0.30 tpy of CO, 1.08 tpy of VOCs, 0.02 tpy of HAPs, 0.01 tpy of Methane and 137 tpy of GHGs. The Department has determined these emissions remaining after appropriate control are of minor significance with regard to causing air pollution, and will not prevent or interfere with the attainment or maintenance of an ambient air quality standard.”*

The Responsible Official and Permit Contact Person were updated per an email received on August 9, 2017.

### **Conclusions and Recommendations**

I recommend that the revised draft Permit No. 31-03036 be redistributed for comments.

Attachments

cc: Permits/SC Region 31-03036, B3

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Email Commenters in 2015

Re: Draft Air Quality Operating Permit Nos. 50-03006, 22-03094 and 31-03036

for the Sunoco Pipeline LP facilities in Toboyne Twp., Perry Co.; Londonderry Twp., Dauphin Co.; and Shirley Twp., Huntingdon Co.

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22	Leitch	Mary Ann	526 Reed St	Philadelphia PA	19147	mleitch@live.com	215-271-7878
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## Email Commenters in 2015

Re: Draft Air Quality Operating Permit Nos. 50-03006, 22-03094 and 31-03036  
for the Sunoco Pipeline LP facilities in Toboynre Twp., Perry Co.; Londonderry Twp., Dauphin Co.; and Shirley Twp., Huntingdon Co.

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145	Parker	Paul	60 Morrow Rd	Avella PA 15312	dparker@cobweb.net	724-344-3676
146	Parker	Paul	60 Morrow Rd	Avella PA 15312	dparker@cobweb.net	724-344-3676
147	Ramos	Joann	64 Fiume St	Iselin NJ 08830	joannspa@yahoo.com	215-723-6329
148	Moyer	Bruce	602 Halteman Rd	Souderton PA 18964	bhmoyer@yahoo.com	
149	Shelton	Susan	221 Oxford Rd	West Chester PA 19380	skemp321@aol.com	724-899-3620
150	Morris	Chrys	3259 Burgettstown Rd	Imperial PA 15126	chrysmorris@yahoo.com	215-637-0486
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152	Sciabarrasi	Rachel	5 5th St	Philadelphia PA 19147	raeannes@gmail.com	215-849-3936
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## Email Commenters in 2015

Re: Draft Air Quality Operating Permit Nos. 50-03006, 22-03094 and 31-03036  
for the Sunoco Pipeline LP facilities in Toboynne Twp., Perry Co.; Londonderry Twp., Dauphin Co.; and Shirley Twp., Huntingdon Co.

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178	Geiger	Melinda	74 Seldom Seen Rd	Bradford Woods PA 15015	imgeiger@mac.com	724-799-2142
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Email Commenters in 2015

Re: Draft Air Quality Operating Permit Nos. 50-03006, 22-03094 and 31-03036

for the Sunoco Pipeline LP facilities in Toboynre Twp., Perry Co.; Londonderry Twp., Dauphin Co.; and Shirley Twp., Huntingdon Co.

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Email Commenters in 2015

Re: Draft Air Quality Operating Permit Nos. 50-03006, 22-03094 and 31-03036

for the Sunoco Pipeline LP facilities in Toboyno Twp., Perry Co.; Londonderry Twp., Dauphin Co.; and Shirley Twp., Huntingdon Co.

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267	Claus	Carol	651 Foxcroft Circle SE	Marietta GA 30067	cdclaus@mindspring.com	770-955-5119
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Email Commenters in 2015

Re: Draft Air Quality Operating Permit Nos. 50-03006, 22-03094 and 31-03036

for the Sunoco Pipeline LP facilities in Toboyne Twp., Perry Co.; Londonderry Twp., Dauphin Co.; and Shirley Twp., Huntingdon Co.

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325	Sadowskas	Bruce	472 Pennsylvania Ave	Reading PA	19606	besad@otd.net	610-779-9698
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328	Miller	Jack	130 DeLong Rd	Middleburg PA	17842	iniller1018@yahoo.com	570-837-6546
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335	Wolfeman	Sondra	112 Buckhill Rd	Albrightsville PA	18210	lperrin21@hotmail.com	
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## Email Commenters in 2015

Re: Draft Air Quality Operating Permit Nos. 50-03006, 22-03094 and 31-03036

for the Sunoco Pipeline LP facilities in Toboyne Twp., Perry Co.; Londonderry Twp., Dauphin Co.; and Shirley Twp., Huntingdon Co.

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351	Poulson	Judi	1881 Knollwood Dr	Fairmont	MN 56031	judpace@gmail.com	507-235-5288
352	Solomon II	M	Rauch	Harrisburg	PA 17109	msolomll@gmail.com	
353	Herrington	George	1679 Washington Rd	Pittsburgh	PA 15216	g.c.herrington_realestate@gmail.com	412-283-0160
354	White	Beulah	2605 El Camino Dr	Middletown	OH 45044	bswhite@att.net	000 000 0000
355	Melton	John & Karen	3232 W Penn St	Philadelphia	PA 19129	karen.meitron59@gmail.com	215-844-4612
356	Steininger	Bob	100 Westridge Place S	Phoenixville	PA 19460	steininger.bob@gmail.com	
357	Fiedler	David	5188 Judson Dr	Bensalem	PA 19020	davefiedler@comcast.net	215-244-1101
358	Saltzman	Susan	1420 Locust St #23M	Philadelphia	PA 19102	scsaltzman@aol.com	215-732-9769
359	Baker-Smith	Gerritt & Elizabeth	338 Braeside Ave	East Stroudsburg	PA 18301	gebakersmith@gmail.com	570-369-4485
360	Greene	David	283 Carpenter Ln	North Huntingdon	PA 15642	david.greene5@comcast.net	412-673-0504
361	Greene	David	283 Carpenter Ln	North Huntingdon	PA 15642	david.greene5@comcast.net	412-673-0504
362	Fox	Kathy	1513 Elm St	Bethlehem	PA 18017	kathyfox@yahoo.com	908-319-8418
363	Girvin	Curtis	312 N 39th St	Harrisburg	PA 17109	curtis.girvin@verizon.net	717-587-8018
364	Oerke Jr	Carl	264 Lexington Dr	River Edge	NJ 07661	carl.oerke@yahoo.com	201-489-0867
365	Hart	Kathy	12 Summit Ln	Successuma	NJ 07876	kathyhart@gmail.com	
366	Kline	Debra	Bolivar	Bradford	PA 16701	dkline8989@yahoo.com	
367	Raddell	Peter	508 5th St	Mt Gretna	PA 17064	s.putnik@verizon.net	717-503-6771
368	Comella	John	1900 JF Kennedy Blvd Apt 1624	Philadelphia	PA 19103	john.comella1@gmail.com	267-687-2288
369	Koplinka-Loehr	Sara	135 S 19th St 300	Philadelphia	PA 19103	skl@cleanair.org	215-567-4004
370	Borres	Kathleen	6371 Kemener Hollow Rd	Export	PA 15632	contini-borres@luno.com	
371	Bedard	Mark	29900 Gloria St	St Clair Shores	MI 48082	mbedard5150@gmail.com	808-343-1471
372	Stewart	Kathy	6510 Union Deposit Rd	Harrisburg	PA 17111	gram-s@comcast.net	
373	Ober	Jamie	1833 Upper Rd	Shamokin	PA 17872	dennisober@hotmail.com	8888888888
374	Struble	Mitch	2006 Naudain St	Philadelphia	PA 19146	elburtsm@yahoo.com	215-732-5868
375	Giulieri	Jason	5160 Cypress St	Pittsburgh	PA 15224	jasongiulieri@gmail.com	412-760-8507
376	Dorn	Valerie	812 Bennington Rd	Folcroft	PA 19032	yvdorn@yahoo.com	610-532-3513
377	Friday	Jean	5127 Cedar Hills Blvd	Belle Vernon	PA 15012	elfriday@atlanticbb.net	724-930-9848
378	Comella	John	1900 JF Kennedy Blvd Apt 1624	Philadelphia	PA 19103	john.comella1@gmail.com	267-687-2288

## Email Commenters in 2015

Re: Draft Air Quality Operating Permit Nos. 50-03006, 22-03094 and 31-03036

for the Sunoco Pipeline LP facilities in Toboyne Twp., Perry Co.; Londonderry Twp., Dauphin Co.; and Shirley Twp., Huntingdon Co.

#	LAST NAME	FIRST NAME	ADDRESS	CITY, STATE, ZIP	EMAIL ADDRESS	PHONE #
379	Sonin	John S	329 5th St	Juneau AK 99801	solohn61@hotmail.com	907-586-8212
380	Steinberg	Ruth	103 Knollwood Dr	Tinton Falls NJ 07724	ruthsteinberg71@gmail.com	
381	Grimley	Chris	52 Shannon Rd	North Wales PA 19454	grimleyvc@live.com	
382	Greinke	Pamylle	PO Box 456	Peconic NY 11958	pamylle1@gmail.com	
383	Friday	Jean	5127 Cedar Hills Blvd	Belle Vernon PA 15012	efriday@attantcbb.net	724-930-9848
384	Kashner	Dale	313 Claremont Dr	Seven Valleys PA 17360	drkashner@comcast.net	
385	Gulla	Ronald	302 Linden Creek Rd	Canonsburg PA 15317	flight1@verizon.net	724-745-3962
386	Gulla	Ronald	302 Linden Creek Rd	Canonsburg PA 15317	flight1@verizon.net	724-745-3962
387	Papandrea	John	110 W 90 St	New York NY 10024	jpap100@aol.com	
388	Stober	Phil	80 N Cornwall Rd	Lebanon PA 17042	pstober80@comcast.net	717-277-5461
389	Parowski	Paul	361 Eaglebrook Ln	Richfield PA 17086	paulparowski@verizon.net	570-539-4283
390	Pendleton	Shannon	815 Fetters Mill	Bryn Athyn PA 19009	sandersondesign@gmail.com	609-933-4872
391	Richard	Bryn	552 Holmes Rd	Morton PA 19070	bryn_r@ecolofund.net	2150000000
392	Leitch	Mary Ann	526 Reed St	Philadelphia PA 19147	mleitch@live.com	215-271-7878
393	Goldstein	Libby J	331 Queen St	Philadelphia PA 19147	gorbetrarsi@verizon.net	215-465-8878
394	Goldstein	Libby J	331 Queen St	Philadelphia PA 19147	gorbetrarsi@verizon.net	215-465-8878
395	Swirley	Thomas	9808 State Highway 249	Knoxville PA 16928	tswirley@gmail.com	814-326-4096
396	Seeger	Kimberly	11373 US Rte 422	Kittanning PA 16201	kimmiland@hotmail.com	724-354-4657
397	Reddig	Joyce	509 Singer Dr	Madison TN 37115	joycereddig@gmail.com	
398	Kosowicz	Aleks	12876 N Balsam Rd	Hayward WI 54843	guerilawordfare@yahoo.com	
399	Kite	Richard	Brown St	Colie NY 12345	coloneladamyc@aol.com	
400	Huddings	Margaret	409 W Union St	West Chester PA 19382	mhuddings@gmail.com	610-692-3849
401	Nash	Nora	609 S Convent Rd	Aston PA 19014	mash@stphila.org	610-558-7661
402	Glazer	Gerttrude	68 E Prospect St	Hopewell NJ 08525	freerangemusic@yahoo.com	609-466-2818
403	Herron	Doug	2132 N Hancock St	Philadelphia PA 19112	dougherron@me.com	
404	Wolfgang	Ken	541 W Elliot St	Philadelphia PA 19119	kenwolfgang@gmail.com	267-252-6717
405	Riddle	Carolyn		Austin TX 78758	riddlegame@gmail.com	
406	Vaughn	Bob	3016 W Harbor View Ave	Tampa FL 33611	vaughnbbob@gmail.com	
407	Koplinka-Loehr	Michael	118 Ross Rd	Lansing NY 14882	mak11@cornell.edu	607-592-8437
408	Payan	Maria	9 Aabel Rd	Delta PA 17314	psayans@zoominternet.net	717-456-5800
409	Harralson	David	3629 Lanckershim Blvd	Hollywood CA 90068	davidharralson@hotmail.com	
410	Tine	Tina	414 N Forest Park Blvd #725	Knoxville TN 37919	tina.m.tine@gmail.com	865-307-3566
411	Herry	William	117 Harshaville Rd	Clinton PA 15026	wfh@zoominternet.net	724-899-3271
412	Armm	Edward	15 Tennis Rd	Lake Hopatcong NJ 07849	edarmm@hotmail.com	973-663-4291
413	Hochheiser	Harry	5742 Woodmont St	Pittsburgh PA 15217	hshoch@gmail.com	
414	Everett	William	1055 W 27th Ave	Anchorage AK 99503	aestevalis.0@yahoo.com	666-420-6969
415	Born	Bernice	612 Avey St	Pittsburgh PA 15212	edward.born@verizon.net	
416	Armm	Edward	15 Tennis Rd	Lake Hopatcong NJ 07849	edarmm@hotmail.com	973-663-4291
417	Hartleben	Christian	732 Spring Ln	Philadelphia PA 19128	prophit1970@gmail.com	215-482-1012
418	Leavy	William	2031 Placita de Vida	Sante Fe NM 87505	quatermass5@hotmail.com	000-000-0000
419	Perron	Andrew	7227 Penn Ave	Pittsburgh PA 15208	dwerdha@gmail.com	412-657-2084
420	Safer	Daniel	3305 Hamilton St	Philadelphia PA 19104	saferdan@hotmail.com	000-000-0000

Email Commenters in 2015

Re: Draft Air Quality Operating Permit Nos. 50-03006, 22-03094 and 31-03036

for the Sunoco Pipeline LP facilities in Toboynne Twp., Perry Co.; Londonderry Twp., Dauphin Co.; and Shirley Twp., Huntingdon Co.

#	LAST NAME	FIRST NAME	ADDRESS	CITY, STATE, ZIP	EMAIL ADDRESS	PHONE #
421	Grimley	Chris	52 Shannon Rd	North Wales PA 19454	grimleyc@live.com	
422	Focht	Linda	50 Glen Oley Dr	Reading PA 19606	ljfocht@hotmail.com	
423	Moore	Barbara	4652 Cheryl Dr	Bethlehem PA 18017	msgemstone@att.net	
424	Hochheiser	Harry	5742 Woodmont St	Pittsburgh PA 15217	hshoch@gmail.com	718-704-7023
425	Guzman	Joseph	87-39 98th St	Woodhaven NY 11421	joguzzzw@aol.com	570-577-8124
426	Lyons	Jonathan	196 Mountaintview Rd	Lewisburg PA 17837	Jonathan.Lyons@bucknell.edu	610-220-2036
427	White	Chuck	1233 Victoria Ln	West Chester PA 19380	cpw048@gmail.com	310-963-6536
428	Sugarman	Steven	PO Box 923	Mallibu CA 90265	wrathchild62@gmail.com	610-849-2212
429	Janusko	Robert & Donna	1329 Eaton Ave	Bethlehem PA 18018	482b71e1@opayg.com	
430	Binder	Caroline	1140 Union Church Rd	McConnellsburg PA 17233	m.s.c.binder@gmail.com	570-489-8409
431	Laverne	David	844 Lincoln St	Dickson City PA 18519	backpack2@comcast.net	
432	Gelfand	Carol	478 Byrlee Dr	Pittsburgh PA 15237	carolegelfand@mac.com	412-367-1921
433	Morelli	Erin	1322 Mary Jane Ln	West Chester PA 19380	erinmorelli@hotmail.com	484-614-6783
434	Neill	John	1254 Longford Rd	West Chester PA 19380	johnkb24@verizon.net	
435	Rapp	Susan	1239 Victoria Ln	West Chester PA 19380	sr19380@yahoo.com	
436	Miller	Michael	102 Lynn Circle	West Chester PA 19380	mshiller@gmail.com	
437	Feridun	Karen	260 E Main St	Kutztown PA 19530	berts@astruth@gmail.com	610-678-7726
438	Miller	Scott	916 N 23rd St	Allentown PA 18104	planoscott@yahoo.com	
439	Flynn	John	88 Dillon Way	Washington Crossing PA 18977	jmflynn33@comcast.net	215-321-3280
440	Smetzler	M	7356 Gun Club Rd	New Tripoli, PA 18066	msmetzlr@ptd.net	
441	Meade	D	Jefferson Ave	Lewisburg PA 17837	dmeade2@gmail.com	
442	Bence	Jeff	1066 Washington Ave PO Box 97	Wycombe PA 18980	jeffence@aol.com	215-860-0360
443	Boring	Sharon	531 Center Grange Rd	Monaca PA 15061	tuppveremiah@aol.com	724-378-0808
444	Bence	Jeff	1066 Washington Ave PO Box 97	Wycombe PA 18980	jeffence@aol.com	215-860-0360
445	Durante	Eric	241 Goss Hollow Ln	Port Matilda PA 16870	ericdurante@gmail.com	814-692-7152
446	Vogelsong	Patrick	443 W Penn St	Carlisle PA 17013	pvog73@zoho.com	717-574-3847
447	Smetzler	M	7356 Gun Club Rd	New Tripoli, PA 18066	msmetzlr@ptd.net	
448	Crtser	Jackie	19747 SW Sweet Gum Ct	Beaverton OR 97078	jackiecrtser@gmail.com	503-880-0292
449	DiRenzo	Jennifer	4997 Watson Rd	Elk Creek MO 65464	foxescreek@aol.com	
450	Saina	Mark	1517 S Stanley St	Philadelphia PA 19146	mbtw12@yahoo.com	

**Wilkes, Dawne**

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**From:** John Grillo <john.grillo@maine.edu>  
**Sent:** Monday, January 26, 2015 8:41 PM  
**To:** Hanlon, Thomas  
**Subject:** [Reject the Proposed Sunoco Logistics Pumping Stations in Huntingdon County, Dauphin County, and Perry County! #31-03036, #22-03094, #50-03006]

Dear DEP Facility Permitting Chief Hanlon,

I respectfully submit this public comment and the following requests pertaining to the proposed Sunoco Logistics natural gas liquids (NGL) pumping stations in Shirley Township, Londonderry Township, and Toboyne Township, PA. The Pennsylvania Department of Environmental Protection (DEP) is responsible for ensuring that residents of [the Commonwealth of] Pennsylvania have clean water and pure air. In order to protect these constitutional rights to the greatest extent possible, I formally request the following:

- 1) PA DEP reject Sunoco Logistics' application to operate NGL pumping stations in Shirley Township, Londonderry Township, and Toboyne Township, PA as they would increase local air pollution and set a dangerous precedent for NGL transport through this corridor.
- 2) PA DEP at the very least hold public hearings and meetings with time for questions and answer[s] regarding each of these proposed NGL pumping stations[:] [P]ermit [N]umbers[ ] 31-03036, 22-03094, and 50-03006.
- 3) PA DEP conduct a cumulative air quality impact and public safety analysis of the entire Sunoco Logistics Mariner East NGL pipeline project[,] including emissions from the 18 proposed pumping stations; the hydraulically-fractured wells at the point of extraction; the MarkWest gas processing facility (63-00936); the fractionation and shipping facility at the Marcus Hook [I]ndustrial [C]omplex (23-0119); and the fugitive emissions from the entire 350-mile pipeline route that is over 80 years old.

Sincerely,

John Grillo  
3 Marsh Lane Apt. 21  
Orono, ME 04473  
(207) 949-7323

**Commonwealth Of Pennsylvania**  
**Department of Environmental Protection**  
**Southcentral Regional Office**  
 May 12, 2017

Subject: Sunoco Pipeline LP/Cornwall Station/Mariner East 1  
 Addendum Memo  
 West Cornwall Township, Lebanon County  
 Permit No. 38-03062

To: William Weaver *WW 5/19/17*  
 Regional Manager  
 Air Quality Program

Thru: Thomas Hanlon, Chief *TH 5/12/17*  
 East Permitting Section  
 Air Quality Program

From: Darrell Hartline *DH 5/12/17*  
 East Permitting Section  
 Air Quality Program

**Comment Period**

Copies of the proposed permit were submitted to Mr. Matthew Kraus of Tetra Tech Inc. representing Sunoco Pipeline LP (SPLP) and to DEP Reading District inspection staff.

Mr. Kraus responded with an email dated 10/3/14, indicating that the SIC Code listed on the cover sheet of the permit was incorrect. DEP concurs with this change.

Notice of the Department's intent to issue the operating permit was published in the Pennsylvania Bulletin on September 20, 2014. In response to requests from the public, DEP held a public hearing on this draft permit on 2/17/15, at the Quentin Volunteer Fire Company. During the public comment period on the draft permit, DEP has received numerous public comments both in favor of, and in opposition to the application, including close to 500 form letter emails, as well as a protest letter from an environmental advocacy group called the Clean Air Council. Copies of these comment items, a list of commenters, and DEP's Comment and Response Document, are included as attachments to this memo.

**Addendum Submittal**

A permit application addendum was submitted by SPLP on 9/12/16 because the emissions associated with the Cornwall Station have been recalculated based on:

- Updated equipment information including flare pilot gas flow rate,
- More detailed information regarding maintenance activities,

- As-built Piping and Instrumentation Diagrams (P&IDs),
- Current equipment specific emission factors, and
- A more conservative flare emission estimate utilizing the manufacturer's guaranteed design destruction and removal efficiency of 98%.

The revised potential emissions estimates are 0.06 tpy of NO<sub>x</sub>, 0.24 tpy of CO, 0.76 tpy of VOCs, 0.01 tpy of Methane and 108 tpy of GHGs.

Note: On December 14, 2016, the Environmental Protection Agency issued minor revisions to AP-42 Section 13.5: Industrial Flares. As a result, the VOC emissions from the flare pilot gas increased by 0.02 tpy.

As part of the ongoing review of this permit, the Department has looked further into the issue of aggregation of the facility with other nearby sources owned by SPLP. They provided supplemental information to their aggregation analysis on 2/16/16. The closest facility identified was the Rexmont Road Block Valve located approximately 6.2 miles away. There is no interdependence between operation of the Block Valve and the Cornwall Station. As a result the Department has determined that no emissions need to be aggregated with those of the Cornwall Station. Sunoco also included an aggregation analysis in the 9/12/16 application update. This was identical to the 2/16/16 submission.

There is no confidential documentation in the updated application and supporting emails.

**Revisions to Draft Permit:**

1. On March 10, 2017 Mr. Jed Werner of SPLP indicated the Cornwall Station does not have pigging equipment. I removed the reference to "pigging" in the Section A, Source ID 103 description. Attached is a copy of the information provided by Mr. Werner concerning pigging equipment.
2. C 001 (now 002): updated to the same fugitive emission language used in recent similar SERO permits
3. C 005 (now 006): updated to the same visible emission language used in recent similar SERO permits
4. C 007 (now 008): changed to reflect stack testing language used in recent similar SERO permits
5. C 008: deleted stack test language for consistency with similar SERO permits; testing issues are already adequately addressed in B 019
6. C 009: deleted stack test language for consistency with similar SERO permits; testing issues are already adequately addressed in B 019
7. C 011 (now 010): changed to reflect weekly periphery inspection language used in recent similar SERO permits and to add fugitive emission leak monitoring and repair language related to the response to Comment 53.
8. C 012: changed to reflect weekly periphery inspection recordkeeping language used in recent similar SERO permits
9. C 013: deleted 5-year recordkeeping provision for consistency with recent similar SERO permits; this issue is already adequately addressed in B 020(b)

10. C 014: deleted requirement to provide records provision for consistency with recent similar SERO permits; this issue already adequately addressed in B 020(b)
11. C 015: changed to reflect malfunction reporting language used in recent similar SERO permits
12. C (new 011): added new condition regarding monitoring of VOC thruput for consistency with language used in recent similar SERO permits
13. C (new 014): added new condition regarding recordkeeping of emission increases for consistency with language used in recent similar SERO permits
14. C 014 (now 013): changed to reflect VOC recordkeeping language used in recent similar SERO permits
15. C (new 016): added new condition regarding accidental release reporting for consistency with language used in recent similar SERO permits.
16. C (new 017): added new condition regarding Chapter 135 reporting for consistency with language used in recent similar SERO permits.
17. C (new 019): added new condition regarding corrective measures for consistency with language used in recent similar SERO permits.
18. C 021 (new): added condition regarding local ordinances; see Response to Comment 19.
19. E 01 006: added the word "immediately" to reflect stack testing language used in recent similar SERO permits
20. Also, the numbering of Section C conditions was affected by revising the condition type classification of certain conditions, unrelated to their content.

### **Conclusions and Recommendations**

I recommend that the revised draft Permit No. 38-03062 be redistributed for comments.

Enclosures

cc: Permits/Lancaster District Office/SC Region 38-03062, B3

Commonwealth Of Pennsylvania  
 Department of Environmental Protection  
 Southcentral Regional Office  
 September 15, 2017

Subject: Sunoco Pipeline LP/Cornwall Station/Mariner East  
 Addendum Memo  
 West Cornwall Township, Lebanon County  
 Permit No. 38-03062

To: William Weaver *WAW 9/15/17*  
 Regional Manager  
 Air Quality Program

Thru: Thomas Hanlon, Chief *TH 9/15/17*  
 East Permitting Section  
 Air Quality Program

From: Darrell Hartline *DH 9/15/17*  
 East Permitting Section  
 Air Quality Program

**Comment Period**

A copy of the proposed permit was submitted to Mr. Jed Werner, Sunoco Logistics Manager – Air Permitting.

Mr. Werner provided the following comments, via email with an attachment, on June 16, 2017:

Page 1 identifies Matthew Gordon as the responsible official. The responsible official for the Cornwall Pump Station is Mark Martin, Operations Supervisor.

Response: The requested change has been made.

Section C Condition #009 visible emissions are to be measured using either a Department approved device or trained opacity observers. Similar to issued SOOP's for other Pump Stations, Sunoco Pipeline requests condition #009 (b). state "Observers, trained and qualified to measure plume opacity with the naked eye or with the aid of any devices approved by the Department.

Response: The requested change has been made.

Section C Condition #010 (b) (5) requires investigation of any observed problems and a first attempt of repair within 15 days and notification to DEP if the repair is not complete within 30 days. Sunoco Pipeline requests removal of this condition.

Response: The Department believes it is appropriate to retain this condition.

Section C Condition #014 requires the maintenance of a log for all fugitive monitoring, visible emissions and odors, including those that deviate from the conditions found in the permit. The method used to determine non-compliance is sight, sound and smell. This log is a monthly sight, sound, and smell log.

Response: I called Mr. Werner and he indicated to me he made a mistake. He was referencing Condition #012 instead of Condition #014. He also indicated Condition #012 as written is acceptable and no change is requested. On June 27, 2017 Mr. Werner sent, via email, a message indicating the condition is acceptable as written.

Notice of the Department's intent to issue the permit was published in the Pennsylvania Bulletin on June 3, 2017. DEP received public comments on the revised draft permit. Copies of these comment items, a list of commenters, and DEP's Comment and Response Document, are included as attachments to his memo.

**Revisions to Draft Permit:**

As part of finalizing this permit, DEP is formalizing its determination that the air emissions expected from the West Cornwall Station, including both stack and fugitive emissions are of minor significance with regard to causing air pollution, and will not, on their own merits, prevent or interfere with the attainment or maintenance of an ambient air quality standard. A condition will be placed in the operating permit to this effect. DEP makes this determination because the post-control emissions from the site:

- 1.) do not meet the criteria for needing an air quality permit and
- 2.) do not exceed the criteria for a de minimis emission increase under 25 Pa. Code Section 127.449.
- 3.) are much smaller than the emissions from many other legally operating sources in the Commonwealth.
- 4.) have not been shown to cause any environmental problems during normal operation.

Lebanon County is currently designated as attainment for the 2008 ozone NAAQS. Also, since Lebanon County is located within the Ozone Transport Region, it is treated as moderate nonattainment for emission offset purposes. The current certified 2016 ozone design value for Lebanon County marginally exceeds the 2015 ozone NAAQS. With regard to particulate pollution, Lebanon County is currently designated as moderate nonattainment for the 2012 annual PM<sub>2.5</sub> NAAQS. As a minor source with post-control emissions below air permit thresholds, the Sunoco West Cornwall facility is not expected to meaningfully affect local or regional compliance with ambient air quality standards.

The following condition will be placed in Section C of the permit, *"The potential fugitive plus stack emissions from this facility, after appropriate control as prescribed in this permit, have been estimated as follows: 0.06 tpy of NO<sub>x</sub>, 0.24 tpy of CO, 0.76 tpy of VOCs, 0.01 tpy of Methane and 108 tpy of GHGs. The Department has determined these emissions remaining after*

*appropriate control are of minor significance with regard to causing air pollution, and will not prevent or interfere with the attainment or maintenance of an ambient air quality standard.”*

On August 3, 2017, via email, Sunoco provided responses to DEP questions about the application. Sunoco’s email is attached for reference.

On August 9, 2017, via email, Sunoco updated the Permit Contact Person.

On August 18, 2017, via email, Sunoco provided some additional responses to DEP questions about the application. Sunoco’s email is attached for reference.

The following additional changes are being made to the permit:

1. Cover Sheet – updated the responsible official and permit contact person.
2. Section C, Condition 009(b) – replaced “*certified in EPA Method 9*” with “*qualified.*”
3. Section C, Condition 011 – the condition was revised for clarity to read as follows: “*The permittee shall calculate the total emissions of VOCs for the entire facility on a 12-month rolling sum basis.*”
4. Section C, Condition 015(c) – revised the telephone reports to the DEP Reading District Office.

### **Conclusions and Recommendations**

I recommend Permit No. 38-03062 be issued.

Attachments

cc: Permits\Reading District\SC Region 38-03062, B3

**Hartline, Darrell**

---

**From:** Hanlon, Thomas  
**Sent:** Thursday, February 18, 2016 1:53 PM  
**To:** Duke, Alicia  
**Cc:** Hartline, Darrell  
**Subject:** FW: Draft ME RFD Supplemental Aggregation Language  
**Attachments:** 01\_HollidaysburgStation(20160215).pdf; 02\_MarklesburgStation(20160215).pdf; 03\_Mt.UnionStation(20160215).pdf; 04\_DoylesburgStation(20160215).pdf; 05\_PlainfieldStation(20160215).pdf; 06\_MiddletownStation(20160215).pdf; 07\_CornwallStation(20160215).pdf; 08\_BlainsportStation(20160215).pdf; 09\_BeckersvilleStation(20160215).pdf

---

**From:** WERNER, JED A [mailto:JAWERNER@sunocologistics.com]  
**Sent:** Tuesday, February 16, 2016 9:25 AM  
**To:** Hanlon, Thomas  
**Cc:** STYLES, MONICA L  
**Subject:** Draft ME RFD Supplemental Aggregation Language

Tom,

Here is the supplemental information for the nine requested pump stations in South Central Region which PADEP has requested supplemental aggregation language to what was already provided in the original RFD applications.

Please call me when you have a chance to review.

Thank you for your time.

Jed A. Werner  
Manager - Environmental Compliance and Projects  
525 Fritztown Road  
Sinking Spring, PA 19608  
p-610-670-3297  
c-610-858-0802  
f-866-599-4936

Insanity is doing the same thing over and over again and expecting different results – Albert Einstein

The purpose of this document is to supply supplemental information regarding the aggregation text for the Sunoco Pipeline L.P. (SPLP) Request for Determination (RFD) submittals to the Pennsylvania Department of Environmental Protection (PADEP) South Central Regional Office (SCRO) associated with the Mariner East (ME) Project (the Project).

SPLP understands that Pennsylvania is considered a "moderate" ozone nonattainment area for oxides of nitrogen (NO<sub>x</sub>) and volatile organic compounds (VOCs) because Pennsylvania is a jurisdiction in the Ozone Transport Region (Section 184 of the Clean Air Act). Therefore, an aggregation determination under New Source Review (NSR) would be determined on a case-by-case basis using the two-part test that considers whether the air contamination source or combination of sources are located on one or more contiguous or adjacent properties and whether the sources are owned or operated by the same person under common control. This case-by-case single source determination would apply to all sources irrespective of their separate status as "minor" or "major" air contamination sources. PADEP and the Pennsylvania Environmental Hearing Board have made clear that the terms "contiguous" and "adjacent" should be given their plain meaning. To that end, PADEP's guidance document has developed a "common sense" approach to determine if sources are located on adjacent or contiguous properties and considers sources located within a quarter-mile distance to be considered contiguous or adjacent (PADEP, 2012). Sources greater than a quarter-mile may be considered contiguous or adjacent on a case-by-case basis. Interdependence may be a factor in conducting a single source determination. That said, the plain meaning of the terms "contiguous" and "adjacent," and not interdependence, should be the dispositive factor in determining whether stationary sources are located on contiguous or adjacent properties.

To determine if the under common control test is met, ownership of each of the operations is just one aspect in determining if the facilities are under common control. If a contract for service relationship exists between the two companies and/or if a support/dependency relationship exists, then this would constitute indirect control. United States Environmental Protection Agency (USEPA) has historically interpreted that an evaluation of common control must consider whether the facilities are functionally interrelated or interdependent of each other. As discussed in the Federal Register (USEPA, 2009), USEPA states that "To be 'substantially related,' there should be an apparent interconnection—either technically or economically—between the physical and/or operational changes, or a complementary relationship whereby a change at a plant may exist and operate independently, however its benefit is significantly reduced without the other activity."

#### **Mt. UNION PUMP STATION**

In determining whether the Mt. Union Pump Station's emissions should be aggregated with any another sources for the purpose of evaluating the applicability of the nonattainment NSR and Title V programs, initially one location was identified: the Shade Valley Road/Highway 35 Block Valve. Per the PADEP SCRO's request, SPLP reviewed the area within 5.0 miles of the Mt. Union Pump Station; no additional facilities for aggregation consideration were found during this review.

### Shade Valley Road/Highway 35 Block Valve

As presented in the Request for Determination (RFD) and referenced in the State Only Operating Permit (SOOP) application, the distance between the Mt. Union Pump Station and the Shade Valley Road/Highway 35 Block Valve is approximately 6.3 miles, which exceeds the ¼ mile “rule of thumb” in the PADEP guidance document (PADEP, 2012).

Furthermore, aggregation would not be appropriate because the two sites should not otherwise be considered “adjacent” or “contiguous” due to the lack of any interdependence between the Shade Valley Road/Highway 35 Block Valve and the Mt. Union Pump Station. The Shade Valley Road/Highway 35 Block Valve is an independently operated valve for isolating a section of pipeline for safety, environmental, or maintenance purposes, whereas the Mt. Union Pump Station is to maintain pipeline system pressure during the transportation of natural gas liquids (NGLs). Neither location is dependent upon the other to properly function. In fact, both locations could fully function even if the other is nonfunctional.

In short, the Mt. Union Pump Station’s emissions should not be aggregated with those from the Shade Valley Road/Highway 35 Block Valve because the two locations are not interdependent of each other and are not in close proximity of each other, and therefore are neither “contiguous” nor “adjacent” for the purposes of aggregating air emissions.

### References:

Pennsylvania Department of Environmental Protection (PADEP), 2012. Guidance for Performing Single Stationary Source Determinations for Oil and Gas Industries. Document No.: 270-0810-006, October 6, 2012.

United States Environmental Protection Agency (USEPA), 2009. Title 40 Code of Federal Regulations Parts 51 and 52, Prevention of Significant Deterioration (PSD) and Nonattainment New Source Review (NSR): Aggregation and Project Netting. Federal Register Volume 74, No. 10, January 15, 2009, pages 2376-2383.

# **State-Only Operating Permit (SOOP) Addendum**

**Mariner East Project**

**Sunoco Pipeline L.P.**

**Mt. Union Station**

**Huntingdon County, PA**

**August 2016**



**Sunoco Logistics**



**TETRA TECH**

August 29, 2016

**FedEx: 7771 1496 2149**

Mr. William Weaver  
Program Manager  
Pennsylvania Department of Environmental Protection  
Bureau of Air Quality  
Southcentral Regional Office  
909 Elmerton Avenue  
Harrisburg, Pennsylvania 17110

Subject: Addendum

RE: Pending State Only Operating Permit (SOOP) 06-031036 Addendum  
Facility ID: 776946  
Sunoco Pipeline L.P. (SPLP) Mount Union Station  
Shirley Township, Huntingdon County, Pennsylvania  
Tetra Tech, Inc. Project No. 112IC05958

Dear Mr. Weaver:

SPLP is submitting this Addendum to the subject facility SOOP application. Triplicate hardcopies of this letter and the impacted SOOP attachments are enclosed (one original and two copies).

There is no change in the status of Mount Union Station and the physical operation remains as represented in the May 2014 SOOP Application. This addendum is being submitted because the emissions associated with the Mount Union Station have been recalculated based on:

- Updated equipment information including flare pilot gas flow rate,
- More detailed information regarding maintenance activities,
- As-built Piping and Instrumentation Diagrams (P&IDs),
- Current equipment specific emission factors, and
- A more conservative flare emission estimate utilizing the manufacturer's guaranteed design destruction and removal efficiency (DRE) of 98%.

SPLP is replacing the following SOOP attachments with the enclosures of this letter as described in the bulleted list below. Modifications to the following only include those items impacted by this update.

- A revised State-Only Permit Application Form is enclosed and the following sections have been modified:
  - Section 1.1 – Application Type
  - Section 1.2 – Plant Information
  - Section 2.1 – Potential Emission Estimates for the Site
  - Section 3 – Site Inventory
  - Section 7 – General Source Information Subsections 7.1, 7.2, and 7.4
  - Section 8 – Control Device Information Subsections 8.1 and 8.2
- A revised Appendix B, Attachment 1 – Emission Calculations is enclosed.
  - Note that the worst-case emission rate per pollutant per product was utilized. The updated emission rates were estimated based on applying the physical properties of the products (i.e., heating value, gas density, etc.) that would result in the highest potential-to-emit estimates.
  - Additionally, note that fugitive pump seal emissions are included in overall facility fugitive emissions and are not considered a separate line item.

APPENDUM *WP*

Administrative Update for SPLP Mount Union Station  
Mr. William Weaver, PADEP SCRO

August 29, 2016

[24]

- A revised Appendix B, Attachment 2 – Aggregation Language is enclosed.

Additionally, per PADEP SCRO's request, SPLP has reviewed SOOP SECTION E language in regards to the current monitoring system for the pilot flame and other Pennsylvania SPLP SOOP SECTION E language. The current SPLP flare monitoring systems consist of a signal from the pilot flame detection device that is transmitted to the Supervisory Control and Data Acquisition (SCADA) system. In the event of a pilot flame malfunction, the flare auto re-ignition will be initiated. Although pilot flame failure information is manually logged, it is not collected in the SCADA system historian. Therefore, for consistency with the PADEP SCRO issued SOOPs for Marklesburg, Hollidaysburg, and Plainfield Stations and to reflect the current system operations, SPLP is suggesting the following language for SECTION E. Source Groups Restrictions. IV. RECORDKEEPING REQUIREMENTS:

#004 [25 Pa. Code §127.441]: "When the enclosed flare is not operational, the permittee shall recorded the downtime and associated emissions."

#005 [25 Pa. Code §127.441]: "The permittee shall maintain detailed records of all maintenance performed on the enclosed flare. The permittee shall retain these records for a minimum of five (5) years and shall make them available to the department upon its request."

Please contact Jed Werner at 610-670-3297 or by email ([jawerner@sunocologistics.com](mailto:jawerner@sunocologistics.com)) if you have any questions.

Sincerely,



Matthew L. Gordon  
Principal Engineer

MLG:vjp

cc: Project file 112IC05958 (electronic)  
Jed Werner, SPLP (email)  
Christopher Embry, SPLP (email)  
Megan Allison, Tetra Tech (email)

MLG:vjp

Enclosures: SOOP Addendum for SPLP Mount Union Station  
Form 2700-PM-AQ13

Appendix B:

Attachment 1 (Potential-to-Emit Calculations)  
Attachment 2 (Aggregation Analysis)

**State Only Permit Application Form**



COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF ENVIRONMENTAL PROTECTION  
BUREAU OF AIR QUALITY

**STATE-ONLY  
PERMIT APPLICATION**

<b>FOR OFFICIAL USE ONLY</b>	
State-Only OP Number:	_____
Reviewed by:	_____
Date:	_____
Comments:	_____

**Section 1 - General Information**

**1.1 Application Type**

Type of permit for which application is made: (Check one)

- Initial
- Renewal      Operating Permit No. \_\_\_\_\_
- Application Revision

**1.2 Plant Information**

Federal Tax ID: <u>23-3102656</u>	Firm Name: <u>Sunoco Pipeline L.P.</u>
Plant Code: _____	Plant Name: <u>Mt. Union Station</u>
NAICS Code: <u>493190</u>	SIC Code: <u>4619</u>
Description of NAICS Code: <u>All Other Pipeline Transportation</u>	
Description of SIC Code: <u>Pipelines, Not Elsewhere Classified</u>	
County: <u>Huntingdon</u>	Municipality: <u>Shirley Township</u>
Latitude: <u>40.345051</u>	Longitude: <u>-77.865313</u>
Horizontal Reference Datum: <u>NAD 1983</u>	Horizontal Collection Method: <u>NTDEP</u> Reference Point: <u>CNTAR</u>

**1.3 Contact Information**

Name: <u>Matt Gordon</u>	Title: <u>Project Manager</u>
Address: <u>525 Fritztown Road</u>	
<u>Sinking Spring, PA 19608</u>	
Telephone Number: <u>(610) 670-3284</u>	
Email Address: <u>mlgordon@sunocologistics.com</u>	

**1.4 Certification of Truth, Accuracy and Completeness**

Note: This certification must be signed by a responsible official. Applications without a signed certification will be returned as incomplete.

I certify under penalty of law that, based on information and belief formed after reasonable inquiry, the statements and information contained in this application are true, accurate, and complete.

(Signed) <u></u>	Date: <u>8/29/2016</u>
Name (Typed): <u>Matt Gordon</u>	Title: <u>Project Manager</u>

## Section 2 - Site Information

### 2.1 Potential Emission Estimates for the Site

Provide the estimated potential emission for the site BEFORE and AFTER utilizing the proposed restriction(s) and/or limitation(s).

Pollutant or CAS No.	Potential Emission BEFORE taking Limitations (TPY)	Potential Emission AFTER taking Limitations (TPY)
CO <sub>2</sub> e	0	112.30
CO <sub>2</sub>	0	111.70
N <sub>2</sub> O	0	<0.01
CH <sub>4</sub>	0	0.01
CO	0	0.25
Total VOCs	26.05	0.80
NO <sub>x</sub>	0	0.06
Total HAPs	0	<0.01
SO <sub>x</sub>	0	<0.01

\* Provide all supporting calculation methods as an attachment at the end of this application.

### 2.2 Facility Type

Is this facility a Synthetic Minor Facility? Yes  No

If yes, go to Section 2.3, "Synthetic Minor Facility".

If no, go to Section 3, "Site Inventory".

**IMPORTANT:** Note that all Synthetic Minor Facilities must be able to meet the proposed restriction(s) and/or limitation(s) immediately upon the submission of this application. By signing the Certification of Compliance in Section 13 of this application, the facility for which a Synthetic Minor Status is proposed will be deemed a Synthetic Minor Facility according to the restriction(s) and/or limitation(s) proposed upon receipt of the application by the Department, unless the Department determines that the facility is unable to meet the Synthetic Minor requirements at a later date.

Please read instructions carefully before completing this application.

**2.3 Synthetic Minor Facility Information (to be completed by all facilities seeking Synthetic Minor Status)**

Synthetic Minor Status for this facility can be taken at the: Source Level  AND/OR Site Level

**If limitation(s) and/or restriction(s) can be taken at the site level (for all sources within this facility), complete the following questions, otherwise please go on to Section 3, "Site Inventory".**

Synthetic Minor Status for the Entire Site is achievable through the following restrictions: (Please check all that apply and describe in detail what is/are proposed):

<input type="checkbox"/>	Hours of Operation	
<input type="checkbox"/>	Production/Throughput Rate	
<input type="checkbox"/>	Type of Fuel	
<input type="checkbox"/>	Fuel Usage	
<input type="checkbox"/>	Control Devices	
<input type="checkbox"/>	Emissions Limitations	
<input type="checkbox"/>	Other	

Describe how the elected restriction(s) will allow the facility to become a Synthetic Minor

**Note: If Section 2.3 is completed and there are no additional restrictions proposed at the source level, the applicant can omit Subsections 5, 6, and 7 in Sections 5, 6, and 7 for all sources in this permit application.**





Please read instructions carefully before completing this application.

**Section 4 - Source Group (Optional)**

**4.1 Source Group Definition**

This section applies to new State-Only Operating Permit applications only.

Define groups of source(s) that are subject to one or more applicable requirements that apply to all source(s) in the group.

Group No.	Source ID (for source(s) in this group)

**4.2 Applicable Requirements for Source Groups**

For renewals, only list group level requirements not included in the current State-Only Operating Permit. If there are no changes, check the box to the right.

No changes from current State-Only Operating Permit.

Describe and cite all applicable requirements pertaining to all source groups.

Note: A Method of Compliance Worksheet (Addendum 1) must be completed for each requirement listed.

Group Number	Citation Number	Citation Limitation	Limitation Used

Please read instructions carefully before completing this application.

**Section 5 - Combustion Operational Inventory**

(Complete this section for each combustion source in this site. Duplicate this section as needed).

For renewals, review and correct any pre-printed information and add additional sections for any new combustion unit listed in Section 3 of this application.

**5.1 General Source Information**

- a. Unit ID No.: \_\_\_\_\_ b. Company Designation: \_\_\_\_\_
- c. Plan Approval or Operating Permit Number: \_\_\_\_\_
- d. Manufacturer: \_\_\_\_\_ e. Model Number: \_\_\_\_\_
- f. Source Description: \_\_\_\_\_
- g. Rated Heat Input/Thruput: \_\_\_\_\_ h. Installation Date: \_\_\_\_\_
- i. Exhaust Temperature: \_\_\_\_\_ Units: \_\_\_\_\_ j. Exhaust % Moisture: \_\_\_\_\_ k. Exhaust Flow Volume: \_\_\_\_\_ SCFM

**5.2 Exhaust System Components**

Explain how the exhaust components are configured:

From Unit	Unit Description	To Unit	Unit Description	Percent Flow

**5.3 Source Classification Code (SCC) Listing for Standard Operation**

Fuel/Material	Associated SCC	Max Throughput Rate	Firing Sequence

Please read instructions carefully before completing this application.

**5.4 Maximum Fuel Physical Characteristics**

If taking limitations on Fuel Physical Characteristics, see instructions.

SCC/Fuel Burned	FML*	% Sulfur	% Ash	BTU Content (Units)

\*FML = Fuel Material Location

**5.5 Limitations on Source Operation (optional)**

Maximum amount of hours of source operation per year: \_\_\_\_\_

<input type="checkbox"/>	Hours of Operation	
<input type="checkbox"/>	Production Throughput Rate	
<input type="checkbox"/>	Type of Fuel	
<input type="checkbox"/>	Fuel Usage	
<input type="checkbox"/>	Control Devices	
<input type="checkbox"/>	Emissions Limitations	
<input type="checkbox"/>	Other	

Describe how the elected restriction(s) will allow the facility to become a Synthetic Minor?

Please read instructions carefully before completing this application.

**5.6 Compliance Method for this source (for Synthetic Minor Sources only)**

Complete this section only if limitation(s) and/or restriction(s) were proposed in Section 5.5.

a. Explain how you would demonstrate compliance with the restriction(s) and/or limitation(s):

---

b. Describe what is to be reported in the compliance report:

---

c. Reporting start date: \_\_\_\_\_

d. Indicate the frequency for submitting compliance report as explained above: \_\_\_\_\_

**5.7 Source Potential to Emit (for Synthetic Minor Sources only)**

Give Potential Emission estimate for all air pollutants emitted at this source. Calculations for the Potential Emissions Estimate here should have included the restriction(s) and/or proposed in Section 5.5, if applicable.

Pollutant or CAS Number	Fuel/SCC	Emissions/Activity Allowable per Unit	Calc. Method	Max. Capacity	Total Hours	Emission in TPY

**5.8 Source Applicable Requirements**

Describe and cite all applicable requirements pertaining to this source.

Note: A Method of Compliance Worksheet (Addendum 1) must be completed for each requirement listed.

For renewals, only list group level requirements not included in the current State Only Operating Permit. If there are no changes, check the box to the right.

No changes from current State Only Operating Permit.

Fuel/SCC	Citation Number	Citation Limitation	Limitation Used

Please read instructions carefully before completing this application.

**Section 6 - Incinerator Operational Inventory**

(Complete this section for each incinerator at this site. Duplicate this section as needed).  
 For renewals, review and correct any pre-printed information and add additional sections for any new incinerator listed in Section 3 of this application.

**6.1 General Source Information**

a. Unit ID: \_\_\_\_\_ b. Company Designation: \_\_\_\_\_

c. Plan Approval or Operating Permit Number: \_\_\_\_\_

d. Manufacturer: \_\_\_\_\_ e. Model Number: \_\_\_\_\_

f. Source Description: \_\_\_\_\_

g. Rated Heat Input/Thruput: \_\_\_\_\_ h. Installation Date: \_\_\_\_\_

i. Exhaust Temperature: \_\_\_\_\_ Units: \_\_\_\_\_ j. Exhaust % Moisture: \_\_\_\_\_ k. Exhaust Flow Volume: \_\_\_\_\_ SCFM

l. Inc. Capacity: \_\_\_\_\_ Lbs/Hr m. Primary Burner Heat Input: \_\_\_\_\_ Units: \_\_\_\_\_

n. Exhaust % CO<sub>2</sub>: \_\_\_\_\_ o. Secondary Burner Heat Input: \_\_\_\_\_ Units: \_\_\_\_\_

p. Incinerator Class: \_\_\_\_\_

q. Waste Type: \_\_\_\_\_ r. Waste BTU/lb: \_\_\_\_\_

**6.2 Exhaust System Components**

Explain how the exhaust components are configured:

From Unit	Unit Description	To Unit	Unit Description	Percent Flow

Please read instructions carefully before completing this application.

6.3 Source Classification Code (SCC) Listing for Standard Operation			
Fuel/Material	Associated SCC	Max. Throughput Rate	Firing Sequence

6.4 Maximum Fuel Physical Characteristics				
If taking limitations on Fuel Physical Characteristics, see instructions.				
SCC/Fuel Burned	FML*	% Sulfur	% Ash	BTU Content (Units)

\*FML = Fuel Material Location

6.5 Limitations on Source Operation (optional) (for Synthetic Minor Sources only)	
Maximum amount of hours of source operation per year: _____	
<input type="checkbox"/>	Hours of Operation
<input type="checkbox"/>	Production Throughput Rate
<input type="checkbox"/>	Type of Fuel
<input type="checkbox"/>	Fuel Usage
<input type="checkbox"/>	Control Devices
<input type="checkbox"/>	Emissions Limitations
<input type="checkbox"/>	Other

Describe how the elected restriction(s) will allow the facility to become a Synthetic Minor?

Please read instructions carefully before completing this application.

**6.6 Compliance Method for this source (for Synthetic Minor Sources only)**  
**Complete this section only if limitation(s) and/or restriction(s) were proposed in Section 6.5.**

a. Explain how you would demonstrate compliance with the restriction(s) and/or limitation(s):

---



---

b. Describe what is to be reported in the compliance report:

---



---

c. Reporting start date: \_\_\_\_\_

d. Indicate the frequency for submitting compliance report as explained above: \_\_\_\_\_

**6.7 Source Potential to Emit (for Synthetic Minor Sources only)**  
 Give Potential Emission estimate for all air pollutants emitted at this source. Calculations for the Potential Emissions Estimate here should have included the restriction(s) and/or limitation(s) proposed in Section 6.5, if applicable.

Pollutant or CAS Number	Fuel/SCC	Emissions/Activity Allowable per Unit	Calc. Method	Max. Capacity	Total Hours	Emission in TPY

**6.8 Source Applicable Requirements**  
 Describe and cite all applicable requirements pertaining to this source.  
 Note: A Method of Compliance Worksheet (Addendum 1) must be completed for each requirement listed.  
 For renewals, only list group level requirements not included in the current State Only Operating Permit. If there are no changes, check the box to the right.  No changes from current State Only Operating Permit.

Fuel/SCC	Citation Number	Citation Limitation	Limitation Used

Please read instructions carefully before completing this application.

**Section 7 – Process Operational Inventory**

(Complete this section for each process at this site. Duplicate this section as needed).  
 For renewals, review and correct any pre-printed information and add additional sections for any new incinerator listed in Section 3 of this application.

**7.1 General Source Information**

a. Unit ID: 101 b. Company Designation: John Zink - Enclosed Flare

c. Plan Approval or Operating Permit Number: S101

d. Manufacturer: John Zink Company LLC e. Model Number: ZTOF04X30PF

f. Source Description: Enclosed Flare

g. Rated Heat Input/Thruput: 10,000.000 BTU/Hour - Max h. Installation Date: TBD - Tentative August 2014

i. Exhaust Temperature: 1,660 Units: °F j. Exhaust % Moisture: 6.1 k. Exhaust Flow Volume: 4,848 SCFM

**7.2 Exhaust System Components**

Explain how the exhaust components are configured:

From Unit	Unit Description	To Unit	Unit Description	Percent Flow
101	Standard Operation Scenario	CD101	John Zink - Enclosed Flare	
102	Fugitive Emissions	atmosphere		
103	Maintenance Operating Scenario	CD101	John Zink - Enclosed Flare	

**7.3 Source Classification Code (SCC) Listing for Standard Operation**

Fuel/Material	Associated SCC	Max. Throughput Rate	Firing Sequence

Please read instructions carefully before completing this application.

**7.4 Maximum Fuel Physical Characteristics**

If taking limitations on Fuel Physical Characteristics, see instructions.

SCC/Fuel Burned	FML*	% Sulfur	% Ash	BTU Content (Units)

\*FML = Fuel Material Location

**7.5 Limitations on Source Operation (optional) (for Synthetic Minor Sources only)**

Maximum amount of hours of source operation per year: \_\_\_\_\_

<input type="checkbox"/>	Hours of Operation	
<input type="checkbox"/>	Production Throughput Rate	
<input type="checkbox"/>	Type of Fuel	
<input type="checkbox"/>	Fuel Usage	
<input type="checkbox"/>	Control Devices	
<input type="checkbox"/>	Emissions Limitations	
<input type="checkbox"/>	Other	

Describe how the elected restriction(s) will allow the facility to become a Synthetic Minor?

Please read instructions carefully before completing this application.

**7.6 Compliance Method for this source (for Synthetic Minor Sources only)**  
**Complete this section only if limitation(s) and/or restriction(s) were proposed in Section 7.6.**

a. Explain how you would demonstrate compliance with the restriction(s) and/or limitation(s):

---



---

b. Describe what is to be reported in the compliance report:

---



---

c. Reporting start date: \_\_\_\_\_

d. Indicate the frequency for submitting compliance report as explained above: \_\_\_\_\_

**7.7 Source Potential to Emit (for Synthetic Minor Sources only)**  
 Give Potential Emission estimate for all air pollutants emitted at this source. Calculations for the Potential Emissions Estimate here should have included the restriction(s) and/or limitation(s) proposed in Section 7.5, if applicable.

Pollutant or CAS Number	Fuel/SCC	Emissions/Activity Allowable per Unit	Calc. Method	Max. Capacity	Total Hours	Emission in TPY

**7.8 Source Applicable Requirements**  
 Describe and cite all applicable requirements pertaining to this source.  
 Note: A Method of Compliance Worksheet (Addendum 1) must be completed for each requirement listed.  
 For renewals, only list group level requirements not included in the current State Only Operating Permit. If there are no changes, check the box to the right.  No changes from current State Only Operating Permit.

Fuel/SCC	Citation Number	Citation Limitation	Limitation Used

Please read instructions carefully before completing this application.

**Section 8 – Control Device Information (duplicate this section as needed)**

For renewals, review and correct any pre-printed information and add additional sections for any new control device listed in Section 3 of this application.

**8.1 General Control Device Information**

a. Unit ID: CD101                      b. Company Designation: John Zink Company - Enclosed Flare

c. Used by Sources: Mariner East Pipeline

d. Type: Enclosed Flare

e. Pressure Drop in H<sub>2</sub>O: ~ 10 psig at max flow rate                      f. Capture Efficiency: 98.0

g. Scrubber Flow Rate (GPM): Not Applicable

h. Manufacturer: John Zink Company LLC                      i. Model Number: ZTOF04X30PF

j. Installation Date: TBD - Tentatively August 2014

**8.2 Control Device Efficiencies for this Control Device:**

Pollutant Name	CAS Number	Estimated Control Efficiency	Basis for Efficiency Estimate
Natural Gas Liquids (NGLs)	64741-48-6	98.0	Performance criteria of the Emission Control Device was assessed as provided by the manufacturer data

Please read instructions carefully before completing this application.

**Section 9 – Stack/Flue Information (duplicate this section as needed)**

For renewals, review and correct any pre-printed information and add additional sections for any new stack/flue listed in Section 3 of this application.

**9.1 General Stack/Vent Information**

a. Unit ID: S101 b. Company Designation: John Zink Company LLC Enclosed Flare

c. Discharge Type: Enclosed Flare

d. Diameter (ft): 4 Height (ft): 30 Base Elevation (ft): 4

e. Exhaust Temperature: 1,660 F Exhaust % Moisture: 6.1 Exhaust Velocity: 27.3 ft/sec

f. Exhaust Volume: 20,583 ACFM Exhaust Volume: 4,848 SCFM

g. Distance to Nearest Property Line (ft): ~ 115 feet

h. Weather Cap?:  Yes  No

i. Used by Sources:

j. Latitude: 40.345051 Longitude: -77.865313  
 Horizontal Reference Datum: NAD 1983 Horizontal Collection Method: NTDEP Reference Point: CNTAR

a. Unit ID: \_\_\_\_\_ b. Company Designation: \_\_\_\_\_

c. Discharge Type: \_\_\_\_\_

d. Diameter (ft): \_\_\_\_\_ Height (ft): \_\_\_\_\_ Base Elevation (ft): \_\_\_\_\_

e. Exhaust Temperature: \_\_\_\_\_ Exhaust % Moisture: \_\_\_\_\_ Exhaust Velocity: \_\_\_\_\_

f. Exhaust Volume: \_\_\_\_\_ ACFM Exhaust Volume: \_\_\_\_\_ SCFM

g. Distance to Nearest Property Line (ft): \_\_\_\_\_

h. Weather Cap?:  Yes  No

i. Used by Sources: \_\_\_\_\_

j. Latitude: \_\_\_\_\_ Longitude: \_\_\_\_\_  
 Horizontal Reference Datum: \_\_\_\_\_ Horizontal Collection Method: \_\_\_\_\_ Reference Point: \_\_\_\_\_

Please read instructions carefully before completing this application.

**Section 10 – Fuel Material Location (FML) Information (Optional)**

For renewals, review and correct any pre-printed information and add additional sections for any new FML listed in Section 3 of this application.

**10.1 Fuel Material Location Information**

a. FML ID Number: \_\_\_\_\_ b. Name: \_\_\_\_\_

c. Capacity: \_\_\_\_\_ Units: \_\_\_\_\_ d. Fuel: \_\_\_\_\_

e. Maximum Fuel Characteristics: If fuel is coal, what is the moisture content? \_\_\_\_\_  
% Ash: \_\_\_\_\_ % Sulfur: \_\_\_\_\_ BTU Content: \_\_\_\_\_ Units: \_\_\_\_\_

f. Used by Source: \_\_\_\_\_

a. FML ID Number: \_\_\_\_\_ b. Name: \_\_\_\_\_

c. Capacity: \_\_\_\_\_ Units: \_\_\_\_\_ d. Fuel: \_\_\_\_\_

e. Maximum Fuel Characteristics: If fuel is coal, what is the moisture content? \_\_\_\_\_  
% Ash: \_\_\_\_\_ % Sulfur: \_\_\_\_\_ BTU Content: \_\_\_\_\_ Units: \_\_\_\_\_

f. Used by Source: \_\_\_\_\_

a. FML ID Number: \_\_\_\_\_ b. Name: \_\_\_\_\_

c. Capacity: \_\_\_\_\_ Units: \_\_\_\_\_ d. Fuel: \_\_\_\_\_

e. Maximum Fuel Characteristics: If fuel is coal, what is the moisture content? \_\_\_\_\_  
% Ash: \_\_\_\_\_ % Sulfur: \_\_\_\_\_ BTU Content: \_\_\_\_\_ Units: \_\_\_\_\_

f. Used by Source: \_\_\_\_\_

Please read instructions carefully before completing this application.

**Section 11 – Alternative Operating Scenario (optional)**

**(Duplicate this section for each source participated in this alternative scenarios)**

**11.1 General Information**

- a. Alternative Operating Scenario Name or ID No.: \_\_\_\_\_
- b. Source ID No.: \_\_\_\_\_ c. Source Name: \_\_\_\_\_
- d. Source Type (check one):  Combustion  Incinerator  Process
- e. Give a brief description of this alternative scenario stating how it is different from the standard operation:

**11.2 Operational Flexibility Request**

Check all that apply.

- Alternative exhaust system component configuration.  
If this box is checked, complete Sections 11.3 and 11.7
- Alternative type of fuel replacing or in addition to an existing fuel in standard operation.  
If this box is checked, complete Sections 11.4 and/or 11.5 and 11.7
- Alternative process method replacing or in addition to a process SCC existing in standard operation.  
If this box is checked, complete Sections 11.6 and 11.7
- Alternative lower limitations.

**11.3 Exhaust System Components**

Specify the complete exhaust system component configuration for this alternative operating scenario.

From Component Type	From Component Number	To Component Type	To Component Number	Percent Flow	Begin Date	End Date

Please read instructions carefully before completing this application.

<b>11.4 Source Classification Code (SCC) Listing for Alternative Operation</b>			
Give a complete listing of all fuels burned, products produced by a process or waste incinerated for this alternative operating scenario.			
<b>Fuel</b>	<b>Associated SCC</b>	<b>Max. Throughput Rate</b>	<b>Firing Sequence</b>

<b>11.5 Alternative Fuel Physical Characteristics</b>				
Give a complete listing of all fuels physical characteristics for this alternative operating scenario.				
<b>SCC/Fuel Burned</b>	<b>FML</b>	<b>% Sulfur</b>	<b>% Ash</b>	<b>BTU Content (Units)</b>

<b>11.6 Alternative Process/Product Description</b>	
a. Briefly describe the change(s) in raw materials and/or process methods used in this operating scenario, if applicable:	
b. Provide and briefly describe the process SCC associated with this alternative operating scenario:	
Process SCC:	SCC Description:
c. Alternative Product(s):	



Please read instructions carefully before completing this application.

**Section 12 – Compliance Plan for the Facility**

- |      |  |                                     |                          |
|------|--|-------------------------------------|--------------------------|
|      |  | Yes                                 | No                       |
| 12.1 | Will your facility be in compliance with all applicable requirements at the time of permit issuance and continue to comply with these requirements during the permit duration? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 12.2 | Will your facility be in compliance with all applicable requirements presently scheduled to take effect during the term of the permit?   | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 12.3 | Will these requirements be met by the regulatory required dates?   | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

If you checked "NO" in part 12.1, 12.2 or 12.3, answer the following questions:

12.4 Identify applicable requirement(s) for which compliance is not or will not be achieved:

Source ID Number	Citation Number

12.4.1 Briefly describe how compliance with this/these applicable requirement(s) will be achieved:



Please read instructions carefully before completing this application.

**Section 13 – Certification of Compliance for Synthetic Minor Source**

In order for this Synthetic Minor facility to avoid the State-Only Operating Permit requirements, the applicant must agree to be bound by the emissions limitation(s) and/or restriction(s) contained in this application. In addition, the applicant must agree that these emission limitation(s) are enforceable by the Department, the Environmental Protection Agency and the citizens.

**13.1 Schedule for Compliance Certification Submission**

- a. Frequency of submittal: \_\_\_\_\_
- b. Beginning date: \_\_\_\_\_

**13.2 Certification of Compliance (for Synthetic Minor Facility only)**

I certify under the penalty of 18 Pa. CS 4904 (b) (2) that the sources covered by this application will comply with the emission limitations and other requirements contained in this application and all previously issued plan approvals and operating permits. I further certify that, based on information and belief formed after reasonable inquiry, the statements and information in this application are true, accurate, and complete.

(Signed) \_\_\_\_\_ Date \_\_\_\_\_

Name (Typed) \_\_\_\_\_

Title: \_\_\_\_\_

**Appendix B, Attachment 1: Emission Calculations**

CLIENT: Sunoco Pipeline, L.P. (SPLP)				JOB NUMBER: 112IC05958.20			
SUBJECT: Mt. Union Station (98% DRE) -- Existing Equipment Overall Project Summary Table							
BASED ON: Emission Calculation Workbooks				DRAWING NUMBER: Not Applicable			
BY: VJPlachy		CHECKED BY: AMO'Bradovich		DATE:		8/11/2016	

**Objective:** Summarize the controlled maximum hourly and annual emission rates.

1. **PRE-CONTROL EMISSION ESTIMATES\***

Emissions Source	Pre-Control Maximum Hourly Emission Rate [pounds per hour (lb/hr)]									
	NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
Control Device (Flare):	0.004	0.02	608.62	N/C	0.0002	0.00004	7.67	0.001	0.0001	7.70
Fugitives:	N/C	N/C	0.03	N/C	N/C	N/C	N/C	N/C	N/C	N/C
<b>TOTAL MAXIMUM HOURLY:</b>	<b>&lt;0.01</b>	<b>0.02</b>	<b>608.65</b>	<b>N/C</b>	<b>&lt;0.01</b>	<b>&lt;0.01</b>	<b>7.67</b>	<b>&lt;0.01</b>	<b>&lt;0.01</b>	<b>7.70</b>

Emissions Source	Pre-Control Annual Average Emission Rate [tons per year (tpy)]									
	NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
Control Device (Flare):	0.02	0.08	25.90	N/C	0.001	0.0002	33.60	0.002	0.0002	33.70
Fugitives:	N/C	N/C	0.15	N/C	N/C	N/C	N/C	N/C	N/C	N/C
<b>TOTAL ANNUAL AVERAGE:</b>	<b>0.02</b>	<b>0.08</b>	<b>26.05</b>	<b>N/C</b>	<b>&lt;0.01</b>	<b>&lt;0.01</b>	<b>33.60</b>	<b>&lt;0.01</b>	<b>&lt;0.01</b>	<b>33.70</b>

2. **POST-CONTROL EMISSION ESTIMATES**

Emission Source	Post-Controlled Maximum Hourly Emission Rate (lb/hr)									
	NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
Control Device (Flare):	0.88	4.02	12.22	N/C	0.04	0.00004	1,852	0.13	0.01	1,862
Fugitives:	N/C	N/C	0.03	N/C	N/C	N/C	N/C	N/C	N/C	N/C
<b>TOTAL MAXIMUM HOURLY:</b>	<b>0.88</b>	<b>4.02</b>	<b>12.25</b>	<b>N/C</b>	<b>0.04</b>	<b>&lt;0.01</b>	<b>1,852</b>	<b>0.13</b>	<b>0.01</b>	<b>1,862</b>

Emission Source	Post-Controlled Annual Average Emission Rate (tpy)									
	NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
Control Device (Flare):	0.06	0.25	0.65	N/C	0.002	0.0002	111.70	0.01	0.001	112.30
Fugitives:	N/C	N/C	0.15	N/C	N/C	N/C	N/C	N/C	N/C	N/C
<b>TOTAL ANNUAL AVERAGE:</b>	<b>0.06</b>	<b>0.25</b>	<b>0.80</b>	<b>N/C</b>	<b>&lt;0.01</b>	<b>&lt;0.01</b>	<b>111.70</b>	<b>0.01</b>	<b>&lt;0.01</b>	<b>112.30</b>

**NOTE:**

The emission estimate workbooks employ the "precision as displayed" option in Excel<sup>®</sup>; therefore, only the displayed significant figure are applied in the calculations. The minor impacts may occurred to emission estimates by utilizing this Excel<sup>®</sup> function/option.

\*The Pre-Control Emission Estimates assume that the pilot gas is continuously supplied and combusted.

**Terminology/Acronyms**

- CH<sub>4</sub> = methane
- CO = carbon monoxide
- CO<sub>2</sub>e = carbon dioxide equivalent
- HAP = hazardous air pollutant
- N/C = Not Calculated because it is not a pollutant associated with the source
- N<sub>2</sub>O = nitrogen dioxide
- NO<sub>x</sub> = oxides of nitrogen
- PM = particulate matter
- PM<sub>2.5</sub> = particles with an aerodynamic diameter less than or equal to 2.5 micrometers
- PM<sub>10</sub> = particles with an aerodynamic diameter less than or equal to 10 micrometers
- SO<sub>x</sub> = oxides of sulfur
- VOC = volatile organic compound

CLIENT: Sunoco Pipeline, L.P. (SPLP)				JOB NUMBER: 1121C05958.20			
SUBJECT: Mt. Union Station (98% DRE) -- Existing Equipment Flare Summary Table							
BASED ON: Emission Calculation Workbooks				DRAWING NUMBER: Not Applicable			
BY: VJPlachy	CHECKED BY: AMO'Bradovich			DATE:			7/7/2016

**Objective:** Present the Maximum Short Term and Annual Emission Rates for the Updated emission estimates.

**PRE-CONTROL EMISSION ESTIMATES\***

Emission Scenario	Pre-Controlled Maximum Hourly Emission Rate (lb/hr)									
	NO <sub>x</sub>	CO	VOC	PM/PM <sub>10f</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2e</sub>
Standard Operating Scenario	3.76E-03	1.72E-02	4.62E+00	N/C	1.53E-04	4.16E-05	7.67E+00	5.54E-04	5.54E-05	7.70E+00
Maintenance Operations Scenario	N/C	N/C	6.04E+02	N/C	N/C	N/C	N/C	N/C	N/C	N/C
<b>TOTAL MAXIMUM HOURLY:</b>	0.004	0.02	608.62	N/C	0.0002	0.00004	7.67	0.001	0.0001	7.70

Emission Scenario	Pre-Controlled Annual Emission Rate (tpy)									
	NO <sub>x</sub>	CO	VOC	PM/PM <sub>10f</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2e</sub>
Standard Operating Scenario	1.65E-02	7.53E-02	2.02E+01	N/C	6.70E-04	1.82E-04	3.36E+01	2.43E-03	2.43E-04	3.37E+01
Maintenance Operations Scenario	N/C	N/C	5.70E+00	N/C	N/C	N/C	N/C	N/C	N/C	N/C
<b>TOTAL ANNUAL AVERAGE:</b>	0.02	0.08	25.90	N/C	0.001	0.0002	33.60	0.002	0.0002	33.70

**POST-CONTROL EMISSION ESTIMATES**

Emission Scenario	Post-Controlled Maximum Hourly Emission Rate (lb/hr)									
	NO <sub>x</sub>	CO	VOC	PM/PM <sub>10f</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2e</sub>
Standard Operating Scenario	1.04E-02	4.74E-02	1.24E-01	N/C	4.28E-04	4.16E-05	2.16E+01	1.53E-03	1.53E-04	2.17E+01
Maintenance Operations Scenario	8.70E-01	3.97E+00	1.21E+01	N/C	4.00E-02	N/C	1.83E+03	1.30E-01	1.00E-02	1.84E+03
<b>TOTAL MAXIMUM HOURLY:</b>	0.88	4.02	12.22	N/C	0.04	0.00004	1,852	0.13	0.01	1,862

Emission Scenario	Post-Controlled Annual Emission Rate (tpy)									
	NO <sub>x</sub>	CO	VOC	PM/PM <sub>10f</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2e</sub>
Standard Operating Scenario	4.55E-02	2.07E-01	5.41E-01	N/C	1.87E-03	1.82E-04	9.45E+01	6.69E-03	6.69E-04	9.50E+01
Maintenance Operations Scenario	1.00E-02	4.00E-02	1.10E-01	N/C	3.00E-04	N/C	1.72E+01	1.00E-03	1.00E-04	1.73E+01
<b>TOTAL ANNUAL AVERAGE:</b>	0.06	0.25	0.65	N/C	0.002	0.0002	111.70	0.01	0.001	112.30

**NOTES:**

\*The Pre-Control Emission Estimates assume that the pilot gas is continuously supplied and combusted.

N/C = not calculated

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20		[53]
SUBJECT Mt. Union Station (98% DRE) -- Existing Equipment Enclosed Flare Emission Calculations: Standard Operating Scenario Emission Sources				
BASED ON SPLP Equipment Data / Specifications			DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE 5/23/2016	

**Objective:** Develop example calculations: Maximum Hourly, Maximum Daily, and Annual Average Emission Rates for the proposed Standard Operating Scenario Emission Streams.

**Inputs and Assumptions:**

- Potential stream products to the enclosed flare consistent of butane, propane, and/or ethane.
- Sources of standard operating scenario emission sources to the enclosed flare that were evaluated included: chromatographs (GC), relief valves (RV), and booster, injection, and feed pump seals (Pump).
- Maintenance intermittent emission sources to the enclosed flare that were evaluated include: gas releases from filter cleaning, prover maintenance, pigging events, and miscellaneous maintenance activities. Maintenance activity emission estimates will be presented in another calculation sheet.
- Stream physical properties that result in the highest potential emission rates have been used.
- Hourly flow to flare from Standard Operating Scenario Emission Streams:

RV (FR<sub>RV-scf/hr</sub>): 0.00 scf/hr → 0 scf/yr No RVs to flare for this station

GC (FR<sub>GC-scf/hr</sub>): 0.00 scf/hr → 0 scf/yr No GCs to flare for this station.

Booster Pumps (FR<sub>BostPmp-scf/hr</sub>) 30.00 scf/hr → 262,800 scf/yr

Injection Pumps (FR<sub>InjPmp-scf/hr</sub>) 0.00 scf/hr → 0 scf/yr No Injection Pump Seals to flare for this station.

Feed Pumps (FR<sub>FeedPmp-scf/hr</sub>) 0.00 scf/hr → 0 scf/yr No Feed Pump Seals to flare for this station.

Pump (FR<sub>total-scf/hr</sub>): 30.00 scf/hr → 262,800 scf/yr

- Because the enclosed flare is considered to be 100% smokeless, particulate matter (PM) emissions are assumed to be negligible.
- The flare's destruction and removal efficiency (DRE) for VOCs and HAPs only: 98 percent (%)  
The flare does not reduce/control NO<sub>x</sub>, CO, SO<sub>x</sub>, CO, CH<sub>4</sub>, N<sub>2</sub>O, or CO<sub>2</sub>e emissions, that is, pre-control emissions equal post-control emissions.
- Flare Emission Factors (EFs)

NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> /PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub>		CH <sub>4</sub>	N <sub>2</sub> O
						butane	propane		
(lb/MMBtu)			(ppmw)			(kg/MMBtu)			
0.068	0.310	0.570	0	30	TBD	64.77	62.87	0.003	0.0006

**PROPERTIES, AND ABBREVIATIONS / ACRONYMS "Standard Inputs" WORKSHEET TAB.**

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20		[54]
SUBJECT Mt. Union Station (98% DRE) -- Existing Equipment Enclosed Flare Emission Calculations: Standard Operating Scenario Emission Sources				
BASED ON SPLP Equipment Data / Specifications			DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE	5/23/2016

**Inputs and Assumptions (Continued):**

9. Oxides of Sulfur (SO<sub>x</sub>) emissions are:

Based on the sulfur content of the stream.

Assume SO<sub>x</sub> as SO<sub>2</sub>.

Assumes that all the all fuel sulfur converts to SO<sub>2</sub>.

10. CO<sub>2</sub>e Global Warming Potential EFs (EF<sub>GWP</sub>)

CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O
1	25	298

CO<sub>2</sub>e emission estimates use the following carbon equivalence factors: 25 for CH<sub>4</sub>, and 298 for N<sub>2</sub>O from 40 CFR Part 98, Subpart A, Table A-1.

11. Maximum emission stream flow rates are achieved when assuming a stream composition of 100 weight percent (wt%) butane.

12. HAPs are generated from propane burned as pilot gas and are contained in the LPG stream.

13. LPG HAP content (HAPs<sub>wt%</sub>): 0 wt%

14. Operating service factor (OSF), that is, percent of the year the unit is operating: 100 %

**Calculations:**

**STANDARD OPERATING SCENARIO EMISSION SOURCES**

1. Calculate the SO<sub>x</sub> Emission Factor (EF) in pounds per standard cubic feet (lb/scf) for butane.

$$EF_{SO_x(lb/scf)} = [(mole\ of\ the\ gas\ stream)] * [(concentration\ of\ sulfur\ in\ gas\ stream)] * [(molar\ ratio\ of\ SO_2\ to\ S)]$$

$$= [(lb\ of\ gas\ stream) * (MW\ gas\ stream) * [(concentration\ of\ sulfur\ in\ gas\ stream)] * [(molar\ ratio\ of\ SO_2\ to\ S)]$$

$$= [(volume\ of\ gas\ stream\ as\ butane) * (MW\ butane)] * [(concentration\ of\ sulfur\ ppmw) / (CF_{ppmw-wt\%}) / (CF_{wt\%-DecEq})] * [(MW\ SO_2) / (MW\ S)]$$

$$= [(CF_{lb\_mol-scf}) * (MW_{butane})] * [(SO_2-ppmw) / (CF_{ppmw-wt\%}) / (CF_{wt\%-DecEq})] * [(MW\ SO_2) / (MW\ S)]$$

$$= \left[ \frac{1\ lb-mol}{379.5\ scf} \right] * \left[ \frac{58.12\ lb-butane}{1\ lb-mole\ gas\ stream\ (butane)} \right] * \left[ \frac{30\ ppmw\ S}{10,000\ ppmw} \right] * \left[ \frac{1\ \%}{100\ \%} \right] * \left[ \frac{1\ DecEq}{1\ DecEq} \right] * \left[ \frac{64.07\ lb\ SO_2/lb-mol}{32.07\ lb-S/lb-mol} \right]$$

$$= 9.18E-06\ lb\ SO_2/cf\ of\ the\ gas\ stream = 9.18E-06\ lb\ SO_x/cf\ of\ the\ gas\ stream$$

2. Calculate the total standard operating scenario flow to the flare in scf/hr (Flow<sub>Std-scf/hr</sub>).

$$Flow_{Std-scf/hr} = [\sum\ Standard\ Operating\ Scenario\ Flow\ Rates\ to\ the\ Flare]$$

$$= (Flow\ from\ the\ GCs) + (Flow\ from\ RVs) + (Flow\ from\ Pumps)$$

$$= 0.00 + 0.00 + 30.00\ scf/hr = 30.00\ scf/hr\ standard\ operating\ scenario\ flow$$

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20		[55]
SUBJECT Mt. Union Station (98% DRE) -- Existing Equipment Enclosed Flare Emission Calculations: Standard Operating Scenario Emission Sources				
BASED ON SPLP Equipment Data / Specifications			DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE 5/23/2016	

**Calculations (Continued):**

**STANDARD OPERATING SCENARIO EMISSION SOURCES**

3. Calculate the flow rate (FR) from the standard operating scenario sources to the flare in MMBtu/hr.  
For the RVs as an example:

$$\text{Flow}_{\text{Std-MMBtu/hr}} = (\text{FR}_{\text{Std-scf/hr}}) * (\text{HHV}_{\text{Butane}}) / (\text{CF}_{\text{Btu-MMBtu}})$$

$$= \left| \frac{30.00 \text{ scf}}{\text{hr}} \right| \left| \frac{3,244 \text{ Btu}}{1 \text{ scf}} \right| \left| \frac{1 \text{ MMBtu}}{1\text{E}+06 \text{ Btu}} \right| = 9.73\text{E-}02 \text{ MMBtu}_{\text{Std}}/\text{hr}$$

4. Convert emission factor from kg/MMBtu to lb/MMBtu.

Using butane CO<sub>2</sub> as an example:

$$\text{EF}_{\text{CO}_2(\text{lb/MMBtu})} = [\text{EF}_{\text{CO}_2(\text{kg/MMBtu})}] / (\text{CF}_{\text{kg-lb}})$$

$$= \left| \frac{64.77 \text{ kg}}{\text{MMBtu}} \right| \left| \frac{1 \text{ lb}}{0.4536 \text{ kg}} \right| = 142.79 \text{ lb CO}_2/\text{MMBtu}$$

EF										EF <sub>GWP</sub>		
NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub>		CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O
						butane	propane					
(lb/MMBtu)			(lb/scf)	(lb/MMBtu)			N/A					
0.068	0.310	0.57	N/A	9.18E-06	N/A	142.79	138.60	0.01	0.001	1	25	298

NOTE:

Because the EF for butane CO<sub>2</sub> is greater than the EF for propane CO<sub>2</sub>, the butane CO<sub>2</sub> emission factor will be applied to estimate the maximum hourly, maximum daily, and annual average emission rates.

**STANDARD OPERATING SCENARIO EMISSION SOURCES: Pre-control Emission Estimate**

5. Calculate the VOC flow rate from the standard operating scenario sources before controls (F-pre<sub>VOC</sub>) in lb/hr.

a. For the GCs, the RVs, the Booster pumps, the Injection pumps, and the Feed Pumps.

$$\text{F-pre}_{\text{VOC-lb/hr}} = (\text{Flow}_{\text{Std-scf/hr}}) / (\text{CF}_{\text{scf-lb-mol}}) * (\text{MW}_{\text{butane}})$$

$$= \left| \frac{30.00 \text{ scf}}{\text{hr}} \right| \left| \frac{1 \text{ lb-mol}}{379.5 \text{ scf}} \right| \left| \frac{58.12 \text{ lb}}{1 \text{ lb-mole}} \right| = 4.59 \text{ lb/hr}$$

6. Calculate the EF for HAPs in pounds per scf (lb/scf).

$$\text{EF}_{\text{HAPs(lb/scf)}} = (\text{HAPs}_{\text{wt\%}}) / (\text{CF}_{\text{wt\%-DecEq}}) * (\text{MW}_{\text{butane}}) / (\text{CF}_{\text{scf-lb/mol}})$$

$$= \left| \frac{0 \text{ wt\%}}{100 \text{ wt\%}} \right| \left| \frac{1 \text{ DecEq}}{\text{lb-mol}} \right| \left| \frac{58.12 \text{ lb}}{379.5 \text{ scf}} \right| \left| \frac{1 \text{ lb-mol}}{1 \text{ lb-mole}} \right| = 0 \text{ lb HAPs/scf}$$

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20		[56]
SUBJECT Mt. Union Station (98% DRE) -- Existing Equipment Enclosed Flare Emission Calculations: Standard Operating Scenario Emission Sources				
BASED ON SPLP Equipment Data / Specifications			DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE 5/23/2016	

**STANDARD OPERATING SCENARIO EMISSION SOURCES: Pre-control Emission Estimate (Continued):**

7. Calculate HAPs the flow rate from the standard operating scenario sources before controls (ER-pre<sub>HAPs</sub>) in lb/hr.

$$ER\text{-pre}_{HAPs\text{-lb/hr}} = (Flow_{Std\text{-scf/hr}}) * (ER_{HAPs\text{-lb/scf}})$$

$$= [(FR_{GC\text{-scf/hr}}) + (FR_{RV\text{-scf/hr}}) + (FR_{Pump\text{-scf/hr}})] * (ER_{HAPs\text{-lb/scf}})$$

$$= \left\| \left\| 30.00 \frac{\text{scf}}{\text{hr}} \right\| \left\| \frac{0 \text{ lb}}{1 \text{ scf}} \right\| \right\| = 0.00E+00 \text{ lb HAPs/hr}$$

Pre-Control Maximum Hourly Emission Rate (ER) (lb/hr)									
NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
N/C	N/C	4.59E+00	N/C	N/C	N/C	N/C	N/C	N/C	N/C

Pre-Control Annual Average ER (tpy)									
NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
N/C	N/C	2.01E+01	N/C	N/C	N/C	N/C	N/C	N/C	N/C

**POST CONTROLS**

**STANDARD OPERAING SCENARIO EMISSION SOURCES: Post-control Emission Estimate**

8. Calculate the Maximum Hourly emission rate for SO<sub>x</sub> ER<sub>MaxHrlySO<sub>x</sub></sub>.

$$ER_{MaxHrlySOx} = (Flow_{Std\text{-scf/hr}}) * (EF_{NOx})$$

$$= \left\| \left\| 30.00 \frac{\text{scf}}{\text{hr}} \right\| \left\| 9.18E-06 \frac{\text{lb}}{\text{scf}} \right\| \right\| = 2.75E-04 \text{ lb SO}_x \text{/hr}$$

9. Calculate the pre-control Annual Average emission rate for the remaining pollutants in tons per year (tpy).

Using NO<sub>x</sub> as an example:

$$ER\text{-pre}_{AnnAvgNOx} = (ER_{MaxHrlyNOx}) * (CF_{hours\text{-year}}) * (OSF) / (CF_{\%DecEq}) / (CF_{lb\text{-tons}})$$

$$= \left| \frac{6.62E-03 \text{ lb}}{1 \text{ hr}} \right| \left| \frac{8,760 \text{ hr}}{1 \text{ year}} \right| \left| \frac{100 \%}{100 \%} \right| \left| \frac{1 \text{ DecEq}}{2,000 \text{ lb}} \right| \left| \frac{1 \text{ ton}}{2,000 \text{ lb}} \right| = 2.90E-02 \text{ tpy of NO}_x$$

10. Calculate the maximum hourly emission rate ER<sub>MaxHrly</sub>.

Using NO<sub>x</sub> as an example:

$$ER_{MaxHrlyNOx} = (EF_{NOx}) * (Flow_{Std\text{-MMBtu/hr}})$$

$$= \left| \frac{0.068 \text{ lb}}{\text{MMBtu}} \right| \left| \frac{9.73E-02 \text{ MMBtu}}{\text{hr}} \right| = 6.62E-03 \text{ lb NO}_x \text{/hr}$$

11. Calculate the maximum hourly emission rate for CO<sub>2</sub>e based on CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O emission rates.

$$ER_{MaxHrlyCO2e} = \sum \{ [(CO_{2\text{-lb/hr}}) * (EF_{CO2\text{-GWP}})] + [(CH_{4\text{-lb/hr}}) * (EF_{CH4\text{-GWP}})] + [(N_{2O\text{-lb/hr}}) * (EF_{N2O\text{-GWP}})] \}$$

$$= \left\| \left\| 1.39E+01 \frac{\text{lb}}{\text{hr}} \right\| \right\| 1 \left\| + \right\| \left\| \left\| 9.73E-04 \frac{\text{lb}}{\text{hr}} \right\| \right\| 25 \left\| + \right\| \left\| \left\| 9.73E-05 \frac{\text{lb}}{\text{hr}} \right\| \right\| 298 \left\| \right\| = 1.40E+01 \text{ lb/hr}$$

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20		[57]
SUBJECT Mt. Union Station (98% DRE) -- Existing Equipment Enclosed Flare Emission Calculations: Standard Operating Scenario Emission Sources				
BASED ON SPLP Equipment Data / Specifications			DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE	5/23/2016

**POST CONTROLS**

***STANDARD OPERAING SCENARIO EMISSION SOURCES: Post-control Emission Estimate (Continued)***

12. Calculate the maximum hourly VOC flow rate (FR) from the standard operating scenario sources in lb/hr.

$$Flow_{VOC-lb/hr} = (Flow_{Std-scf/hr}) / (CF_{scf-lb-mol}) * (MW_{butane}) * [1 - (DRE / CF_{\%DecEq})]$$

$$= \left| \frac{30.00 \text{ scf}}{\text{hr}} \right| \left| \frac{1 \text{ lb-mol}}{379.5 \text{ scf}} \right| \left| \frac{58.12 \text{ lb}}{\text{lb-mole}} \right| \left| 1 - \left| \frac{98 \%}{100 \%} \right| \right| = 9.19E-02 \text{ lb VOC/hr}$$

13. Calculate the maximum hourly HAPs flow rate (FR) from the standard operating scenario sources in lb/hr.

$$Flow_{HAPs-lb/hr} = (Flow_{Std-scf/hr}) * (EF_{HAPs(lb/scf)}) * [1 - (DRE / CF_{\%DecEq})]$$

$$= \left| \frac{30.00 \text{ scf}}{\text{hr}} \right| \left| \frac{0 \text{ lb}}{1 \text{ scf}} \right| \left| 1 - \left| \frac{98 \%}{100 \%} \right| \right| = 0.00E+00 \text{ lb HAPs/hr}$$

14. Calculate CO<sub>2</sub> the flow rate (FR) from the standard operating scenario sources in lb/hr.

$$Flow_{CO2-lb/hr} = (Flow_{Std\_MMBtu/hr}) * (EF_{CO2-lb/MMBtu})$$

$$= \left| \frac{9.73E-02 \text{ lb}}{\text{MMBtu}} \right| \left| \frac{142.79 \text{ MMBtu}}{\text{MMBtu}} \right| = 1.39E+01 \text{ lb CO}_2\text{/hr}$$

Post Control Maximum Short Term Hourly Emission Rate (lb/hr)									
NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
6.62E-03	3.02E-02	9.19E-02	N/C	2.75E-04	N/C	1.39E+01	9.73E-04	9.73E-05	1.40E+01

15. Calculate the daily maximum emission rate ER<sub>MaxDaily</sub>.

Using NO<sub>x</sub> as an example:

$$ER_{MaxDailyNOx} = (ER_{MaxStTmNOx}) * (CF_{hours-day})$$

$$= \left| \frac{6.62E-03 \text{ lb}}{1 \text{ hr}} \right| \left| \frac{24 \text{ hr}}{1 \text{ day}} \right| = 1.59E-01 \text{ lb NO}_x\text{/day}$$

Post Maximum Daily Emission Rate (lb/day)									
NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
1.59E-01	7.25E-01	2.21E+00	N/C	6.60E-03	N/C	3.34E+02	2.34E-02	2.34E-03	3.36E+02

16. Calculate the annual average emission rate for the remaining pollutants in tons per year (tpy).

Using NO<sub>x</sub> as an example:

$$ER_{AnnNOx} = (ER_{MaxShtTmNOx}) * (CF_{hours-year}) * (OSF) / (CF_{\%DecEq}) / (CF_{lb-tons})$$

$$= \left| \frac{6.62E-03 \text{ lb}}{1 \text{ hr}} \right| \left| \frac{8,760 \text{ hr}}{1 \text{ year}} \right| \left| \frac{100 \%}{100 \%} \right| \left| \frac{1 \text{ DecEq}}{100 \%} \right| \left| \frac{1 \text{ ton}}{2,000 \text{ lb}} \right| = 2.90E-02 \text{ NO}_x\text{ tpy}$$

Annual Emission Rate (tpy)									
NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
2.90E-02	1.32E-01	4.03E-01	N/C	1.20E-03	N/C	6.09E+01	4.26E-03	4.26E-04	6.13E+01

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20		[58]
SUBJECT Mt. Union Station (98% DRE) -- Existing Equipment Standard Operating Scenario Sources: Total Flow from Booster Pump Seals				
BASED ON SPLP provided equipment volume/specification for the maximum anticipated standard operating scenario			DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE	5/23/2016

**Objective:** Calculate the volume from the booster pumps that are sent to the enclosed flare.

**Inputs and Assumptions:**

- The pump seal leaks will be captured and sent to the flare header as the volatile organic compound (VOC) and hazardous air pollutant (HAP) control device.
- Worst case scenario is for the station to be at a sea level elevation.
 

Pressure at atmosphere:	0	ft	1.00	atm
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Source for conversion: [http://www.engineeringtoolbox.com/air-altitude-pressure-d\\_462.html](http://www.engineeringtoolbox.com/air-altitude-pressure-d_462.html)  
 Pressure at release point ( $P_{act-release-atm}$ ) = Pressure at atmospheric = 1.00 atm
- Operating service factor (OSF), that is, percent of the year the unit is operating: 100.00 %
- Equipment Quantities:
 

Booster Pumps ( $N_{BP}$ ):	1
-----------------------------	---
- Equipment Volume:
- Pump Seal Leak Rates:
 

Booster Pumps Inlet ( $LR_{BPIn}$ ):	0	grams per hour (g/hr) @ 60°	14.7	psi	1.00	atm
	30	scf/hr @ 60°F				
Booster Pumps Outlet ( $LR_{BPOut}$ ):	0	g/hr @ 60°F	0	psi	0.00	atm
	0	scf/hr @ 60°F				

Source: Total pump seal leak rates provided by the Manufacturer (Flowserve):
- The ideal gas law applies:
 
$$PV = nR_{specific}T$$
- System temperature: 60 degrees Fahrenheit (°F) = 520.67 degrees Rankine (°R)
- Average release temperature: 60 °F = 520.67 °R
- Propane physical properties result in the greatest release volumes, therefore, propane will be used to calculate the gas release volumes from the equipment.
- Propane physical properties:
 

Density at pipe pressure ( $\rho_{pipe}$ ):	33.74	pounds per cubic feet (lb/ft <sup>3</sup> ) at 40°F and 1,480 psig
Density at atmospheric conditions ( $\rho_{released}$ ):	0.12	pounds per standard cubic feet (lb/scf) at 60°F and 1 atm
Density at Booster Pump Inlet ( $\rho_{BPIn}$ ):	0.12	lb/ft <sup>3</sup> at 60°F at 1 atm
Density at Booster Pump Outlet ( $\rho_{BPOut}$ ):	0.00	

Source:

  - The density of propane at atmospheric conditions taken from the National Institute of Standards and Technology website of isothermal properties for propane.  
<http://webbook.nist.gov/cgi/fluid.cgi?ID=C74986&TUnit=F&PUnit=atm&DUnit=lbm%2Fft3&HUnit=Btu%2Flbm&WUnit=ft%2Fs&VisUnit=cP&STUnit=lb%2Fft&Type=IsoTherm&RefState=DEF&Action=Page>
  - The higher heating value (HHV) of Butane based on 40 CFR Part 98 Subpart C, Table C-1:
- There are no hazardous air pollutants in butane, propane, or ethane.
- Flare designed capacity ( $C_{flare}$ ): 10 MMBtu/hr

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20	[59]
SUBJECT Mt. Union Station (98% DRE) -- Existing Equipment Standard Operating Scenario Sources: Total Flow from Booster Pump Seals			
BASED ON SPLP provided equipment volume/specification for the maximum anticipated standard operating scenario		DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE 5/23/2016

**Calculations:**

1. Calculate the leakage rate per pump seal in scf/hr at atmospheric pressure ( $LR_{atm}$ ).

$$\frac{P_1 V_1}{P_2 V_2} = \frac{n_1 R T_1}{n_2 R T_2} ; \quad \text{Where } n_1 = n_2 \text{ and } T_1 = T_2 \quad ; \quad \frac{P_1 V_1}{P_2 V_2} = 1$$

$$P_1 V_1 = P_2 V_2 \quad ==> \quad V_2 = P_1 V_1 / P_2$$

$$LR_{atmBPin-scf/hr} = [(P_{BPin}) / (CF_{psi-atm}) * (LR_{BPin-acf/hr})] / (P_{atm})$$

$$= \left| \frac{14.7 \text{ psi}}{14.7 \text{ psi}} \right| \left| \frac{1 \text{ atm}}{1 \text{ atm}} \right| \left| \frac{30 \text{ scf}}{\text{hr}} \right| \left| \frac{1}{1.00 \text{ atm}} \right| = 30 \text{ scf/hr}$$

Pump Seal	Pressure (psig)	Leakage Rate	
		(acf/hr)	(scf/hr)
Booster Inlet	14.7	30	30
Booster Outlet	0	0	0

2. Calculate the total pump leakage rate in scf/hr ( $LR_{total-scf/hr}$ ).

$$LR_{totalBP-scf/hr} = [\sum(LR_{atmBPin-scf/hr} + LR_{atmBPout-scf/hr}) * (N_{BP})] * (OSF) / (CF_{\%DecEq})$$

$$= \left| \frac{30 \text{ scf}}{\text{hr}} + \frac{0.00 \text{ scf}}{\text{hr}} \right| \left| \frac{1 \text{ pumps}}{1} \right| \left| \frac{100.00 \%}{100 \%} \right| \left| \frac{1 \text{ DecEq}}{100 \%} \right|$$

$$= 30 \text{ scf/hr}$$

3. Calculate the total pump leakage rate in scf/yr ( $LR_{total-scf/yr}$ )

$$LR_{totalBP-scf/yr} = (LR_{totalBP-scf/hr}) * (CF_{hr-yr}) * (OSF) / (CF_{\%DecEq})$$

$$= \left| \frac{30 \text{ scf}}{\text{hr}} \right| \left| \frac{8,760 \text{ hrs}}{1 \text{ yr}} \right| \left| \frac{100.00 \%}{100 \%} \right| \left| \frac{1 \text{ DecEq}}{100 \%} \right| = 262,800 \text{ scf/yr}$$

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20		[60]
SUBJECT Mt. Union Station (98% DRE) -- Existing Equipment Standard Operating Scenario Sources: Total Flow from Pilot Gas for the Enclosed Flare				
BASED ON SPLP Equipment Data / Specifications			DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE 8/29/2016	

**Objective:** Develop example calculations for: Maximum Hourly, Maximum Daily, and Annual Average Emission Rate for the Enclosed Flare Propane Pilot Gas.

**Inputs and Assumptions:**

- Pilot gas composition: 100.00 weight percent (wt%) propane
- Pilot gas flow rate are based on the flare design specifications.  
 flow rate (FR<sub>Btu/hr</sub>): 50,000 British thermal units per hour (Btu/hr)  
 flow rate (FR<sub>scf/hr</sub>): 22 standard cubic feet per hour (scf/hr)  
 Flow rate source: manufacturer's data.
- Higher heating value (HHV<sub>butane</sub>): 3,244 British thermal units per standard cubic feet (Btu/scf)
- Operating service factor (OF), that is, percent of the year the unit is operating: 100.00 %
- The flare's destruction and removal efficiency (DRE) has been applied to the pilot gas VOC emissions:  
98.0 percent (%)
- Because the enclosed flare is considered to be 100% smokeless, particulate matter (PM) emissions are assumed to be negligible.
- HAPs are generated from propane burned as pilot gas and are contained in the LPG stream.
- Flare Emission Factors (EFs)

NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub>		CH <sub>4</sub>	N <sub>2</sub> O
						butane	propane		
(lb/MMBtu)				(ppmw)	(lb/MMscf)	(kg/MMBtu)			
0.068	0.310	0.570	0	30	1.89	64.77	62.87	0.003	0.0006

**INFORMATION REGARDING THE SOURCE OF INPUTS FOR THIS THIS TABLE ARE PRESENTED IN THE CONVERSION FACTORS, PHYSICAL PROPERTIES, AND ABBREVIATIONS / ACRONYMS WORKSHEET.**

- Oxides of Sulfur (SO<sub>x</sub>) emissions are:  
 Based on the sulfur content of the stream.  
 Assumes SO<sub>x</sub> as SO<sub>2</sub>.  
 Assumes that all the all fuel sulfur converts to SO<sub>2</sub>.

- CO<sub>2</sub>e Global Warming Potential EFs (EF<sub>GWP</sub>)

CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O
1	25	298

CO<sub>2</sub>e emission estimates use the following carbon equivalence factors: 25 for CH<sub>4</sub>, and 298 for N<sub>2</sub>O from 40 CFR Part 98, Subpart A, Table A-1.

- There are no hazardous air pollutants in propane. However, for a conservative estimate the pilot gas was assumed to have the same HAPs as natural gas, that is, AP-42, Section 1.4, Tables 1.4-3 (EFs for Speciated Organic Compounds from Natural Gas Combustion) and 1.4-4 (ER for metals from Natural Gas Combustion) applies.

AP-42 Chapter 1.4; Table 1.4-2; footnote a: To convert from lb/10<sup>6</sup> scf to lb/MMBtu, divide by 1,020. The emission factors in this table may be converted to other natural gas heating values by multiplying the given emission factor by the ratio of specified heating values to this average heating value.

<https://www3.epa.gov/ttn/chief/ap42/ch01/final/c01s04.pdf>

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20		[61]
SUBJECT Mt. Union Station (98% DRE) -- Existing Equipment Standard Operating Scenario Sources: Total Flow from Pilot Gas for the Enclosed Flare				
BASED ON SPLP Equipment Data / Specifications			DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE	8/29/2016

**Calculations:**

**PILOT GAS EMISSIONS**

1. Calculate the pilot gas flow rate in Btu/hr at 22 scf/hr.

$$ER_{bt/hr} = (FR_{scf/hr}) * (HHV_{Propane-MMBtu/scf})$$

$$= \left| \frac{22 \text{ scf}}{\text{hr}} \right| \left| \frac{2,516 \text{ Btu}}{\text{scf}} \right| = 55,352 \text{ Btu/hr estimated based on manufacturer's flow rate in scf/hr}$$

2. Calculate the SO<sub>x</sub> emission factor in pounds per standard cubic feet (lb/scf).

$$EF_{SOx(lb/scf)} = (EF_{SOx-ppmw}) / (CF_{ppm-\%}) / (CF_{\%-DecEq}) / (CF_{scf-lb\_mol}) * (MW_{propane}) * [(molar \text{ ratio of } SO_2 \text{ to S})]$$

$$= \left| \frac{30 \text{ ppmw}}{1E+04 \text{ ppmw}} \right| \left| \frac{1 \text{ \%}}{100 \text{ \%}} \right| \left| \frac{1 \text{ DecEq}}{100 \text{ \%}} \right| \left| \frac{1 \text{ lb-mol}}{379.5 \text{ scf}} \right| \left| \frac{44.10 \text{ lb}}{\text{lb-mol}} \right| \left| \frac{64.07 \text{ lb } SO_2/\text{lb-mol}}{32.07 \text{ lb-S/lb-mol}} \right|$$

$$= 6.96E-06 \text{ lb } SO_2/\text{propane scf} = 6.96E-06 \text{ lb } SO_x/\text{propane scf}$$

3. Convert emission factor from kg/MMBtu to lb/MMBtu.

Using propane CO<sub>2</sub> as an example:

$$EF_{CO2(lb/MMBtu)} = [EF_{CO2(kg/MMBtu)}] / (CF_{kg-lb})$$

$$= \left| \frac{62.87 \text{ kg}}{\text{MMBtu}} \right| \left| \frac{1 \text{ lb}}{0.4536 \text{ kg}} \right| = 138.60 \text{ lb } CO_2/\text{MMBtu}$$

EF									EF <sub>GWP</sub>		
NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> propane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O
(lb/MMBtu)				(lb/scf)	(lb/MMscf)	(lb/MMBtu)			N/A		
0.068	0.310	0.570	0	6.96E-06	1.89	138.60	0.01	0.001	1	25	298

4. Calculate the maximum hourly emission rate ER<sub>MaxShtTm\*</sub>

Using NO<sub>x</sub> as an example:

$$ER_{MaxHrlyNOx} = (EF_{NOx}) * (Flow_{Btu/hr}) / (CF_{Btu-MMBtu})$$

$$= \left| \frac{0.068 \text{ lb}}{\text{MMBtu}} \right| \left| \frac{55,352 \text{ Btu}}{\text{hr}} \right| \left| \frac{1 \text{ MMBtu}}{1E+06 \text{ Btu}} \right| = 3.76E-03 \text{ lb } NO_x/\text{hr}$$

5. Estimate the pilot gas flow rate and compared to the design value in scf/hr

$$ER_{scf/hr} = (FR_{Btu/hr}) / (HHV_{MMBtu/scf})$$

$$= \left| \frac{55,352 \text{ Btu}}{\text{hr}} \right| \left| \frac{\text{scf}}{3,244 \text{ Btu}} \right| = 17.1 \text{ pilot gas flow scf/hr}$$

The design flow rate of 22 scf/hr is greater than the estimated value. Therefore, the design flow rate of 22 scf/hr is presented in the application of Table 1-1 and used in the emission when scf is applied.

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20	[62]
SUBJECT Mt. Union Station (98% DRE) -- Existing Equipment Standard Operating Scenario Sources: Total Flow from Pilot Gas for the Enclosed Flare			
BASED ON SPLP Equipment Data / Specifications		DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE 8/29/2016

**Calculations (Continued):**

PILOT GAS EMISSIONS

6. Calculate the maximum hourly emission rate for SO<sub>x</sub> ER<sub>MaxHrlySO<sub>x</sub></sub>\*

$$ER_{MaxHrlySO_x} = (EF_{SO_x}) * (FR_{Btu/hr}) / (HHV_{propane})$$

$$= \left| \frac{6.96E-06 \text{ lb}}{\text{scf}} \right| \left| \frac{55,352 \text{ Btu}}{\text{hr}} \right| \left| \frac{\text{scf}}{2,516 \text{ Btu}} \right| = 1.53E-04 \text{ lb/hr}$$

7. Calculate the maximum hourly emission rate based on the heat rate of the pilot gas for HAPs ER<sub>MaxHrlyHAPs</sub>\*

$$ER_{MaxHrlyHAPs} = (FR_{scf/hr}) * (EF_{HAPs}) / (CF_{scf-MMscf})$$

$$= \left| \frac{22 \text{ scf}}{\text{hr}} \right| \left| \frac{1.89 \text{ lb}}{\text{MMscf}} \right| \left| \frac{1 \text{ MMscf}}{1E+06 \text{ scf}} \right| = 4.16E-05 \text{ lb HAPs /hr}$$

8. Calculate the maximum hourly emission rate for the other pollutants

Using CO as an example:

$$ER_{MaxHrlyCO} = (FR_{Btu/hr}) * (EF_{CO}) / (CF_{Btu-MMBtu})$$

$$= \left| \frac{55,352 \text{ Btu}}{\text{hr}} \right| \left| \frac{0.31 \text{ lb}}{\text{MMBtu}} \right| \left| \frac{1 \text{ MMBtu}}{1E+06 \text{ Btu}} \right| = 1.72E-02 \text{ lb CO /hr}$$

9. Calculate the maximum hourly emission rate for CO<sub>2</sub>e based on CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O emission rates.

$$ER_{MaxHrlyCO_2e} = \sum \{ [(CO_2_{lb/hr}) * (EF_{CO_2\_GWP})] + [(CH_4_{lb/hr}) * (EF_{CH_4\_GWP})] + [(N_2O_{lb/hr}) * (EF_{N_2O\_GWP})] \}$$

$$= \left\| 7.67E+00 \frac{\text{lb}}{\text{hr}} \right\| 1 \left\| + \left\| 5.54E-04 \frac{\text{lb}}{\text{hr}} \right\| 25 \left\| + \left\| 5.54E-05 \frac{\text{lb}}{\text{hr}} \right\| 298 \right\| = 7.70E+00 \text{ lb/hr}$$

Maximum Hourly Emission Rate (lb/hr)								
NO <sub>x</sub>	CO	VOC	SO <sub>x</sub>	HAPs	CO <sub>2</sub> propane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
3.76E-03	1.72E-02	3.16E-02	1.53E-04	4.16E-05	7.67E+00	5.54E-04	5.54E-05	7.70E+00

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20	[63]
SUBJECT Mt. Union Station (98% DRE) -- Existing Equipment Standard Operating Scenario Sources: Total Flow from Pilot Gas for the Enclosed Flare			
BASED ON SPLP Equipment Data / Specifications		DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE 8/29/2016

**Calculations (Continued):**

PILOT GAS EMISSIONS

10. Calculate the daily maximum emission rate  $ER_{MaxDaily}$ .

Using  $NO_x$  as an example:

$$ER_{MaxDaily} = (ER_{MaxHrlyNOx}) / (CF_{hours-day})$$

$$= \left| \frac{3.76E-03 \text{ lb}}{1 \text{ hr}} \right| \left| \frac{24 \text{ hr}}{1 \text{ day}} \right| = 9.02E-02 \text{ lb } NO_x / \text{day}$$

Maximum Daily Emission Rate (lb/day)								
$NO_x$	CO	VOC	$SO_x$	HAPs	$CO_2$ propane	$CH_4$	$N_2O$	$CO_2e$
9.02E-02	4.13E-01	7.58E-01	3.67E-03	9.98E-04	1.84E+02	1.33E-02	1.33E-03	1.85E+02

11. Calculate the annual average emission rate for  $ER_{AnnAvg}$ .

Using  $NO_x$  as an example:

$$ER_{AnnAvgNOx} = (ER_{MaxHrlyNOx}) * (CF_{hours-year}) * (OSF) / (CF_{\%DecEq}) / (CF_{lb-ton})$$

$$= \left| \frac{3.76E-03 \text{ lb}}{\text{hr}} \right| \left| \frac{8,760 \text{ hr}}{1 \text{ yr}} \right| \left| \frac{100 \%}{100 \%} \right| \left| \frac{1 \text{ DecEq}}{2,000 \text{ lb}} \right| \left| \frac{1 \text{ t}}{2,000 \text{ lb}} \right| = 1.65E-02 \text{ tpy } NO_x$$

Annual Emission Rate (tpy)								
$NO_x$	CO	VOC	$SO_x$	HAPs	$CO_2$ propane	$CH_4$	$N_2O$	$CO_2e$
1.65E-02	7.53E-02	1.38E-01	6.70E-04	1.82E-04	3.36E+01	2.43E-03	2.43E-04	3.37E+01

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20	[64]
SUBJECT Mt. Union Station (98% DRE) -- Existing Equipment Enclosed Flare Emission Calculations: Maintenance Operations Scenario Emissions Sources			
BASED ON SPLP provided equipment volume/specification for the maximum anticipated maintenance operation scenarios		DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich	DATE	5/23/2016

**Objective:** Develop example calculations for: Maximum Hourly, Maximum Daily, and Annual Average Emission Rate for the proposed Maintenance Activities.

**Inputs and Assumptions:**

- Potential stream products to the enclosed flare consistent of butane, propane, and/or ethane.
- Maintenance intermittent emission sources to the enclosed flare that were evaluated include: gas releases from filter cleaning, prover maintenance, pigging events, and miscellaneous maintenance activities.
- The number of filter changes, prover maintenances, and pigging events has been developed to include miscellaneous maintenance activities.
- Stream physical properties that result in the maximum potential emission rates have been used.
- Example calculations for total annual volumes from filter changes, prover maintenances, and pigging events are presented in a separate example calculation sheet.
- The flare's destruction and removal efficiency (DRE) for VOCs and HAPs only: 98.0 percent (%)  
The flare does not reduce/control NO<sub>x</sub>, CO, SO<sub>x</sub>, CO, CH<sub>4</sub>, N<sub>2</sub>O, or CO<sub>2</sub>e emissions, that is, pre-control emissions equal post-control emissions.
- Pilot gas is propane and is calculated in a separate workbook (Example calculations; Enclosed Flare Emission Calculations; Pilot Gas Emission Source).
- Total annual flow to flare from:

Filter (F) (FR <sub>F-scf/yr</sub> ):	53,880 standard cubic feet per year (scf/yr)	
Prover (F) (FR <sub>Prover-scf/yr</sub> ):	0 scf/yr	N/A to this station.
Pigging (F) (FR <sub>pigging-scf/yr</sub> ):	20,565 scf/yr	
<hr/>		
Total Maximum Annual Flow rate (FR <sub>MaxAnn</sub> ):	74,445 scf/yr	

Flare designed capacity (C<sub>flare</sub>): 10 MMBtu/hr

Maximum Pilot Gas Hourly Flow rate (FR<sub>MaxHrlyPilot</sub>): 55,352 British thermal units per hour (Btu/hr)

Flow rate conversions to the units below are presented in the Example Calculations for Enclosed Flare Emission Calculations: Total Maintenance.

Maintenance activity emission estimates are presented in another calculation sheet.

- Because the enclosed flare is considered to be 100% smokeless, particulate matter (PM) emissions are assumed to be negligible.
- Maximum emission stream flow rates are achieved when assuming a stream composition 100 wt% butane
- Flared Emission Factors (EFs)

NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub>		CH <sub>4</sub>	N <sub>2</sub> O
						butane	propane		
(lb/MMBtu)				(ppmw)	(lb/MMBtu)	(kg/MMBtu)			
0.068	0.310	0.570	0	30	1.89	64.77	62.87	0.003	0.0006

**NOTES FOR THIS TABLE ARE PRESENTED IN THE CONVERSION FACTORS, PHYSICAL PROPERTIES, AND ABBREVIATIONS / ACRONYMS WORKSHEET.**

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SUBJECT Mt. Union Station (98% DRE) -- Existing Equipment Enclosed Flare Emission Calculations: Maintenance Operations Scenario Emissions Sources			
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BY VJPlachy	CHECKED BY AMO'Bradovich		DATE 5/23/2016

**Inputs and Assumptions (Continued):**

12. HAPs are generated from propane burned as pilot gas and are contained in the LPG stream.

13. LPG HAP content (HAPs<sub>wt%</sub>): 0 wt%

14. Oxides of Sulfur (SO<sub>x</sub>) emissions are:

Based on the sulfur content of the stream.

Assume SO<sub>x</sub> as SO<sub>2</sub>.

Assumes that all the all fuel sulfur converts to SO<sub>2</sub>.

15. CO<sub>2</sub>e Global Warming Potential EFs (EF<sub>GWP</sub>)

CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O
1	25	298

CO<sub>2</sub>e emission estimates use the following carbon equivalence factors: 25 for CH<sub>4</sub>, and 298 for N<sub>2</sub>O from 40 CFR Part 98, Subpart A, Table A-1.

**Calculations:**

**MAINTENANCE ACTIVITIES EMISSION SOURCES**

1. Calculate the maximum hourly flow to the flare for maintenance activities (scf/hr)

$$\text{Flow}_{\text{scf/hr}} = \left[ \frac{(\text{FR}_{\text{Flare-MMBtu/hr}})}{(\text{HHV}_{\text{Propane}})} * (\text{CF}_{\text{Btu-MMBtu}}) \right] - (\text{Flow}_{\text{Std-scf/hr}})$$

$$= \left[ \frac{10 \text{ MMBtu}}{\text{hr}} \frac{\text{scf}}{2,516 \text{ Btu}} \frac{1\text{E}+06 \text{ Btu}}{1 \text{ MMBtu}} \right] - \left[ \frac{30.00 \text{ scf}}{\text{hr}} \right] = 3,945 \text{ scf/hr}$$

2. Calculate the SO<sub>x</sub> emission factor in pounds per standard cubic feet (lb/scf).

$$\text{EF}_{\text{SO}_x(\text{lb/scf})} = [(\text{mole of the gas stream})] * [(\text{concentration of sulfur in gas stream})] * [(\text{molar ratio of SO}_2 \text{ to S})]$$

$$= [(\text{lb of gas stream}) * (\text{MW gas stream})] * [(\text{concentration of sulfur in gas stream})] * [(\text{molar ratio of SO}_2 \text{ to S})]$$

$$= [(\text{volume of gas stream as butane}) * (\text{MW}_{\text{butane}})] * [(\text{concentration of sulfur ppmw}) / (\text{CF}_{\text{ppmw-wt\%}}) / (\text{CF}_{\text{wt\%-DecEq}})] * [(\text{MW SO}_2) / (\text{MW S})]$$

$$= [(\text{CF}_{\text{lb}_\text{mol-scf}}) * (\text{MW}_{\text{butane}})] * [(\text{SO}_2\text{-ppmw}) / (\text{CF}_{\text{ppmw-wt\%}}) / (\text{CF}_{\text{wt\%-DecEq}})] * [(\text{MW SO}_2) / (\text{MW S})]$$

$$= \left[ \frac{1 \text{ lb-mol}}{379.5 \text{ scf}} \frac{58.12 \text{ lb-butane}}{\text{lb-mol}} \frac{30 \text{ ppmw S}}{\text{gas stream}} \frac{1 \text{ wt\%}}{10000 \text{ ppmw}} \frac{1 \text{ DecEq}}{100 \text{ wt\%}} \frac{64.07 \text{ lb SO}_2/\text{lb-mol}}{32.07 \text{ lb-S/lb-mol}} \right]$$

$$= 9.18\text{E-}06 \text{ lb SO}_2/\text{scf of the gas stream} = 9.18\text{E-}06 \text{ lb SO}_x/\text{scf of the gas stream}$$

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20		[66]
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**Calculations:**

**MAINTENANCE ACTIVITIES EMISSION SOURCES**

3. Convert emission factor from kg/MMBtu to lb/MMBtu.

Using butane CO<sub>2</sub> as an example:

$$EF_{CO_2(lb/MMBtu)} = [EF_{CO_2(kg/MMBtu)}] / (CF_{kg-lb})$$

$$= \left| \frac{64.77 \text{ kg}}{\text{MMBtu}} \right| \left| \frac{1 \text{ lb}}{0.4536 \text{ kg}} \right| = 142.79 \text{ lb CO}_2/\text{MMBtu}$$

EF										EF <sub>GWP</sub>		
NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub>		CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O
						butane	propane					
(lb/MMBtu)				(lb/scf)	(lb/MMBtu)				N/A			
0.068	0.310	N/C	N/C	9.18E-06	TBD	142.79	138.6	0.01	0.001	1	25	298

NOTE:

Because the EF for butane CO<sub>2</sub> is greater than the EF for propane CO<sub>2</sub>, the butane CO<sub>2</sub> emission factor will be applied to estimate the maximum short term, maximum daily, and annual average emission rates.

**MAINTENANCE ACTIVITIES EMISSION SOURCES ANNUAL EMISSION ESTIMATE**

**Pre-controls**

4. Calculate the annual heat input HI<sub>Annual</sub> in MMBtu/hr

$$HI_{MMBtu/yr} = (FR_{MaxAnn}) * (HHV_{Butane}) / (CF_{Btu-MMBtu})$$

$$= \left| \frac{74,445 \text{ scf}}{\text{yr}} \right| \left| \frac{3,244 \text{ Btu}}{\text{scf}} \right| \left| \frac{1 \text{ MMBtu}}{1E+06 \text{ Btu}} \right| = 241.50 \text{ MMBtu/yr}$$

5. Calculate the VOC flow rate (FR) from the pre-control maintenance sources in lb/hr (F<sub>preVOC-lb/hr</sub>).

$$FR_{preVOC-lb/hr} = (FR_{MaxHrly-scf/hr}) * (MW_{butane}) / (CF_{scf-lb-mol}) * (WT\%VOC) / (CF\%-DecEq)$$

$$= \left| \frac{3,945 \text{ scf}}{\text{hr}} \right| \left| \frac{58.12 \text{ lb}}{\text{lb-mole}} \right| \left| \frac{1 \text{ lb-mol}}{379.5 \text{ scf}} \right| \left| \frac{100 \text{ wt\%}}{100 \%} \right| \left| \frac{1 \text{ DecEq}}{100 \%} \right|$$

$$= 604.17 \text{ lb VOC /hr}$$

6. Calculate the EF for HAPs in pounds per scf (lb/scf).

$$EF_{HAPs(lb/scf)} = (HAPs_{wt\%}) / (CF_{wt\%-DecEq}) * (MW_{butane}) / (CF_{scf-lb_mol})$$

$$= \left| \frac{0 \text{ wt\%}}{100 \text{ wt\%}} \right| \left| \frac{1 \text{ DecEq}}{100 \text{ wt\%}} \right| \left| \frac{58.12 \text{ lb}}{\text{lb-mol}} \right| \left| \frac{1 \text{ lb-mol}}{379.5 \text{ scf}} \right| = 0 \text{ lb HAPs/scf}$$

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**Calculations (Continued):**

**MAINTENANCE ACTIVITIES EMISSION SOURCES: Pre-control**

7. Calculate HAPs the pre-control flow rate (FR) from the maintenance sources in lb/hr (Fpre<sub>HAPs-lb/hr</sub>).

$$FR_{pre\text{HAPs-lb/hr}} = (FR_{MaxHrly-scf/hr}) * (EF_{HAPs-lb/scf})$$

$$= \left| \frac{3,945 \text{ scf}}{\text{hr}} \right| \left| \frac{0 \text{ lb}}{1 \text{ scf}} \right| = 0.00 \text{ lb HAPs/hr}$$

Pre-Control Maximum Hourly Emission Rate (lb/hr)									
NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
N/C	N/C	604.17	N/C	N/C	N/C	N/C	N/C	N/C	N/C

8. Calculate the VOC pre-control annual emission rate from the maintenance sources in tpy.

$$Fpre_{VOC(tpy)} = (FR_{MaxAnn}) * (MW_{butane}) / (CF_{lb\_mole-scf}) / (CF_{lb-ton})$$

$$= \left| \frac{74,445 \text{ scf}}{\text{yr}} \right| \left| \frac{58.12 \text{ lb}}{\text{lb-mole}} \right| \left| \frac{1 \text{ lb-mol}}{379.5 \text{ scf}} \right| \left| \frac{1 \text{ ton}}{2,000 \text{ lb}} \right| = 5.70 \text{ tpy VOC}$$

9. Calculate the HAP pre-control annual emission rate from the maintenance sources in tpy.

$$Fpre_{HAP(tpy)} = (Fpre_{VOC(tpy)}) * (HAPs_{wt\%}) / (CF_{\%-\text{dec.eq.}})$$

$$= \left| \frac{5.70 \text{ t}}{\text{yr}} \right| \left| \frac{0 \text{ wt\%}}{100 \text{ \%}} \right| \left| \frac{1 \text{ DecEq}}{100 \text{ \%}} \right| = 0.00E+00 \text{ tpy HAP}$$

Pre-Control Annual Average Emission Rate (tpy)									
NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
N/C	N/C	5.70	N/C	N/C	N/C	N/C	N/C	N/C	N/C

10. Calculate the maximum hourly emission rate for SO<sub>x</sub> ER<sub>MaxStTmSO<sub>x</sub></sub>.

$$ER_{MaxStTmSOx} = (FR_{MaxHrly}) * (EF_{SOx})$$

$$= \left| \frac{3,945 \text{ scf}}{\text{hr}} \right| \left| \frac{9.18E-06 \text{ lb}}{\text{scf}} \right| = 3.62E-02 \text{ lb SO}_x \text{ /hr}$$

11. Calculate the maximum hourly emission rate for NO<sub>x</sub>, CO, CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O ER<sub>MaxStTm</sub>.

Using NO<sub>x</sub> as an example:

$$ER_{MaxStTmNOx} = (FR_{MaxHrly}) * (EF_{NOx}) * (HHV_{butane}) / (CF_{Btu-MMBtu})$$

$$= \left| \frac{3,945 \text{ scf}}{\text{hr}} \right| \left| \frac{6.80E-02 \text{ lb}}{\text{MMBtu}} \right| \left| \frac{3,244 \text{ Btu}}{\text{scf}} \right| \left| \frac{1 \text{ MMBtu}}{1E+06 \text{ Btu}} \right| = 8.70E-01 \text{ lb NO}_x \text{ /hr}$$

12. Calculate the maximum hourly emission rate for CO<sub>2</sub>e based on CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O emission rates.

$$ER_{MaxHrlyCO2e} = \sum \{ [(CO_{2-lb/hr}) * (EF_{CO2-GWP})] + [(CH_{4-lb/hr}) * (EF_{CH4-GWP})] + [(N_{2O-lb/hr}) * (EF_{N2O-GWP})] \}$$

$$= \left| \frac{1.83E+03 \text{ lb}}{\text{hr}} \right| \left| 1 \right| + \left| \frac{1.30E-01 \text{ lb}}{\text{hr}} \right| \left| 25 \right| + \left| \frac{1.00E-02 \text{ lb}}{\text{hr}} \right| \left| 298 \right| =$$

$$= \left| \frac{1.83E+03 \text{ lb}}{\text{hr}} \right| + \left| \frac{3.25E+00 \text{ lb}}{\text{hr}} \right| + \left| \frac{2.98E+00 \text{ lb}}{\text{hr}} \right| = 1.84E+03 \text{ lb/hr}$$

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BASED ON SPLP provided equipment volume/specification for the maximum anticipated maintenance operation scenarios			DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE	5/23/2016

**Calculations (Continued):**

**MAINTENANCE ACTIVITIES EMISSION SOURCES: Post-control Emission Estimate (Continued)**

13. Calculate the annual average emission rate for the CO<sub>2</sub>e in tons per year (tpy).

$$ER_{MaxStTmCO_2e} = \sum \{ [(CO_{2-tpy}) * (EF_{CO_2-GWP})] + [(CH_{4-tpy}) * (EF_{CH_4-GWP})] + [(N_2O_{-tpy}) * (EF_{N_2O-GWP})] \}$$

$$= \left| \frac{1.72E+01 \text{ t}}{\text{yr}} \right| 1 + \left| \frac{1.00E-03 \text{ t}}{\text{yr}} \right| 25 + \left| \frac{1.00E-04 \text{ t}}{\text{yr}} \right| 298 = 1.73E+01 \text{ tpy}$$

14. Calculate the annual emission rate for the remaining pollutants in tons per year (tpy).  
Using NO<sub>x</sub> as an example:

$$ER_{AnnualNO_x} = (FR_{MMBtu/yr}) * (EF_{NO_x}) / (CF_{lb-tons})$$

$$= \left| \frac{241.50 \text{ MMBtu}}{\text{yr}} \right| \left| \frac{0.068 \text{ lb}}{\text{MMBtu}} \right| \left| \frac{1 \text{ t}}{2,000 \text{ lb}} \right| = 8.21E-03 \text{ tpy of NO}_x$$

15. Calculate the SO<sub>x</sub> emission rate from the maintenance sources in tpy.

$$ER_{MaxStTmSO_x} = (FR_{MaxAnn}) * (EF_{SO_x}) / (CF_{lb-ton})$$

$$= \left| \frac{74,445 \text{ scf}}{\text{yr}} \right| \left| \frac{9.18E-06 \text{ lb}}{\text{scf}} \right| \left| \frac{1 \text{ t}}{2,000 \text{ lb}} \right| = 3.42E-04 \text{ tpy SO}_x$$

16. Calculate the post-control VOC and HAPs emission in lb/hr and tpy.  
Using short term maximum VOCs as an example:

$$Flow\text{-post}_{VOC\text{-lb/hr}} = (Flow_{VOCs\text{-lb/hr}}) * [1 - (DRE / CF_{\%DecEq})]$$

$$= \left| \frac{604.17 \text{ lb}}{\text{hr}} \right| 1 - \left| \frac{98.0 \%}{100 \%} \right| \left| \frac{1 \text{ DecEq}}{100 \%} \right| = 12.08 \text{ lb VOCs/hr}$$

Post Control Maximum Hourly Emission Rate (lb/hr)									
NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
0.87	3.97	12.08	N/C	0.04	N/C	1,827	0.13	0.01	1,840

Post-Control Annual Average Emission Rate (tpy)									
NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
0.01	0.04	0.11	N/C	0.0003	N/C	17.24	0.001	0.0001	17.30

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20	[69]
SUBJECT Mt. Union Station (98% DRE) -- Existing Equipment Maintenance Operations Scenario Sources: Total Flow from Filter			
BASED ON SPLP provided equipment volume/specification for the maximum anticipated maintenance operation scenarios		DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich	DATE	5/23/2016

**Objective:** Calculate the filter volume from maintenance activities that are sent to the enclosed flare.

**Inputs and Assumptions:**

- Worst case scenario is for the station to be at a sea level elevation. 0 ft  
Pressure at atmosphere: 1.00 atm  
Source for conversion: [http://www.engineeringtoolbox.com/air-altitude-pressure-d\\_462.html](http://www.engineeringtoolbox.com/air-altitude-pressure-d_462.html)
- Pipe pressure at release point ( $P_{\text{pipe-release}}$ ) = Pressure at atmospheric = 1.00 atm
- Operating service factor (OSF), that is, percent of the year the unit is operating: 100.00 %
- Propane physical properties result in the greatest release volumes, therefore, propane will be used to calculate the gas release volumes from the equipment.
- Propane physical properties:  
Density at pipe pressure ( $\rho_{\text{pipe}}$ ): 33.74 pounds per cubic feet (lb/ft<sup>3</sup>) at 40°F and 1,480 psig  
Density at atmospheric conditions ( $\rho_{\text{released}}$ ): 0.12 pounds per standard cubic feet (lb/scf) at 60°F and 1 atm

**NOTES:**

The density of propane at atmospheric conditions taken from the National Institute of Standards and Technology website of isothermal properties for propane.

<http://webbook.nist.gov/cgi/fluid.cgi?ID=C74986&TUnit=F&PUnit=atm&DUnit=lbm%2Fft3&HUnit=Btu%2Flbm&WUnit=ft%2Fs&VisUnit=cP&STUnit=lb%2Fft&Type=IsoTherm&RefState=DEF&Action=Page>

- Filter:  
Filters ( $N_{\text{Filters}}$ ): 1  
Max annual filter changing events ( $E_{\text{Filter}}$ ): 6 event-filter/yr  
Filter ( $V_{\text{Filters}}$ ): 31.94 cubic feet (ft<sup>3</sup>)

7. The ideal gas law applies:

$$PV = nR_{\text{specific}}T, \text{ where } n \text{ is equivalent the number of moles multiplied by the molecular weight (MW) and divided by density } (\rho).$$

**Calculations:**

- Calculate the volume of gas released ( $V_{\text{Filter}}$ ) in standard cubic feet (scf) at release temperature and pressure.

$$PV = nR_{\text{specific}}T$$

$$\frac{P_1 V_1}{P_2 V_2} = \frac{[n]RT_1}{[n]RT_2} = \frac{[(MW_{\text{lb/lb-mole}}) / \rho_1] * (R_{\text{specific}} T_1)}{[(MW_{\text{lb/lb-mole}}) / \rho_2] * (R_{\text{specific}} T_2)} = \frac{(\rho_2)}{(\rho_1)}$$

Solving for the release volume:

$$V_2 = \left| \frac{\rho_1}{\rho_2} \right| \left| \frac{P_1}{P_2} \right| V_1$$

$$= \left| \frac{33.74 \text{ lb}}{\text{ft}^3} \right| \left| \frac{1 \text{ atm}}{1 \text{ atm}} \right| \left| \frac{31.94 \text{ ft}^3}{\text{filter-event}} \right| = 8,980 \text{ scf/filter-event}$$

- Calculate the total annual volume released to the flare from filters cleanings in scf/yr ( $V_{\text{Filter-scf/yr}}$ ).

$$V_{\text{Filter-scf/yr}} = (V_{\text{Filter}}) * (N_{\text{Filter}}) * (E_{\text{Filter}}) * (OSF) / (CF_{\text{-DecEq}})$$

$$= \left| \frac{8,980 \text{ scf}}{\text{event-filter}} \right| \left| \frac{1 \text{ filter}}{\text{yr}} \right| \left| \frac{6 \text{ events}}{\text{yr}} \right| \left| \frac{100.00 \%}{100 \%} \right| \left| \frac{1 \text{ DecEq}}{100 \%} \right| = 53,880 \text{ scf/yr}$$

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20	[70]
SUBJECT Mt. Union Station (98% DRE) -- Existing Equipment Maintenance Operations Scenario Sources: Total Flow from Pigging			
BASED ON SPLP provided equipment volume/specification for the maximum anticipated maintenance operation scenarios		DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE 5/23/2016

**Objective:** Calculate the pigging volume from maintenance activities that are sent to the enclosed flare.

**Inputs and Assumptions:**

- Worst case scenario is for the station to be at a sea level elevation. 0 ft  
 Pressure at atmosphere: 1.00 atm  
 Source for conversion: [http://www.engineeringtoolbox.com/air-altitude-pressure-d\\_462.html](http://www.engineeringtoolbox.com/air-altitude-pressure-d_462.html)
- Pipe pressure at release point ( $P_{act-pipe-atm}$ ) = Pressure at atmospheric = 1.00 atm  
 Density at pipe pressure ( $\rho_{pipe}$ ): 33.74 pounds per cubic feet (lb/ft<sup>3</sup>) at 40°F and 1,480 psig  
 Density at atmospheric conditions ( $\rho_{released}$ ): 0.12 pounds per standard cubic feet (lb/scf) at 60°F and 1 atm
- Site maintenance will include evacuation of the pig launchers and receivers.
- Equipment Quantities:
  - 20" Pig Launchers ( $N_{20Launchers}$ ): 0
  - 20" Pig Receivers ( $N_{20Receivers}$ ): 0
  - 12" Pig Launchers ( $N_{12Launchers}$ ): 0
  - 12" Pig Receivers ( $N_{12Receivers}$ ): 0
  - 10" Pig Receivers ( $N_{10Receivers}$ ): 0
  - 8" Pig Launchers ( $N_{8Launcher}$ ): 1
  - 8" Pig Receivers ( $N_{8Receiver}$ ): 1
- Equipment Volume:
  - Pig Launcher ( $V_{20pig-Launcher}$ ): 65.70 cubic feet (ft<sup>3</sup>)
  - Pig Receiver ( $V_{20pig-Receiver}$ ): 61.51 ft<sup>3</sup>
  - Pig Launcher ( $V_{12pig-Launcher}$ ): 24.17 ft<sup>3</sup>
  - Pig Receiver ( $V_{12pig-Receiver}$ ): 22.56 ft<sup>3</sup>
  - Pig Receiver ( $V_{10pig-Receiver}$ ): 17.18 ft<sup>3</sup>
  - Pig Launcher ( $V_{8pig-Launcher}$ ): 13.11 ft<sup>3</sup>
  - Pig Receiver ( $V_{8pig-Receiver}$ ): 11.27 ft<sup>3</sup>
 Source: Equipment volume provided by the Rooney Engineering (REI):
- Pigging events:
  - Max ann smart pigging events ( $E_{SmartPigging}$ ): 1 event/yr
  - Max ann clean pigging events ( $E_{CleanPigging}$ ): 2 event/yr
- The ideal gas law applies:
 
$$PV = nR_{specific}T$$
 where n is equivalent the number of moles multiplied by the molecular weight (MW) and divided by density ( $\rho$ ).

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20	[71]
SUBJECT Mt. Union Station (98% DRE) -- Existing Equipment Maintenance Operations Scenario Sources: Total Flow from Pigging			
BASED ON SPLP provided equipment volume/specification for the maximum anticipated maintenance operation scenarios		DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich	DATE	5/23/2016

**Calculations:**

1. Calculate the volume of gas released (V<sub>2</sub>) in standard cubic feet (scf) at release temperature and pressure.

Using 20" pig launcher as an example:

$$PV = nR_{\text{specific}}T$$

$$\frac{P_1V_1}{P_2V_2} = \frac{[n]RT_1}{[n]RT_2} = \frac{[(MW_{\text{lb/lb-mole}}) / \rho_1] * (R_{\text{specific}} T_1)}{[(MW_{\text{lb/lb-mole}}) / \rho_2] * (R_{\text{specific}} T_2)} = \frac{(\rho_2)}{(\rho_1)}$$

Solving for the release volume:

$$V_2 = \left| \frac{\rho_1}{\rho_2} \right| \left| \frac{P_1}{P_2} \right| V_1$$

$$= \left| \frac{33.74 \text{ lb}}{\text{ft}^3} \right| \left| \frac{1.00 \text{ atm}}{1 \text{ atm}} \right| \left| \frac{65.70 \text{ ft}^3}{0.12 \text{ lb}} \right| = 18,473 \text{ scf/pig launcher-event}$$

Equipment	Pig Volume (acf)	Volume at Atmosphere (scf)
20" Pig Launcher	65.70	18,473
20" Pig Receiver	61.51	17,295
12" Pig Launcher	24.17	6,796
12" Pig Receiver	22.56	6,343
10" Pig Receiver	17.18	4,830
8" Pig Launcher	13.11	3,686
8" Pig Receiver	11.27	3,169

2. Calculate the total annual volume from the launching events (V<sub>PigLaunchers-scf/yr</sub>).

$$V_{\text{PigLauncher-scf/yr}} = [(V_{\text{PigLauncher}}) * (N_{\text{PigLaunchers}})] * [(\sum \text{Pigging Events})]$$

Using the 8" pig launchers as an example:

$$= \left| \frac{3,686 \text{ scf}}{\text{pig launcher-event}} \right| \left| \frac{1 \text{ pig launcher}}{1 \text{ yr}} \right| \left| \frac{1 \text{ events}_{\text{smart pigging}}}{\text{yr}} \right| + \left| \frac{2 \text{ events}_{\text{clean pigging}}}{\text{yr}} \right|$$

$$= 11,058 \text{ scf/yr}$$

Equipment	Volume (scf)	Number	Volume (scf/yr)
20" Pig Launcher	18,473	0	0
20" Pig Receiver	17,295	0	0
12" Pig Launcher	6,796	0	0
12" Pig Receiver	6,343	0	0
10" Pig Receiver	4,830	0	0
8" Pig Launcher	3,686	1	11,058
8" Pig Receiver	3,169	1	9,507
Total Annual Pigging Event Volume			20,565

CLIENT Sunoco Pipeline, L.P. (SPLP)	JOB NUMBER 112IC05958.20 [72]
SUBJECT Mt. Union Station (98% DRE) -- Existing Equipment Fugitive Emission Estimate	
BASED ON SPLP Process and Instrumentation Drawings (P&IDs)	DRAWING NUMBER E_MTUN_P030000 Sheets 1 through 5
BY VJPlachy	CHECKED BY AMO'Bradovich
DATE 8/11/2016	

**Objective:** Calculation the Maximum Hourly and Annual Average Emissions associated with fugitive components for the proposed fittings, valves, relief valves, and other miscellaneous component types.

**Inputs and Assumptions:**

1. Component counts

**Equipment Counts:**

Fittings:	261
Valves:	160
Relief Valves:	1
Pump Seals:	1

**Other Components:**

Coriolis Meter	0
Prover	0
Composite Sampler	0
Instruments	21
Static Mixer	0
Check Valves	2

**TOTAL Other Components 23**

2. The leak emission factors are taken from the USEPA Protocol for Equipment Leak Emission Estimates, EPA-453/R-95-017, November, 1995, Table 2-3 for light liquid service.

3. Emission Leak Factors:

Fittings:	8.00E-06	kilogram per hour per component (kg/hr-component)
Valves:	4.30E-05	kg/hr-component
Relief Valves:	1.30E-04	kg/hr-component
Pump Seals:	5.40E-04	kg/hr-component
Other Components:	1.30E-04	kg/hr-component

4. Assume the total organic compound emissions are equivalent to total VOCs.

5. The HAP content as a result of the LPG (WT%<sub>HAP</sub>): 0 wt %

6. The relief valves on any butane, propane, and ethane spheres/tanks that release to the atmosphere are fugitive emitters.

7. Butane, propane, and ethane do not contain any HAPs.

8. Number of atmospheric relief valves on non-HAP spheres/tanks (N<sub>RVBPS</sub>): 1 Relief Valves

9. The contingency (Cont) for as-built modifications during the construction phase is: 20 %

10. Operating service factor (OSF): 100 %

**Calculations:**

1. Convert the component leak EFs from kg/hr-component to lb/hr-component (EF<sub>lb/hr-component</sub>).

Using fittings as an example:

$$EF_{\text{Fittings\_lb/hr-component}} = (EF_{\text{kg/hr-component}}) * (CF_{\text{kg-g}}) / (CF_{\text{g-lb}})$$

$$= \frac{8.00E-06 \text{ kg}}{\text{hr-component}} \times \frac{1,000 \text{ g}}{1 \text{ kg}} \times \frac{1 \text{ lb}}{453.6 \text{ g}} = 1.76E-05 \text{ lb/hr-component}$$

Equipment Type	Leak EF (lb/hr-component)
Fittings	1.76E-05
Valves	9.48E-05
Relief Valves to atm	2.87E-04
Pump Seals	1.19E-03
Other Components	2.87E-04

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20	[73]
SUBJECT Mt. Union Station (98% DRE) -- Existing Equipment Fugitive Emission Estimate			
BASED ON SPLP Process and Instrumentation Drawings (P&IDs)		DRAWING NUMBER E_MTUN_P030000 Sheets 1 through 5	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE 8/11/2016

**Calculations (Continued):**

2. Calculate the VOC Max Hourly ER in lb/hr (ER<sub>VOC lb/hr</sub>).

Using fittings as an example:

$$ER_{\text{Fittings-VOC lb/hr}} = (EF_{\text{lb/hr-component}}) * (EC_{\text{Fittings}})$$

$$= \left| \frac{1.76\text{E-}05 \text{ lb}}{\text{hr-component}} \right| 261 \text{ components} = 4.59\text{E-}03 \text{ lb VOCs/hr}$$

Equipment Type	Leak EF (lb/hr-component)	Equipment Count	VOC Max Hourly (lb/hr)
Fittings	1.76E-05	261	4.59E-03
Valves	9.48E-05	160	1.52E-02
Relief Valves to atm	2.87E-04	1	2.87E-04
Pump Seals	1.19E-03	1	1.19E-03
Other Components	2.87E-04	23	6.60E-03
<b>TOTAL:</b>			<b>2.79E-02</b>

3. Calculate the ER for HAPs in lb/hr (ER<sub>RV-HAP lb/hr</sub>) for the relief valves to atmosphere (not butane or propane sphere relief valves).

$$ER_{\text{RV-HAP lb/hr}} = \{ (EF_{\text{RV-lb/hr-component}}) * [(EC_{\text{RV}}) - (N_{\text{RVBPS}})] \} * [(WT\%_{\text{HAP}}) / (CF\%_{\text{-DecEq}})]$$

$$= \left| \frac{2.87\text{E-}04 \text{ lb}}{\text{hr-component}} \right| 1 - 1 \left| \text{comp} \right] * \left[ \frac{0 \text{ wt\%}}{100 \text{ wt\%}} \right] \left| \frac{1 \text{ DecEq}}{100 \text{ DecEq}} \right] = 0.00\text{E+}00 \text{ lb HAPs/hr}$$

4. Calculate the ER for HAPs in lb/hr (ER<sub>HAP lb/hr</sub>) for the fittings, valves, and other components.

Using fittings as an example:

$$ER_{\text{Fittings-HAP lb/hr}} = (ER_{\text{Fittings-VOC lb/hr}}) * (WT\%_{\text{HAP}}) / (CF\%_{\text{-DecEq}})$$

$$= \left| \frac{4.59\text{E-}03 \text{ lb}}{\text{hr}} \right| 0 \% \left| \frac{1 \text{ DecEq}}{100 \text{ DecEq}} \right] = 0.00\text{E+}00 \text{ lb HAPs/hr}$$

Equipment Type	HAP Max Hourly (lb/hr)	
Fittings	N/C	
Valves	N/C	
Relief Valves to atm	N/C	
Pump Seals	N/C	
Other Components	N/C	
<b>TOTAL:</b>		<b>N/C</b>

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20		[74]
SUBJECT Mt. Union Station (98% DRE) -- Existing Equipment Fugitive Emission Estimate				
BASED ON SPLP Process and Instrumentation Drawings (P&IDs)		DRAWING NUMBER E_MTUN_P030000 Sheets 1 through 5		
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE 8/11/2016	

**Calculations (Continued):**

5. Calculate the Annual ER for VOCs in tpy ( $ER_{VOC-tpy}$ ).

Using fittings as an example:

$$ER_{FittingsVOC-tpy} = (ER_{FittingsVOC-lb/hr}) * (CF_{hr-yr}) * (OSF) / (CF_{\%DecEq}) / (CF_{lb-tons})$$

$$= \frac{4.59E-03 \frac{lb}{hr} * 8,760 \frac{hr}{yr} * 100 \%}{100 \%} \frac{1 DecEq}{2,000 \frac{t}{lb}} = 2.01E-02 \text{ tpy VOCs}$$

Equipment Type	VOC Max Hourly (lb/hr)	VOC Annual Average
Fittings	4.59E-03	2.01E-02
Valves	1.52E-02	6.66E-02
Relief Valves to atm	2.87E-04	1.26E-03
Pump Seals	1.19E-03	5.21E-03
Other Components	6.60E-03	2.89E-02
<b>TOTAL</b>		<b>1.22E-01</b>

6. Calculate the ER for HAPs in tpy ( $ER_{RV-HAPtpy}$ ) for the relief valve to atmosphere (this is in addition to the butane or propane sphere relief valves).

$$ER_{RV-HAPtpy} = (ER_{RV-HAPlb/hr}) * (CF_{hr-yr}) * (OSF) / (CF_{\%DecEq}) / (CF_{lb-ton})$$

$$= \frac{0.00E+00 \frac{lb}{hr} * 8,760 \frac{hr}{yr} * 100 \%}{100 \%} \frac{1 DecEq}{2,000 \frac{t}{lb}} = 0.00E+00 \text{ tpy HAPs}$$

7. Calculate the ER for HAPs in tpy ( $ER_{HAPtpy}$ ) for fittings, valves, and other components.

Using fittings as an example:

$$ER_{Fittings-HAPtpy} = (ER_{Fittings-VOCtpy}) * (WT\%_{HAP}) / (CF_{\%DecEq})$$

$$= \frac{2.01E-02 \text{ ton}}{\text{year}} \frac{0 \text{ wt\%}}{100 \%} \frac{1 DecEq}{100 \%} = 0.00E+00 \text{ tpy HAPs}$$

Equipment Type	HAP Annual (tpy)
Fittings	N/C
Valves	N/C
Relief Valves to atm	N/C
Pump Seals	N/C
Other Components	N/C
<b>TOTAL:</b>	<b>N/C</b>

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20	[75]
SUBJECT Mt. Union Station (98% DRE) -- Existing Equipment Fugitive Emission Estimate			
BASED ON SPLP Process and Instrumentation Drawings (P&IDs)		DRAWING NUMBER E_MTUN_P030000 Sheets 1 through 5	
BY VJPlachy	CHECKED BY AMO'Bradovich	DATE	8/11/2016

**Calculations (Continued):**

8. Incorporate the contingency into Maximum Hourly and Annual Average VOC fugitives (TF<sub>VOCMax-Ann</sub>).

Using Maximum Hourly as an example:

$$TF_{VOCMaxHrly-lb/hr} = (ER_{TOTAL-VOC-lb/hr}) * [(1) + (Cont\%) / (CF_{\%-Dec Eq})]$$

$$= \left| \frac{2.79E-02 \text{ lb}}{\text{hr}} \right| 1 + \left| \frac{20 \%}{100 \%} \right| \frac{1 \text{ DecEq}}{100 \%} = 3.35E-02 \text{ lb VOCs/hr}$$

VOC Fugitive Emission Rate		
Type	ER	TF <sub>voc</sub>
Max Hourly (lb/hr)	0.03	0.03
Annual Average (tpy)	0.12	0.15

9. Incorporate the contingency into Maximum Hourly and Annual Average total HAP fugitives (TF<sub>HAPMaxHrly</sub>).

Using Maximum Hourly as an example:

$$TF_{HAPMaxHrly-lb/hr} = (ER_{TOTAL-HAP-lb/hr}) * [(1) + (Cont\%) / (CF_{\%-Dec Eq})]$$

$$= \left| \frac{0.00E+00 \text{ lb}}{\text{hr}} \right| 1 + \left| \frac{20 \%}{100 \%} \right| \frac{1 \text{ DecEq}}{100 \%} = 0.00E+00 \text{ lb HAPs/hr}$$

HAP Fugitive Emission Rate		
Type	ER	TF <sub>HAP</sub>
Max Hourly (lb/hr)	N/C	N/C
Annual Average (tpy)	N/C	N/C

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20	[76]
SUBJECT: Mt. Union Station (98% DRE) -- Existing Equipment Product Analysis Specification			
BASED ON SPLP Product Analyses		DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE 4/19/2016

Objective: Calculate Product Specifications for Butane, Propane, and Liquid Petroleum Gas (LPG) volatile organic compounds (VOCs) and hazardous air pollutants (HAPs).

**Inputs and Assumptions:**

1. Composition of the Butane and Propane stream analyses are as provided by SPLP.
2. Only the LPG stream will contain hazardous air pollutants (HAPs).
3. VOCs for Butane and Propane Streams are hydrocarbon constituents that contain three or more carbon atoms in their molecular formula, that is, ethane is a not a regulated VOC.
4. Composition of the Butane Stream:
  - propane: 2 mole percent (mol%)
  - i-butane: 44 mol%
  - n-butane: 54 mol%
  - i-pentane: 1 mol%
5. Composition of the Propane Stream:
  - ethane: 2 mol%
  - propane: 95 mol%
  - i-butane: 3.5 mol%
6. Composition of the LPG Stream: LPG is not present at this station.
  - ethane: 0 mol%
  - propane: 0 mol%
  - i-butane: 0 mol%
  - n-butane: 0 mol%
  - i-pentane: 0 mol%
  - n-pentane: 0 mol%
  - n-hexane: 0 mol%
7. Molecular Formula (MF) and Molecular Weight (MW)
 

Constituent	MF	MW	
ethane:	C <sub>2</sub> H <sub>6</sub>	30.07	lb per lb-mole (lb/lb mol)
propane:	C <sub>3</sub> H <sub>8</sub>	44.10	lb/lb mol
i-butane:	iC <sub>4</sub> H <sub>10</sub>	58.12	lb/lb mol
n-butane:	nC <sub>4</sub> H <sub>10</sub>	58.12	lb/lb mol
i-pentane:	iC <sub>5</sub> H <sub>12</sub>	72.15	lb/lb mol
n-pentane:	nC <sub>5</sub> H <sub>12</sub>	72.15	lb/lb mol
n-hexane:	nC <sub>6</sub> H <sub>14</sub>	86.17	lb/lb mol

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20		[77]
SUBJECT: Mt. Union Station (98% DRE) -- Existing Equipment Product Analysis Specification				
BASED ON SPLP Product Analyses			DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE 4/19/2016	

**Calculations:**

1. Determine the molar mass (MM) of each constituent in butane and propane stream.  
Using the propane in Butane Stream as an example:

$$MM_{\text{propane/Butane}} = \left[ \frac{\text{Mol\%}_{\text{propane/Butane}}}{\text{CF\%}_{\text{DecEq}}} \right] * (MW_{\text{propane}})$$

$$= \left[ \frac{2\%}{100\%} \right] \left[ \frac{44.10 \text{ lb}}{\text{lb-mol}} \right] = 0.88 \text{ lb/lb-mol}$$

Butane Stream			
Component	Mol%	MW (lb/lb-mol)	MM (lb/lb-mol)
propane	2	44.10	0.88
i-butane	44	58.12	25.57
n-butane	54	58.12	31.38
i-pentane	1	72.15	0.72
<b>TOTAL:</b>			<b>58.55</b>

Propane Stream			
Component	Mol%	MW (lb/lb-mol)	MM (lb/lb-mol)
ethane	2	30.07	0.60
propane	95	44.10	41.90
i-butane	3.5	58.12	2.03
<b>TOTAL:</b>			<b>44.53</b>

LPG Stream			
Component	Mol%	MW (lb/lb-mol)	MM (lb/lb-mol)
ethane	0.00	30.07	0.00
propane	0.00	44.1	0.00
i-butane	0.00	58.1	0.00
n-butane	0.00	58.1	0.00
i-pentane	0.00	72.2	0.00
n-pentane	0.00	72.2	0.00
n-hexane	0.00	86.1	0.00
<b>TOTAL:</b>			<b>0.00</b>

2. Calculate the weight percent (Wt%) of each component in butane and propane streams.  
Using the propane in Butane Stream as an example:

$$Wt\%_{\text{propane/Butane}} = \left( \frac{MM_{\text{propane/Butane}}}{MM_{\text{total}}} \right) * (CF_{\text{DecEq}\%})$$

$$= \left[ \frac{0.88 \text{ lb}}{\text{lb-mol}} \right] \left[ \frac{100 \text{ wt\%}}{58.55 \text{ lb}} \right] = 1.50 \text{ wt\%}$$

Butane Stream		
Component	MM (lb/lb-mol)	Wt%
propane	0.88	1.50
i-butane	25.57	43.67
n-butane	31.38	53.60
i-pentane	0.72	1.23
<b>TOTAL:</b>		<b>100.00</b>

Propane Stream		
Component	MM (lb/lb-mol)	Wt%
ethane	0.60	1.35
propane	41.90	94.09
i-butane	2.03	4.56
<b>TOTAL:</b>		<b>100.00</b>

LPG Stream		
Component	MM (lb/lb-mol)	Wt%
ethane	0.00	0
propane	0.00	0
i-butane	0.00	0
n-butane	0.00	0
i-pentane	0.00	0
n-pentane	0.00	0
n-hexane	0.00	0
<b>TOTAL:</b>		<b>0.00</b>

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20	[78]
SUBJECT: Mt. Union Station (98% DRE) -- Existing Equipment Product Analysis Specification			
BASED ON SPLP Product Analyses		DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE 4/19/2016

**Calculations (continued):**

3. Calculate the VOC Wt% of in Butane and Propane Streams.

a. Butane Stream

$$\begin{aligned} \text{Wt\%}_{\text{ButaneVOC}} &= \sum \text{Wt\% for components with carbon atoms of C}_3 \text{ or higher} \\ &= (\text{Wt\%}_{\text{propane}}) + (\text{Wt\%}_{\text{i-butane}}) + (\text{Wt\%}_{\text{n-butane}}) + (\text{Wt\%}_{\text{i-pentane}}) \\ &= 1.50 + 43.67 + 53.60 + 1.23 \text{ || wt\%} = 100.00 \text{ wt\% VOC} \end{aligned}$$

b. Propane Stream

$$\begin{aligned} \text{Wt\%}_{\text{PropaneVOC}} &= \sum \text{Wt\% for components with carbon atoms of C}_3 \text{ or higher} \\ &= (\text{Wt\%}_{\text{propane}}) + (\text{Wt\%}_{\text{i-butane}}) \\ &= 94.09 + 4.56 \text{ || wt\%} = 98.65 \text{ wt\% VOC} \end{aligned}$$

c. LPG Stream

$$\begin{aligned} \text{Wt\%}_{\text{LPGVOC}} &= \sum \text{Wt\% for components with carbon atoms of C}_3 \text{ or higher} \\ &= (\text{Wt\%}_{\text{propane}}) + (\text{Wt\%}_{\text{i-butane}}) + (\text{Wt\%}_{\text{n-butane}}) + (\text{Wt\%}_{\text{i-pentane}}) + (\text{Wt\%}_{\text{n-pentane}}) + (\text{Wt\%}_{\text{n-hexane}}) \\ &= 0 + 0 + 0 + 0 + 0 + 0 \text{ || wt\%} = 0.00 \text{ wt\% VOC} \\ \text{Wt\%}_{\text{LPGHAP}} &= \text{Wt\% of Hexane} \\ &= 0 \text{ wt\% HAP} \end{aligned}$$

Butane Stream		
Component	MM (lb/lb-mol)	Wt%
propane	0.88	1.50
i-butane	25.57	43.67
n-butane	31.38	53.60
i-pentane	0.72	1.23
<b>TOTAL VOCs:</b>		<b>100.00</b>

Propane Stream		
Component	MM (lb/lb-mol)	Wt%
ethane	0.60	N/A
propane	41.90	94.09
i-butane	2.03	4.56
<b>TOTAL VOCs:</b>		<b>98.65</b>

LPG Stream		
Component	MM (lb/lb-mol)	Wt%
ethane	0.00	0
propane	0.00	0
i-butane	0.00	0
n-butane	0.00	0
i-pentane	0.00	0
n-pentane	0.00	0
n-hexane	0.00	0
<b>TOTAL VOCs:</b>		<b>0.00</b>
<b>TOTAL HAPs:</b>		<b>0</b>

CLIENT: Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER: 112IC05958.20	[79]
SUBJECT: Mt. Union Station (98% DRE) -- Existing Equipment Combustion Source's Hazardous Air Pollutant (HAP) Emission Factor Estimate			
BASED ON: Emission Calculation Workbooks		DRAWING NUMBER: Not Applicable	
BY: VJPlachy	CHECKED BY: AMO'Bradovich	DATE:	4/19/2016

**Objective:** Develop emission factors for Hazardous Air Pollutants (HAPs) based on AP-42 Section 1.4, Tables 1.4-3 and 1.4-4, and Section 3.3 Table 3.3-2.

**Inputs and Assumptions:** AP-42; Section 1.4; Tables 1.4-3 and 1.4-4  
Source: <http://www3.epa.gov/ttn/chief/ap42/ch01/final/c01s04.pdf>

AP-42, Section 1.4, Tables 1.4-3 and 1.4-4 Emission Factors for Speciated Organic Compounds from Natural Gas Combustion	
Individual HAP	Emission Factor (EF) (lb/MMscf)
2-Methylnaphthalene	2.40E-05
3-Methylchloranthrene	1.80E-06
7,12-Dimethylbenz(a)anthracene	1.60E-05
Acenaphthene	1.80E-06
Acenaphthylene	1.80E-06
Anthracene	2.40E-06
Benz(a)anthracene	1.80E-06
Benzene	2.10E-03
Benzo(a)pyrene	1.20E-06
Benzo(b)fluoranthene	1.80E-06
Benzo(g,h,i)perylene	1.20E-06
Benzo(k)fluoranthene	1.80E-06
Chrysene	1.80E-06
Dibenzo(a,h)anthracene	1.20E-06
Dichlorobenzene	1.20E-03
Fluoranthene	3.00E-06
Fluorene	2.80E-06
Formaldehyde	7.50E-02
Hexane	1.80E+00
Indeno(1,2,3-cd)pyrene	1.80E-06
Naphthalene	6.10E-04
Phenanathrene	1.70E-05
Pyrene	5.00E-06
Toluene	3.40E-03
Arsenic	2.00E-04
Beryllium	1.20E-05
Cadmium	1.10E-03
Chromium	1.40E-03
Cobalt	8.40E-05
Manganese	3.80E-04
Mercury	2.60E-04
Nickel	2.10E-03
Selenium	2.40E-05
TOTAL (HAP <sub>individual-total</sub> ):	<b>1.89E+00</b>

**Calculations:** Total (HAP<sub>individual-total</sub>) = Sum of the individual HAP constituents

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20	[80]
SUBJECT Mt. Union Station (98% DRE) -- Existing Equipment Conversion Factors, Physical Properties, and Abbreviations / Acronyms used in the emission estimate calculation workbooks.			
BASED ON SPLP Equipment Data / Specifications / Reference Material		DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE 5/23/2016

**Objective:** Consolidate the inputs of conversion factors, emission factors, acronyms, and abbreviations that are used throughout the emission estimations associated with potential emission sources for midstream operations.

**Inputs and Assumptions:**

1. Miscellaneous Conversion Factors (CF):

1 lb-mol = 379.5 scf

Basis: Ideal gas law conversion factor (CF<sub>ideal</sub>):

1 mole of any ideal gas at standard conditions occupies a volume of 379.5 cubic feet (cf).

10,000 = ppm H<sub>2</sub>S = 1 mole % H<sub>2</sub>S = 627 grains H<sub>2</sub>S per 100 scf

Source: AP-42 Chapter 5.3 Table 5.3.1; footnote d.

<https://www3.epa.gov/ttn/chief/ap42/ch05/final/c05s03.pdf>

2. CO<sub>2</sub>e Global Warming Potential EFs (EF<sub>GWP</sub>)

CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O
1	25	298

CO<sub>2</sub>e emission rates use the following carbon equivalence factors: 25 for CH<sub>4</sub> and 298 for N<sub>2</sub>O from 40 CFR Part 98, Subpart A, Table A-1.

<http://www.ecfr.gov/cgi-bin/text-idx?SID=7cd55ec5ecd5f06bf94c50d3452a94c3&mc=true&node=pt40.21.98&rqn=div5%20-%20ap40.21.98.19.1#ap40.21.98.19.1>

3. Flare Emission Factors (EFs)

NO <sub>x</sub> <sup>a</sup>	CO <sup>a</sup>	VOC <sup>a</sup>	PM/PM <sub>10</sub> /PM <sub>2.5</sub> <sup>a</sup>	SO <sub>x</sub> <sup>b</sup>	HAPs	CO <sub>2</sub>		CH <sub>4</sub> <sup>d</sup>	N <sub>2</sub> O <sup>d</sup>
						butane <sup>c</sup>	propane <sup>c</sup>		
(lb/MMBtu)				(ppmw)		(kg/MMBtu)			
0.068	0.31	0.57	0	30	TBD	64.77	62.87	0.003	0.0006

Footnotes:

a. NO<sub>x</sub>, CO, PM, and VOC emission factor (EF) source is AP-42; Chapter 13.5 for Industrial Flares, Table 13.5-1 and 13.5-2, dated: April 2015.

PM emissions are assumed to be negligible because the enclosed flare is considered to be 100% smokeless.

[https://www3.epa.gov/ttn/chief/ap42/ch13/final/C13S05\\_4-20-15.pdf](https://www3.epa.gov/ttn/chief/ap42/ch13/final/C13S05_4-20-15.pdf)

b. Provided by SPLP

c. Gas heat content (Btu/scf) for butane and propane (kg/MMBtu) is based on the higher heating values (HHV) presented in 40 CFR Part 98 Subpart C, Table C-1.

d. CH<sub>4</sub> and N<sub>2</sub>O emission factors (kg/MMBtu) are based on the default emission factors presented in 40 CFR Part 98 Subpart C, Table C-2 for "Petroleum (All fuel types in Table C-1)."

<http://www.ecfr.gov/cgi-bin/text-idx?SID=7cd55ec5ecd5f06bf94c50d3452a94c3&mc=true&node=pt40.21.98&rqn=div5%20-%20ap40.21.98.19.1%20-%20ap40.21.98.138.1%20-%20ap40.21.98.138.1>

NOTES:

AP-42 VOC EF is only applicable to emission estimates for VOCs from the pilot gas, that is, VOC emissions from the captured gas that are sent to the flare from GC, Pumps, and RV emissions are based on the flare's DRE.

4. Sources of standard operating scenario emission to the flare can include: GC(s), Pump Seal(s), and/or Relief Valves that are connected to the flare header.

5. Sources of maintenances emission to the flare can include evaluation of the following equipment: filter(s), pig launcher(s), pig receiver(s), and/or prover(s).

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20	[81]
SUBJECT Mt. Union Station (98% DRE) -- Existing Equipment Conversion Factors, Physical Properties, and Abbreviations / Acronyms used in the emission estimate calculation workbooks.			
BASED ON SPLP Equipment Data / Specifications / Reference Material		DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE 5/23/2016

**Inputs and Assumptions (Continued):**

6. Physical Properties:

Source: <http://www.lenntech.com/calculators/molecular/molecular-weight-calculator.htm>

i-butane = n-C <sub>4</sub> H <sub>10</sub>	= 58.12 lb/lb mol (g/g mol)	
n-butane = i-C <sub>4</sub> H <sub>10</sub>	= 58.12 lb/lb mol (g/g mol)	
carbon = C	= 12.01 lb/lb mol (g/g mol)	
carbon monoxide = CO	= 28.01 lb/lb mol (g/g mol)	Calculated
ethane = C <sub>2</sub> H <sub>6</sub>	= 30.07 lb/lb mol (g/g mol)	
methane = CH <sub>4</sub>	= 16.04 lb/lb mol (g/g mol)	
n-hexane = C <sub>6</sub> H <sub>14</sub>	= 86.17 lb/lb mol (g/g mol)	
hydrogen = H	= 1.01 lb/lb mol (g/g mol)	
nitrogen = N	= 14.01 lb/lb mol (g/g mol)	
nitrogen dioxide = N <sub>2</sub> O	= 44.02 lb/lb mol (g/g mol)	Calculated
oxygen = O	= 16.00 lb/lb mol (g/g mol)	
i-pentane = i-C <sub>5</sub> H <sub>12</sub>	= 72.15 lb/lb mol (g/g mol)	
n-pentane = n-C <sub>5</sub> H <sub>12</sub>	= 72.15 lb/lb mol (g/g mol)	
propane = C <sub>3</sub> H <sub>8</sub>	= 44.10 lb/lb mol (g/g mol)	
sulfur = S	= 32.07 lb/lb mol (g/g mol)	
sulfur dioxide = SO <sub>2</sub>	= 64.07 lb/lb mol (g/g mol)	Calculated

7. Higher heating value (HHV):

a. butane

HHV<sub>propane</sub> = 2,516 Btu/scf

Source: [http://www.altenergy.com/downloads/pdf\\_public/propdatapdf.pdf](http://www.altenergy.com/downloads/pdf_public/propdatapdf.pdf)

b. butane

HHV<sub>butane</sub> = 0.103 MMBtu/gal default HHV

40 CFR Part 98 Subpart C, Table C-1 value used with the Volume of butane vapor/gallon @ 60°F.

Source: [http://www.ecfr.gov/cgi-bin/text-idx?SID=9da8a4fcd9db970a85466ea89282596cb&mc=true&node=sp40.21.98.c&rgn=div6#ap40.21.98\\_138.1](http://www.ecfr.gov/cgi-bin/text-idx?SID=9da8a4fcd9db970a85466ea89282596cb&mc=true&node=sp40.21.98.c&rgn=div6#ap40.21.98_138.1)

Vol<sub>butane</sub> = 31.75 scf/gal at 60°F

Source: <http://www.aeropres.com/files/physical%20properties.pdf>

HHV <sub>butane</sub> = 3,244 Btu/scf	0.103 MMBtu	gal	1E+06 Btu
	gal	31.75 scf	1 MMBtu

8. Conversion factors (CF):

1 bhp	= 0.746 kW	<a href="http://www.convertunits.com/from/horsepower/to/kilowatt">http://www.convertunits.com/from/horsepower/to/kilowatt</a>
1 °F	= 460.67 °R	<a href="http://www.convertunits.com/from/Fahrenheit/to/Rankine">http://www.convertunits.com/from/Fahrenheit/to/Rankine</a>
1 atm	= 14.7 psi	<a href="http://www.convertunits.com/from/atm/to/psi">http://www.convertunits.com/from/atm/to/psi</a>
1 day	= 24 hours	<a href="http://www.convertunits.com/from/day/to/hour">http://www.convertunits.com/from/day/to/hour</a>
1 %	= 1E+04 ppmw	<a href="http://www.rapidtables.com/convert/number/PPM_to_Percent.htm">http://www.rapidtables.com/convert/number/PPM_to_Percent.htm</a>
1 DecEq	= 100 %	<a href="http://www.calculatorsoup.com/calculators/math/percent-to-decimal-calculator.php">http://www.calculatorsoup.com/calculators/math/percent-to-decimal-calculator.php</a>
1 g	= 0.002205 lb	<a href="http://www.convertunits.com/from/grams/to/pounds">http://www.convertunits.com/from/grams/to/pounds</a>
1 grain	= 0.000143 lb	<a href="http://www.convert-me.com/en/convert/weight/grain.html">http://www.convert-me.com/en/convert/weight/grain.html</a>
1 hp-hr	= 7,000 Btu	Source: AP-42, Table 3.3-1; footnote a.

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20	[82]
SUBJECT Mt. Union Station (98% DRE) -- Existing Equipment Conversion Factors, Physical Properties, and Abbreviations / Acronyms used in the emission estimate calculation workbooks.			
BASED ON SPLP Equipment Data / Specifications / Reference Material		DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE 5/23/2016

**Inputs and Assumptions (Continued):**

8. Conversion factors (CF) (Continued): Source (Continued):

1 hr	=	60 minutes	<a href="http://www.convertunits.com/from/hours/to/minutes">http://www.convertunits.com/from/hours/to/minutes</a>
1 kg	=	1,000 g	<a href="http://www.convertunits.com/from/kilograms/to/grams">http://www.convertunits.com/from/kilograms/to/grams</a>
1 kg/m <sup>3</sup>	=	0.008345 lb/gal	<a href="http://convert-to.com/conversion/density/convert-kg-per-m3-to-lb-per-gal.html">http://convert-to.com/conversion/density/convert-kg-per-m3-to-lb-per-gal.html</a>
1 lb	=	453.6 g	<a href="http://www.convertunits.com/from/pounds/to/grams">http://www.convertunits.com/from/pounds/to/grams</a>
1 lb	=	0.4536 kg	<a href="http://www.convertunits.com/from/pounds/to/kilograms">http://www.convertunits.com/from/pounds/to/kilograms</a>
1 lb	=	8.34 gal@60°F	<a href="http://www.engineeringtoolbox.com/water-density-specific-weight-d_595.html">http://www.engineeringtoolbox.com/water-density-specific-weight-d_595.html</a>
1 MMBtu	=	1E+06 Btu	<a href="http://www.convertunits.com/from/million+British+thermal+unit/to/British+thermal+unit">http://www.convertunits.com/from/million+British+thermal+unit/to/British+thermal+unit</a>
1 MMscf	=	1E+06 scf	<a href="http://www.convertunits.com/from/million+cubic+feet/to/cubic+feet">http://www.convertunits.com/from/million+cubic+feet/to/cubic+feet</a>
1 pascal	=	0.000010 atm	<a href="http://www.convertunits.com/from/pascal/to/atmosphere+[standard]">http://www.convertunits.com/from/pascal/to/atmosphere+[standard]</a>
1 ppmw	=	0.0001 wt%	<a href="http://www.rapidtables.com/convert/number/PPM_to_Percent.htm">http://www.rapidtables.com/convert/number/PPM_to_Percent.htm</a>
1 ft <sup>3</sup> / scf	=	28,317 cc	<a href="http://www.convertunits.com/from/cubic+feet/to/cubic+centimeters">http://www.convertunits.com/from/cubic+feet/to/cubic+centimeters</a>
1 ton	=	2,000 lb	<a href="http://www.convertunits.com/from/ton+[short,+US]/to/pounds">http://www.convertunits.com/from/ton+[short,+US]/to/pounds</a>
1 yr	=	8,760 hrs	Calculated: (24 hours/day) * (365 days/year)

9. Abbreviations / Acronyms

- % = percent
- Ann = annual
- AOH = annual operating hours
- cc = cubic centimeter
- CF = conversion factor
- CH<sub>4</sub> = methane
- CO = carbon monoxide
- CO<sub>2</sub>e = carbon dioxide equivalent
- dec = decimal
- DecEq = Decimal Equivalent
- EC = equipment count
- EF = emission factor
- eq = equivalent
- ER = Emission Rate
- FR = flow rate
- ft = feet
- ft<sup>3</sup> = cubic feet
- g = gram
- GC = gas chromatograph
- HAP = hazardous air pollutant
- HHV = higher heating value
- hr = hour
- kg = kilogram
- kg/MMBtu = kilograms per million British thermal units
- lb = pound
- lb/MMBtu = pounds per million British thermal units
- lb/MMscf = pounds per million standard cubic feet
- lb/scf = pounds per standard cubic feet

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20	[83]
SUBJECT Mt. Union Station (98% DRE) -- Existing Equipment Conversion Factors, Physical Properties, and Abbreviations / Acronyms used in the emission estimate calculation workbooks.			
BASED ON SPLP Equipment Data / Specifications / Reference Material		DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE 5/23/2016

**Inputs and Assumptions (Continued):**

9. Abbreviations / Acronyms (Continued)

- lb-mol = pound mole
- LPG = liquid petroleum gas
- LHV = lower heating value
- Max Daily = maximum daily
- Max Hourly = maximum hourly
- MM = molar mass
- mol = mole
- MW = molecular weight
- n = moles
- N/A = Pollutant is Not Applicable to this source
- N/A E = This equipment is not applicable to this station
- N/C = Not Calculated
- N<sub>2</sub>O = nitrogen dioxide
- NO<sub>x</sub> = oxides of nitrogen
- OSF = operating service factor
- P = pressure
- PM = particulate matter
- PM<sub>10</sub> = particles with an aerodynamic diameter less than or equal to 10 micrometers
- PM<sub>2.5</sub> = particles with an aerodynamic diameter less than or equal to 2.5 micrometers
- ppmw = parts per million by weight
- propane = C<sub>3</sub>H<sub>8</sub>
- psi = pounds per square inch
- psia = pounds per square inch absolute
- psig = pounds per square inch gauge
- R<sub>specific</sub> = Ideal gas law constant specific to units
- RV = relief valve
- S = sulfur
- scf = standard cubic feet
- SG<sub>o</sub> = specific gravity of the oil
- SO<sub>2</sub> = sulfur dioxide
- SO<sub>x</sub> = oxides of sulfur
- T = temperature
- t = ton
- TBD = To Be Determined
- TF = Total Fugitives
- tpy = tons per year
- USEPA = United States Environmental Protection Agency
- V = volume
- VS = valve seat
- VOC = volatile organic compound
- wt = weight
- yr = year

**Appendix B, Attachment 2: Aggregation Language**

The purpose of this document is to supply supplemental information regarding the aggregation text for the Sunoco Pipeline L.P. (SPLP) Request for Determination (RFD) submittals to the Pennsylvania Department of Environmental Protection (PADEP) South Central Regional Office (SCRO) associated with the Mariner East (ME) Project (the Project).

SPLP understands that Pennsylvania is considered a “moderate” ozone nonattainment area for oxides of nitrogen (NO<sub>x</sub>) and volatile organic compounds (VOCs) because Pennsylvania is a jurisdiction in the Ozone Transport Region (Section 184 of the Clean Air Act). Therefore, an aggregation determination under New Source Review (NSR) would be determined on a case-by-case basis using the two-part test that considers whether the air contamination source or combination of sources are located on one or more contiguous or adjacent properties and whether the sources are owned or operated by the same person under common control. This case-by-case single source determination would apply to all sources irrespective of their separate status as “minor” or “major” air contamination sources. PADEP and the Pennsylvania Environmental Hearing Board have made clear that the terms “contiguous” and “adjacent” should be given their plain meaning. To that end, PADEP’s guidance document has developed a “common sense” approach to determine if sources are located on adjacent or contiguous properties and considers sources located within a quarter-mile distance to be considered contiguous or adjacent (PADEP, 2012). Sources greater than a quarter-mile may be considered contiguous or adjacent on a case-by-case basis. Interdependence may be a factor in conducting a single source determination. That said, the plain meaning of the terms “contiguous” and “adjacent,” and not interdependence, should be the dispositive factor in determining whether stationary sources are located on contiguous or adjacent properties.

To determine if the under common control test is met, ownership of each of the operations is just one aspect in determining if the facilities are under common control. If a contract for service relationship exists between the two companies and/or if a support/dependency relationship exists, then this would constitute indirect control. United States Environmental Protection Agency (USEPA) has historically interpreted that an evaluation of common control must consider whether the facilities are functionally interrelated or interdependent of each other. As discussed in the Federal Register (USEPA, 2009), USEPA states that “To be ‘substantially related,’ there should be an apparent interconnection—either technically or economically—between the physical and/or operational changes, or a complementary relationship whereby a change at a plant may exist and operate independently, however its benefit is significantly reduced without the other activity.”

In determining whether the Mt. Union Pump Station’s emissions should be aggregated with any another sources for the purpose of evaluating the applicability of the nonattainment NSR and Title V programs, initially one location was identified: the Shade Valley Road/Highway 35 Block Valve. Per the PADEP SCRO’s request, SPLP reviewed the area within 5.0 miles of the Mt. Union Pump Station; no additional facilities for aggregation consideration were found during this review.

The distance between the Mt. Union Pump Station and the Shade Valley Road/Highway 35 Block Valve is approximately 6.3 miles, which exceeds the ¼ mile “rule of thumb” in the PADEP guidance document (PADEP, 2012).

Furthermore, aggregation would not be appropriate because the two sites should not otherwise be considered “adjacent” or “contiguous” due to the lack of any interdependence between the Shade Valley Road/Highway 35 Block Valve and the Mt. Union Pump Station. The Shade Valley Road/Highway 35 Block Valve is an independently operated valve for isolating a section of pipeline for safety, environmental, or maintenance purposes, whereas the Mt. Union Pump Station is to maintain pipeline system pressure during the transportation of natural gas liquids (NGLs). Neither location is dependent upon the other to properly function. In fact, both locations could fully function even if the other is nonfunctional.

In short, the Mt. Union Pump Station’s emissions should not be aggregated with those from the Shade Valley Road/Highway 35 Block Valve because the two locations are not interdependent of each other and are not in close proximity of each other, and therefore are neither “contiguous” nor “adjacent” for the purposes of aggregating air emissions.

References:

Pennsylvania Department of Environmental Protection (PADEP), 2012. Guidance for Performing Single Stationary Source Determinations for Oil and Gas Industries. Document No.: 270-0810-006, October 6, 2012.

United States Environmental Protection Agency (USEPA), 2009. Title 40 Code of Federal Regulations Parts 51 and 52, Prevention of Significant Deterioration (PSD) and Nonattainment New Source Review (NSR): Aggregation and Project Netting. Federal Register Volume 74, No. 10, January 15, 2009, pages 2376-2383.

September 9, 2016

**FedEx: 7771 9363 0000**

Mr. William Weaver  
Program Manager  
Pennsylvania Department of Environmental Protection  
Bureau of Air Quality  
Southcentral Regional Office  
909 Elmerton Avenue  
Harrisburg, Pennsylvania 17110

Subject: Addendum

RE: Pending State Only Operating Permit (SOOP) 06-031036 Addendum  
Facility ID: 776946  
Sunoco Pipeline L.P. (SPLP) Mount Union Station  
Shirley Township, Huntingdon County, Pennsylvania  
Tetra Tech, Inc. Project No. 112IC05958

Dear Mr. Weaver:

SPLP is submitting this Addendum to the subject facility SOOP application. Triplicate hardcopies of this letter and the impacted SOOP attachments are enclosed (one original and two copies).

There is no change in the status of Mount Union Station and the physical operation remains as represented in the May 2014 SOOP Application. This addendum is being submitted because the emissions associated with the Mount Union Station have been recalculated based on:

- Updated equipment information including flare pilot gas flow rate,
- More detailed information regarding maintenance activities,
- As-built Piping and Instrumentation Diagrams (P&IDs),
- Current equipment specific emission factors, and
- A more conservative flare emission estimate utilizing the manufacturer's guaranteed design destruction and removal efficiency (DRE) of 98%.

As part of the review of existing equipment and potential station modifications, the DRE associated with a 10 million British thermal unit per hour (MMBtu/hr) flare was evaluated. The manufacturer (John Zink) shop testing and a field stack study conducted at a similar SPLP facility on an identical flare demonstrates the capability of the 10 MMBtu/hr to achieve a DRE of 99.99 percent (%) for these size units as presented in Tables 1 and 2, respectively. However, we do not presently have sufficient data or operating history to determine that a 99.99% DRE can be achieved for the operational life of the flare. We do however anticipate that the more conservative 98% DRE that is the manufacturer's minimum rated performance can be achieved and likely exceeded for the operational life of the flare. See Manufacturer Guidance (Attachment 1).

Furthermore, the potential for changing one or more flares present at this or other aboveground facilities serving the same pipeline system to larger units is being considered. Although the larger units may be capable of achieving a 99.99% DRE or better over the operational life of the flare, SPLP does not have stack study data or historic operational data to support the 99.99% DRE for those flares.

**Table 1. John Zink's October 23 through 25, 2013 Stack Emission Study Summary Results**

Parameter	Average Result	Data Source
VOC Destruction Efficiency	99.993%	0 - 30 - 0 Load Data
VOC Destruction Efficiency	99.999%	30 - 70 - 30 Load Data
VOC Destruction Efficiency	99.999%	70 - 100 - 70 Load Data
VOC Destruction Efficiency	99.999%	90 - 00 Load Data
John Zink Stack Emissions Study, EPA 40 CFR Part 60 Subpart OOOO for the ZTOF025X15PF Unit. Tulsa R&D Facility. Tulsa, Oklahoma. October 23 through 25, 2013		

**Table 2. Sunoco April 26, 2016 Stack Study Summary Results**

Parameter	Average Result	Fuel Source
Destruction and Removal Efficiency	99.996%	Propane and Ethane
Blue Mountain Environmental Management Corporation Volatile Organic Compound Destruction and Removal Efficiency Study Test Report. John Zink Flare System. SPLP Twin Oaks Station. Aston, Pennsylvania, Delaware County. April 26, 2016.		

SPLP also evaluated the manufacturer's DRE design guarantee, which was a 98% DRE. Based upon the presently available data SPLP determined that it is appropriate and conservative to utilize the manufacturer's design guarantee DRE of 98%. SPLP also believes that by installing, operating, and maintaining all enclosed flares in accordance with the manufacturer's (John Zink's) guidance, a minimum 98% DRE can be anticipated for the operational life of the enclosed flares. Again, based on our operations and testing, we believe that a DRE in excess of 99% is likely for the life of the unit, but have chosen the more conservative number for our calculations.

Consequently, SPLP has updated the flare emission estimate to reflect the design DRE of 98% for Plainfield enclosed flare and plans to incorporate the design based DRE in future submittals. This change in DRE results in a very minor increase in the emissions calculations.

SPLP is replacing the following SOOP attachments with the enclosures of this letter as described in the bulleted list below. Modifications to the following only include those items impacted by this update.

- A revised State-Only Permit Application Form is enclosed and the following sections have been modified:
  - Section 1.1 – Application Type
  - Section 1.2 – Plant Information
  - Section 2.1 – Potential Emission Estimates for the Site
  - Section 3 – Site Inventory
  - Section 7 – General Source Information Subsections 7.1, 7.2, and 7.4
  - Section 8 – Control Device Information Subsections 8.1 and 8.2
- A revised Appendix B, Attachment 1 – Emission Calculations is enclosed.
  - Note that the worst-case emission rate per pollutant per product was utilized. The updated emission rates were estimated based on applying the physical properties of the products (i.e., heating value, gas density, etc.) that would result in the highest potential-to-emit estimates.
  - Additionally, note that fugitive pump seal emissions are included in overall facility fugitive emissions and are not considered a separate line item.
- A revised Appendix B, Attachment 2 – Aggregation Language is enclosed.

Additionally, per PADEP SCRO's request, SPLP has reviewed SOOP SECTION E language in regards to the current monitoring system for the pilot flame and other Pennsylvania SPLP SOOP SECTION E language. The current SPLP flare monitoring systems consist of a signal from the pilot flame detection device that is transmitted to the Supervisory Control and Data Acquisition (SCADA) system. In the event of a pilot flame malfunction, the flare auto re-ignition will be initiated. Although pilot flame failure information

Administrative Update for SPLP Mount Union Station  
Mr. William Weaver, PADEP SCRO

September 9, 2016

is manually logged, it is not collected in the SCADA system historian. Therefore, for consistency with the PADEP SCRO issued SOOPs for Marklesburg, Hollidaysburg, and Plainfield Stations and to reflect the current system operations, SPLP is suggesting the following language for SECTION E. Source Groups Restrictions. IV. RECORDKEEPING REQUIREMENTS:

#004 [25 Pa. Code §127.441]: "When the enclosed flare is not operational, the permittee shall record the downtime and associated emissions."

#005 [25 Pa. Code §127.441]: "The permittee shall maintain detailed records of all maintenance performed on the enclosed flare. The permittee shall retain these records for a minimum of five (5) years and shall make them available to the department upon its request."

Please contact Jed Werner at 610-670-3297 or by email ([jawerner@sunocologistics.com](mailto:jawerner@sunocologistics.com)) if you have any questions.

Sincerely,



Matthew L. Gordon  
Principal Engineer

MLG:vjp

cc: Project file 112IC05958 (electronic)  
Jed Werner, SPLP (email)  
Christopher Embry, SPLP (email)  
Megan Allison, Tetra Tech (email)

MLG:vjp

Enclosures: SOOP Addendum for SPLP Mount Union Station  
Form 2700-PM-AQ13

Appendix B:

Attachment 1 (Potential-to-Emit Calculations)  
Attachment 2 (Aggregation Analysis)



**RECOMMENDED MAINTENANCE FORM  
PRODUCTION FLARE**

SYSTEM COMPONENT	INTERVAL	DATE	INITIALS	COMMENTS
<b>General</b>				
Confirm all covers are secure.	monthly			
Inspect enclosures for moisture.	monthly			
Confirm no gas or liquid leaks exist.	monthly			
Confirm all threaded connections are tight.	annually			
Replace all thermocouples.	annually			
Calibrate instruments and flow meter.	annually			
<b>Flare</b>				
Record flame arrester differential pressure.	monthly			
Inspect exterior paint.	monthly			
Conduct recommended System Testing.	quarterly			
Inspect internal insulation.	quarterly			
Inspect foundation and anchor bolts.	annually			
Clean sight port, flare tip, and flame arrester.	annually			
Conduct emissions performance test.	annually			
<b>Pilot</b>				
Record pilot gas pressure.	monthly			
Inspect mixer for debris or moisture.	monthly			
Clean mixer and orifice.	quarterly			
Clean solenoid.	annually			
Replace electrode.	annually			

**Weaver, William**

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**From:** WERNER, JED A <JAWERNER@sunocologistics.com>  
**Sent:** Friday, March 10, 2017 1:51 PM  
**To:** Weaver, William  
**Subject:** Mariner East facilities  
**Attachments:** MARINER EAST I EQUIPMENT LIST.pdf

Mr. Weaver,

Attached is a list of all the sources installed at each Pump Station as part of the Mariner East project.

In the Southcentral Region Pump Stations there are the following pigging sources:

Hollidaysburg

- One (1) Pig Launcher – 8 inch
- One (1) Pig Receiver – 8 inch

Mt. Union

- One (1) Pig Launcher – 8 inch
- One (1) Pig Receiver – 8 inch

Middletown

- One (1) Pig Launcher – 8 inch
- One (1) Pig Receiver – 8 inch

Beckersville

- One (1) Pig Launcher – 8 inch
- One (1) Pig Receiver – 8 inch

Please let me know if you have any questions

Jed A. Werner  
Manager - Environmental Compliance and Projects  
525 Fritztown Road  
Sinking Spring, PA 19608  
p-610-670-3297  
c-610-858-0802  
f-866-599-4936

**EVERY** day, is a good day!



## MARINER EAST I: STATION EQUIPMENT

### Southwest Region

#### **Delmont Station**

- One (1) Mainline Pump – 1,500 horsepower (hp)
- One (1) Filter – 31.94 ft<sup>3</sup>
- One (1) Pig Launcher – 8 in
- One (1) Pig Receiver – 12 in
- One (1) Propane Storage Tank – 60,000 gallons
- One (1) Propane Pilot Gas Tank – 500 gallons
- One (1) Hose – 2 in diameter, 18 feet long
- One (1) Basket Strainer – 0.34 ft<sup>3</sup>
- One (1) Basket Strainer – 1.27 ft<sup>3</sup>
- One (1) Prover – 5.35 ft<sup>3</sup>
- One (1) Enclosed Flare – 10 million British thermal units per hour (MMBtu/hr)

#### **Blairsville Station**

- One (1) Mainline Pump – 1,500 hp
- One (1) Filter – 31.94 ft<sup>3</sup>
- One (1) Propane Pilot Gas Tank – 500 gallons
- One (1) Enclosed Flare – 10 MMBtu/hr

#### **Ebensburg Station**

- One (1) Mainline Pump – 1,750 hp
- One (1) Filter – 31.94 ft<sup>3</sup>
- One (1) Propane Pilot Gas Tank – 500 gallons
- One (1) Enclosed Flare – 10 MMBtu/hr

#### **Cramer Station**

- One (1) Mainline Pump – 1,750 hp
- One (1) Filter – 31.94 ft<sup>3</sup>
- One (1) Propane Pilot Gas Tank – 500 gallons
- One (1) Enclosed Flare – 10 MMBtu/hr

**South Central Region****Hollidaysburg Station**

- One (1) Mainline Pump – 1,500 hp
- One (1) Filter – 31.94 ft<sup>3</sup>
- One (1) Prover – 31.42 ft<sup>3</sup>
- One (1) Pig Launcher – 8 in
- One (1) Pig Receiver – 8 in
- One (1) Coriolis Meter
- One (1) Propane Pilot Gas Tank – 500 gallons
- One (1) Enclosed Flare – 10 MMBtu/hr

**Marklesburg Station**

- One (1) Mainline Pump – 1,250 hp
- One (1) Filter – 31.94 ft<sup>3</sup>
- One (1) Propane Pilot Gas Tank – 500 gallons
- One (1) Enclosed Flare – 10 MMBtu/hr

**Mt. Union Station**

- One (1) Mainline Pump – 1,500 hp
- One (1) Filter – 31.94 ft<sup>3</sup>
- One (1) Pig Launcher – 8 in
- One (1) Pig Receiver – 8 in
- One (1) Propane Pilot Gas Tank – 500 gallons
- One (1) Enclosed Flare – 10 MMBtu/hr

**Doylesburg Station**

- One (1) Mainline Pump – 1,500 hp
- One (1) Filter – 31.94 ft<sup>3</sup>
- One (1) Propane Pilot Gas Tank – 500 gallons
- One (1) Enclosed Flare – 10 MMBtu/hr

**Mechanicsburg Station**

- One (1) Mainline Pump – 1,750 hp
- One (1) Filter – 31.94 ft<sup>3</sup>

**Plainfield Station**

- One (1) Mainline Pump – 1,750 hp
- One (1) Filter – 31.94 ft<sup>3</sup>
- One (1) Propane Pilot Gas Tank – 500 gallons
- One (1) Enclosed Flare – 10 MMBtu/hr

**Middletown Station**

- One (1) Mainline Pump – 1,500 hp
- One (1) Filter – 31.94 ft<sup>3</sup>
- One (1) Prover – 31.42 ft<sup>3</sup>

- One (1) Pig Launcher – 8 in
- One (1) Pig Receiver – 8 in
- One (1) Coriolis Meter
- One (1) Propane Pilot Gas Tank – 500 gallons
- One (1) Enclosed Flare – 10 MMBtu/hr

**Cornwall Station**

- One (1) Mainline Pump – 1,500 hp
- One (1) Filter – 31.94 ft<sup>3</sup>
- One (1) Propane Pilot Gas Tank – 500 gallons
- One (1) Enclosed Flare – 10 MMBtu/hr

**Blainsport Station**

- One (1) Mainline Pump – 1,750 hp
- One (1) Filter – 31.94 ft<sup>3</sup>
- One (1) Propane Pilot Gas Tank – 500 gallons
- One (1) Enclosed Flare – 10 MMBtu/hr

**Beckersville Station**

- One (1) Mainline Pump – 1,750 hp
- One (1) Filter – 31.94 ft<sup>3</sup>
- One (1) Gas Chromatograph
- One (1) Pig Launcher – 8 in
- One (1) Pig Receiver – 8 in
- One (1) Propane Pilot Gas Tank – 500 gallons
- One (1) Enclosed Flare – 10 MMBtu/hr

**Southeast Region****Eagle Station**

- One (1) Mainline Pump – 1,000 hp
- One (1) Filter – 31.94 ft<sup>3</sup>
- One (1) Propane Pilot Gas Tank – 1,000 gallons
- One (1) Enclosed Flare – 10 MMBtu/hr

**Boot Station**

- One (1) Mainline Pump – 1,750 hp
- One (1) Filter – 31.94 ft<sup>3</sup>
- One (1) Propane Pilot Gas Tank – 1,000 gallons
- One (1) Enclosed Flare – 10 MMBtu/hr

**Twin Oaks Station**

- One (1) Filter – 31.94 ft<sup>3</sup>
- One (1) Prover – 31.42 ft<sup>3</sup>
- One (1) Pig Launcher – 12 in
- One (1) Pig Receiver – 8 in
- One (1) Coriolis Meter
- One (1) Propane Pilot Gas Tank – 1,000 gallons
- One (1) Enclosed Flare – 10 MMBtu/hr

March 22, 2017

Mr. Chris Embry  
Sr. Environmental Specialist  
Sunoco Logistics  
535 Fritztown Road  
Sinking Spring, PA 19608

Re: Request for Determinations #1437  
25 Pa. Code 127.14(a)(8) exemption request  
Sunoco Pipeline, L.P. (SPLP)  
SPLP Mount Union Station – Mariner East II  
Shirley Township, Huntingdon County

Dear Mr. Embry:

After review, the Department of Environmental Protection has determined that the facility modifications to add equipment and components for cleaning and inspection of the pipeline for natural gas liquids is exempt from the Plan Approval requirements per 25 PA Code §127.14(d) listed as No. 44 in the Department's Plan Approval and Operating Permit Exemptions list under Title 25 PA Code §127.14(a)(8). It is the Department's understanding that the additional equipment at this facility will include the following:

- 1) Maintenance Operating Scenario emission sources which will include gas releases from one (1) Pig Launcher (20 in.) and one (1) Pig Receiver (20 in.), which are controlled by the existing John Zink Enclosed ZTOF Flare rated at 10.0 mmbtu/hr.
- 2) One (1) Flare Knockout Tank – no emissions are associated with the tank.
- 3) Fugitive Emissions Sources which include fugitive VOC and HAP emissions resulting from leaks of sealed surfaces from valve stems, flanges, connectors and other miscellaneous component types.

It is also the Department's understanding that potential to emit from the project will not exceed 0.01 tpy NOx, 0.05 tpy CO, 0.26 tpy VOC and 0.02 tpy HAPs.; that any compression for the project will be electrically powered as supplied by a public utility; that the flare will be operated by the manufacturer's specification and maintained by the manufacturer's recommended maintenance schedule; that the facility will implement a leak detection and repair program using audible, visual, and olfactory detection methods on a monthly basis to satisfy BAT for fugitive emissions; that the Mount Union Station is not considered to be adjacent or contiguous with any facilities under common control; and that this project will not trigger the requirements of 25 PA Code Subchapter E or 40 CFR Part 52.

March 22, 2017

The Department has also determined that this project is not exempt from the operating permit requirements.

This exemption does not affect your obligation to meet all applicable Pennsylvania Air Quality Regulations for this source. All air contamination sources and air pollution control devices must be operated in a manner consistent with the manufacturer's specifications and good engineering practice. Please be advised that this exemption is only valid for the equipment, throughput, and emission levels proposed in this request for determination (RFD). A revised RFD or plan approval application may be required prior to any future expansions or changes which increase atmospheric emissions.

On August 31, 2016, SPLP submitted an addendum to the Mariner East I draft operating permit #31-03036. The potential emissions were recalculated to be 0.06 tpy NO<sub>x</sub>, 0.25 tpy CO, 0.80 tpy VOC and 0.01 tpy Methane, which the Department has determined are exempt from Plan Approval requirements but not exempt from the operating permit requirements.

If you have any questions or comments, please call me at 717.705.4879.

Sincerely,

*Darrell Hartline*

Darrell Hartline  
Air Quality Permitting Section  
Air Quality Program

Enclosure

cc: Permits/Altoona District Office/SC Region 31-03036, B3

OFFICIAL USE ONLY

RFD #: 1437

Date Received: 8/31/16

Reviewed By: Darrell Hartline

- A plan approval is not required for this source (See 25 Pa. Code Section 127.14(a)(1)-(9))
- An operating permit is not required for this source (See 25 Pa. Code Section 127.443(a))
- The source(s) do(es) not qualify for exemption. Applicant is required to submit a plan approval application.
- The source(s) do(es) not qualify for exemption. Applicant is required to submit an operating permit application.

Thomas J. Harlan  
Signature

Thomas J. Harlan, Permitting Chief  
Name and Title

Date 3/22/17

Remarks: *Please reference the cover letter for remarks.*

Conditions:



TETRA TECH

[100]



August 30, 2016

**FedEx: 7771 1496 2149**

Mr. William Weaver  
Program Manager  
Pennsylvania Department of Environmental Protection  
Bureau of Air Quality  
Southcentral Regional Office  
909 Elmerton Avenue  
Harrisburg, Pennsylvania 17110

Subject: Request for Determination (RFD)

RE: Facility ID: 776946  
Sunoco Pipeline L.P. (SPLP) Mount Union Station  
Shirley Township, Huntingdon County, Pennsylvania  
Tetra Tech, Inc. Project No. 112IC05958

ORIGINAL

Dear Mr. Weaver:

SPLP is submitting the enclosed RFD for the subject facility in triplicate haracopies (one original and two copies).

Please contact Jed Werner at 610-670-3297 or by email ([jawerner@sunocologistics.com](mailto:jawerner@sunocologistics.com)) if you have any questions.

Sincerely,

Valerie J. Plachy, P.E.  
Air Quality Specialist

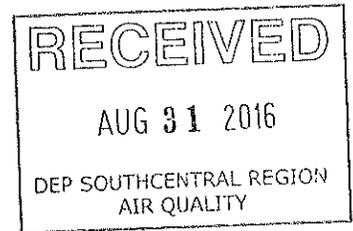
VJP:vjp

cc: Project file 112IC05958 (electronic)  
Jed Werner, SPLP (email)  
Christopher Embry, SPLP (email)  
Megan Allison, Tetra Tech (email)

Enclosures: Request for Determination; SPLP Mount Union Station

# REQUEST FOR DETERMINATION

**Sunoco Pipeline, L.P.**  
**Mt. Union Station**  
**Huntingdon County, PA**



**Prepared for:**

Sunoco Pipeline, L.P.  
535 Fritztown Road  
Sinking Spring, PA 19608

**Prepared by:**



TETRATECH

Tetra Tech, Inc.  
400 Penn Center Blvd., Suite 200  
Pittsburgh, PA 15235

[www.tetratech.com](http://www.tetratech.com)

**August 2016**

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Attachment B – Air Emission Calculations

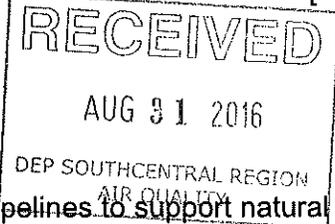
## ABBREVIATIONS AND ACRONYMS

%	percent
AVO	audible, visual, and olfactory
BAT	Best Available Technology
CAA	Clean Air Act
CAAA	1990 Clean Air Act Amendments
CFR	Code of Federal Regulations
CH <sub>4</sub>	methane
CO	carbon monoxide
CO <sub>2</sub>	carbon dioxide
CO <sub>2</sub> e	carbon dioxide equivalent
DRE	destruction and removal efficiency
ft	feet
ft <sup>3</sup>	cubic feet
GHG	greenhouse gas
HAP	hazardous air pollutant
hr	hour
hr/day	hours per day
hr/yr	hours per year
in	inch
lb/hr	pounds per hour
LPG	liquefied petroleum gas
MACT	Maximum Achievable Control Technology
ME	Mariner East
MMBtu	million British thermal units
MMBtu/hr	million British thermal units per hour
MOS	Maintenance Operations Scenario
N <sub>2</sub> O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
N/C	not calculated
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NGL	natural gas liquid
NNSR	Nonattainment New Source Review
NO <sub>x</sub>	oxides of nitrogen
NSPS	New Source Performance Standards
NSR	New Source Review
OTR	Ozone Transport Region
P&ID	Piping and Instrumentation Diagram
PADEP	Pennsylvania Department of Environmental Protection
PFD	process flow diagram
PM <sub>10</sub>	particles with an aerodynamic diameter less than or equal to 10 micrometers
ppmw	parts per million by weight
PSD	Prevention of Significant Deterioration
PTE	potential-to-emit
RFD	Request for Determination
SCADA	supervisory control and data acquisition
scf	standard cubic feet
scf/hr	standard cubic feet per hour
SCRO	South Central Regional Office
SIC	Standard Industrial Classification

## ABBREVIATIONS AND ACRONYMS

(CONTINUED)

SO <sub>2</sub>	sulfur dioxide
SO <sub>x</sub>	oxides of sulfur
SOOP	State-Only Operating Permit
SOS	Standard Operating Scenario
SPLP	Sunoco Pipeline, L.P.
the Facility	proposed Mt. Union Station modifications
tpy	tons per year
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
VRU	vapor recovery unit
wt%	percent by weight



## 1 INTRODUCTION

Sunoco Pipeline L.P. (SPLP) proposes to expand the Mariner East (ME) pipelines to support natural gas liquid (NGL) transportation including propane, butane, liquefied petroleum gas (LPG), and ethane. In addition to expanding the existing ME pipelines, some aboveground facilities such as block valves and pump stations will be required to support the expansion. Specifically, for the purposes of this Request for Determination (RFD), SPLP is proposing to modify the pending State-Only Operating Permit (SOOP) emission limits for Mt. Union Station located in Shirley Township, Huntingdon County, Pennsylvania. This RFD is being submitted in addition to the August 2016 Mt. Union Station Addendum. (The August 2016 Mt. Union Addendum requested emission limits updates based upon re-calculations that were associated with finalized AP-42 emission factors, updated equipment information, more detailed information regarding maintenance activities, current preliminary Piping and Instrumentation Diagrams [P&IDs], current equipment emission factors, and utilizing the manufacturer's [John Zink's] flare design destruction and removal efficiency [DRE] of 98 percent [%] for pending SOOP permit number 31-03036.) Product transportation will be facilitated by the proposed Mt. Union Station modifications (the Facility). The Facility is considered a minor source for all pollutants and is operating under a SOOP (permit number 31-03036). Mt. Union Station will remain a minor source for all pollutants after completion of the proposed modifications. The proposed modifications will not impact the current station emissions but proposes additional equipment, that is, new emission sources. The Facility will consist of added equipment and components to be utilized for cleaning and inspection of the pipeline. Table 1-1 below details the emissions sources and the control equipment.

**Table 1-1. Equipment List**

Equipment List	Rating/Size	Quantity
<b>Maintenance Operations Scenario Emission Sources</b>		
Pig Launcher (20 in)	65.70 ft <sup>3</sup>	1
Pig Receiver (20 in)	61.51 ft <sup>3</sup>	1
<b>Control Equipment</b>		
Existing Enclosed Flare	10 MMBtu/hr	1
<b>Pressure Vessel</b>		
Flare Knockout Tank	60 in x 20 ft	1
<b>Fugitive Emission Sources</b>		
Various component types and quantities based on engineering design		

The Facility will continue to operate under two scenarios: the Standard Operating Scenario (SOS) and the Maintenance Operations Scenario (MOS). During the SOS, the Facility's emissions will only consist of emissions from fugitive sources (e.g., emissions from sealed surfaces associated with the equipment such as valve stems, flanges, connectors, and other miscellaneous component types) and combustion of pilot gas (not included in this RFD, see the August 2014 Addendum for additional information and emissions estimates associated with this component). Because MOS activities are intermittent in nature, the emissions resulting from these MOS activities are also intermittent.

Emissions associated with the MOS operations will be captured and diverted to the existing enclosed flare for control of volatile organic compounds (VOCs) and, with these modifications, hazardous air pollutants (HAPs).

The existing enclosed flare is a John Zink Company LLC enclosed ZTOF flare with a maximum heat input rating of 10 million British thermal units per hour (MMBtu/hr). The purpose of the flare is to control VOC and HAP emissions associated with the MOS emission sources. The DRE of the flare is 98% based upon the proposed manufacturer's (John Zink's) design. This DRE has been utilized to estimate potential controlled emissions from the Facility.

Additionally, fugitive sources (e.g., emissions from sealed surfaces associated with equipment such as valve stems, flanges, and other miscellaneous component types) will be present at the Facility. Though many individual pieces of equipment are included, this RFD will only include two sources as indicated in Table 1-2 below:

**Table 1-2. Source List**

Source Description	Source Name
MOS emissions diverted to an enclosed flare	Control Device (Enclosed Flare) (F-4610)
Fugitive emissions consisting of various component types and quantities	Fugitives (FE-01)
Note: Pressurized tanks are not included in the Source List. No emissions are associated with the pressurized tanks; however, pressurized tank components are included in the fugitive equipment counts for a conservative estimate.	

Emissions from each source and the entire Facility will be de minimis and will not exceed the emission limits for de minimis emission increases as allowed by Title 25 of Pennsylvania Code (25 Pa Code §127.449(d)) presented in Table 1-3:

**Table 1-3. De Minimis Emission Increases**

Compound	Single Source (tpy)	Entire Facility (tpy)
Carbon Monoxide (CO)	1	20
Oxides of Nitrogen (NO <sub>x</sub> )	1	5
Oxides of Sulfur (SO <sub>x</sub> )	1.6	8
Particulate Matter <10 $\mu$ (PM <sub>10</sub> )	0.6	3
Volatile Organic Compounds (VOCs)	1	5

The Facility site location map is provided as Figure 1 and a process flow diagram (PFD) is provided as Figure 2. The Facility emission estimates summary and detailed calculation methodology are presented

in Section 2. An analysis of federal and state regulations applicable to the Facility are presented in Section 3. References are presented in Section 4. The RFD forms and emission calculations are presented as Attachments in Section 5.

## **2 EMISSION ESTIMATES**

### **2.1 New Emission Sources**

The proposed emission sources for the Facility modifications will consist of the:

- MOS emissions associated with pigging operations and other miscellaneous routine maintenance activities that may occur; and
- Fugitive sources (e.g., emission from sealed surfaces associated with equipment such as valve stems, flanges, and other miscellaneous component types) as a result of leaks from the sealed surfaces.

The vapors associated with MOS emission sources will be captured and diverted to the enclosed flare header for the control of VOC and HAP emissions.

Detailed emission calculations are presented in Attachment B and summarized in Section 2.

#### **2.1.1 Maintenance Operations Scenario Emission Sources**

Emissions associated with MOS for the proposed modifications of the Facility will generally result from pigging operations and other miscellaneous maintenance activities that may occur, which are directly associated with the operation of the Facility.

Pigging operations are maintenance activities that clean and inspect the integrity of isolated pipeline sections. The pig launchers and receivers require depressurization (e.g., venting) after pigging activities and the resulting vapors will be directed to the enclosed flare for the control of VOC and HAP emissions.

#### **2.1.2 Enclosed Flare**

The existing 10 MMBtu/hr enclosed flare (John Zink Company LLC enclosed ZTOF model flare) will be used to control the captured VOC and HAP emissions. Propane, supplied by an existing pressurized storage tank, associated with the current 10 MMBtu/hr flare, will continue to be used as the pilot gas fuel source. The pilot gas will continue to be combusted at the same rate, that is, 0.053 MMBtu/hr (22 standard cubic feet per hour [scf/hr]). The pilot gas emissions were presented to the Pennsylvania Department of Environmental Protection (PADEP) as part of the August 2016 Addendum for Mt. Union Station and will not be addressed in this RFD. The design-based DRE of the proposed flare is 98% and the flare will be designed to comply with the applicable requirements specified in 40 Code of Federal Regulations (CFR) 60.18.

The existing flare does operate and is monitored 24 hours per day (hr/day), seven days per week via a supervisory control and data acquisition (SCADA) system and a physical inspection will occur at a

minimum of once per week. SPLP will continue to operate and maintain the existing enclosed flare in accordance with the manufacturer's guidelines and specifications.

The existing flare is equipped with a pilot gas control system that includes a pressure regulator, a fail-close shutdown valve, a manual block valve, and a pressure indicator to monitor and assure operations. Additionally, the existing flare is equipped with an auto re-ignition system. Under standard operating conditions, continuous flow from pilot gas would be the only source of potential uncontrolled emissions during a flare malfunction (i.e., the pilot flame is unable to be re-ignited by the operating system or another type of malfunction). In the event of a flare malfunction during a scheduled maintenance event, the activity would be halted until an operational flare becomes available.

To provide a conservative flare emission estimate for the proposed modifications at the Facility, the design based DRE of 98% has been used for the purposes of this RFD.

### **2.1.3 Pressure Vessel**

SPLP proposes to install a 60-inch diameter by 20-foot-long pressurized tank for the collection of entrained liquids in the existing flare header piping. The tank will not have a liquid level, therefore, there will be no working or evaporative losses associated with this tank. The knockout tank acts as a "bump in the line," that is, the product directed to the flare flows through the knockout tank in-route to the flare. Additionally, this tank will be considered an exempt source in accordance with the Trivial Activity Category No. 24 [Storage tanks, vessels, and containers holding or storing liquids that will not emit any VOCs or HAPs] listed in PADEP's Air Quality Permit Exemptions, Document Number 275-2101-003 (PADEP 2013).

### **2.1.4 Fugitive Emissions**

Fugitive sources (e.g., emissions from sealed surfaces associated with equipment such as valve stems, flanges, and other miscellaneous component types) will be present at the Facility and will be potential sources of fugitive VOC and HAP emissions. The fugitive emission estimates were developed using the leak emission factors for light liquid service presented in Table 2-3 of the United States Environmental Protection Agency (USEPA) report "Protocol for Equipment Leak Emission Estimates" (USEPA, 1995) and the item count quantities are based on the engineering P&IDs for the Facility. An addition of a 20% contingency was incorporated to account for any engineering and design changes as well as changes during the construction phase.

## **2.2 Calculation Methodology**

The emissions associated with the Facility were calculated in accordance with regulatory guidance and are based on the most representative data available. The calculation methodology is presented below for each source type; emission summaries are presented in Section 2 for the Facility modifications and the existing sources. The emissions associated with the existing sources reflect the recalculations presented to PADEP as part of the August 2016 Addendum for the Mt. Union Station. (The August 2016 Addendum re-calculations were based on updated equipment information,

more detailed information regarding maintenance activities, current P&IDs, and current emission factors. Additionally, to provide a conservative estimate in the August 2016 Addendum and this RFD, flare emission estimates are based on the manufacturer's design DRE of 98%.)

Calculations were estimated based on the Facility operating for 8,760 hours per year (hr/yr), that is, a 100% operating service factor. The NGLs for the proposed Facility modifications will consist of butane, LPG, and propane; the NGLs for the existing Facility equipment include butane, propane, and ethane. Based on a representative analysis of each NGL, butane consists of 100 percent by weight (wt%) of regulated VOCs; the LPG product consists of 99.95 wt% of regulated VOCs; and, the propane product consists of 98.65 wt% regulated VOCs. The ethane product consists of 100 wt% VOCs that are exempt under 40 CFR §51.100(s)(1). Only the LPG contains any measurable HAPs with a maximum HAP concentration of approximately 5.86 wt%. In order to conservatively estimate the potential-to-emit (PTE) for the Facility, the worst case emission rate per pollutant per product was utilized. These emission rates were applied to each pollutant based on the various physical properties of the products (i.e., heating value, gas density, HAP content, etc.). The Facility annual average PTE was estimated based on the MOS and fugitive emissions. For estimating the impact to the maximum hourly PTE, the maximum design heat input to the flare and fugitive emissions were utilized.

Emissions associated with MOS activities are based on the estimated annual vented emissions being sent to the existing enclosed flare as a result of pigging events. The anticipated maintenance operations include: "clean" pigging occurring on an annual basis; "smart" pigging (an inline integrity inspection of the pipeline) occurring once every five years; and other miscellaneous routine maintenance activities required for station operations. Based on the proposed MOSs and to account for other miscellaneous routine maintenance activities, annual emissions were conservatively estimated assuming two (2) clean pigging activities and one (1) smart pigging activity per year. Emissions associated with these activities will be routed to the existing enclosed flare.

Flare combustion emissions consist of oxides of nitrogen ( $\text{NO}_x$ ), carbon monoxide (CO), VOCs, HAPs, oxides of sulfur ( $\text{SO}_x$ ) as sulfur dioxide ( $\text{SO}_2$ ), and greenhouse gases (GHGs) as measured as carbon dioxide equivalents ( $\text{CO}_2\text{e}$ ). The  $\text{NO}_x$  and CO emissions were estimated based on emission factors presented in USEPA's AP-42 Section 13.5 (USEPA, 2015). VOC and HAP emissions resulting from the control of the sources were estimated based on a 98% DRE flare design.  $\text{SO}_2$  emissions were estimated assuming that the total sulfur content of the NGL is completely converted to  $\text{SO}_2$  during the combustion process. Based on the representative analysis of the NGL, the maximum amount of sulfur in the NGL is 30 parts per million by weight (ppmw). GHG emissions were estimated utilizing the emission factors for carbon dioxide ( $\text{CO}_2$ ), methane ( $\text{CH}_4$ ), and nitrous oxide ( $\text{N}_2\text{O}$ ) presented in Tables C-1 and C-2 of 40 CFR Part 98, Subpart C (USEPA, 2016a).

The proposed Facility modifications will include fugitive VOC and HAP emission sources in addition to the emissions controlled by an enclosed flare. Potential fugitive emission estimates were quantified based on the proposed new equipment and estimated component counts from the preliminary P&IDs, a 20% item count contingency, and the best available emission factors for fugitive emissions from NGL operations. The fugitive emission calculations were estimated using the leak emission factors

for light liquid service presented in Table 2-3 of USEPA report "Protocol for Equipment Leak Emission Estimates" (USEPA, 1995) and a representative NGL analysis.

### 2.3 Potential Emissions

Based on the calculation methodology presented above, the potential maximum hourly and annual average emission rates for the modifications to the Facility are presented in Table 2-1. Table 2-2 presents the Facility overall PTE and de minimis Emission Change Rates Comparison. Table 2-3 features the overall PTE for Mt. Union Station. The detailed emission calculations associated with this RFD are presented in Attachment B. (The August 2016 Mt. Union Addendum requested SOOP 31-03036 emission limits updates based upon re-calculations that were associated with finalized AP-42 emission factors, updated equipment information, more detailed information regarding maintenance activities, current preliminary P&IDs, current equipment emission factors, and utilizing the manufacturer's [John Zink's] flare design DRE of 98%.)

As shown in Table 2-2 and Table 2-3, the Mt. Union Station updated emissions changes result in a de minimis increase in emissions, pursuant to 25 Pa. Code §127.449.

**Table 2-1. Post-Control Proposed Project Emission Estimates**

Emission Source <sup>(1)</sup>	NO <sub>x</sub>	CO	VOC	SO <sub>x</sub>	HAP	CO <sub>2e</sub> (GHG)
(lb/hr)						
<i>Control Device (Flare)<sup>1</sup></i>	0.88	4.00	12.20	0.04	0.71	1,850
<i>Fugitives</i>	N/C	N/C	0.02	N/C	0.001	N/C
<b>TOTAL MAXIMUM HOURLY</b>	<b>0.88</b>	<b>4.00</b>	<b>12.22</b>	<b>0.04</b>	<b>0.71</b>	<b>1,850</b>
(tpy)						
<i>Control Device (Flare)<sup>1</sup></i>	0.01	0.05	0.16	0.001	0.01	25.00
<i>Fugitives</i>	N/C	N/C	0.10	N/C	0.01	N/C
<b>TOTAL ANNUAL AVERAGE</b>	<b>0.01</b>	<b>0.05</b>	<b>0.26</b>	<b>&lt;0.01</b>	<b>0.02</b>	<b>25.00</b>

<sup>1</sup> Smokeless flares have no measurable particulate emissions pursuant to AP-42, Section 13.5, Table 13.5-1 (USEPA, 2015).

**Table 2-2. Potential-to-Emit and De Minimis Emission Change Rate Comparison**

Source	Pollutant	NO <sub>x</sub>	CO	VOC
		(tpy)		
<i>PTE de minimis Change Request as submitted in the August 2016 Addendum</i>		0.06	0.25	0.80
<i>Proposed Facility Modification PTE Increases (as presented in Table 2-1)</i>		0.01	0.05	0.26
<b>Proposed Net Change to the Overall Facility PTE In This RFD</b>		<b>0.07</b>	<b>0.30</b>	<b>1.06</b>
		tons per facility per permit term		
<b>25 PA Code §127.449(d) de minimis Emission Rates</b>		<b>5</b>	<b>20</b>	<b>5</b>

**Table 2-3. Mt. Union Station Post Project Overall Potential-to-Emit**

Emission Source <sup>(1)</sup>	NO <sub>x</sub>	CO	VOC	SO <sub>x</sub>	HAP	CO <sub>2e</sub> (GHG)
(lb/hr)						
<i>Control Device (Flare)</i>	0.88	4.02	12.22	0.04	0.71	1,862
<i>Fugitives</i>	N/C	N/C	0.05	N/C	0.001	N/C
<b>TOTAL MAXIMUM HOURLY</b>	<b>0.88</b>	<b>4.02</b>	<b>12.27</b>	<b>0.04</b>	<b>0.71</b>	<b>1,862</b>
(tpy)						
<i>Control Device (Flare)</i>	0.07	0.30	0.81	0.003	0.01	137.30
<i>Fugitives</i>	N/C	N/C	0.25	N/C	0.01	N/C
<b>TOTAL MAXIMUM HOURLY</b>	<b>0.07</b>	<b>0.30</b>	<b>1.06</b>	<b>&lt;0.01</b>	<b>0.02</b>	<b>137.30</b>
<sup>1</sup> Smokeless flares have no measurable particulate emissions pursuant to AP-42, Section 13.5, Table 13.5-1 (USEPA, 2015).						

### 3 REGULATORY REVIEW AND APPLICABILITY

#### 3.1 New Source Review

Separate preconstruction review procedures have been established for new major projects and major modifications of existing major sources proposed in designated attainment areas (areas in which air quality is better than the National Ambient Air Quality Standards [NAAQS]) and nonattainment areas (areas in which air quality is worse than NAAQS) under the Clean Air Act (CAA) New Source Review (NSR) program. The preconstruction review process for new or modified major sources located in areas designated as attainment or unclassifiable is performed under the Prevention of Significant Deterioration (PSD) program (USEPA, 2009). The preconstruction review process for new or modified major sources located in nonattainment areas is performed under the Nonattainment New Source Review (NNSR) program. A new major facility or major modification at an existing major facility can undergo both types of review, depending on the total emissions of each pollutant and the regional air quality attainment status.

The major source threshold under PSD depends upon the type of facility. A facility is considered major source under PSD if it emits or has the potential-to-emit any criteria pollutant greater than 100 tpy if it belongs to one of the 28 categories of stationary sources listed under 40 CFR 52.21 (b)(1)(i). The PSD major source threshold for all other source categories is 250 tons per year (tpy). The Facility is not one of the named 28 source categories, and therefore the applicable major source PSD threshold is 250 tpy. All of Pennsylvania is located within the Ozone Transport Region (OTR) and considered a moderate non-attainment area for ozone. Accordingly, the NNSR major source threshold for ozone precursors NO<sub>x</sub> and VOC are 100 and 50 tpy, respectively. Based on the Facility's PTE as documented in Section 2 as well as in Attachment B, PSD and NNSR major source thresholds will not be exceeded, and therefore NSR would not apply (USEPA, 2016c).

### 3.2 New Source Performance Standards

USEPA has established New Source Performance Standards (NSPS) under 40 CFR 60 that regulate air pollutant emissions from certain categories of stationary sources. For combustion sources, emission standards typically are expressed in terms of mass emissions per unit of fuel combusted, fuel quality, or exhaust gas concentration. Sources subject to a specific NSPS category are also subject to the general rules in 40 CFR 60, Subpart A. Applicability of the Facility source categories under 40 CFR 60 is discussed below for emission units included in the Facility (USEPA, 2016b).

- 40 CFR 60, Subpart Kb applies to storage vessels with a capacity greater than or equal to 75 cubic meters that is used to store volatile organic liquids for which construction, reconstruction, or modification is commenced after July 23, 1984. A 60-inch diameter by 20-foot-long (11.2 cubic meters) pressurized knock-out tank is proposed for the Facility. However, this vessel is exempt from Subpart Kb in accordance with 40 CFR §60.110b(d)(2), as a pressurized vessel designed to operate in excess of 204.9 kilopascals and without emissions to the atmosphere, and because the vessel capacity is less than 75 cubic meters.
- 40 CFR 60, Subpart OOOOa applies to certain types of natural gas and crude oil processing equipment, generally associated with the processing of natural gas, pipeline distribution of crude oil, or pipeline transportation of natural gas (USEPA, 2016b). The Facility is part of the NGL transmission system and is not considered an affected facility under Subpart OOOOa; therefore, Subpart OOOOa does not apply to the Facility.

### 3.3 National Emission Standards for Hazardous Air Pollutants

The National Emissions Standards for Hazardous Air Pollutants (NESHAP), codified in 40 CFR Parts 61 and 63, regulate HAP emissions. Part 61 was promulgated prior to the 1990 Clean Air Act Amendments (CAAA) and regulates only eight types of hazardous substances (asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride). The Facility is not in one of the source categories regulated by Part 61; therefore, the requirements of Part 61 are not applicable.

The 1990 CAAA established an initial list of 189 HAPs, resulting in the promulgation of 40 CFR Part 63. Part 63, also known as the Maximum Achievable Control Technology (MACT) standards, regulates HAP emissions from both major sources of HAP emissions, and non-major (area) sources of HAP emissions within specific source categories. Part 63 defines a major source of HAP as any "stationary source or group of stationary sources located within a contiguous area and under common control" that has the PTE 10 tpy of any single HAP or 25 tpy of HAPs in aggregate. The Facility HAP emissions are below these limits, and therefore, 40 CFR 63 is not applicable to the Facility.

### 3.4 Source Aggregation

Pursuant to PADEP guidance, two or more facilities may be considered a single source when they are under common control, operate on properties that are contiguous or adjacent to each other, have the same two-digit Standard Industrial Classification (SIC) Code and interact such that they are not

fully independent operations. Emissions from these sources must be aggregated and considered a single source to evaluate applicability with regards to permitting requirements under the PSD, NSR, and Title V programs. If the aggregate emissions from the sources meet or exceed a major source emission threshold under one of these permitting programs, then the aggregated source must obtain a major source permit under that program (PADEP, 2012).

Pennsylvania is considered a “moderate” ozone nonattainment area for NO<sub>x</sub> and VOCs because Pennsylvania is a jurisdiction in the OTR (Section 184 of the CAA). Therefore, an aggregation determination under NNSR would be determined on a case-by-case basis using the two-part test which considers whether the air contamination source or combination of sources are located on one or more contiguous or adjacent properties and whether the sources are owned or operated by the same person under common control. This case-by-case single source determination would apply to all sources irrespective of their separate status as “minor” or “major” air contamination sources. PADEP has developed a guidance document to assist in performing single stationary source determinations (PADEP, 2012). Within this guidance document, PADEP has developed a common sense approach in determining if sources are located on adjacent or contiguous properties and considers sources located within a quarter-mile distance to be considered contiguous or adjacent. Sources greater than a quarter-mile apart may be considered contiguous or adjacent on a case-by-case basis.

To determine if the under common control test is met, ownership of each of the operations is just one aspect in determining if the facilities are under common control. If a contract for service relationship exists between the two companies and/or if a support/dependency relationship exists, then this would constitute indirect control. USEPA has historically interpreted that an evaluation of common control must consider whether the facilities are functionally interrelated or interdependent of each other. As discussed in the Federal Register (USEPA, 2009), USEPA states that “To be ‘substantially related,’ there should be an apparent interconnection—either technically or economically—between the physical and/or operational changes, or a complementary relationship whereby a change at a plant may exist and operate independently, however its benefit is significantly reduced without the other activity.”

In determining whether the Mt. Union Station’s emissions should be aggregated with any other sources for the purpose of evaluating the applicability of the nonattainment NSR and Title V programs, initially one location was identified: the Shade Valley Road/Highway 35 Block Valve. Per the PADEP Southcentral Regional Office’s (SCRO’s) request, SPLP reviewed the area within 5.0 miles of the Mt. Union Station; no additional facilities for aggregation consideration were found during this review.

### **3.4.1 Shade Valley Road/Highway 35 Block Valve**

As presented in the RFD and referenced in the SOOP application, the distance between the Mt. Union Station and the Shade Valley Road/Highway 35 Block Valve is approximately 6.3 miles, which exceeds the ¼ mile “rule of thumb” in the PADEP guidance document (PADEP, 2012).

Furthermore, aggregation would not be appropriate because the two sites should not otherwise be considered “adjacent” or “contiguous” due to the lack of any interdependence between the Shade

Valley Road/Highway 35 Block Valve and the Mt. Union Station. The Shade Valley Road/Highway 35 Block Valve is an independently operated valve for isolating a section of pipeline for safety, environmental, or maintenance purposes, whereas the purpose of the Mt. Union Station is to maintain pipeline system pressure during the transportation of NGLs. Neither location is dependent upon the other to properly function. In fact, both locations could fully function even if the other is nonfunctional.

In short, the Mt. Union Station's emissions should not be aggregated with those from the Shade Valley Road/Highway 35 Block Valve because the two locations are not interdependent and are not in close proximity to one another, and therefore are neither "contiguous" nor "adjacent" for the purposes of aggregating air emissions.

### **3.5 Pennsylvania State Requirements**

Air pollution control regulations have been established by the PADEP for miscellaneous sources and air emissions associated with stationary sources. The sources of emissions for the proposed Facility modifications are not listed as regulated sources in 25 Pa. Code Chapters 123 and 129. The emissions of VOC and NO<sub>x</sub> from stationary sources are presented in this RFD; however, none of the sources are regulated by 25 Pa. Code Chapters 123 and 129.

#### **3.5.1 Best Available Technology**

Best Available Technology (BAT) is required for each source as part of a Plan Approval application per 25 Pa. Code §127.12(a)(5) and defined in 25 Pa. Code §121.1 as:

*"Equipment, devices, methods or techniques as determined by the Department which will prevent, reduce or control emissions of air contaminants to the maximum degree possible and which are available or may be made available."*

Because the estimated emissions for the proposed modifications at this Facility will not exceed de minimis thresholds, a Plan Approval application is not required to be prepared and BAT would not apply to these sources. However, it is understood that the final determination regarding permitting requirements is decided by PADEP. Additionally, SPLP has evaluated BAT for controlling emissions from the MOS sources. The two control devices that were evaluated to control the VOC and HAP emissions were an enclosed flare and a vapor recovery unit (VRU). The enclosed flare is a proven technology to effectively reduce the VOC and HAP emissions with a design DRE of 98%. SPLP did evaluate the use of a VRU to control the VOCs and HAPs; however, the VRU is not able to be utilized for this operation due to the associated high pressures of the NGL vapors and the inability to recycle any of the recovered condensate NGLs back into pipeline system. Therefore, a VRU was determined not to be technically feasible for the Facility. Based on this, the enclosed flare would be considered BAT for the Facility.

BAT for fugitive emissions from the NGL operations as a result of leaks from sealed surfaces from the operating equipment and pipelines was also evaluated. The potential source of fugitive emissions generated from the NGL streams include various equipment and their components such as connectors, flanges, valves, vents, sample ports, etc. SPLP will implement a leak detection and

repair program using audible, visual, and olfactory detection (AVO) methods on a monthly basis to satisfy BAT for fugitive emissions, which is consistent with previous SOOPs issued by PADEP for similar SPLP facilities. Facility personnel will conduct monthly inspections for visible stack emissions, fugitive emissions, and malodors. This stack emission observation will not be required to be performed by a person certified as a qualified observer under USEPA Method 9 for Visual Determination of the Opacity of Emissions from Stationary Sources. Records of each inspection will be maintained on site for a period of five (5) years and available upon request. The inspection records will identify each leak and the time until it is repaired.

### **3.5.2 Permit Applicability**

To determine the permit applicability, potential emissions were estimated as set forth in this RFD. Emission estimates associated with this RFD are presented in Attachment B. The emissions estimates were then compared to the Mt. Union Station August 2016 Addendum PTE Values to determine 25 Pa. Code §127.449(d) applicability. Details of this evaluation follow.

The existing Mt. Union Station is considered a minor source for all pollutants and is to operate under pending SOOP 31-03036. The RFD values, updated PTE estimates in the August 2016 Addendum, and the proposed net change to the Facility PTE are summarized in Section 2 of this document and in comparison with 25 PA Code §127.449(d).

Based upon this evaluation as presented in Section 2 of this document, the net potential emission change for each pollutant does not exceed the emission rates set forth by 25 PA Code §127.449(d) from a single facility during the term of the permit, that is, the potential emission changes are considered de minimis. SPLP requests that PADEP accept this RFD as a notification for a de minimis emission change to reflect the emission estimates presented in Attachment B. However, it is understood that the final determination regarding permitting requirements is decided by PADEP.

## **4 REFERENCES**

PADEP, 2012. Guidance for Performing Single Stationary Source Determinations for Oil and Gas Industries. Document Number 270-0810-006. October 6, 2012.

PADEP, 2013. Air Quality Permit Exemptions. Document Number 275-2101-003. July 26, 2003. Revised August 10, 2013.

USEPA, 1995. Protocol for Equipment Leak Emission Estimates. EPA-453/R-95-017, Table 2-3, November, 1995.

USEPA, 2009. Title 40 Code of Federal Regulations Parts 51 and 52, Prevention of Significant Deterioration (PSD) and Nonattainment New Source Review (NNSR): Aggregation and Project Netting. Federal Register Volume 74, No. 10, January 15, 2009, pages 2376-2383.

USEPA, 2015. AP-42. Compilation of Air Pollution Emission Factors, Volume I: Stationary Point and Area Sources, Section 13.5, Industrial Flares, Tables 13.5-1 and 13.5-2, Fifth Edition, April, 2015.

USEPA, 2016a. Title 40 CFR, Part 98, Subpart C. - Mandatory Greenhouse Gas Reporting, Appendix, Tables C-1 and C-2. February 22, 2016.

USEPA, 2016b. Title 40 CFR, Part 60. Standards of Performance for New Stationary Sources. April 4, 2016.

USEPA. 2016c. Title 40 CFR, Part 52. Approval and Promulgation of Implementation Plans. June 23, 2016.

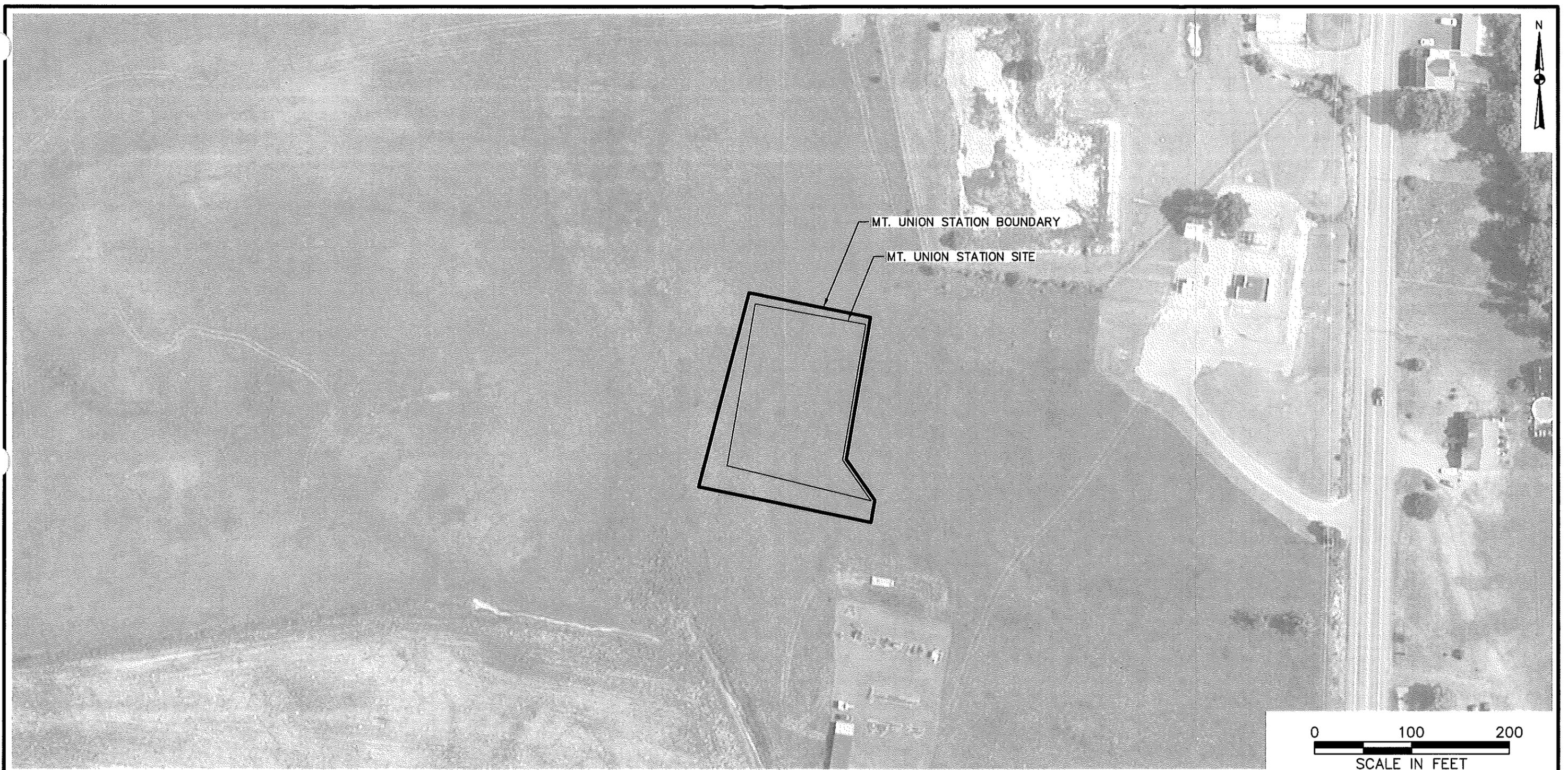
## 5 REQUEST FOR DETERMINATION

This submittal includes RFD forms associated with the emissions from flaring activities and fugitives. The supporting information associated with this RFD package includes the following:

- Figures
  - Figure 1 – Site Location Map
  - Figure 2 – Process Flow Diagram
- Attachment A – RFD Forms
- Attachment B – Air Emission Calculations

## Figures

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SUNOCO PIPELINE L.P.  
 HUNTINGDON COUNTY, PENNSYLVANIA  
 SITE LOCATION MAP  
 PENNSYLVANIA PIPELINE PROJECT  
 MT. UNION STATION

DATE:	9/25/15
PROJECT NO.:	112IC05958
DESIGNED BY:	MS
DRAWN BY:	NN
CHECKED BY:	TD
SHEET:	1 OF 1

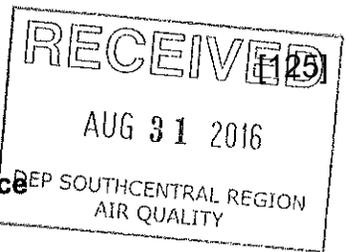
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**FIGURE 1**



**Attachment A – RFD Forms**

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**Request for Determination of Changes of Minor Significance  
and Exemption from Plan Approval/Operating Permit  
Under Pa Code §127.14 or §127.449**

**A. Type of Request**

**Exemption from Plan Approval**

Select all that apply (see Instructions):

<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-77119/2700-BK-DEP4103.pdf>

- Minor Sources or classes of sources, pursuant to 25 Pa. Code § 127.14(a)(1)-(7).
- Other sources and classes of sources of minor significance, pursuant to 25 Pa. Code § 127.14(a)(8).
- Physical changes to sources of minor significance, pursuant to 25 Pa. Code § 127.14(a)(9).
- Additional physical changes of minor significance that do not add new equipment, pursuant to 25 Pa. Code § 127.14(c)(1).
- Additional physical changes of minor significance that add new equipment, pursuant to 25 Pa. Code § 127.14(c)(2).
- Changes due to de minimis increases in emissions, pursuant to 25 Pa. Code § 127.449.

**Exemption from Operating Permit**

Select all that apply (see Instructions):

<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-77119/2700-BK-DEP4103.pdf>

- Other sources and classes of sources of minor significance, pursuant to 25 Pa. Code § 127.14(a)(8).
- Physical changes to sources of minor significance, pursuant to 25 Pa. Code § 127.14(a)(9).
- Additional physical changes of minor significance that do not add new equipment, pursuant to 25 Pa. Code § 127.14(c)(1).
- Additional physical changes of minor significance that add new equipment, pursuant to 25 Pa. Code § 127.14(c)(2).
- Changes due to de minimis increases in emissions, pursuant to 25 Pa. Code § 127.449.

(Must have valid operating permit conditions authorizing de minimis increases.)

**B. Facility/Company Information**

**Facility/Company Name:** Sunoco Pipeline, L.P.

**Plant Name (if applicable):** Mt. Union Station

**Site Address:** 15242 Croghan Pike, Shirley, PA 17260; Latitude: 40° 20' 43.0404" N, Longitude: -77° 51' 58.8672" W

**Municipality:** Shirley Township

**County:** Huntingdon

**Mailing Address (if different):** 535 Fritztown Road, Sinking Spring, PA 19608

**Federal Employer Identification Number (EIN) (if applicable):** 23-3102656

**Current Operating Permit No. (if applicable):** 31-03036 (pending)

**NAICS Code:** 493190

**Person Completing Form:** Valerie Plachy, P.E.

**Affiliation:** Tetra Tech, Inc.

**Address (if different from facility/company):**

400 Penn Center Blvd., Suite 200, Pittsburgh, PA 15235

**Telephone:** (412) 829 - 3610

**E-Mail:** Valerie.Plachy@tetrattech.com

**Facility/Company Contact Person:** Chris Embry

**Title:** Sr. Environmental Specialist

**Address (if different from facility/company):**

535 Fritztown Road  
Sinking Spring, PA 19608

**Telephone:** (610) 670 - 3237

**E-Mail:** CPEMBRY@sunocologistics.com

**C. Project Description**

**Project Type:**  New construction

Modification

Remediation

Other (see Instructions)

<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-77119/2700-BK-DEP4103.pdf>

**Total number of sources in project:** 3

**Description of project** (may include process description, site diagram, and any other pertinent information – see Instructions (<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-77119/2700-BK-DEP4103.pdf>) and attach supporting documents in Section F. as needed):

See attached report for a description of project and sources.

**Request for Determination of Changes of Minor Significance and Exemption from  
Plan Approval/Operating Permit Under 25 Pa. Code § 127.14 or §127.449**

**D. Source Description**

Complete a separate sheet for each source included in the project. For projects with more than one source, make additional copies of this page or download from DEP's Air Quality/Permits Web site ([www.depweb.state.pa.us](http://www.depweb.state.pa.us), keyword: Request for Determination.)

**Source Name:** Fugitives (FE-01)

**Source Category Code and Description** ([2700-BK-DEP4103.pdf](http://www.depweb.state.pa.us/dsweb/Get/Document-77119/2700-BK-DEP4103.pdf)): 50.007; Petroleum Refining Equipment Leaks/Fugitive Emissions

**Source location** (if source is portable, submit a separate Request For Determination (RFD) application for each operating location):  
Mt. Union Station

**Type:**  Stationary  Portable (Enter number of days in operation at this location: \_\_\_\_\_)  
Fugitives

**Is equipment existing or proposed?**  Existing  Proposed  
Actual or Planned Date of Installation: 10/15/2016

**Source Description** (see Instructions (<http://www.eibrary.dep.state.pa.us/dsweb/Get/Document-77119/2700-BK-DEP4103.pdf>) for examples of applicable information, attach supporting documents in Section F, and provide separate justification for any document designated as Confidential Business Information):

Fugitive sources include but are not limited to: emissions from sealed surfaces associated with equipment such as valve stems, flanges, and other miscellaneous component types. Fugitive emissions are a result of leaks from the sealed surfaces which contain the pipeline NGLs and are in service 24 hours per day. See attached document for more details regarding the facility operations.

Is the source subject to any New Source Performance Standards (NSPS) or National Emission Standards for Hazardous Air Pollutants (NESHAP) or Maximum Achievable Control Technology (MACT) standard? If yes, specify federal citation including Subpart.

Yes Subpart: \_\_\_\_\_  No

You must enter potential emissions below. If also reporting actual emissions, provide the actual emission amounts and calculations as attachment(s) in Section F. of this RFD.

Pollutant(s) (from Instructions)	Emissions (lbs/hr)*	Emissions (tons/year)*	Calculation Method Code Appendix B
PM	0.00	0.00	NA
PM-10	0.00	0.00	NA
PM-2.5	0.00	0.00	NA
SO <sub>x</sub>	0.00	0.00	NA
CO	0.00	0.00	NA
NO <sub>x</sub>	0.00	0.00	NA
VOC	0.02	0.10	9-EPA factors & 11-material balance
Total HAPs**	<0.01	0.01	9-EPA factors & 11-material balance

Will the construction or modification of this source increase emissions from other sources at the facility?  
 Yes (Describe and quantify emissions on separate sheet)  
 No

Is the construction or modification of the source subject to 25 Pa. Code, Chapter 127, Subchapter E, New Source Review (NSR) requirements or Prevention of Significant Deterioration (PSD) of Air Quality regulations at Subchapter D?  
 Yes  No

\* Must enter value or N/A  
\*\* For speciated HAPs (see Instructions (<http://www.eibrary.dep.state.pa.us/dsweb/Get/Document-77119/2700-BK-DEP4103.pdf>) for required speciated HAPs) or other pollutants, please attach additional sheets in Section F.

**Request for Determination of Changes of Minor Significance and Exemption from  
Plan Approval/Operating Permit Under 25 Pa. Code § 127.14 or §127.449**

**D. Source Description**

Complete a separate sheet for each source included in the project. For projects with more than one source, make additional copies of this page or download from DEP's Air Quality/Permits Web site ([www.depweb.state.pa.us](http://www.depweb.state.pa.us), keyword: Request for Determination.)

**Source Name:** Enclosed Flare (F-4610)

**Source Category Code and Description** ([2700-BK-DEP4103.pdf](http://www.depweb.state.pa.us/dsweb/Get/Document-77119/2700-BK-DEP4103.pdf)): 11.005; EXTERNAL COMBUSTION -- Natural Gas Combustion

**Source location** (if source is portable, submit a separate Request For Determination (RFD) application for each operating location):

Mt. Union Station

**Type:** Enclosed Flare     Stationary     Portable (Enter number of days in operation at this location: \_\_\_\_\_)

**Is equipment existing or proposed?**     Existing     Proposed

Actual or Planned Date of Installation: 10/15/2016

**Source Description** (see Instructions (<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-77119/2700-BK-DEP4103.pdf>) for examples of applicable information, attach supporting documents in Section F, and provide separate justification for any document designated as Confidential Business Information):

The existing enclosed flare is a John Zink Company LLC enclosed ZTOF model flare with a maximum heat input rating of 10 million British thermal units per hour (MMBtu/hr). The enclosed flare will be used to control VOC and HAP emissions associated with standard operating and maintenance operations scenarios associated with pipeline NGLs. The destruction and removal efficiency (DRE) of the flare is 98 percent (%) based upon the proposed manufacturer's (John Zink's) design. The flare will operate 24 hours per day. See attached document for more details regarding the facility operations.

Is the source subject to any New Source Performance Standards (NSPS) or National Emission Standards for Hazardous Air Pollutants (NESHAP) or Maximum Achievable Control Technology (MACT) standard? If yes, specify federal citation including Subpart.

Yes Subpart: \_\_\_\_\_     No

You must enter potential emissions below. If also reporting actual emissions, provide the actual emission amounts and calculations as attachment(s) in Section F. of this RFD.

Pollutant(s) (from Instructions)	Emissions (lbs/hr)*	Emissions (tons/year)*	Calculation Method Code Appendix B
PM	0.00	0.00	15 – AP-42
PM-10	0.00	0.00	15 – AP-42
PM-2.5	0.00	0.00	15 – AP-42
SO <sub>x</sub>	0.04	<0.01	11 - Material Balance
CO	4.00	0.05	15 – AP-42
NO <sub>x</sub>	0.88	0.01	15 – AP-42
VOC	12.20	0.16	15 – AP-42, 12 - Efficiency of Control Device
Total HAPs**	0.71	0.01	12 - Efficiency of Control Device

Will the construction or modification of this source increase emissions from other sources at the facility?

Yes (Describe and quantify emissions on separate sheet)  
 No

Is the construction or modification of the source subject to 25 Pa. Code, Chapter 127, Subchapter E, New Source Review (NSR) requirements or Prevention of Significant Deterioration (PSD) of Air Quality regulations at Subchapter D?

Yes     No

\* Must enter value or N/A

\*\* For speciated HAPs (see Instructions (<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-77119/2700-BK-DEP4103.pdf>) for required speciated HAPs) or other pollutants, please attach additional sheets in Section F.

**Request for Determination of Changes of Minor Significance and Exemption from  
Plan Approval/Operating Permit Under 25 Pa. Code § 127.14 or §127.449**

**D. Source Description**

Complete a separate sheet for each source included in the project. For projects with more than one source, make additional copies of this page or download from DEP's Air Quality/Permits Web site ([www.depweb.state.pa.us](http://www.depweb.state.pa.us), keyword: Request for Determination.)

**Source Name:** Knockout Drum (TK-9702)

**Source Category Code and Description** (2700-BK-DEP4103.pdf): 42.009; ORGANIC LIQUID STORAGE & MARKETING -- Volatile Organic Liquid Storage

**Source location** (if source is portable, submit a separate Request For Determination (RFD) application for each operating location): Mt. Union Station

**Type:**  Stationary  Portable (Enter number of days in operation at this location: \_\_\_\_\_)

**Is equipment existing or proposed?**  Existing  Proposed

Actual or Planned Date of Installation: 10/15/2016

**Source Description** (see Instructions (<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-77119/2700-BK-DEP4103.pdf>) for examples of applicable information, attach supporting documents in Section F, and provide separate justification for any document designated as Confidential Business Information):

A single tank for the collection of entrained liquid material prior to the vapors flowing to the flare. During standard and maintenance operations, the knockout tank will not have associated working or breathing losses, because it does not maintain a liquid level. Only SOS and MOS associated vapor emissions and fugitive emissions will be associated with this tank. Fugitive Emissions are addressed in the separate fugitive RFD form. SOS and MOS emissions are addressed in the separate flare RFD form. See attached application report document for more detail on the operations.

Is the source subject to any New Source Performance Standards (NSPS) or National Emission Standards for Hazardous Air Pollutants (NESHAP) or Maximum Achievable Control Technology (MACT) standard? If yes, specify federal citation including Subpart.

Yes Subpart: \_\_\_\_\_  No

You must enter potential emissions below. If also reporting actual emissions, provide the actual emission amounts and calculations as attachment(s) in Section F. of this RFD.

Pollutant(s) (from Instructions)	Emissions (lbs/hr)*	Emissions (tons/year)*	Calculation Method Code Appendix B
PM	NA	NA	NA
PM-10	NA	NA	NA
PM-2.5	NA	NA	NA
SO <sub>x</sub>	NA	NA	NA
CO	NA	NA	NA
NO <sub>x</sub>	NA	NA	NA
VOC	NA	NA	NA
Total HAPs**	NA	NA	NA

Will the construction or modification of this source increase emissions from other sources at the facility?

Yes (Describe and quantify emissions on separate sheet)  
 No

Is the construction or modification of the source subject to 25 Pa. Code, Chapter 127, Subchapter E, New Source Review (NSR) requirements or Prevention of Significant Deterioration (PSD) of Air Quality regulations at Subchapter D?

Yes  No

\* Must enter value or N/A

\*\* For speciated HAPs (see Instructions (<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-77119/2700-BK-DEP4103.pdf>) for required speciated HAPs) or other pollutants, please attach additional sheets in Section F.

**Request for Determination of Changes of Minor Significance and Exemption from  
Plan Approval/Operating Permit Under 25 Pa Code §127.14 or §127.449**

**E. Exemption History**

Identify all sources exempted within the last five years from plan approval/operating permit requirements for one of the following reasons: 1. Request for Determination (RFD), 2. Exemption List, or 3. De minimis emissions provisions of 25 Pa. Code §127.449 (see Instructions) (<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-77119/2700-BK-DEP4103.pdf>):

Source Name	Date of Installation	Reason for Exemption (check one)		
		RFD	Exemption List	De Minimis
Enclosed Flare	12/01/2014	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Pressurized Propane Storage Tank	12/01/2014	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Fugitives	12/01/2014	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**F. List of Attached Documents (see Instructions)** (<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-77119/2700-BK-DEP4103.pdf>)

List all supporting documents attached to this application. If any document contains Confidential Business Information (CBI), provide justification on separate attachment (see Instructions) (<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-77119/2700-BK-DEP4103.pdf>).

Confidential?	Description of Attachment
---------------	---------------------------

<input type="checkbox"/>	A document that provides the project description, facility layout, list of emission sources, emission estimation methodologies, estimates for potential emissions, and a regulatory review/applicability determination.
<input type="checkbox"/>	

**G. Signature of Responsible Person or Authorized Designee (see Instructions)**  
(<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-77119/2700-BK-DEP4103.pdf>)

I, Matthew L. Gordon, certify under penalty of law as provided in 18 Pa. C.S.A. § 4904 and 35 P.S. § 4009(b)(2) that based on information and belief formed after reasonable inquiry, the statements and information contained in this form are true, accurate, and complete.

Signature: 	Title: Principal Engineer	Date: 7/11/2016
Name (typed or printed): Matthew L. Gordon		Telephone: 610-670-3284



**Note: Please make a copy of this application and all attachments for your records and maintain all information related to this application for review by DEP.**

**OFFICIAL USE ONLY**

RFD #:

Date Received: \_\_\_\_\_

Reviewed By: \_\_\_\_\_

- A plan approval is not required for this source (See 25 Pa. Code Section 127.14(a)(1)-(9))
- An operating permit is not required for this source (See 25 Pa. Code Section 127.443(a))
- The source(s) do(es) not qualify for exemption. Applicant is required to submit a plan approval application.
- The source(s) do(es) not qualify for exemption. Applicant is required to submit an operating permit application.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Name and Title

Date \_\_\_\_\_

**Remarks:**

**Conditions:**

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**Attachment B – Air Emission Calculations**

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CLIENT: Sunoco Pipeline, L.P. (SPLP)					JOB NUMBER: 112IC05958.20				
SUBJECT: Mt. Union Station (98% DRE) Request for Determination (RFD) -- Comparison Tables for Post-Control Existing Equipment and Proposed Facility Overall Summary Table									
BASED ON: Emission Calculation Workbooks					DRAWING NUMBER: Not Applicable				
BY: VJPlachy		CHECKED BY: AMO'Bradovich			APPROVED BY:			DATE: 8/26/2016	

**Objective:** Summarize the controlled maximum hourly and annual emission rates.

1. **POST-CONTROL EMISSION ESTIMATES, PROPOSED FACILITY<sup>1</sup>**

Flared Emissions	Post-Controlled Maximum Hourly Emission Rate (lb/hr) - Proposed Facility									
	NO <sub>x</sub>	CO	VOC	PM/PM <sub>10f</sub> PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2e</sub>
Flared Emission Sources	0.88	4.00	12.20	N/C	0.04	0.71	1,840	0.13	0.01	1,850
Fugitive Sources	N/C	N/C	0.02	N/C	N/C	0.001	N/C	N/C	N/C	N/C
<b>TOTAL Hourly Flared Emissions:</b>	<b>0.88</b>	<b>4.00</b>	<b>12.22</b>	<b>N/C</b>	<b>0.04</b>	<b>0.71</b>	<b>1,840</b>	<b>0.13</b>	<b>0.01</b>	<b>1,850</b>

Flared Emissions	Post-Controlled Annual Average Emission Rate (tpy) - Proposed Facility									
	NO <sub>x</sub>	CO	VOC	PM/PM <sub>10f</sub> PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2e</sub>
Flared Emission Sources	0.01	0.05	0.16	N/C	0.001	0.01	24.90	0.002	0.0002	25.00
Fugitive Sources	N/C	N/C	0.10	N/C	N/C	0.01	N/C	N/C	N/C	N/C
<b>TOTAL Annual Flared Emissions:</b>	<b>0.01</b>	<b>0.05</b>	<b>0.26</b>	<b>N/C</b>	<b>&lt;0.01</b>	<b>0.02</b>	<b>24.90</b>	<b>&lt;0.01</b>	<b>&lt;0.01</b>	<b>25.00</b>

2. **POST-CONTROL EMISSION ESTIMATES, EXISTING EQUIPMENT<sup>1</sup>**

Flared Emissions	Post-Control Maximum Hourly Emission Rate (lb/hr) - Existing Equipment									
	NO <sub>x</sub>	CO	VOC	PM/PM <sub>10f</sub> PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2e</sub>
Flared Emission Sources	0.88	4.02	12.22	N/C	0.04	0.00004	1,852	0.13	0.01	1,862
Fugitive Sources	N/C	N/C	0.03	N/C	N/C	N/C	N/C	N/C	N/C	N/C
<b>TOTAL Hourly Flared Emissions:</b>	<b>0.88</b>	<b>4.02</b>	<b>12.25</b>	<b>N/C</b>	<b>0.04</b>	<b>&lt;0.01</b>	<b>1,852</b>	<b>0.13</b>	<b>0.01</b>	<b>1,862</b>

Flared Emissions	Post-Control Annual Average Emission Rate (tpy) - Existing Equipment									
	NO <sub>x</sub>	CO	VOC	PM/PM <sub>10f</sub> PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2e</sub>
Flared Emission Sources	0.06	0.25	0.65	N/C	0.002	0.0002	111.70	0.01	0.001	112.30
Fugitive Sources	N/C	N/C	0.15	N/C	N/C	N/C	N/C	N/C	N/C	N/C
<b>TOTAL Annual Flared Emissions:</b>	<b>0.06</b>	<b>0.25</b>	<b>0.80</b>	<b>N/C</b>	<b>&lt;0.01</b>	<b>&lt;0.01</b>	<b>111.70</b>	<b>0.01</b>	<b>&lt;0.01</b>	<b>112.30</b>

3. **OVERALL POST-CONTROL EMISSION ESTIMATES<sup>1</sup>**

Flared Emissions	Post-Controlled Maximum Hourly Emission Rate (lb/hr) <sup>2</sup>									
	NO <sub>x</sub>	CO	VOC	PM/PM <sub>10f</sub> PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2e</sub>
Flared Emission Sources	0.88	4.02	12.22	N/C	0.04	0.71	1,852	0.13	0.01	1,862
Fugitive Sources	N/C	N/C	0.05	N/C	N/C	0.001	N/C	N/C	N/C	N/C
<b>TOTAL Hourly Flared Emissions:</b>	<b>0.88</b>	<b>4.02</b>	<b>12.27</b>	<b>N/C</b>	<b>0.04</b>	<b>0.71</b>	<b>1,852</b>	<b>0.13</b>	<b>0.01</b>	<b>1,862</b>

Flared Emissions	Post-Controlled Annual Average Emission Rate (tpy) <sup>3</sup>									
	NO <sub>x</sub>	CO	VOC	PM/PM <sub>10f</sub> PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2e</sub>
Flared Emission Sources	0.07	0.30	0.81	N/C	0.003	0.01	136.60	0.01	0.001	137.30
Fugitive Sources	N/C	N/C	0.25	N/C	N/C	0.01	N/C	N/C	N/C	N/C
<b>TOTAL Annual Flared Emissions:</b>	<b>0.07</b>	<b>0.30</b>	<b>1.06</b>	<b>N/C</b>	<b>&lt;0.01</b>	<b>0.02</b>	<b>136.60</b>	<b>0.01</b>	<b>&lt;0.01</b>	<b>137.30</b>

**NOTE:**

1. The emission estimate workbooks employ the "precision as displayed" option in Excel®; therefore, only the displayed significant figure are applied in the calculations. The minor impacts may occurred to emission estimates by utilizing this Excel® function/option.
2. The maximum hourly emission rate is based upon the flare capacity selecting the worst case for each pollutant.
3. The annual average emission rate is the sum of annual average emission rates for the existing equipment and the proposed facility modifications.

CLIENT: Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER: 112IC05958.20	
SUBJECT: Mt. Union Station (98% DRE) Request for Determination (RFD) -- Comparison Tables for Post-Control Existing Equipment and Proposed Facility Overall Summary Table			
BASED ON: Emission Calculation Workbooks		DRAWING NUMBER: Not Applicable	
BY: VJPlachy	CHECKED BY: AMO'Bradovich	APPROVED BY:	DATE: 8/26/2016
<p><b>Terminology/Acronyms</b></p> <ul style="list-style-type: none"> <li>CH<sub>4</sub> = methane</li> <li>CO = carbon monoxide</li> <li>CO<sub>2e</sub> = carbon dioxide equivalent</li> <li>HAP = hazardous air pollutant</li> <li>N<sub>2</sub>O = nitrogen dioxide</li> <li>NO<sub>x</sub> = oxides of nitrogen</li> <li>PM = particulate matter</li> <li>PM<sub>2.5</sub> = particles with an aerodynamic diameter less than or equal to 2.5 micrometers</li> <li>PM<sub>10</sub> = particles with an aerodynamic diameter less than or equal to 10 micrometers</li> <li>SO<sub>x</sub> = oxides of sulfur</li> <li>VOC = volatile organic compound</li> </ul>			

CLIENT: Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER: 112IC05958.20	
SUBJECT: Mt. Union Station (98% DRE) Request for Determination (RFD) -- Proposed Equipment Overall Project Summary Table			
BASED ON: Emission Calculation Workbooks		DRAWING NUMBER: Not Applicable	
BY: VJPlachy	CHECKED BY: AMO'Bradovich	DATE:	8/12/2016

**Objective:** Summarize the controlled maximum hourly and annual emission rates.

1. **PRE-CONTROL EMISSION ESTIMATES**

Emissions Source	Pre-Control Maximum Hourly Emission Rate [pounds per hour (lb/hr)]									
	NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
Control Device (Flare):	N/C	N/C	609.00	N/C	N/C	35.70	N/C	N/C	N/C	N/C
Fugitives:	N/C	N/C	0.02	N/C	N/C	0.001	N/C	N/C	N/C	N/C
<b>TOTAL MAXIMUM HOURLY:</b>	N/C	N/C	609.02	N/C	N/C	35.70	N/C	N/C	N/C	N/C

Emissions Source	Pre-Control Annual Average Emission Rate [tons per year (tpy)]									
	NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
Control Device (Flare):	N/C	N/C	8.22	N/C	N/C	0.48	N/C	N/C	N/C	N/C
Fugitives:	N/C	N/C	0.10	N/C	N/C	0.01	N/C	N/C	N/C	N/C
<b>TOTAL ANNUAL AVERAGE:</b>	N/C	N/C	8.32	N/C	N/C	0.49	N/C	N/C	N/C	N/C

2. **POST-CONTROL EMISSION ESTIMATES**

Emission Source	Post-Controlled Maximum Hourly Emission Rate (lb/hr)									
	NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
Control Device (Flare):	0.88	4.00	12.20	N/C	0.04	0.71	1,840	0.13	0.01	1,850
Fugitives:	N/C	N/C	0.02	N/C	N/C	0.001	N/C	N/C	N/C	N/C
<b>TOTAL MAXIMUM HOURLY:</b>	0.88	4.00	12.22	N/C	0.04	0.71	1,840	0.13	0.01	1,850

Emission Source	Post-Controlled Annual Average Emission Rate (tpy)									
	NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
Control Device (Flare):	0.01	0.05	0.16	N/C	0.001	0.01	24.90	0.002	0.0002	25.00
Fugitives:	N/C	N/C	0.10	N/C	N/C	0.01	N/C	N/C	N/C	N/C
<b>TOTAL ANNUAL AVERAGE:</b>	0.01	0.05	0.26	N/C	<0.01	0.02	24.90	<0.01	<0.01	25.00

**NOTE:**

The emission estimate workbooks employ the "precision as displayed" option in Excel®; therefore, only the displayed significant figure are applied in the calculations. The minor impacts may occurred to emission estimates by utilizing this Excel® function/option.

**Terminology/Acronyms**

- CH<sub>4</sub> = methane
- CO = carbon monoxide
- CO<sub>2</sub>e = carbon dioxide equivalent
- HAP = hazardous air pollutant
- N/C = Not Calculated because it is not a pollutant associated with the source
- N<sub>2</sub>O = nitrogen dioxide
- NO<sub>x</sub> = oxides of nitrogen
- PM = particulate matter
- PM<sub>2.5</sub> = particles with an aerodynamic diameter less than or equal to 2.5 micrometers
- PM<sub>10</sub> = particles with an aerodynamic diameter less than or equal to 10 micrometers
- SO<sub>x</sub> = oxides of sulfur
- VOC = volatile organic compound

CLIENT: Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER: 112IC05958.20	
SUBJECT: Mt. Union Station (98% DRE) Request for Determination (RFD) -- Proposed Equipment Flare Summary Table			
BASED ON: Emission Calculation Workbooks		DRAWING NUMBER: Not Applicable	
BY: VJPlachy	CHECKED BY: AMO'Bradovich	DATE: 7/21/2016	

**Objective:** Present the Maximum Short Term and Annual Emission Rates for the Updated emission estimates .

**PRE-CONTROL EMISSION ESTIMATES**

Emission Scenario	Pre-Controlled Maximum Hourly Emission Rate (lb/hr)									
	NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
Standard Operating Scenario	N/C	N/C	N/C	N/C	N/C	N/C	N/C	N/C	N/C	N/C
Maintenance Operations Scenario	N/C	N/C	6.09E+02	N/C	N/C	3.57E+01	N/C	N/C	N/C	N/C
<b>TOTAL MAXIMUM HOURLY:</b>	N/C	N/C	609.00	N/C	N/C	35.70	N/C	N/C	N/C	N/C

Emission Scenario	Pre-Controlled Annual Emission Rate (tpy)									
	NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
Standard Operating Scenario	N/C	N/C	N/C	N/C	N/C	N/C	N/C	N/C	N/C	N/C
Maintenance Operations Scenario	N/C	N/C	8.22E+00	N/C	N/C	4.82E-01	N/C	N/C	N/C	N/C
<b>TOTAL ANNUAL AVERAGE:</b>	N/C	N/C	8.22	N/C	N/C	0.48	N/C	N/C	N/C	N/C

**POST-CONTROL EMISSION ESTIMATES**

Emission Scenario	Post-Controlled Maximum Hourly Emission Rate (lb/hr)									
	NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
Standard Operating Scenario	N/C	N/C	N/C	N/C	N/C	N/C	N/C	N/C	N/C	N/C
Maintenance Operations Scenario	8.80E-01	4.00E+00	1.22E+01	N/C	4.00E-02	7.10E-01	1.84E+03	1.30E-01	1.00E-02	1.85E+03
<b>TOTAL MAXIMUM HOURLY:</b>	0.88	4.00	12.20	N/C	0.04	0.71	1,840	0.13	0.01	1,850

Emission Scenario	Post-Controlled Annual Emission Rate (tpy)									
	NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
Standard Operating Scenario	N/C	N/C	N/C	N/C	N/C	N/C	N/C	N/C	N/C	N/C
Maintenance Operations Scenario	1.00E-02	5.00E-02	1.60E-01	N/C	5.00E-04	1.00E-02	2.49E+01	2.00E-03	2.00E-04	2.50E+01
<b>TOTAL ANNUAL AVERAGE:</b>	0.01	0.05	0.16	N/C	0.001	0.01	24.90	0.002	0.0002	25.00

N/C = not calculated

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20	[139]
SUBJECT Mt. Union Station (98% DRE) Request for Determination (RFD) -- Proposed Equipment Enclosed Flare Emission Calculations: Standard Operating Scenario Emission Sources			
BASED ON SPLP Equipment Data / Specifications		DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE 5/23/2016

**Objective:** Develop example calculations: Maximum Hourly, Maximum Daily, and Annual Average Emission Rates for the proposed Standard Operating Scenario Emission Streams.

**Inputs and Assumptions:**

- Potential stream products to the enclosed flare consistent of butane, propane, ethane, and/or LPG.
- Sources of standard operating scenario emission sources to the enclosed flare that were evaluated included: chromatographs (GC), relief valves (RV), and booster, injection, and feed pump seals (Pump).
- Maintenance intermittent emission sources to the enclosed flare that were evaluated include: gas releases from filter cleaning, prover maintenance, pigging events, and miscellaneous maintenance activities.  
Maintenance activity emission estimates will be presented in another calculation sheet.
- Stream physical properties that result in the highest potential emission rates have been used.
- Hourly flow to flare from Standard Operating Scenario Emission Streams:
 

RV (FR <sub>RV-scf/hr</sub> ):	0.00	scf/hr	→	0 scf/yr	No RVs to flare for this station
GC (FR <sub>GC-scf/hr</sub> ):	0.00	scf/hr	→	0 scf/yr	No GCs to flare for this station.
Booster Pumps (FR <sub>BostPmp-scf/hr</sub> )	0.00	scf/hr	→	0 scf/yr	No Booster Pump Seals to flare for this station
Injection Pumps (FR <sub>InjPmp-scf/hr</sub> )	0.00	scf/hr	→	0 scf/yr	No Injection Pump Seals to flare for this station.
Feed Pumps (FR <sub>FeedPmp-scf/hr</sub> )	0.00	scf/hr	→	0 scf/yr	No Feed Pump Seals to flare for this station.
Pump (FR <sub>total-scf/hr</sub> ):	0.00	scf/hr	→	0 scf/yr	
- Because the enclosed flare is considered to be 100% smokeless, particulate matter (PM) emissions are assumed to be negligible.
- The flare's destruction and removal efficiency (DRE) for VOCs and HAPs only: 98 percent (%)  
The flare does not reduce/control NO<sub>x</sub>, CO, SO<sub>x</sub>, CO, CH<sub>4</sub>, N<sub>2</sub>O, or CO<sub>2</sub>e emissions, that is, pre-control emissions equal post-control emissions.
- Flare Emission Factors (EFs)

NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> /PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub>		CH <sub>4</sub>	N <sub>2</sub> O
						butane	propane		
(lb/MMBtu)			(ppmw)			(kg/MMBtu)			
0.068	0.310	0.570	0	30	TBD	64.77	62.87	0.003	0.0006

**AND ABBREVIATIONS / ACRONYMS "Standard Inputs" WORKSHEET TAB.**

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20		[140]
SUBJECT Mt. Union Station (98% DRE) Request for Determination (RFD) -- Proposed Equipment Enclosed Flare Emission Calculations: Standard Operating Scenario Emission Sources				
BASED ON SPLP Equipment Data / Specifications			DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE	5/23/2016

**Inputs and Assumptions (Continued):**

- 9. Oxides of Sulfur (SO<sub>x</sub>) emissions are:  
 Based on the sulfur content of the stream.  
 Assume SO<sub>x</sub> as SO<sub>2</sub>.  
 Assumes that all the all fuel sulfur converts to SO<sub>2</sub>.

- 10. CO<sub>2</sub>e Global Warming Potential EFs (EF<sub>GWP</sub>)

CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O
1	25	298

CO<sub>2</sub>e emission estimates use the following carbon equivalence factors: 25 for CH<sub>4</sub>, and 298 for N<sub>2</sub>O from 40 CFR Part 98, Subpart A, Table A-1.

- 11. Maximum emission stream flow rates are achieved when assuming a stream composition of 100 weight percent (wt%) butane.
- 12. HAPs are generated from propane burned as pilot gas and are contained in the LPG stream.
- 13. LPG HAP content (HAPs<sub>wt%</sub>): 5.86 wt%
- 14. Operating service factor (OSF), that is, percent of the year the unit is operating: 100 %

**Calculations:**

**STANDARD OPERATING SCENARIO EMISSION SOURCES**

- 1. Calculate the SO<sub>x</sub> Emission Factor (EF) in pounds per standard cubic feet (lb/scf) for butane.

$$\begin{aligned}
 EF_{SO_x(lb/scf)} &= [(mole\ of\ the\ gas\ stream)] * [(concentration\ of\ sulfur\ in\ gas\ stream)] * [(molar\ ratio\ of\ SO_2\ to\ S)] \\
 &= [(lb\ of\ gas\ stream) * (MW\ gas\ stream)] \\
 &\quad * [(concentration\ of\ sulfur\ in\ gas\ stream)] * [(molar\ ratio\ of\ SO_2\ to\ S)] \\
 &= [(volume\ of\ gas\ stream\ as\ butane) * (MW\ butane)] \\
 &\quad * [(concentration\ of\ sulfur\ ppmw) / (CF_{ppmw-wt\%}) / (CF_{wt\%-DecEq})] * [(MW\ SO_2) / (MW\ S)] \\
 &= [(CF_{lb\_mol-scf}) * (MW_{butane})] * [(SO_2-ppmw) / (CF_{ppmw-wt\%}) / (CF_{wt\%-DecEq})] * [(MW\ SO_2) / (MW\ S)] \\
 &= \left[ \frac{1\ lb-mol}{379.5\ scf} \right] \left[ \frac{58.12\ lb-butane}{1\ lb-mole\ gas\ stream\ (butane)} \right] \left[ \frac{30\ ppmw\ S}{10,000\ ppmw} \right] \left[ \frac{1\ \%}{100\ \%} \right] \left[ \frac{1\ DecEq}{100\ \%} \right] \left[ \frac{64.07\ lb\ SO_2/lb-mol}{32.07\ lb-S/lb-mol} \right] \\
 &= 9.18E-06\ lb\ SO_2/cf\ of\ the\ gas\ stream \quad = \quad 9.18E-06\ lb\ SO_x/cf\ of\ the\ gas\ stream
 \end{aligned}$$

- 2. Calculate the total standard operating scenario flow to the flare in scf/hr (Flow<sub>Std-scf/hr</sub>).

$$\begin{aligned}
 Flow_{Std-scf/hr} &= [\sum\ Standard\ Operating\ Scenario\ Flow\ Rates\ to\ the\ Flare] \\
 &= (Flow\ from\ the\ GCs) + (Flow\ from\ RVs) + (Flow\ from\ Pumps) \\
 &= 0.00 + 0.00 + 0.00\ scf/hr = 0.00\ scf/hr\ standard\ operating\ scenario\ flow
 \end{aligned}$$

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20 [141]	
SUBJECT Mt. Union Station (98% DRE) Request for Determination (RFD) -- Proposed Equipment Enclosed Flare Emission Calculations: Standard Operating Scenario Emission Sources			
BASED ON SPLP Equipment Data / Specifications		DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich	DATE 5/23/2016	

**Calculations (Continued):**

**STANDARD OPERATING SCENARIO EMISSION SOURCES**

3. Calculate the flow rate (FR) from the standard operating scenario sources to the flare in MMBtu/hr.

For the RVs as an example:

$$Flow_{Std-MMBtu/hr} = (FR_{Std-scf/hr}) * (HHV_{Butane}) / (CF_{Btu-MMBtu})$$

$$= \left| \frac{0.00 \text{ scf}}{\text{hr}} \right| \left| \frac{3,244 \text{ Btu}}{1 \text{ scf}} \right| \left| \frac{1 \text{ MMBtu}}{1E+06 \text{ Btu}} \right| = 0.00E+00 \text{ MMBtu}_{Std} / \text{hr}$$

4. Convert emission factor from kg/MMBtu to lb/MMBtu.

Using butane CO<sub>2</sub> as an example:

$$EF_{CO_2(lb/MMBtu)} = [EF_{CO_2(kg/MMBtu)}] / (CF_{kg-lb})$$

$$= \left| \frac{64.77 \text{ kg}}{\text{MMBtu}} \right| \left| \frac{1 \text{ lb}}{0.4536 \text{ kg}} \right| = 142.79 \text{ lb CO}_2 / \text{MMBtu}$$

EF										EF <sub>GWP</sub>		
NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub>		CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O
						butane	propane					
(lb/MMBtu)			(lb/scf)		(lb/MMBtu)				N/A			
0.068	0.310	0.57	N/A	9.18E-06	N/A	142.79	138.60	0.01	0.001	1	25	298

**NOTE:**

Because the EF for butane CO<sub>2</sub> is greater than the EF for propane CO<sub>2</sub>, the butane CO<sub>2</sub> emission factor will be applied to estimate the maximum hourly, maximum daily, and annual average emission rates.

**STANDARD OPERATING SCENARIO EMISSION SOURCES: Pre-control Emission Estimate**

5. Calculate the VOC flow rate from the standard operating scenario sources before controls (F-pre<sub>VOC</sub>) in lb/hr.

a. For the GCs, the RVs, the Booster pumps, the Injection pumps, and the Feed Pumps.

$$F\text{-pre}_{VOC\text{-lb/hr}} = (Flow_{Std-scf/hr}) / (CF_{scf-lb-mol}) * (MW_{butane})$$

$$= \left| \frac{0.00 \text{ scf}}{\text{hr}} \right| \left| \frac{1 \text{ lb-mol}}{379.5 \text{ scf}} \right| \left| \frac{58.12 \text{ lb}}{1 \text{ lb-mole}} \right| = 0.000 \text{ lb/hr}$$

6. Calculate the EF for HAPs in pounds per scf (lb/scf).

$$EF_{HAPs(lb/scf)} = (HAPs_{wt\%}) / (CF_{wt\%-DecEq}) * (MW_{butane}) / (CF_{scf-lb/mol})$$

$$= \left| \frac{5.86 \text{ wt\%}}{100 \text{ wt\%}} \right| \left| \frac{1 \text{ DecEq}}{100 \text{ wt\%}} \right| \left| \frac{58.12 \text{ lb}}{\text{lb-mol}} \right| \left| \frac{1 \text{ lb-mol}}{379.5 \text{ scf}} \right| = 0.009 \text{ lb HAPs/scf}$$

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20		[142]
SUBJECT Mt. Union Station (98% DRE) Request for Determination (RFD) -- Proposed Equipment Enclosed Flare Emission Calculations: Standard Operating Scenario Emission Sources				
BASED ON SPLP Equipment Data / Specifications			DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE 5/23/2016	

**STANDARD OPERATING SCENARIO EMISSION SOURCES: Pre-control Emission Estimate (Continued):**

7. Calculate HAPs the flow rate from the standard operating scenario sources before controls (ER-pre<sub>HAPs</sub>) in lb/hr.

$$ER\text{-pre}_{HAPs\text{-lb/hr}} = (Flow_{Std\text{-scf/hr}}) * (ER_{HAPs\text{-lb/scf}})$$

$$= [(FR_{GC\text{-scf/hr}}) + (FR_{RV\text{-scf/hr}}) + (FR_{Pump\text{-scf/hr}})] * (ER_{HAPs\text{-lb/scf}})$$

$$= \left\| \left\| \begin{array}{c} 0.00 \\ \text{scf} \\ \text{hr} \end{array} \right\| \left\| \begin{array}{c} 0.009 \text{ lb} \\ 1 \text{ scf} \end{array} \right\| \right\| = 0.00E+00 \text{ lb HAPs/hr}$$

Pre-Control Maximum Hourly Emission Rate (ER) (lb/hr)									
NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
N/C	N/C	0.00E+00	N/C	N/C	N/C	N/C	N/C	N/C	N/C

Pre-Control Annual Average ER (tpy)									
NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
N/C	N/C	0.00E+00	N/C	N/C	N/C	N/C	N/C	N/C	N/C

**POST CONTROLS**

**STANDARD OPERAING SCENARIO EMISSION SOURCES: Post-control Emission Estimate**

8. Calculate the Maximum Hourly emission rate for SO<sub>x</sub> ER<sub>MaxHrlySO<sub>x</sub></sub>

$$ER_{MaxHrlySOx} = (Flow_{Std\text{-scf/hr}}) * (EF_{NOx})$$

$$= \left\| \left\| \begin{array}{c} 0.00 \\ \text{scf} \\ \text{hr} \end{array} \right\| \left\| \begin{array}{c} 9.18E-06 \text{ lb} \\ \text{scf} \end{array} \right\| \right\| = 0.00E+00 \text{ lb SO}_x \text{/hr}$$

9. Calculate the pre-control Annual Average emission rate for the remaining pollutants in tons per year (tpy).  
Using NO<sub>x</sub> as an example:

$$ER\text{-pre}_{AnnAvgNOx} = (ER_{MaxHrlyNOx}) * (CF_{hours\text{-year}}) * (OSF) / (CF_{\%DecEq}) / (CF_{lb\text{-tons}})$$

$$= \left| \frac{0.00E+00 \text{ lb}}{1 \text{ hr}} \right| \left| \frac{8,760 \text{ hr}}{1 \text{ year}} \right| \left| \frac{100 \%}{100 \%} \right| \left| \frac{1 \text{ DecEq}}{2,000 \text{ lb}} \right| \left| \frac{1 \text{ ton}}{1} \right| = 0.00E+00 \text{ tpy of NO}_x$$

10. Calculate the maximum hourly emission rate ER<sub>MaxHrly</sub>

Using NO<sub>x</sub> as an example:

$$ER_{MaxHrlyNOx} = (EF_{NOx}) * (Flow_{Std\text{-MMBtu/hr}})$$

$$= \left| \frac{0.068 \text{ lb}}{\text{MMBtu}} \right| \left| \frac{0.00E+00 \text{ MMBtu}}{\text{hr}} \right| = 0.00E+00 \text{ lb NO}_x \text{/hr}$$

11. Calculate the maximum hourly emission rate for CO<sub>2</sub>e based on CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O emission rates.

$$ER_{MaxHrlyCO2e} = \sum \{ [(CO_{2\text{-lb/hr}}) * (EF_{CO2\_GWP})] + [(CH_{4\text{-lb/hr}}) * (EF_{CH4\_GWP})] + [(N_{2O\text{-lb/hr}}) * (EF_{N2O\_GWP})] \}$$

$$= \left\| \left\| \begin{array}{c} 0.00E+00 \text{ lb} \\ \text{hr} \end{array} \right\| \left\| \begin{array}{c} 1 \\ \text{hr} \end{array} \right\| \right\| + \left\| \left\| \begin{array}{c} 0.00E+00 \text{ lb} \\ \text{hr} \end{array} \right\| \left\| \begin{array}{c} 25 \\ \text{hr} \end{array} \right\| \right\| + \left\| \left\| \begin{array}{c} 0.00E+00 \text{ lb} \\ \text{hr} \end{array} \right\| \left\| \begin{array}{c} 298 \\ \text{hr} \end{array} \right\| \right\| = 0.00E+00 \text{ lb/hr}$$

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20		[143]
SUBJECT Mt. Union Station (98% DRE) Request for Determination (RFD) -- Proposed Equipment Enclosed Flare Emission Calculations: Standard Operating Scenario Emission Sources				
BASED ON SPLP Equipment Data / Specifications			DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE	5/23/2016

**POST CONTROLS**

**STANDARD OPERAING SCENARIO EMISSION SOURCES: Post-control Emission Estimate (Continued)**

12. Calculate the maximum hourly VOC flow rate (FR) from the standard operating scenario sources in lb/hr.

$$Flow_{VOC-lb/hr} = (Flow_{Std-scf/hr}) / (CF_{scf-lb-mol}) * (MW_{butane}) * [1 - (DRE / CF_{\%DecEq})]$$

$$= \left| \frac{0.00 \text{ scf}}{\text{hr}} \right| \left| \frac{1 \text{ lb-mol}}{379.5 \text{ scf}} \right| \left| \frac{58.12 \text{ lb}}{\text{lb-mole}} \right| \left| 1 - \left| \frac{98 \%}{100 \%} \right| \right| = 0.00E+00 \text{ lb VOC/hr}$$

13. Calculate the maximum hourly HAPs flow rate (FR) from the standard operating scenario sources in lb/hr.

$$Flow_{HAPs-lb/hr} = (Flow_{Std-scf/hr}) * (EF_{HAPs(lb/scf)}) * [1 - (DRE / CF_{\%DecEq})]$$

$$= \left| \frac{0.00 \text{ scf}}{\text{hr}} \right| \left| \frac{0.009 \text{ lb}}{1 \text{ scf}} \right| \left| 1 - \left| \frac{98 \%}{100 \%} \right| \right| = 0.00E+00 \text{ lb HAPs/hr}$$

14. Calculate CO<sub>2</sub> the flow rate (FR) from the standard operating scenario sources in lb/hr.

$$Flow_{CO2-lb/hr} = (Flow_{Std\_MMBtu/hr}) * (EF_{CO2-lb/MMBtu})$$

$$= \left| \frac{0.00E+00 \text{ lb}}{\text{MMBtu}} \right| \left| \frac{142.79 \text{ MMBtu}}{\text{MMBtu}} \right| = 0.00E+00 \text{ lb CO}_2\text{/hr}$$

Post Control Maximum Short Term Hourly Emission Rate (lb/hr)									
NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
0.00E+00	0.00E+00	0.00E+00	N/C	0.00E+00	N/C	0.00E+00	0.00E+00	0.00E+00	0.00E+00

15. Calculate the daily maximum emission rate ER<sub>MaxDaily</sub>.

Using NO<sub>x</sub> as an example:

$$ER_{MaxDailyNOx} = (ER_{MaxStTmNOx}) * (CF_{hours-day})$$

$$= \left| \frac{0.00E+00 \text{ lb}}{1 \text{ hr}} \right| \left| \frac{24 \text{ hr}}{1 \text{ day}} \right| = 0.00E+00 \text{ lb NO}_x\text{/day}$$

Post Maximum Daily Emission Rate (lb/day)									
NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
0.00E+00	0.00E+00	0.00E+00	N/C	0.00E+00	N/C	0.00E+00	0.00E+00	0.00E+00	0.00E+00

16. Calculate the annual average emission rate for the remaining pollutants in tons per year (tpy).

Using NO<sub>x</sub> as an example:

$$ER_{AnnNOx} = (ER_{MaxShTmNOx}) * (CF_{hours-year}) * (OSF) / (CF_{\%DecEq}) / (CF_{lb-tons})$$

$$= \left| \frac{0.00E+00 \text{ lb}}{1 \text{ hr}} \right| \left| \frac{8,760 \text{ hr}}{1 \text{ year}} \right| \left| \frac{100 \%}{100 \%} \right| \left| \frac{1 \text{ DecEq}}{2,000 \text{ lb}} \right| \left| \frac{1 \text{ ton}}{\text{ton}} \right| = 0.00E+00 \text{ NO}_x\text{ tpy}$$

Annual Emission Rate (tpy)									
NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
0.00E+00	0.00E+00	0.00E+00	N/C	0.00E+00	N/C	0.00E+00	0.00E+00	0.00E+00	0.00E+00

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20 [144]	
SUBJECT Mt. Union Station (98% DRE) Request for Determination (RFD) -- Proposed Equipment Enclosed Flare Emission Calculations: Maintenance Operations Scenario Emissions Sources			
BASED ON SPLP provided equipment volume/specification for the maximum anticipated maintenance operation scenarios		DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich	DATE	5/23/2016

**Objective:** Develop example calculations for: Maximum Hourly, Maximum Daily, and Annual Average Emission Rates for the proposed Maintenance Activities.

**Inputs and Assumptions:**

- Potential stream products to the enclosed flare consistent of butane, propane, ethane and/or LPG.
- Maintenance intermittent emission sources to the enclosed flare that were evaluated include: gas releases from filter cleaning, prover maintenance, pigging events, and miscellaneous maintenance activities.
- The number of filter changes, prover maintenances, and pigging events has been developed to include miscellaneous maintenance activities.
- Stream physical properties that result in the maximum potential emission rates have been used.
- Example calculations for total annual volumes from filter changes, prover maintenances, and pigging events are presented in a separate example calculation sheet.
- The flare's destruction and removal efficiency (DRE) for VOCs and HAPs only: 98.0 percent (%)  
The flare does not reduce/control NO<sub>x</sub>, CO, SO<sub>x</sub>, CO, CH<sub>4</sub>, N<sub>2</sub>O, or CO<sub>2</sub>e emissions, that is, pre-control emissions equal post-control emissions.
- Pilot gas is propane and was included in the existing equipment emission estimate. The flow of the pilot gas was not impacted by the flare design changes.
- Total annual flow to flare from:

Filter (F) (FR <sub>F-scf/yr</sub> ):	0 standard cubic feet per year (scf/yr)	N/A to this station.
Prover (F) (FR <sub>Prover-scf/yr</sub> ):	0 scf/yr	N/A to this station.
Pigging (F) (FR <sub>pigging-scf/yr</sub> ):	107,304 scf/yr	

**Total Maximum Annual Flow rate (FR<sub>MaxAnn</sub>): 107,304 scf/yr**

Flare designed capacity (C<sub>flare</sub>): 10 MMBtu/hr

Maximum Pilot Gas Hourly Flow rate (FR<sub>MaxHrlyPilot</sub>): 0 British thermal units per hour (Btu/hr)

Flow rate conversions to the units below are presented in the Example Calculations for Enclosed Flare Emission Calculations: Total Maintenance.

Maintenance activity emission estimates are presented in another calculation sheet.

- Because the enclosed flare is considered to be 100% smokeless, particulate matter (PM) emissions are assumed to be negligible.
- Maximum emission stream flow rates are achieved when assuming a stream composition of 100 wt% butane
- Flared Emission Factors (EFs)

NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub>		CH <sub>4</sub>	N <sub>2</sub> O
						butane	propane		
(lb/MMBtu)				(ppmw)	(lb/MMBtu)	(kg/MMBtu)			
0.068	0.310	0.570	0	30	1.89	64.77	62.87	0.003	0.0006

**NOTES FOR THIS TABLE ARE PRESENTED IN THE CONVERSION FACTORS, PHYSICAL PROPERTIES, AND ABBREVIATIONS / ACRONYMS WORKSHEET.**

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20		[145]
SUBJECT Mt. Union Station (98% DRE) Request for Determination (RFD) -- Proposed Equipment Enclosed Flare Emission Calculations: Maintenance Operations Scenario Emissions Sources				
BASED ON SPLP provided equipment volume/specification for the maximum anticipated maintenance operation scenarios		DRAWING NUMBER Not Applicable		
BY VJPlachy	CHECKED BY AMO'Bradovich	DATE		5/23/2016

**Inputs and Assumptions (Continued):**

12. HAPs are generated from propane burned as pilot gas and are contained in the LPG stream.

13. LPG HAP content (HAPs<sub>wt%</sub>): 5.86 wt%

14. Oxides of Sulfur (SO<sub>x</sub>) emissions are:

Based on the sulfur content of the stream.

Assume SO<sub>x</sub> as SO<sub>2</sub>.

Assumes that all the all fuel sulfur converts to SO<sub>2</sub>.

15. CO<sub>2</sub>e Global Warming Potential EFs (EF<sub>GWP</sub>)

CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O
1	25	298

CO<sub>2</sub>e emission estimates use the following carbon equivalence factors: 25 for CH<sub>4</sub>, and 298 for N<sub>2</sub>O from 40 CFR Part 98, Subpart A, Table A-1.

**Calculations:**

**MAINTENANCE ACTIVITIES EMISSION SOURCES**

1. Calculate the maximum hourly flow to the flare for maintenance activities (scf/hr)

$$\text{Flow}_{\text{scf/hr}} = \left[ \frac{(\text{FR}_{\text{Flare-MMBtu/hr}})}{(\text{HHV}_{\text{Propane}})} * (\text{CF}_{\text{Btu-MMBtu}}) \right] - (\text{Flow}_{\text{Std-scf/hr}})$$

$$= \left[ \frac{10 \text{ MMBtu}}{\text{hr}} \frac{\text{scf}}{2,516 \text{ Btu}} \frac{1\text{E}+06 \text{ Btu}}{1 \text{ MMBtu}} \right] - \left[ \frac{0.00 \text{ scf}}{\text{hr}} \right] = 3,975 \text{ scf/hr}$$

2. Calculate the SO<sub>x</sub> emission factor in pounds per standard cubic feet (lb/scf).

$$\text{EF}_{\text{SOx(lb/scf)}} = [(\text{mole of the gas stream}) * [(\text{concentration of sulfur in gas stream})] * [(\text{molar ratio of SO}_2 \text{ to S})]$$

$$= [(\text{lb of gas stream}) * (\text{MW gas stream})] * [(\text{concentration of sulfur in gas stream})] * [(\text{molar ratio of SO}_2 \text{ to S})]$$

$$= [(\text{volume of gas stream as butane}) * (\text{MW}_{\text{butane}})] * [(\text{concentration of sulfur ppmw}) / (\text{CF}_{\text{ppmw-wt\%}}) / (\text{CF}_{\text{wt\%-DecEq}})] * [(\text{MW SO}_2) / (\text{MW S})]$$

$$= [(\text{CF}_{\text{lb-mol-scf}}) * (\text{MW}_{\text{butane}})] * [(\text{SO}_2\text{-ppmw}) / (\text{CF}_{\text{ppmw-wt\%}}) / (\text{CF}_{\text{wt\%-DecEq}})] * [(\text{MW SO}_2) / (\text{MW S})]$$

$$= \left[ \frac{1 \text{ lb-mol}}{379.5 \text{ scf}} \frac{58.12 \text{ lb-butane}}{\text{lb-mol}} \frac{30 \text{ ppmw S}}{\text{gas-stream}} \frac{1 \text{ wt\%}}{10000 \text{ ppmw}} \frac{1 \text{ DecEq}}{100 \text{ wt\%}} \frac{64.07 \text{ lb SO}_2/\text{lb-mol}}{32.07 \text{ lb-S/lb-mol}} \right]$$

$$= 9.18\text{E-}06 \text{ lb SO}_2/\text{scf of the gas stream} = 9.18\text{E-}06 \text{ lb SO}_x/\text{scf of the gas stream}$$

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20 [146]	
SUBJECT Mt. Union Station (98% DRE) Request for Determination (RFD) -- Proposed Equipment Enclosed Flare Emission Calculations: Maintenance Operations Scenario Emissions Sources			
BASED ON SPLP provided equipment volume/specification for the maximum anticipated maintenance operation scenarios		DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE 5/23/2016

**Calculations:**

**MAINTENANCE ACTIVITIES EMISSION SOURCES**

3. Convert emission factor from kg/MMBtu to lb/MMBtu.

Using butane CO<sub>2</sub> as an example:

$$EF_{CO_2(lb/MMBtu)} = [EF_{CO_2(kg/MMBtu)}] / (CF_{kg-lb})$$

$$= \left| \frac{64.77 \text{ kg}}{\text{MMBtu}} \right| \left| \frac{1 \text{ lb}}{0.4536 \text{ kg}} \right| = 142.79 \text{ lb CO}_2/\text{MMBtu}$$

EF										EF <sub>GWP</sub>				
NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> /PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub>		CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O		
						butane	propane							
(lb/MMBtu)						(lb/scf)						N/A		
0.068	0.310	N/C	N/C	9.18E-06	TBD	142.79	138.6	0.01	0.001	1	25	298		

**NOTE:**

Because the EF for butane CO<sub>2</sub> is greater than the EF for propane CO<sub>2</sub>, the butane CO<sub>2</sub> emission factor will be applied to estimate the maximum short term, maximum daily, and annual average emission rates.

**MAINTENANCE ACTIVITIES EMISSION SOURCES ANNUAL EMISSION ESTIMATE**

**Pre-controls**

4. Calculate the annual heat input HI<sub>Annual</sub> in MMBtu/hr

$$HI_{MMBtu/yr} = (FR_{MaxAnn}) * (HHV_{Butane}) / (CF_{Btu-MMBtu})$$

$$= \left| \frac{107,304 \text{ scf}}{\text{yr}} \right| \left| \frac{3,244 \text{ Btu}}{\text{scf}} \right| \left| \frac{1 \text{ MMBtu}}{1E+06 \text{ Btu}} \right| = 348.09 \text{ MMBtu/yr}$$

5. Calculate the VOC flow rate (FR) from the pre-control maintenance sources in lb/hr (FR<sub>preVOC-lb/hr</sub>).

$$FR_{preVOC-lb/hr} = (FR_{MaxHrly-scf/hr}) * (MW_{butane}) / (CF_{scf-lb-mol}) * (WT\%VOC) / (CF_{\%DecEq})$$

$$= \left| \frac{3,975 \text{ scf}}{\text{hr}} \right| \left| \frac{58.12 \text{ lb}}{\text{lb-mole}} \right| \left| \frac{1 \text{ lb-mol}}{379.5 \text{ scf}} \right| \left| \frac{100 \text{ wt\%}}{100 \%} \right| \left| \frac{1 \text{ DecEq}}{100 \%} \right|$$

$$= 608.77 \text{ lb VOC /hr}$$

6. Calculate the EF for HAPs in pounds per scf (lb/scf).

$$EF_{HAPs(lb/scf)} = (HAPs_{wt\%}) / (CF_{wt\%-DecEq}) * (MW_{butane}) / (CF_{scf-lb-mol})$$

$$= \left| \frac{5.86 \text{ wt\%}}{100 \text{ wt\%}} \right| \left| \frac{1 \text{ DecEq}}{100 \text{ wt\%}} \right| \left| \frac{58.12 \text{ lb}}{\text{lb-mol}} \right| \left| \frac{1 \text{ lb-mol}}{379.5 \text{ scf}} \right| = 0.009 \text{ lb HAPs/scf}$$

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 1121C05958.20	[147]
SUBJECT Mt. Union Station (98% DRE) Request for Determination (RFD) -- Proposed Equipment Enclosed Flare Emission Calculations: Maintenance Operations Scenario Emissions Sources			
BASED ON SPLP provided equipment volume/specification for the maximum anticipated maintenance operation scenarios		DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich	DATE 5/23/2016	

**Calculations (Continued):**

**MAINTENANCE ACTIVITIES EMISSION SOURCES: Pre-control**

7. Calculate HAPs the pre-control flow rate (FR) from the maintenance sources in lb/hr (FR<sub>preHAPs-lb/hr</sub>).

$$FR_{preHAPs-lb/hr} = (FR_{MaxHrly-scf/hr}) * (EF_{HAPs-lb/scf})$$

$$= \left| \frac{3,975 \text{ scf}}{\text{hr}} \right| \left| \frac{0.009 \text{ lb}}{1 \text{ scf}} \right| = 35.67 \text{ lb HAPs/hr}$$

Pre-Control Maximum Hourly Emission Rate (lb/hr)									
NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
N/C	N/C	608.77	N/C	N/C	35.67	N/C	N/C	N/C	N/C

8. Calculate the VOC pre-control annual emission rate from the maintenance sources in tpy.

$$F_{preVOC(tpy)} = (FR_{MaxAnn}) * (MW_{butane}) / (CF_{lb\_mole-scf}) / (CF_{lb-ton})$$

$$= \left| \frac{107,304 \text{ scf}}{\text{yr}} \right| \left| \frac{58.12 \text{ lb}}{\text{lb-mole}} \right| \left| \frac{1 \text{ lb-mol}}{379.5 \text{ scf}} \right| \left| \frac{1 \text{ ton}}{2,000 \text{ lb}} \right| = 8.22 \text{ tpy VOC}$$

9. Calculate the HAP pre-control annual emission rate from the maintenance sources in tpy.

$$F_{preHAP(tpy)} = (F_{preVOC(tpy)}) * (HAPs_{wt\%}) / (CF_{\%-dec.eq.})$$

$$= \left| \frac{8.22 \text{ t}}{\text{yr}} \right| \left| \frac{5.86 \text{ wt\%}}{100 \text{ \%}} \right| \left| \frac{1 \text{ DecEq}}{100 \text{ \%}} \right| = 4.82E-01 \text{ tpy HAP}$$

Pre-Control Annual Average Emission Rate (tpy)									
NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
N/C	N/C	8.22	N/C	N/C	0.482	N/C	N/C	N/C	N/C

10. Calculate the maximum hourly emission rate for SO<sub>x</sub> ER<sub>MaxStTmSOx</sub>.

$$ER_{MaxStTmSOx} = (FR_{MaxHrly}) * (EF_{SOx})$$

$$= \left| \frac{3,975 \text{ scf}}{\text{hr}} \right| \left| \frac{9.18E-06 \text{ lb}}{\text{scf}} \right| = 3.65E-02 \text{ lb SO}_x \text{ /hr}$$

11. Calculate the maximum hourly emission rate for NO<sub>x</sub>, CO, CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O ER<sub>MaxStTm</sub>.

Using NO<sub>x</sub> as an example:

$$ER_{MaxStTmNOx} = (FR_{MaxHrly}) * (EF_{NOx}) * (HHV_{butane}) / (CF_{Btu-MMBtu})$$

$$= \left| \frac{3,975 \text{ scf}}{\text{hr}} \right| \left| \frac{6.80E-02 \text{ lb}}{\text{MMBtu}} \right| \left| \frac{3,244 \text{ Btu}}{\text{scf}} \right| \left| \frac{1 \text{ MMBtu}}{1E+06 \text{ Btu}} \right| = 8.77E-01 \text{ lb NO}_x \text{ /hr}$$

12. Calculate the maximum hourly emission rate for CO<sub>2</sub>e based on CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O emission rates.

$$ER_{MaxHrlyCO2e} = \sum \{ [(CO_{2-lb/hr}) * (EF_{CO2-GWP})] + [(CH_{4-lb/hr}) * (EF_{CH4-GWP})] + [(N_{2O-lb/hr}) * (EF_{N2O-GWP})] \}$$

$$= \left| \frac{1.84E+03 \text{ lb}}{\text{hr}} \right| \left| 1 \right| + \left| \frac{1.30E-01 \text{ lb}}{\text{hr}} \right| \left| 25 \right| + \left| \frac{1.00E-02 \text{ lb}}{\text{hr}} \right| \left| 298 \right|$$

$$= \left| \frac{1.84E+03 \text{ lb}}{\text{hr}} \right| + \left| \frac{3.25E+00 \text{ lb}}{\text{hr}} \right| + \left| \frac{2.98E+00 \text{ lb}}{\text{hr}} \right| = 1.85E+03 \text{ lb/hr}$$

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20 [148]	
SUBJECT Mt. Union Station (98% DRE) Request for Determination (RFD) -- Proposed Equipment Enclosed Flare Emission Calculations: Maintenance Operations Scenario Emissions Sources			
BASED ON SPLP provided equipment volume/specification for the maximum anticipated maintenance operation scenarios		DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich	DATE	5/23/2016

**Calculations (Continued):**

**MAINTENANCE ACTIVITIES EMISSION SOURCES: Post-control Emission Estimate (Continued)**

13. Calculate the annual average emission rate for the CO<sub>2</sub>e in tons per year (tpy).

$$ER_{MaxStTmCO_2e} = \sum \{ [(CO_{2-tpy}) * (EF_{CO_2-GWP})] + [(CH_{4-tpy}) * (EF_{CH_4-GWP})] + [(N_2O_{-tpy}) * (EF_{N_2O-GWP})] \}$$

$$= \left| \frac{2.49E+01 \text{ t}}{\text{yr}} \right| 1 + \left| \frac{2.00E-03 \text{ t}}{\text{yr}} \right| 25 + \left| \frac{2.00E-04 \text{ t}}{\text{yr}} \right| 298 = 2.50E+01 \text{ tpy}$$

14. Calculate the annual emission rate for the remaining pollutants in tons per year (tpy).  
Using NO<sub>x</sub> as an example:

$$ER_{AnnualNO_x} = (FR_{MMBtu/yr}) * (EF_{NO_x}) / (CF_{lb-tons})$$

$$= \left| \frac{348.09 \text{ MMBtu}}{\text{yr}} \right| \left| \frac{0.068 \text{ lb}}{\text{MMBtu}} \right| \left| \frac{1 \text{ t}}{2,000 \text{ lb}} \right| = 1.18E-02 \text{ tpy of NO}_x$$

15. Calculate the SO<sub>x</sub> emission rate from the maintenance sources in tpy.

$$ER_{MaxStTmSO_x} = (FR_{MaxAnn}) * (EF_{SO_x}) / (CF_{lb-ton})$$

$$= \left| \frac{107,304 \text{ scf}}{\text{yr}} \right| \left| \frac{9.18E-06 \text{ lb}}{\text{scf}} \right| \left| \frac{1 \text{ t}}{2,000 \text{ lb}} \right| = 4.93E-04 \text{ tpy SO}_x$$

16. Calculate the post-control VOC and HAPs emission in lb/hr and tpy.  
Using short term maximum VOCs as an example:

$$Flow\text{-post}_{VOC\text{-lb/hr}} = (Flow_{VOCs\text{-lb/hr}}) * [1 - (DRE / CF_{\%DecEq})]$$

$$= \left| \frac{608.77 \text{ lb}}{\text{hr}} \right| 1 - \left| \frac{98.0 \text{ \%}}{100 \text{ \%}} \right| \left| \frac{1 \text{ DecEq}}{100 \text{ \%}} \right| = 12.18 \text{ lb VOCs/hr}$$

Post Control Maximum Hourly Emission Rate (lb/hr)									
NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
0.88	4.00	12.18	N/C	0.04	0.71	1,841	0.13	0.01	1,850

Post-Control Annual Average Emission Rate (tpy)									
NO <sub>x</sub>	CO	VOC	PM/PM <sub>10</sub> / PM <sub>2.5</sub>	SO <sub>x</sub>	HAPs	CO <sub>2</sub> butane	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
0.01	0.05	0.16	N/C	0.0005	0.01	24.85	0.002	0.0002	25.00

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20		[149]
SUBJECT Mt. Union Station (98% DRE) Request for Determination (RFD) -- Proposed Equipment Maintenance Operations Scenario Sources: Total Flow from Pigging				
BASED ON SPLP provided equipment volume/specification for the maximum anticipated maintenance operation scenarios		DRAWING NUMBER Not Applicable		
BY VJPlachy	CHECKED BY AMO'Bradovich	DATE		5/23/2016

**Objective:** Calculate the pigging volume from maintenance activities that are sent to the enclosed flare.

**Inputs and Assumptions:**

- Worst case scenario is for the station to be at a sea level elevation.
  - 0 ft
  - Pressure at atmosphere: 1.00 atm
  - Source for conversion: [http://www.engineeringtoolbox.com/air-altitude-pressure-d\\_462.html](http://www.engineeringtoolbox.com/air-altitude-pressure-d_462.html)
- Pipe pressure at release point ( $P_{act-pipe-atm}$ ) = Pressure at atmospheric = 1.00 atm
  - Density at pipe pressure ( $\rho_{pipe}$ ): 33.74 pounds per cubic feet (lb/ft<sup>3</sup>) at 40°F and 1,480 psig
  - Density at atmospheric conditions ( $\rho_{released}$ ): 0.12 pounds per standard cubic feet (lb/scf) at 60°F and 1 atm
- Site maintenance will include evacuation of the pig launchers and receivers.
- Equipment Quantities:
  - 20" Pig Launchers ( $N_{20Launchers}$ ): 1
  - 20" Pig Receivers ( $N_{20Receivers}$ ): 1
  - 12" Pig Launchers ( $N_{12Launchers}$ ): 0
  - 12" Pig Receivers ( $N_{12Receivers}$ ): 0
  - 10" Pig Receivers ( $N_{10Receivers}$ ): 0
  - 8" Pig Launchers ( $N_{8Launcher}$ ): 0
  - 8" Pig Receivers ( $N_{8Receiver}$ ): 0
- Equipment Volume:
  - Pig Launcher ( $V_{20pig-Launcher}$ ): 65.70 cubic feet (ft<sup>3</sup>)
  - Pig Receiver ( $V_{20pig-Receiver}$ ): 61.51 ft<sup>3</sup>
  - Pig Launcher ( $V_{12pig-Launcher}$ ): 24.17 ft<sup>3</sup>
  - Pig Receiver ( $V_{12pig-Receiver}$ ): 22.56 ft<sup>3</sup>
  - Pig Receiver ( $V_{10pig-Receiver}$ ): 17.18 ft<sup>3</sup>
  - Pig Launcher ( $V_{8pig-Launcher}$ ): 13.11 ft<sup>3</sup>
  - Pig Receiver ( $V_{8pig-Receiver}$ ): 11.27 ft<sup>3</sup>

Source: Equipment volume provided by the Rooney Engineering (REI):
- Pigging events:
  - Max ann smart pigging events ( $E_{SmartPigging}$ ): 1 event/yr
  - Max ann clean pigging events ( $E_{CleanPigging}$ ): 2 event/yr
- The ideal gas law applies:
  - $PV = nR_{specific}T$ , where n is equivalent the number of moles multiplied by the molecular weight (MW) and divided by density ( $\rho$ ).

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20 [150]	
SUBJECT Mt. Union Station (98% DRE) Request for Determination (RFD) -- Proposed Equipment Maintenance Operations Scenario Sources: Total Flow from Pigging			
BASED ON SPLP provided equipment volume/specification for the maximum anticipated maintenance operation scenarios		DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich	DATE	5/23/2016

**Calculations:**

1. Calculate the volume of gas released (V<sub>2</sub>) in standard cubic feet (scf) at release temperature and pressure.

Using 20" pig launcher as an example:

$$PV = nR_{\text{specific}}T$$

$$\frac{P_1V_1}{P_2V_2} = \frac{[n]RT_1}{[n]RT_2} = \frac{[(MW_{\text{lb/lb-mole}}) / \rho_1] * (R_{\text{specific}}T_1)}{[(MW_{\text{lb/lb-mole}}) / \rho_2] * (R_{\text{specific}}T_2)} = \frac{(\rho_2)}{(\rho_1)}$$

Solving for the release volume:

$$V_2 = \left\| \frac{\rho_1}{\rho_2} \left\| \frac{P_1}{P_2} \right\| V_1 \right\|$$

$$= \left\| \frac{33.74 \text{ lb}}{\text{ft}^3} \left\| \frac{1.00 \text{ atm}}{1 \text{ atm}} \right\| \frac{65.70 \text{ ft}^3}{0.12 \text{ lb}} \right\| = 18,473 \text{ scf/pig launcher-event}$$

Equipment	Pig Volume (acf)	Volume at Atmosphere (scf)
20" Pig Launcher	65.70	18,473
20" Pig Receiver	61.51	17,295
12" Pig Launcher	24.17	6,796
12" Pig Receiver	22.56	6,343
10" Pig Receiver	17.18	4,830
8" Pig Launcher	13.11	3,686
8" Pig Receiver	11.27	3,169

2. Calculate the total annual volume from the launching events (V<sub>PigLaunchers-scf/yr</sub>).

$$V_{\text{PigLauncher-scf/yr}} = [(V_{\text{PigLauncher}}) * (N_{\text{PigLaunchers}})] * [(\sum \text{Pigging Events})]$$

Using the 20" pig launchers as an example:

$$= \left\| \frac{18,473 \text{ scf}}{\text{pig launcher-event}} \left\| \frac{1 \text{ pig-launcher}}{\text{yr}} \right\| \left\| \frac{1 \text{ events}_{\text{smart pigging}}}{\text{yr}} \right\| + \left\| \frac{2 \text{ events}_{\text{clean pigging}}}{\text{yr}} \right\| \right\|$$

$$= 55,419 \text{ scf/yr}$$

Equipment	Volume (scf)	Number	Volume (scf/yr)
20" Pig Launcher	18,473	1	55,419
20" Pig Receiver	17,295	1	51,885
12" Pig Launcher	6,796	0	0
12" Pig Receiver	6,343	0	0
10" Pig Receiver	4,830	0	0
8" Pig Launcher	3,686	0	0
8" Pig Receiver	3,169	0	0
Total Annual Pigging Event Volume			107,304

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20	[151]
SUBJECT Mt. Union Station (98% DRE) Request for Determination (RFD) -- Proposed Equipment Fugitive Emission Estimate			
BASED ON SPLP Process and Instrumentation Drawings (P&IDs)		DRAWING NUMBER	
BY VJPlachy	CHECKED BY AMO'Bradovich	DATE	8/12/2016

**Objective:** Calculation the Maximum Hourly and Annual Average Emissions associated with fugitive components for the proposed fittings, valves, relief valves, and other miscellaneous component types.

**Inputs and Assumptions:**

1. Component counts

**Equipment Counts:**

Fittings:	270
Valves:	94
Relief Valves:	1

**Other Components:**

Coriolis Meter	0
Prover	0
Composite Sampler	0
Instruments	12
Static Mixer	0
Check Valves	3

TOTAL Other Components 15

2. The leak emission factors are taken from the USEPA Protocol for Equipment Leak Emission Estimates, EPA-453/R-95-017, November, 1995, Table 2-3 for light liquid service.

3. Emission Leak Factors:

Fittings:	8.00E-06	kilogram per hour per component (kg/hr-component)
Valves:	4.30E-05	kg/hr-component
Relief Valves:	1.30E-04	kg/hr-component
Other Components:	1.30E-04	kg/hr-component

4. Assume the total organic compound emissions are equivalent to total VOCs.

5. The HAP content as a result of the LPG (WT%<sub>HAP</sub>): 5.86 wt %

6. The relief valves on any butane, propane, and ethane spheres/tanks that release to the atmosphere are fugitive emitters.

7. Butane, propane, and ethane do not contain any HAPs.

8. Number of atmospheric relief valves on non-HAP spheres/tanks (N<sub>RVBPS</sub>): 0 Relief Valves

9. The contingency (Cont) for as-built modifications during the construction phase is: 20 %

10. Operating service factor (OSF): 100 %

**Calculations:**

1. Convert the component leak EFs from kg/hr-component to lb/hr-component (EF<sub>lb/hr-component</sub>).

Using fittings as an example:

$$EF_{\text{Fittings\_lb/hr-component}} = (EF_{\text{kg/hr-component}}) * (CF_{\text{kg-g}}) / (CF_{\text{g-lb}})$$

$$= \left| \frac{8.00\text{E-}06 \text{ kg}}{\text{hr-component}} \right| \left| \frac{1,000 \text{ g}}{1 \text{ kg}} \right| \left| \frac{1 \text{ lb}}{453.6 \text{ g}} \right| = 1.76\text{E-}05 \text{ lb/hr-component}$$

Equipment Type	Leak EF (lb/hr-component)
Fittings	1.76E-05
Valves	9.48E-05
Relief Valves to atm	2.87E-04
Other Components	2.87E-04

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20 [152]	
SUBJECT Mt. Union Station (98% DRE) Request for Determination (RFD) -- Proposed Equipment Fugitive Emission Estimate			
BASED ON SPLP Process and Instrumentation Drawings (P&IDs)		DRAWING NUMBER	
BY VJPlachy	CHECKED BY AMO'Bradovich	DATE	8/12/2016

**Calculations (Continued):**

2. Calculate the VOC Max Hourly ER in lb/hr ( $ER_{VOC\text{lb/hr}}$ ).

Using fittings as an example:

$$ER_{\text{Fittings-VOC}\text{lb/hr}} = (EF_{\text{lb/hr-component}}) * (EC_{\text{Fittings}})$$

$$= \left[ \frac{1.76\text{E-}05 \text{ lb}}{\text{hr-component}} \right] \left[ 270 \text{ components} \right] = 4.75\text{E-}03 \text{ lb VOCs/hr}$$

Equipment Type	Leak EF (lb/hr-component)	Equipment Count	VOC Max Hourly (lb/hr)
Fittings	1.76E-05	270	4.75E-03
Valves	9.48E-05	94	8.91E-03
Relief Valves to atm	2.87E-04	1	2.87E-04
Other Components	2.87E-04	15	4.31E-03
<b>TOTAL:</b>			<b>1.83E-02</b>

3. Calculate the ER for HAPs in lb/hr ( $ER_{RV\text{-HAP}\text{lb/hr}}$ ) for the relief valves to atmosphere (not butane or propane sphere relief valves).

$$ER_{RV\text{-HAP}\text{lb/hr}} = \{ (EF_{RV\text{-lb/hr-component}}) * [(EC_{RV}) - (N_{RVBPS})] \} * [(WT\%_{\text{HAP}}) / (CF\%_{\text{-DecEq}})]$$

$$= \left[ \frac{2.87\text{E-}04 \text{ lb}}{\text{hr-component}} \right] \left[ 1 - 0 \right]_{\text{comp}} * \left[ \frac{5.86 \text{ wt\%}}{100 \text{ wt\%}} \right] \left[ \frac{1 \text{ DecEq}}{100 \text{ wt\%}} \right] = 1.68\text{E-}05 \text{ lb HAPs/hr}$$

4. Calculate the ER for HAPs in lb/hr ( $ER_{\text{HAP}\text{lb/hr}}$ ) for the fittings, valves, and other components.

Using fittings as an example:

$$ER_{\text{Fittings-HAP}\text{lb/hr}} = (ER_{\text{Fittings-VOC}\text{lb/hr}}) * (WT\%_{\text{HAP}}) / (CF\%_{\text{-DecEq}})$$

$$= \left[ \frac{4.75\text{E-}03 \text{ lb}}{\text{hr}} \right] \left[ \frac{5.86 \text{ \%}}{100 \text{ wt\%}} \right] \left[ \frac{1 \text{ DecEq}}{100 \text{ wt\%}} \right] = 2.78\text{E-}04 \text{ lb HAPs/hr}$$

Equipment Type	HAP Max Hourly (lb/hr)
Fittings	2.78E-04
Valves	5.22E-04
Relief Valves to atm	1.68E-05
Other Components	2.53E-04
<b>TOTAL: 1.07E-03</b>	

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20	[153]
SUBJECT Mt. Union Station (98% DRE) Request for Determination (RFD) -- Proposed Equipment Fugitive Emission Estimate			
BASED ON SPLP Process and Instrumentation Drawings (P&IDs)		DRAWING NUMBER	
BY VJPlachy	CHECKED BY AMO'Bradovich	DATE	8/12/2016

**Calculations (Continued):**

5. Calculate the Annual ER for VOCs in tpy ( $ER_{VOC-tpy}$ ).

Using fittings as an example:

$$ER_{FittingsVOC-tpy} = (ER_{FittingsVOC-lb/hr}) * (CF_{hr-yr}) * (OSF) / (CF_{\%DecEq}) / (CF_{lb-tons})$$

$$= \left| \frac{4.75E-03 \text{ lb}}{hr} \right| \left| \frac{8,760}{yr} \right| \left| \frac{100 \%}{100 \%} \right| \left| \frac{1 \text{ DecEq}}{100 \%} \right| \left| \frac{1 \text{ t}}{2,000 \text{ lb}} \right| = 2.08E-02 \text{ tpy VOCs}$$

Equipment Type	VOC Max Hourly (lb/hr)	VOC Annual Average (tpy)
Fittings	4.75E-03	2.08E-02
Valves	8.91E-03	3.90E-02
Relief Valves to atm	2.87E-04	1.26E-03
Other Components	4.31E-03	1.89E-02
<b>TOTAL</b>		<b>8.00E-02</b>

6. Calculate the ER for HAPs in tpy ( $ER_{RV-HAPtpy}$ ) for the relief valve to atmosphere (this is in addition to the butane or propane sphere relief valves).

$$ER_{RV-HAPtpy} = ER_{RV-HAPlb/hr} * (CF_{hr-yr}) * (OSF) / (CF_{\%DecEq}) / (CF_{lb-ton})$$

$$= \left| \frac{1.68E-05 \text{ lb}}{hr} \right| \left| \frac{8,760}{yr} \right| \left| \frac{100 \%}{100 \%} \right| \left| \frac{1 \text{ DecEq}}{100 \%} \right| \left| \frac{1 \text{ t}}{2,000 \text{ lb}} \right| = 7.36E-05 \text{ tpy HAPs}$$

7. Calculate the ER for HAPs in tpy ( $ER_{HAPtpy}$ ) for fittings, valves, and other components.

Using fittings as an example:

$$ER_{Fittings-HAPtpy} = (ER_{Fittings-VOCtpy}) * (WT\%_{HAP}) / (CF_{\%DecEq})$$

$$= \left| \frac{2.08E-02 \text{ ton}}{year} \right| \left| \frac{5.86 \text{ wt\%}}{100 \%} \right| \left| \frac{1 \text{ DecEq}}{100 \%} \right| = 1.22E-03 \text{ tpy HAPs}$$

Equipment Type	HAP Annual (tpy)
Fittings	1.22E-03
Valves	2.29E-03
Relief Valves to atm	7.36E-05
Other Components	1.11E-03
<b>TOTAL:</b>	<b>4.69E-03</b>

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20 [154]	
SUBJECT Mt. Union Station (98% DRE) Request for Determination (RFD) -- Proposed Equipment Fugitive Emission Estimate			
BASED ON SPLP Process and Instrumentation Drawings (P&IDs)		DRAWING NUMBER	
BY VJPlachy	CHECKED BY AMO'Bradovich	DATE	8/12/2016

**Calculations (Continued):**

8. Incorporate the contingency into Maximum Hourly and Annual Average VOC fugitives (TF<sub>VOCMaxAnn</sub>).  
Using Maximum Hourly as an example:

$$TF_{VOCMaxHrly-lb/hr} = (ER_{TOTAL-VOCib/hr}) * [(1) + (Cont\%) / (CF_{\%-DecEq})]$$

$$= \left| \frac{1.83E-02 \text{ lb}}{\text{hr}} \right| 1 + \left| \frac{20 \%}{100 \%} \right| \frac{1 \text{ DecEq}}{100 \%} = 2.20E-02 \text{ lb VOCs/hr}$$

VOC Fugitive Emission Rate		
Type	ER	TF <sub>VOC</sub>
Max Hourly (lb/hr)	0.02	0.02
Annual Average (tpy)	0.08	0.10

9. Incorporate the contingency into Maximum Hourly and Annual Average total HAP fugitives (TF<sub>HAPMaxHrly</sub>).  
Using Maximum Hourly as an example:

$$TF_{HAPMaxHrly-lb/hr} = (ER_{TOTAL-HAPib/hr}) * [(1) + (Cont\%) / (CF_{\%-DecEq})]$$

$$= \left| \frac{1.07E-03 \text{ lb}}{\text{hr}} \right| 1 + \left| \frac{20 \%}{100 \%} \right| \frac{1 \text{ DecEq}}{100 \%} = 1.28E-03 \text{ lb HAPs/hr}$$

HAP Fugitive Emission Rate		
Type	ER	TF <sub>HAP</sub>
Max Hourly (lb/hr)	0.001	0.001
Annual Average (tpy)	0.005	0.01

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20	[155]
SUBJECT: Mt. Union Station (98% DRE) Request for Determination (RFD) -- Proposed Equipment Product Analysis Specification			
BASED ON SPLP Product Analyses		DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE 4/18/2016

**Objective:** Calculate Product Specifications for Butane, Propane, and Liquid Petroleum Gas (LPG) volatile organic compounds (VOCs) and hazardous air pollutants (HAPs).

**Inputs and Assumptions:**

1. Composition of the Butane and Propane stream analyses are as provided by SPLP.
2. Only the LPG stream will contain hazardous air pollutants (HAPs).
3. VOCs for Butane and Propane Streams are hydrocarbon constituents that contain three or more carbon atoms in their molecular formula, that is, ethane is not a regulated VOC.
4. Composition of the Butane Stream:
  - propane: 2 mole percent (mol%)
  - i-butane: 44 mol%
  - n-butane: 54 mol%
  - i-pentane: 1 mol%
5. Composition of the Propane Stream:
  - ethane: 2 mol%
  - propane: 95 mol%
  - i-butane: 3.5 mol%
6. Composition of the LPG Stream:
  - ethane: 0.08 mol%
  - propane: 63.8 mol%
  - i-butane: 7.39 mol%
  - n-butane: 17.8 mol%
  - i-pentane: 3.40 mol%
  - n-pentane: 4.09 mol%
  - n-hexane: 3.49 mol%

**7. Molecular Formula (MF) and Molecular Weight (MW)**

Constituent	MF	MW	
ethane:	C <sub>2</sub> H <sub>6</sub>	30.07	lb per lb-mole (lb/lb mol)
propane:	C <sub>3</sub> H <sub>8</sub>	44.10	lb/lb mol
i-butane:	iC <sub>4</sub> H <sub>10</sub>	58.12	lb/lb mol
n-butane:	nC <sub>4</sub> H <sub>10</sub>	58.12	lb/lb mol
i-pentane:	iC <sub>5</sub> H <sub>12</sub>	72.15	lb/lb mol
n-pentane:	nC <sub>5</sub> H <sub>12</sub>	72.15	lb/lb mol
n-hexane:	nC <sub>6</sub> H <sub>14</sub>	86.17	lb/lb mol

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20 [156]	
SUBJECT: Mt. Union Station (98% DRE) Request for Determination (RFD) -- Proposed Equipment Product Analysis Specification			
BASED ON SPLP Product Analyses		DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE 4/18/2016

**Calculations:**

- Determine the molar mass (MM) of each constituent in butane and propane stream.  
Using the propane in Butane Stream as an example:

$$MM_{\text{propane/Butane}} = [(Mol\%_{\text{propane/Butane}}) / (CF_{\%-\text{DecEq}})] * (MW_{\text{propane}})$$

$$= \left[ \frac{2\%}{100\%} \right] \left[ \frac{44.10 \text{ lb}}{\text{lb-mol}} \right] = 0.88 \text{ lb/lb-mol}$$

Component	Mol%	MW (lb/lb-mol)	MM (lb/lb-mol)
propane	2	44.10	0.88
i-butane	44	58.12	25.57
n-butane	54	58.12	31.38
i-pentane	1	72.15	0.72
<b>TOTAL:</b>			<b>58.55</b>

Component	Mol%	MW (lb/lb-mol)	MM (lb/lb-mol)
ethane	2	30.07	0.60
propane	95	44.10	41.90
i-butane	3.5	58.12	2.03
<b>TOTAL:</b>			<b>44.53</b>

Component	Mol%	MW (lb/lb-mol)	MM (lb/lb-mol)
ethane	0.08	30.07	0.02
propane	63.80	44.1	28.14
i-butane	7.39	58.1	4.29
n-butane	17.80	58.1	10.34
i-pentane	3.40	72.2	2.45
n-pentane	4.09	72.2	2.95
n-hexane	3.49	86.1	3.00
<b>TOTAL:</b>			<b>51.19</b>

- Calculate the weight percent (Wt%) of each component in butane and propane streams.  
Using the propane in Butane Stream as an example:

$$Wt\%_{\text{propane/Butane}} = (MM_{\text{propane/Butane}}) / (MM_{\text{total}}) * (CF_{\text{DecEq-\%}})$$

$$= \left[ \frac{0.88 \text{ lb}}{\text{lb-mol}} \right] \left[ \frac{100 \text{ wt\%}}{58.55 \text{ lb}} \right] = 1.50 \text{ wt\%}$$

Component	MM (lb/lb-mol)	Wt%
propane	0.88	1.50
i-butane	25.57	43.67
n-butane	31.38	53.60
i-pentane	0.72	1.23
<b>TOTAL:</b>		<b>100.00</b>

Component	MM (lb/lb-mol)	Wt%
ethane	0.60	1.35
propane	41.90	94.09
i-butane	2.03	4.56
<b>TOTAL:</b>		<b>100.00</b>

Component	MM (lb/lb-mol)	Wt%
ethane	0.02	0.04
propane	28.14	54.97
i-butane	4.29	8.38
n-butane	10.34	20.20
i-pentane	2.45	4.79
n-pentane	2.95	5.76
n-hexane	3.00	5.86
<b>TOTAL:</b>		<b>100.00</b>

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20		[157]
SUBJECT: Mt. Union Station (98% DRE) Request for Determination (RFD) -- Proposed Equipment Product Analysis Specification				
BASED ON SPLP Product Analyses			DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE	4/18/2016

**Calculations (continued):**

3. Calculate the VOC Wt% of in Butane and Propane Streams.

a. Butane Stream

$$\begin{aligned} \text{Wt\%}_{\text{ButaneVOC}} &= \sum \text{Wt\% for components with carbon atoms of } C_3 \text{ or higher} \\ &= (\text{Wt\%}_{\text{propane}}) + (\text{Wt\%}_{\text{i-butane}}) + (\text{Wt\%}_{\text{n-butane}}) + (\text{Wt\%}_{\text{i-pentane}}) \\ &= || 1.50 + 43.67 + 53.60 + 1.23 || \text{wt\%} = 100.00 \text{ wt\% VOC} \end{aligned}$$

b. Propane Stream

$$\begin{aligned} \text{Wt\%}_{\text{PropaneVOC}} &= \sum \text{Wt\% for components with carbon atoms of } C_3 \text{ or higher} \\ &= (\text{Wt\%}_{\text{propane}}) + (\text{Wt\%}_{\text{i-butane}}) \\ &= || 94.09 + 4.56 || \text{wt\%} = 98.65 \text{ wt\% VOC} \end{aligned}$$

c. LPG Stream

$$\begin{aligned} \text{Wt\%}_{\text{LPGVOC}} &= \sum \text{Wt\% for components with carbon atoms of } C_3 \text{ or higher} \\ &= (\text{Wt\%}_{\text{propane}}) + (\text{Wt\%}_{\text{i-butane}}) + (\text{Wt\%}_{\text{n-butane}}) + (\text{Wt\%}_{\text{i-pentane}}) + (\text{Wt\%}_{\text{n-pentane}}) + (\text{Wt\%}_{\text{n-hexane}}) \\ &= || 54.97 + 8.38 + 20.20 + 4.79 + 5.76 + 5.86 || \text{wt\%} = 99.96 \text{ wt\% VOC} \\ \text{Wt\%}_{\text{LPGHAP}} &= \text{Wt\% of Hexane} \\ &= 5.86 \text{ wt\% HAP} \end{aligned}$$

Butane Stream		
Component	MM (lb/lb-mol)	Wt%
propane	0.88	1.50
i-butane	25.57	43.67
n-butane	31.38	53.60
i-pentane	0.72	1.23
<b>TOTAL VOCs:</b>		<b>100.00</b>

Propane Stream		
Component	MM (lb/lb-mol)	Wt%
ethane	0.60	N/A
propane	41.90	94.09
i-butane	2.03	4.56
<b>TOTAL VOCs:</b>		<b>98.65</b>

LPG Stream		
Component	MM (lb/lb-mol)	Wt%
ethane	0.02	0.04
propane	28.14	54.97
i-butane	4.29	8.38
n-butane	10.34	20.20
i-pentane	2.45	4.79
n-pentane	2.95	5.76
n-hexane	3.00	5.86
<b>TOTAL VOCs:</b>		<b>99.96</b>
<b>TOTAL HAPs:</b>		<b>5.86</b>

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20 [158]	
SUBJECT Mt. Union Station (98% DRE) Request for Determination (RFD) -- Proposed Equipment Conversion Factors, Physical Properties, and Abbreviations / Acronyms used in the emission estimate calculation workbook			
BASED ON SPLP Equipment Data / Specifications / Reference Material		DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE 5/23/2016

**Objective:** Consolidate the inputs of conversion factors, emission factors, acronyms, and abbreviations that are used throughout the emission estimations associated with potential emission sources for midstream operations.

**Inputs and Assumptions:**

1. Miscellaneous Conversion Factors (CF):

1 lb-mol = 379.5 scf

Basis: Ideal gas law conversion factor (CF<sub>ideal</sub>):

1 mole of any ideal gas at standard conditions occupies a volume of 379.5 cubic feet (cf).

10,000 = ppm H<sub>2</sub>S = 1 mole % H<sub>2</sub>S = 627 grains H<sub>2</sub>S per 100 scf

Source: AP-42 Chapter 5.3 Table 5.3.1; footnote d.

<https://www3.epa.gov/ttn/chieff/ap42/ch05/final/c05s03.pdf>

2. CO<sub>2</sub>e Global Warming Potential EFs (EF<sub>GWP</sub>)

CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O
1	25	298

CO<sub>2</sub>e emission rates use the following carbon equivalence factors: 25 for CH<sub>4</sub> and 298 for N<sub>2</sub>O from 40 CFR Part 98, Subpart A, Table A-1.

[http://www.ecfr.gov/cgi-bin/text-idx?SID=7cd55ec5ecd5f06bf94c50d3452a94c3&mc=true&node=pt40.21.98&rgn=div5%20-%20ap40.21.98\\_19.1#ap40.21.98\\_19.1](http://www.ecfr.gov/cgi-bin/text-idx?SID=7cd55ec5ecd5f06bf94c50d3452a94c3&mc=true&node=pt40.21.98&rgn=div5%20-%20ap40.21.98_19.1#ap40.21.98_19.1)

3. Flare Emission Factors (EFs)

NO <sub>x</sub> <sup>a</sup>	CO <sup>a</sup>	VOC <sup>a</sup>	PM/PM <sub>10</sub> /PM <sub>2.5</sub> <sup>a</sup>	SO <sub>x</sub> <sup>b</sup>	HAPs	CO <sub>2</sub>		CH <sub>4</sub> <sup>d</sup>	N <sub>2</sub> O <sup>d</sup>
						butane <sup>c</sup>	propane <sup>c</sup>		
(lb/MMBtu)			(ppmw)		(kg/MMBtu)				
0.068	0.31	0.57	0	30	TBD	64.77	62.87	0.003	0.0006

Footnotes:

a. NO<sub>x</sub>, CO, PM, and VOC emission factor (EF) source is AP-42; Chapter 13.5 for Industrial Flares, Table 13.5-1 and 13.5-2, dated: April 2015.

PM emissions are assumed to be negligible because the enclosed flare is considered to be 100% smokeless.

[https://www3.epa.gov/ttn/chieff/ap42/ch13/final/C13S05\\_4-20-15.pdf](https://www3.epa.gov/ttn/chieff/ap42/ch13/final/C13S05_4-20-15.pdf)

b. Provided by SPLP

c. Gas heat content (Btu/scf) for butane and propane (kg/MMBtu) is based on the higher heating values (HHV) presented in 40 CFR Part 98 Subpart C, Table C-1.

d. CH<sub>4</sub> and N<sub>2</sub>O emission factors (kg/MMBtu) are based on the default emission factors presented in 40 CFR Part 98 Subpart C, Table C-2 for "Petroleum (All fuel types in Table C-1)."

[http://www.ecfr.gov/cgi-bin/text-idx?SID=7cd55ec5ecd5f06bf94c50d3452a94c3&mc=true&node=pt40.21.98&rgn=div5%20-%20ap40.21.98\\_19.1%20-%20ap40.21.98\\_138.1%20-%20ap40.21.98\\_138.1](http://www.ecfr.gov/cgi-bin/text-idx?SID=7cd55ec5ecd5f06bf94c50d3452a94c3&mc=true&node=pt40.21.98&rgn=div5%20-%20ap40.21.98_19.1%20-%20ap40.21.98_138.1%20-%20ap40.21.98_138.1)

NOTES:

AP-42 VOC EF is only applicable to emission estimates for VOCs from the pilot gas, that is, VOC emissions from the captured gas that are sent to the flare from GC, Pumps, and RV emissions are based on the flare's DRE.

4. Sources of standard operating scenario emission to the flare can include: GC(s), Pump Seal(s), and/or Relief Valves that are connected to the flare header.

5. Sources of maintenances emission to the flare can include evaluation of the following equipment: filter(s), pig launcher(s), pig receiver(s), and/or prover(s).

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20	[159]
SUBJECT Mt. Union Station (98% DRE) Request for Determination (RFD) -- Proposed Equipment Conversion Factors, Physical Properties, and Abbreviations / Acronyms used in the emission estimate calculation workbooks.			
BASED ON SPLP Equipment Data / Specifications / Reference Material		DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich	DATE	5/23/2016

**Inputs and Assumptions (Continued):**

6. Physical Properties:

Source: <http://www.lenntech.com/calculators/molecular/molecular-weight-calculator.htm>

i-butane = n-C <sub>4</sub> H <sub>10</sub>	= 58.12 lb/lb mol (g/g mol)	
n-butane = i-C <sub>4</sub> H <sub>10</sub>	= 58.12 lb/lb mol (g/g mol)	
carbon = C	= 12.01 lb/lb mol (g/g mol)	
carbon monoxide = CO	= 28.01 lb/lb mol (g/g mol)	Calculated
ethane = C <sub>2</sub> H <sub>6</sub>	= 30.07 lb/lb mol (g/g mol)	
methane = CH <sub>4</sub>	= 16.04 lb/lb mol (g/g mol)	
n-hexane = C <sub>6</sub> H <sub>14</sub>	= 86.17 lb/lb mol (g/g mol)	
hydrogen = H	= 1.01 lb/lb mol (g/g mol)	
nitrogen = N	= 14.01 lb/lb mol (g/g mol)	
nitrogen dioxide = N <sub>2</sub> O	= 44.02 lb/lb mol (g/g mol)	Calculated
oxygen = O	= 16.00 lb/lb mol (g/g mol)	
i-pentane = i-C <sub>5</sub> H <sub>12</sub>	= 72.15 lb/lb mol (g/g mol)	
n-pentane = n-C <sub>5</sub> H <sub>12</sub>	= 72.15 lb/lb mol (g/g mol)	
propane = C <sub>3</sub> H <sub>8</sub>	= 44.10 lb/lb mol (g/g mol)	
sulfur = S	= 32.07 lb/lb mol (g/g mol)	
sulfur dioxide = SO <sub>2</sub>	= 64.07 lb/lb mol (g/g mol)	Calculated

7. Higher heating value (HHV):

a. butane

HHV<sub>propane</sub> = 2,516 Btu/scf

Source: [http://www.altenergy.com/downloads/pdf\\_public/propdatapdf.pdf](http://www.altenergy.com/downloads/pdf_public/propdatapdf.pdf)

b. butane

HHV<sub>butane</sub> = 0.103 MMBtu/gal default HHV

40 CFR Part 98 Subpart C, Table C-1 value used with the Volume of butane vapor/gallon @ 60°F.

Source: [http://www.ecfr.gov/cgi-bin/text-idx?SID=9da8a4fcd9db970a85466ea8928596cb&mc=true&node=sp40.21.98.c&rgn=div6#ap40.21.98\\_138.1](http://www.ecfr.gov/cgi-bin/text-idx?SID=9da8a4fcd9db970a85466ea8928596cb&mc=true&node=sp40.21.98.c&rgn=div6#ap40.21.98_138.1)

Vol<sub>butane</sub> = 31.75 scf/gal at 60°F

Source: <http://www.aeropres.com/files/physical%20properties.pdf>

HHV <sub>butane</sub> = 3,244 Btu/scf	0.103 MMBtu	gal	1E+06 Btu
	gal	31.75 scf	1 MMBtu

8. Conversion factors (CF):

1 bhp	= 0.746 kW	Source: <a href="http://www.convertunits.com/from/horsepower/to/kilowatt">http://www.convertunits.com/from/horsepower/to/kilowatt</a>
1 °F	= 460.67 °R	<a href="http://www.convertunits.com/from/Fahrenheit/to/Rankine">http://www.convertunits.com/from/Fahrenheit/to/Rankine</a>
1 atm	= 14.7 psi	<a href="http://www.convertunits.com/from/atm/to/psi">http://www.convertunits.com/from/atm/to/psi</a>
1 day	= 24 hours	<a href="http://www.convertunits.com/from/day/to/hour">http://www.convertunits.com/from/day/to/hour</a>
1 %	= 1E+04 ppmw	<a href="http://www.rapidtables.com/convert/number/PPM_to_Percent.htm">http://www.rapidtables.com/convert/number/PPM_to_Percent.htm</a>
1 DecEq	= 100 %	<a href="http://www.calculatorsoup.com/calculators/math/percent-to-decimal-calculator.php">http://www.calculatorsoup.com/calculators/math/percent-to-decimal-calculator.php</a>
1 g	= 0.002205 lb	<a href="http://www.convertunits.com/from/grams/to/pounds">http://www.convertunits.com/from/grams/to/pounds</a>
1 grain	= 0.000143 lb	<a href="http://www.convert-me.com/en/convert/weight/grain.html">http://www.convert-me.com/en/convert/weight/grain.html</a>
1 hp-hr	= 7,000 Btu	Source: AP-42, Table 3.3-1; footnote a.

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20 [160]	
SUBJECT Mt. Union Station (98% DRE) Request for Determination (RFD) -- Proposed Equipment Conversion Factors, Physical Properties, and Abbreviations / Acronyms used in the emission estimate calculation workbook			
BASED ON SPLP Equipment Data / Specifications / Reference Material		DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich		DATE 5/23/2016

**Inputs and Assumptions (Continued):**

<b>8. Conversion factors (CF) (Continued):</b>		<b>Source (Continued):</b>
1 hr	= 60 minutes	<a href="http://www.convertunits.com/from/hours/to/minutes">http://www.convertunits.com/from/hours/to/minutes</a>
1 kg	= 1,000 g	<a href="http://www.convertunits.com/from/kilograms/to/grams">http://www.convertunits.com/from/kilograms/to/grams</a>
1 kg/m <sup>3</sup>	= 0.008345 lb/gal	<a href="http://convert-to.com/conversion/density/convert-kg-per-m3-to-lb-per-gal.html">http://convert-to.com/conversion/density/convert-kg-per-m3-to-lb-per-gal.html</a>
1 lb	= 453.6 g	<a href="http://www.convertunits.com/from/pounds/to/grams">http://www.convertunits.com/from/pounds/to/grams</a>
1 lb	= 0.4536 kg	<a href="http://www.convertunits.com/from/pounds/to/kilograms">http://www.convertunits.com/from/pounds/to/kilograms</a>
1 lb	= 8.34 gal@60°F	<a href="http://www.engineeringtoolbox.com/water-density-specific-weight-d_595.html">http://www.engineeringtoolbox.com/water-density-specific-weight-d_595.html</a>
1 MMBtu	= 1E+06 Btu	<a href="http://www.convertunits.com/from/million+British+thermal+unit/to/British+thermal+unit">http://www.convertunits.com/from/million+British+thermal+unit/to/British+thermal+unit</a>
1 MMscf	= 1E+06 scf	<a href="http://www.convertunits.com/from/million+cubic+feet/to/cubic+feet">http://www.convertunits.com/from/million+cubic+feet/to/cubic+feet</a>
1 pascal	= 0.000010 atm	<a href="http://www.convertunits.com/from/pascal/to/atmosphere+[standard]">http://www.convertunits.com/from/pascal/to/atmosphere+[standard]</a>
1 ppmw	= 0.0001 wt%	<a href="http://www.rapidtables.com/convert/number/PPM_to_Percent.htm">http://www.rapidtables.com/convert/number/PPM_to_Percent.htm</a>
1 ft <sup>3</sup> / scf	= 28,317 cc	<a href="http://www.convertunits.com/from/cubic+feet/to/cubic+centimeters">http://www.convertunits.com/from/cubic+feet/to/cubic+centimeters</a>
1 ton	= 2,000 lb	<a href="http://www.convertunits.com/from/ton+[short,+US]/to/pounds">http://www.convertunits.com/from/ton+[short,+US]/to/pounds</a>
1 yr	= 8,760 hrs	Calculated: (24 hours/day) * (365 days/year)

**9. Abbreviations / Acronyms**

- % = percent
- Ann = annual
- AOH = annual operating hours
- cc = cubic centimeter
- CF = conversion factor
- CH<sub>4</sub> = methane
- CO = carbon monoxide
- CO<sub>2</sub>e = carbon dioxide equivalent
- dec = decimal
- DecEq = Decimal Equivalent
- EC = equipment count
- EF = emission factor
- eq = equivalent
- ER = Emission Rate
- FR = flow rate
- ft = feet
- ft<sup>3</sup> = cubic feet
- g = gram
- GC = gas chromatograph
- HAP = hazardous air pollutant
- HHV = higher heating value
- hr = hour
- kg = kilogram
- kg/MMBtu = kilograms per million British thermal units
- lb = pound
- lb/MMBtu = pounds per million British thermal units
- lb/MMscf = pounds per million standard cubic feet
- lb/scf = pounds per standard cubic feet

CLIENT Sunoco Pipeline, L.P. (SPLP)		JOB NUMBER 112IC05958.20	[161]
SUBJECT Mt. Union Station (98% DRE) Request for Determination (RFD) -- Proposed Equipment Conversion Factors, Physical Properties, and Abbreviations / Acronyms used in the emission estimate calculation workbooks.			
BASED ON SPLP Equipment Data / Specifications / Reference Material		DRAWING NUMBER Not Applicable	
BY VJPlachy	CHECKED BY AMO'Bradovich	DATE	5/23/2016

**Inputs and Assumptions (Continued):**

9. Abbreviations / Acronyms (Continued)

- lb-mol = pound mole
- LPG = liquified petroleum gas
- LHV = lower heating value
- Max Daily = maximum daily
- Max Hourly = maximum hourly
- MM = molar mass
- mol = mole
- MW = molecular weight
- n = moles
- N/A = Pollutant is Not Applicable to this source
- N/A E = This equipment is not applicable to this station
- N/C = Not Calculated
- N<sub>2</sub>O = nitrogen dioxide
- NOx = oxides of nitrogen
- OSF = operating service factor
- P = pressure
- PM = particulate matter
- PM<sub>10</sub> = particles with an aerodynamic diameter less than or equal to 10 micrometers
- PM<sub>2.5</sub> = particles with an aerodynamic diameter less than or equal to 2.5 micrometers
- ppmw = parts per million by weight
- propane = C<sub>3</sub>H<sub>8</sub>
- psi = pounds per square inch
- psia = pounds per square inch absolute
- psig = pounds per square inch gauge
- R<sub>specific</sub> = Ideal gas law constant specific to units
- RV = relief valve
- S = sulfur
- scf = standard cubic feet
- SG<sub>o</sub> = specific gravity of the oil
- SO<sub>2</sub> = sulfur dioxide
- SOx = oxides of sulfur
- T = temperature
- t = ton
- TBD = To Be Determined
- TF = Total Fugitives
- tpy = tons per year
- USEPA = United States Environmental Protection Agency
- V = volume
- VS = valve seat
- VOC = volatile organic compound
- wt = weight
- yr = year

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**Hartline, Darrell**

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**From:** SION, LAUREN N <LAUREN.SION@energytransfer.com>  
**Sent:** Wednesday, August 09, 2017 10:42 AM  
**To:** Hartline, Darrell  
**Subject:** RE: Air Quality Permit Responsible Officials

Yes- Mark Martin should also be the Responsible Official there if you do not already have that information.

Thanke,

**Lauren Sion**  
Energy Transfer Partners  
Office: (412) 784-3474  
Cell: (313) 706-9455

---

**From:** Hartline, Darrell [mailto:dahartline@pa.gov]  
**Sent:** Wednesday, August 09, 2017 10:41 AM  
**To:** SION, LAUREN N <LAUREN.SION@energytransfer.com>  
**Subject:** RE: Air Quality Permit Responsible Officials

Thanks Lauren. Will you be the Permit Contact Person for Cornwall?

Thanks,  
Darrell Hartline

---

**From:** SION, LAUREN N [mailto:LAUREN.SION@energytransfer.com]  
**Sent:** Wednesday, August 09, 2017 10:14 AM  
**To:** Hartline, Darrell <dahartline@pa.gov>  
**Subject:** RE: Air Quality Permit Responsible Officials

Darrell-

I will be the permit contact for all of these facilities:

Lauren Sion  
Environmental Specialist  
(412) 784-3474

The Responsible Official for Beckersville, Blainsport, and Middletown is Mark Martin:

Mark A. Martin  
Operations Supervisor  
(610) 670-3278

The Responsible Official for Doylesburg and Mt. Union is Jim Tidd:

James W. Tidd  
Operations Supervisor  
(724) 630-2462

Please let me know if you need any more information.

Thank you,

**Lauren Sion**  
Energy Transfer Partners  
Office: (412) 784-3474  
Cell: (313) 706-9455

---

**From:** WERNER, JED A  
**Sent:** Wednesday, August 09, 2017 9:46 AM  
**To:** SION, LAUREN N <[LAUREN.SION@energytransfer.com](mailto:LAUREN.SION@energytransfer.com)>  
**Cc:** O'TOOLE, RONALD J <[RONALD.OTOOLE@energytransfer.com](mailto:RONALD.OTOOLE@energytransfer.com)>  
**Subject:** Fwd: Air Quality Permit Responsible Officials

Lauren

Can you please provide this information to Darrell

Thanks

Jed

Sent from my iPhone

Begin forwarded message:

**From:** "Hartline, Darrell" <[dahartline@pa.gov](mailto:dahartline@pa.gov)>  
**Date:** August 9, 2017 at 9:40:49 AM EDT  
**To:** "WERNER, JED A" <[JED.WERNER@energytransfer.com](mailto:JED.WERNER@energytransfer.com)>  
**Subject:** Air Quality Permit Responsible Officials

Jed,

Are the Responsible Officials or Permit Contact Person for Doylestown, Middletown, Mt. Union, Beckersville and Blainsport going to change? If so, please provide their name, job title and telephone number.

Thanks,  
Darrell Hartline

**From:** WERNER, JED A [mailto:[JED.WERNER@energytransfer.com](mailto:JED.WERNER@energytransfer.com)]  
**Sent:** Wednesday, September 20, 2017 2:57 PM  
**To:** Hartline, Darrell <[dahartline@pa.gov](mailto:dahartline@pa.gov)>  
**Subject:** RE Mariner East II Pump Stations Status Update

Yes

**From:** Hartline, Darrell [mailto:[dahartline@pa.gov](mailto:dahartline@pa.gov)]  
**Sent:** Wednesday, September 20, 2017 2:56 PM  
**To:** WERNER, JED A <[JED.WERNER@energytransfer.com](mailto:JED.WERNER@energytransfer.com)>  
**Subject:** RE Mariner East II Pump Stations Status Update

Thanks Jed for your prompt response. Is the flare knockout tank installed at each of these sites?

**From:** WERNER, JED A [mailto:[JED.WERNER@energytransfer.com](mailto:JED.WERNER@energytransfer.com)]  
**Sent:** Wednesday, September 20, 2017 2:39 PM  
**To:** Hartline, Darrell <[dahartline@pa.gov](mailto:dahartline@pa.gov)>  
**Cc:** SON, LAUREN N <[LAUREN.SON@energytransfer.com](mailto:LAUREN.SON@energytransfer.com)>; O'TOOLE, RONALD J <[RONALD.OTOOLE@energytransfer.com](mailto:RONALD.OTOOLE@energytransfer.com)>  
**Subject:** RE Mariner East II Pump Stations Status Update

Darrell,

Here is the information for the new sources installed for Mt Union, Middletown, and Beckersville Pump Stations. The equipment is installed, but will not be in service until the MEI system is put in service. The only source that is currently in service is the 30 MMBtu/hr Enclosed Flare at Middletown.

Mt. Union

Pig Launcher (20 in) – installed, to be used upon start-up of MEI  
Pig Receiver (20 in) – installed, to be used upon start-up of MEI

Middletown

Mainline Booster Pumps (2-4,500 hp) - installed, to be used upon start-up of MEI  
Pig Launcher (20 in) - installed, to be used upon start-up of MEI  
Pig Receiver (20 in) - installed, to be used upon start-up of MEI  
Filter - installed, to be used upon start-up of MEI  
Prover - installed, to be used upon start-up of MEI  
Enclosed Flare (30 MMBtu/hr) – installed, in use

Beckersville

Pig Launcher (20 in) – installed, to be used upon start-up of MEI  
Pig Receiver (20 in) – installed, to be used upon start-up of MEI

Please let me know if you need any additional information.

Thanks

Jed

**From:** Hartline, Darrell [mailto:[dahartline@pa.gov](mailto:dahartline@pa.gov)]  
**Sent:** Wednesday, September 20, 2017 8:04 AM  
**To:** WERNER, JED A <[JED.WERNER@energytransfer.com](mailto:JED.WERNER@energytransfer.com)>  
**Subject:** Mariner East II Pump Stations Status Update

Hi Jed,

I know the MEII pipeline is still being installed. We would like an update on the status of the installation of the equipment and modifications outlined in the Request for Determinations for Mt. Union, Middletown and Beckersville.

Thanks,

Darrell Hartline

Private and confidential as detailed [here](#). If you cannot access hyperlink, please e-mail sender.

Private and confidential as detailed [here](#). If you cannot access hyperlink, please e-mail sender.



COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF ENVIRONMENTAL PROTECTION  
AIR QUALITY PROGRAM

STATE ONLY OPERATING PERMIT

Issue Date: \_\_\_\_\_ Effective Date: \_\_\_\_\_  
Expiration Date: \_\_\_\_\_

In accordance with the provisions of the Air Pollution Control Act, the Act of January 8, 1960, P.L. 2119, as amended, and 25 Pa. Code Chapter 127, the Owner, [and Operator if noted] (hereinafter referred to as permittee) identified below is authorized by the Department of Environmental Protection (Department) to operate the air emission source(s) more fully described in this permit. This Facility is subject to all terms and conditions specified in this permit. Nothing in this permit relieves the permittee from its obligations to comply with all applicable Federal, State and Local laws and regulations.

The regulatory or statutory authority for each permit condition is set forth in brackets. All terms and conditions in this permit are federally enforceable unless otherwise designated.

State Only Permit No: 31-03036

Federal Tax Id - Plant Code: 23-3102656-6

<b>Owner Information</b>
Name: SUNOCO PIPELINE LP Mailing Address: 525 FRITZTOWN RD SINKING SPRING, PA 19608-1509
<b>Plant Information</b>
Plant: SUNOCO PIPELINE LP/MT UNION PS Location: 31     Huntingdon County     31936 Shirley Township SIC Code: 4619 Trans. & Utilities - Pipelines, Nec
<b>Responsible Official</b>
Name: JAMES W. TIDD Title: OPERATIONS SUPERVISOR Phone (724) 830 - 2462
<b>Permit Contact Person</b>
Name: LAUREN SION Title: ENVIRONMENTAL SPECIALIST Phone: (412) 784 - 3474
[Signature] _____ WILLIAM R. WEAVER, SOUTHCENTRAL REGION AIR PROGRAM MANAGER

**SECTION A. Table of Contents****Section A. Facility/Source Identification**

Table of Contents  
Site Inventory List

**Section B. General State Only Requirements**

- #001 Definitions.
- #002 Operating Permit Duration.
- #003 Permit Renewal.
- #004 Operating Permit Fees under Subchapter I.
- #005 Transfer of Operating Permits.
- #006 Inspection and Entry.
- #007 Compliance Requirements.
- #008 Need to Halt or Reduce Activity Not a Defense.
- #009 Duty to Provide Information.
- #010 Revising an Operating Permit for Cause.
- #011 Operating Permit Modifications
- #012 Severability Clause.
- #013 De Minimis Emission Increases.
- #014 Operational Flexibility.
- #015 Reactivation
- #016 Health Risk-based Emission Standards and Operating Practice Requirements.
- #017 Circumvention.
- #018 Reporting Requirements.
- #019 Sampling, Testing and Monitoring Procedures.
- #020 Recordkeeping.
- #021 Property Rights.
- #022 Alternative Operating Scenarios.

**Section C. Site Level State Only Requirements**

- C-I: Restrictions
- C-II: Testing Requirements
- C-III: Monitoring Requirements
- C-IV: Recordkeeping Requirements
- C-V: Reporting Requirements
- C-VI: Work Practice Standards
- C-VII: Additional Requirements
- C-VIII: Compliance Certification
- C-IX: Compliance Schedule

**Section D. Source Level State Only Requirements**

- D-I: Restrictions
- D-II: Testing Requirements
- D-III: Monitoring Requirements
- D-IV: Recordkeeping Requirements
- D-V: Reporting Requirements
- D-VI: Work Practice Standards
- D-VII: Additional Requirements

Note: These same sub-sections are repeated for each source!

**Section E. Source Group Restrictions**

- E-I: Restrictions
- E-II: Testing Requirements
- E-III: Monitoring Requirements

**SECTION A. Table of Contents**

- E-IV: Recordkeeping Requirements
- E-V: Reporting Requirements
- E-VI: Work Practice Standards
- E-VII: Additional Requirements

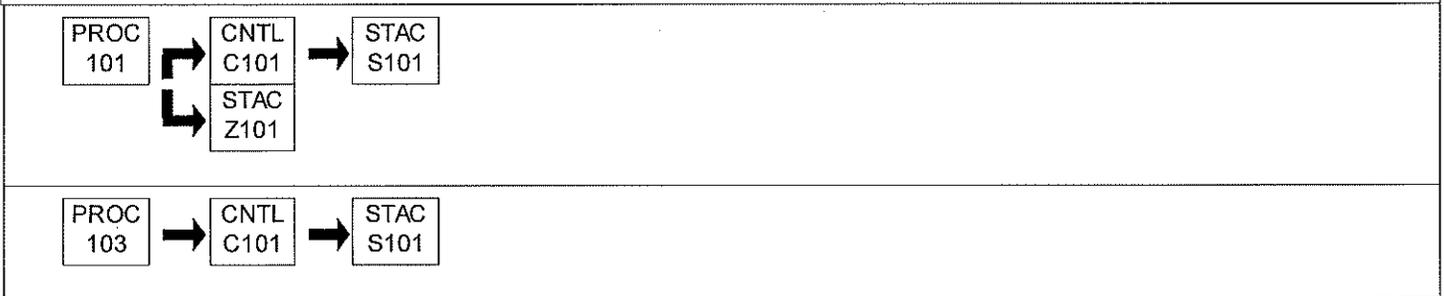
**Section F. Alternative Operating Scenario(s)**

- F-I: Restrictions
- F-II: Testing Requirements
- F-III: Monitoring Requirements
- F-IV: Recordkeeping Requirements
- F-V: Reporting Requirements
- F-VI: Work Practice Standards
- F-VII: Additional Requirements

**Section G. Emission Restriction Summary****Section H. Miscellaneous**

**SECTION A. Site Inventory List**

Source ID	Source Name	Capacity/Throughput	Fuel/Material
101	PUMP STATION SEAL LEAKS		
103	MAINTENANCE OPERATIONS		
C101	ENCLOSED FLARE		
S101	ENCLOSED FLARE STACK		
Z101	FUGITIVE EMISSIONS		

**PERMIT MAPS**

**SECTION B. General State Only Requirements****#001 [25 Pa. Code § 121.1]****Definitions.**

Words and terms that are not otherwise defined in this permit shall have the meanings set forth in Section 3 of the Air Pollution Control Act (35 P.S. § 4003) and in 25 Pa. Code § 121.1.

**#002 [25 Pa. Code § 127.446]****Operating Permit Duration.**

(a) This operating permit is issued for a fixed term of five (5) years and shall expire on the date specified on Page 1 of this permit.

(b) The terms and conditions of the expired permit shall automatically continue pending issuance of a new operating permit, provided the permittee has submitted a timely and complete application and paid applicable fees required under 25 Pa. Code Chapter 127, Subchapter I and the Department is unable, through no fault of the permittee, to issue or deny a new permit before the expiration of the previous permit.

**#003 [25 Pa. Code §§ 127.412, 127.413, 127.414, 127.446 & 127.703(b)&(c)]****Permit Renewal.**

(a) The permittee shall submit a timely and complete application for renewal of the operating permit to the appropriate Regional Air Program Manager. The application for renewal of the operating permit shall be submitted at least six (6) months and not more than 18 months before the expiration date of this permit.

(b) The application for permit renewal shall include the current permit number, a description of any permit revisions that occurred during the permit term, and any applicable requirements that were promulgated and not incorporated into the permit during the permit term. An application is complete if it contains sufficient information to begin processing the application, has the applicable sections completed and has been signed by a responsible official.

(c) The permittee shall submit with the renewal application a fee for the processing of the application and an additional annual administrative fee as specified in 25 Pa. Code § 127.703(b) and (c). The fees shall be made payable to "The Commonwealth of Pennsylvania - Clean Air Fund" and shall be for the amount specified in the following schedule specified in 25 Pa. Code § 127.703(b) and (c).

(1) Three hundred dollars for applications filed during the 2000-2004 calendar years.

(2) Three hundred seventy-five dollars for applications filed for the calendar years beginning in 2005.

(d) The renewal application shall also include submission of proof that the local municipality and county, in which the facility is located, have been notified in accordance with 25 Pa. Code § 127.413.

(e) The application for renewal of the operating permit shall also include submission of supplemental compliance review forms in accordance with the requirements of 25 Pa. Code § 127.412(b) and § 127.412(j).

(f) The permittee, upon becoming aware that any relevant facts were omitted or incorrect information was submitted in the permit application, shall promptly submit such supplementary facts or corrected information as necessary to address any requirements that become applicable to the source after the permittee submits a complete application, but prior to the date the Department takes action on the permit application.

**#004 [25 Pa. Code § 127.703]****Operating Permit Fees under Subchapter I.**

(a) The permittee shall pay fees according to the following schedule specified in 25 Pa. Code § 127.703(b):

(1) Three hundred dollars for applications filed during the 2000-2004 calendar years.

(2) Three hundred seventy-five dollars for applications filed for the calendar years beginning in 2005.

This fee schedule shall apply to the processing of an application for an operating permit as well as the extension,



**SECTION B. General State Only Requirements**

modification, revision, renewal, and re-issuance of each operating permit or part thereof.

(b) The permittee shall pay an annual operating permit administrative fee according to the fee schedule established in 25 Pa. Code § 127.703(c).

(1) Two hundred fifty dollars for applications filed during the 1995-1999 calendar years.

(2) Three hundred dollars for applications filed during the 2000-2004 calendar years.

(3) Three hundred seventy-five dollars for applications filed during the years beginning in 2005.

(c) The applicable fees shall be made payable to "The Commonwealth of Pennsylvania - Clean Air Fund".

**#005 [25 Pa. Code §§ 127.450 (a)(4) and 127.464]**

**Transfer of Operating Permits.**

(a) This operating permit may not be transferred to another person, except in cases of transfer-of-ownership that are documented and approved by the Department.

(b) In accordance with 25 Pa. Code § 127.450(a)(4), a change in ownership of the source shall be treated as an administrative amendment if the Department determines that no other change in the permit is required and a written agreement has been submitted to the Department identifying the specific date of the transfer of permit responsibility, coverage and liability between the current and the new permittee and a compliance review form has been submitted to, and the permit transfer has been approved by, the Department.

(c) This operating permit is valid only for those specific sources and the specific source locations described in this permit.

**#006 [25 Pa. Code § 127.441 and 35 P.S. § 4008]**

**Inspection and Entry.**

(a) Upon presentation of credentials and other documents as may be required by law, the permittee shall allow the Department or authorized representatives of the Department to perform the following:

(1) Enter at reasonable times upon the permittee's premises where a source is located or emissions related activity is conducted, or where records are kept under the conditions of this permit;

(2) Have access to and copy, at reasonable times, any records that are kept under the conditions of this permit;

(3) Inspect at reasonable times, any facilities, equipment including monitoring and air pollution control equipment, practices, or operations regulated or required under this permit;

(4) Sample or monitor, at reasonable times, any substances or parameters, for the purpose of assuring compliance with the permit or applicable requirements as authorized by the Clean Air Act, the Air Pollution Control Act, or the regulations promulgated under the Acts.

(b) Pursuant to 35 P.S. § 4008, no person shall hinder, obstruct, prevent or interfere with the Department or its personnel in the performance of any duty authorized under the Air Pollution Control Act or regulations adopted thereunder including denying the Department access to a source at this facility. Refusal of entry or access may constitute grounds for permit revocation and assessment of criminal and/or civil penalties.

(c) Nothing in this permit condition shall limit the ability of the EPA to inspect or enter the premises of the permittee in accordance with Section 114 or other applicable provisions of the Clean Air Act.

**#007 [25 Pa. Code §§ 127.441 & 127.444]**

**Compliance Requirements.**

(a) The permittee shall comply with the conditions of this operating permit. Noncompliance with this permit constitutes

**SECTION B. General State Only Requirements**

a violation of the Clean Air Act and the Air Pollution Control Act and is grounds for one or more of the following:

- (1) Enforcement action
- (2) Permit termination, revocation and reissuance or modification
- (3) Denial of a permit renewal application

(b) A person may not cause or permit the operation of a source which is subject to 25 Pa. Code Article III unless the source(s) and air cleaning devices identified in the application for the plan approval and operating permit and the plan approval issued for the source is operated and maintained in accordance with specifications in the applications and the conditions in the plan approval and operating permit issued by the Department. A person may not cause or permit the operation of an air contamination source subject to 25 Pa. Code Chapter 127 in a manner inconsistent with good operating practices.

(c) For purposes of Sub-condition (b) of this permit condition, the specifications in applications for plan approvals and operating permits are the physical configurations and engineering design details which the Department determines are essential for the permittee's compliance with the applicable requirements in this State-Only permit. Nothing in this sub-condition shall be construed to create an independent affirmative duty upon the permittee to obtain a predetermination from the Department for physical configuration or engineering design detail changes made by the permittee.

**#008 [25 Pa. Code § 127.441]****Need to Halt or Reduce Activity Not a Defense.**

It shall not be a defense for the permittee in an enforcement action that it was necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

**#009 [25 Pa. Code §§ 127.442(a) & 127.461]****Duty to Provide Information.**

(a) The permittee shall submit reports to the Department containing information the Department may prescribe relative to the operation and maintenance of each source at the facility.

(b) The permittee shall furnish to the Department, in writing, information that the Department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with the permit. Upon request, the permittee shall also furnish to the Department copies of records that the permittee is required to maintain in accordance with this permit.

**#010 [25 Pa. Code § 127.461]****Revising an Operating Permit for Cause.**

This operating permit may be terminated, modified, suspended or revoked and reissued if one or more of the following applies:

- (1) The permittee constructs or operates the source subject to the operating permit so that it is in violation of the Air Pollution Control Act, the Clean Air Act, the regulations thereunder, a plan approval, a permit or in a manner that causes air pollution.
- (2) The permittee fails to properly or adequately maintain or repair an air pollution control device or equipment attached to or otherwise made a part of the source.
- (3) The permittee has failed to submit a report required by the operating permit or an applicable regulation.
- (4) The EPA determines that the permit is not in compliance with the Clean Air Act or the regulations thereunder.

**#011 [25 Pa. Code §§ 127.450 & 127.462]****Operating Permit Modifications**

(a) The permittee is authorized to make administrative amendments, minor operating permit modifications and

**SECTION B. General State Only Requirements**

significant operating permit modifications, under this permit, as outlined below:

(b) **Administrative Amendments.** The permittee shall make administrative operating permit amendments (as defined in 25 Pa. Code § 127.450(a)), according to procedures specified in § 127.450 unless precluded by the Clean Air Act or its regulations.

(c) **Minor Operating Permit Modifications.** The permittee shall make minor operating permit modifications (as defined 25 Pa. Code § 121.1) in accordance with 25 Pa. Code § 127.462.

(d) Permit modifications which do not qualify as minor permit modifications under 25 Pa. Code § 127.541 will be treated as a significant operating permit revision subject to the public notification procedures in §§ 127.424 and 127.425.

**#012 [25 Pa. Code § 127.441]****Severability Clause.**

The provisions of this permit are severable, and if any provision of this permit is determined by a court of competent jurisdiction to be invalid or unenforceable, such a determination will not affect the remaining provisions of this permit.

**#013 [25 Pa. Code § 127.449]****De Minimis Emission Increases.**

(a) This permit authorizes de minimis emission increases in accordance with 25 Pa. Code § 127.449 so long as the permittee provides the Department with seven (7) days prior written notice before commencing any de minimis emissions increase. The written notice shall:

(1) Identify and describe the pollutants that will be emitted as a result of the de minimis emissions increase.

(2) Provide emission rates expressed in tons per year and in terms necessary to establish compliance consistent with any applicable requirement.

(b) The Department may disapprove or condition de minimis emission increases at any time.

(c) Except as provided below in (d), the permittee is authorized to make de minimis emission increases (expressed in tons per year) up to the following amounts without the need for a plan approval or prior issuance of a permit modification:

(1) Four tons of carbon monoxide from a single source during the term of the permit and 20 tons of carbon monoxide at the facility during the term of the permit.

(2) One ton of NOx from a single source during the term of the permit and 5 tons of NOx at the facility during the term of the permit.

(3) One and six-tenths tons of the oxides of sulfur from a single source during the term of the permit and 8.0 tons of oxides of sulfur at the facility during the term of the permit.

(4) Six-tenths of a ton of PM10 from a single source during the term of the permit and 3.0 tons of PM10 at the facility during the term of the permit. This shall include emissions of a pollutant regulated under Section 112 of the Clean Air Act unless precluded by the Clean Air Act, the regulations thereunder or 25 Pa. Code Article III.

(5) One ton of VOCs from a single source during the term of the permit and 5.0 tons of VOCs at the facility during the term of the permit. This shall include emissions of a pollutant regulated under Section 112 of the Clean Air Act unless precluded by the Clean Air Act, the regulations thereunder or 25 Pa. Code Article III.

(6) Other sources and classes of sources determined to be of minor significance by the Department.

(d) In accordance with § 127.14, the permittee is authorized to install the following minor sources without the need for a plan approval or permit modification:

**SECTION B. General State Only Requirements**

- (1) Air conditioning or ventilation systems not designed to remove pollutants generated or released from other sources.
  - (2) Combustion units rated at 2,500,000 or less Btu per hour of heat input.
  - (3) Combustion units with a rated capacity of less than 10,000,000 Btu per hour heat input fueled by natural gas supplied by a public utility or by commercial fuel oils which are No. 2 or lighter, viscosity less than or equal to 5.82 c St, and which meet the sulfur content requirements of 25 Pa. Code §123.22 (relating to combustion units). For purposes of this permit, commercial fuel oil shall be virgin oil which has no reprocessed, recycled or waste material added.
  - (4) Space heaters which heat by direct heat transfer.
  - (5) Laboratory equipment used exclusively for chemical or physical analysis.
  - (6) Other sources and classes of sources determined to be of minor significance by the Department.
- (e) This permit does not authorize de minimis emission increases if the emissions increase would cause one or more of the following:
- (1) Increase the emissions of a pollutant regulated under Section 112 of the Clean Air Act except as authorized in Subparagraphs (c)(4) and (5) of this permit condition.
  - (2) Subject the facility to the prevention of significant deterioration requirements in 25 Pa. Code Chapter 127, Subchapter D and/or the new source review requirements in Subchapter E.
  - (3) Violate any applicable requirement of this permit, the Air Pollution Control Act, the Clean Air Act, or the regulations promulgated under either of the acts.
- (f) Emissions authorized under this permit condition shall be included in the monitoring, recordkeeping and reporting requirements of this permit.
- (g) Except for de minimis emission increases, installation of minor sources made pursuant to this permit condition and Plan Approval Exemptions under 25 Pa. Code § 127.14 (relating to exemptions), the permittee is prohibited from making changes or engaging in activities that are not specifically authorized under this permit without first applying for a plan approval. In accordance with § 127.14(b), a plan approval is not required for the construction, modification, reactivation, or installation of the sources creating the de minimis emissions increase.
- (h) The permittee may not meet de minimis emission threshold levels by offsetting emission increases or decreases at the same source.

**#014 [25 Pa. Code § 127.3]****Operational Flexibility.**

The permittee is authorized to make changes within the facility in accordance with the regulatory provisions outlined in 25 Pa. Code § 127.3 (relating to operational flexibility) to implement the operational flexibility requirements provisions authorized under Section 6.1(i) of the Air Pollution Control Act and the operational flexibility terms and conditions of this permit. The provisions in 25 Pa. Code Chapter 127 which implement the operational flexibility requirements include the following:

- (1) Section 127.14 (relating to exemptions)
- (2) Section 127.447 (relating to alternative operating scenarios)
- (3) Section 127.448 (relating to emissions trading at facilities with Federally enforceable emissions caps)
- (4) Section 127.449 (relating to de minimis emission increases)
- (5) Section 127.450 (relating to administrative operating permit amendments)

**SECTION B. General State Only Requirements**

(6) Section 127.462 (relating to minor operating permit modifications)

(7) Subchapter H (relating to general plan approvals and general operating permits)

**#015 [25 Pa. Code § 127.11]****Reactivation**

(a) The permittee may not reactivate a source that has been out of operation or production for at least one year unless the reactivation is conducted in accordance with a plan approval granted by the Department or in accordance with reactivation and maintenance plans developed and approved by the Department in accordance with 25 Pa. Code § 127.11a(a).

(b) A source which has been out of operation or production for more than five (5) years but less than 10 years may be reactivated and will not be considered a new source if the permittee satisfies the conditions specified in 25 Pa. Code § 127.11a(b).

**#016 [25 Pa. Code § 127.36]****Health Risk-based Emission Standards and Operating Practice Requirements.**

(a) When needed to protect public health, welfare and the environment from emissions of hazardous air pollutants from new and existing sources, the permittee shall comply with the health risk-based emission standards or operating practice requirements imposed by the Department, except as precluded by §§ 6.6(d)(2) and (3) of the Air Pollution Control Act [35 P.S. § 4006.6(d)(2) and (3)].

(b) A person challenging a performance or emission standard established by the Department has the burden to demonstrate that performance or emission standard does not meet the requirements of Section 112 of the Clean Air Act.

**#017 [25 Pa. Code § 121.9]****Circumvention.**

No person may permit the use of a device, stack height which exceeds good engineering practice stack height, dispersion technique or other technique which, without resulting in reduction of the total amount of air contaminants emitted, conceals or dilutes an emission of air contaminants which would otherwise be in violation of 25 Pa. Code Article III, except that with prior approval of the Department, the device or technique may be used for control of malodors.

**#018 [25 Pa. Code §§ 127.402(d) & 127.442]****Reporting Requirements.**

(a) The permittee shall comply with the applicable reporting requirements of the Clean Air Act, the regulations thereunder, the Air Pollution Control Act and 25 Pa. Code Article III including Chapters 127, 135 and 139.

(b) The permittee shall submit reports to the Department containing information the Department may prescribe relative to the operation and maintenance of any air contamination source.

(c) Reports, test data, monitoring data, notifications and requests for renewal of the permit shall be submitted to the:

Regional Air Program Manager  
PA Department of Environmental Protection  
(At the address given in the permit transmittal letter, or otherwise notified)

(d) Any records or information including applications, forms, or reports submitted pursuant to this permit condition shall contain a certification by a responsible official as to truth, accuracy and completeness. The certifications submitted under this permit shall require a responsible official of the facility to certify that based on information and belief formed after reasonable inquiry, the statements and information in the documents are true, accurate and complete.

(e) Any records, reports or information submitted to the Department shall be available to the public except for such

**SECTION B. General State Only Requirements**

records, reports or information which meet the confidentiality requirements of § 4013.2 of the Air Pollution Control Act and §§ 112(d) and 114(c) of the Clean Air Act. The permittee may not request a claim of confidentiality for any emissions data generated for the facility.

**#019 [25 Pa. Code §§ 127.441(c) & 135.5]****Sampling, Testing and Monitoring Procedures.**

(a) The permittee shall comply with the monitoring, recordkeeping or reporting requirements of 25 Pa. Code Chapter 139 and the other applicable requirements of 25 Pa. Code Article III and additional requirements related to monitoring, reporting and recordkeeping required by the Clean Air Act and the regulations thereunder including the Compliance Assurance Monitoring requirements of 40 CFR Part 64, where applicable.

(b) Unless alternative methodology is required by the Clean Air Act and regulations adopted thereunder, sampling, testing and monitoring required by or used by the permittee to demonstrate compliance with any applicable regulation or permit condition shall be conducted in accordance with the requirements of 25 Pa. Code Chapter 139.

**#020 [25 Pa. Code §§ 127.441(c) and 135.5]****Recordkeeping.**

(a) The permittee shall maintain and make available, upon request by the Department, the following records of monitored information:

- (1) The date, place (as defined in the permit) and time of sampling or measurements.
- (2) The dates the analyses were performed.
- (3) The company or entity that performed the analyses.
- (4) The analytical techniques or methods used.
- (5) The results of the analyses.
- (6) The operating conditions as existing at the time of sampling or measurement.

(b) The permittee shall retain records of any required monitoring data and supporting information for at least five (5) years from the date of the monitoring, sample, measurement, report or application. Supporting information includes the calibration data and maintenance records and original strip-chart recordings for continuous monitoring instrumentation, and copies of reports required by the permit.

(c) The permittee shall maintain and make available to the Department upon request, records including computerized records that may be necessary to comply with the reporting, recordkeeping and emission statement requirements in 25 Pa. Code Chapter 135 (relating to reporting of sources). In accordance with 25 Pa. Code Chapter 135, § 135.5, such records may include records of production, fuel usage, maintenance of production or pollution control equipment or other information determined by the Department to be necessary for identification and quantification of potential and actual air contaminant emissions.

**#021 [25 Pa. Code § 127.441(a)]****Property Rights.**

This permit does not convey any property rights of any sort, or any exclusive privileges.

**#022 [25 Pa. Code § 127.447]****Alternative Operating Scenarios.**

The permittee is authorized to make changes at the facility to implement alternative operating scenarios identified in this permit in accordance with 25 Pa. Code § 127.447.

**SECTION C. Site Level Requirements****I. RESTRICTIONS.****Emission Restriction(s).****# 001 [25 Pa. Code §121.7]****Prohibition of air pollution.**

No person may permit air pollution as that term is defined in the Air Pollution Control Act (35 P.S. Section 4003).

**# 002 [25 Pa. Code §123.1]****Prohibition of certain fugitive emissions**

No person may permit the emission into the outdoor atmosphere of fugitive air contaminant from a source other than the following:

- (a) construction or demolition of buildings or structures;
- (b) grading, paving and maintenance of roads and streets;
- (c) use of roads and streets. Emissions from material in or on trucks, railroad cars and other vehicular equipment are not considered as emissions from use of roads and streets;
- (d) clearing of land;
- (e) stockpiling of materials;
- (f) open burning operations, as specified in 25 Pa. Code § 129.14;
- (g) blasting in open pit mines. Emissions from drilling are not considered as emissions from blasting;
- (h) coke oven batteries, provided the fugitive air contaminants emitted from any coke oven battery comply with the standards for visible fugitive emissions in 25 Pa. Code §§ 123.44 and 129.15 (relating to limitations of visible fugitive air contaminants from operation of any coke oven battery; and coke pushing operations); and
- (i) sources and classes of sources other than those identified in (a)-(h), above, for which the permittee has obtained a determination from the Department that fugitive emissions from the source, after appropriate control, meet the following requirements:
  - (1) the emissions are of minor significance with respect to causing air pollution; and
  - (2) the emissions are not preventing or interfering with the attainment or maintenance of any ambient air quality standard.

**# 003 [25 Pa. Code §123.2]****Fugitive particulate matter**

The permittee shall not allow the emission of fugitive particulate matter into the outdoor atmosphere from a source specified in Section C, Condition #002, if the emissions are visible at the point the emissions pass outside the person's property.

**# 004 [25 Pa. Code §123.31]****Limitations**

The permittee shall not allow the emission into the outdoor atmosphere of any malodorous air contaminants from any source in such a manner that the malodors are detectable outside the property of the person on whose land the source is being operated.

**# 005 [25 Pa. Code §123.41]****Limitations**

The permittee shall not allow the emission into the outdoor atmosphere of visible air contaminants in such a manner that the opacity of the emission is either of the following:

- (a) Equal to or greater than 20% for a period or periods aggregating more than three (3) minutes in any one hour.
- (b) Equal to or greater than 60% at any time.

**SECTION C. Site Level Requirements****# 006 [25 Pa. Code §123.42]****Exceptions**

The emission limitation of 25 Pa. Code Section 123.41, shall not apply when:

- (a) The presence of uncombined water is the only reason for failure of the emission to meet the limitations.
- (b) The emission results from the operation of equipment used solely to train and test persons in observing the opacity of visible emissions.
- (c) The emission results from sources specified in Section C, Condition #002, subsections (a) - (i).

**# 007 [25 Pa. Code §129.14]****Open burning operations**

(a) The permittee shall not conduct open burning of materials in such a manner that:

- (1) The emissions are visible, at any time, at the point such emissions pass outside the property of the person on whose land the open burning is being conducted.
- (2) Malodorous air contaminants from the open burning are detectable outside the property of the person on whose land the open burning is being conducted.
- (3) The emissions interfere with the reasonable enjoyment of life and property.
- (4) A fire set in conjunction with the production of agricultural commodities in their unmanufactured state on the premises of the farm operation.
- (5) The emissions cause damage to vegetation or property.
- (6) The emissions are or may be deleterious to human or animal health.

(b) Exceptions. The requirements of Subsection (a) do not apply where the open burning operations result from:

- (1) A fire set to prevent or abate a fire hazard, when approved by the Department and set by or under the supervision of a public official.
- (2) Any fire set for the purpose of instructing personnel in fire fighting, when approved by the Department.
- (3) A fire set for the prevention and control of disease or pests, when approved by the Department.
- (4) A fire set solely for recreational or ceremonial purposes.
- (5) A fire set solely for cooking food.

(c) This permit does not constitute authorization to burn solid waste pursuant to section 610 (3) of the Solid Waste Management Act 35 P.S. Section 6018.610 (3), or any other provision of the Solid Waste Management Act.

**II. TESTING REQUIREMENTS.****# 008 [25 Pa. Code §127.441]****Operating permit terms and conditions.**

(a) If at any time the Department has cause to believe that air contaminant emissions from any source(s) listed in Section A, of this Permit, may be in excess of the limitations specified in this Permit, or established pursuant to, any applicable rule or regulation contained in 25 Pa. Code Article III, the permittee shall be required to conduct whatever tests are deemed necessary by the Department to determine the actual emission rate(s).

**SECTION C. Site Level Requirements**

(b). Such testing shall be conducted in accordance with the provisions of 25 Pa. Code Chapter 139, when applicable, and in accordance with any restrictions or limitations established by the Department at such time as it notifies the permittee that testing is required.

**III. MONITORING REQUIREMENTS.****# 009 [25 Pa. Code §123.43]****Measuring techniques**

Visible emissions may be measured using either of the following:

- (a) A device approved by the Department and maintained to provide accurate opacity measurements.
- (b) Observers, trained and qualified to measure plume opacity with the naked eye or with the aid of any device(s) approved by the Department.

**# 010 [25 Pa. Code §127.441]****Operating permit terms and conditions.**

(a) The permittee shall monitor the facility weekly for the following:

- (1) odors which may be objectionable (as per 25 Pa. Code §123.31);
- (2) visible emissions (as per 25 Pa. Code §§123.41 and 123.42); and
- (3) fugitive emissions (as per 25 Pa. Code §§ 123.1 and 123.2).

(b) Objectionable odors, fugitive emissions, and visible emissions that are caused or may be caused by operations at the site shall:

- (1) be investigated;
  - (2) be reported to the facility management, or individual(s) designated by the permittee;
  - (3) have appropriate corrective action taken (for emissions that originate on-site); and
  - (4) be recorded in a permanent written log.
  - (5) for any observed problems, a first attempt at equipment repair must be made within 15 days of discovery, and DEP must be notified if the final repair is not completed in 30 days.
- (c) After six (6) months of weekly monitoring, and upon the permittee's request, the Department will determine the feasibility of decreasing the frequency of monitoring to monthly.

(d) The Department reserves the right to change the above monitoring requirements at any time, based on but not limited to: the review of the compliance certification, complaints, monitoring results, and/or Department findings.

**# 011 [25 Pa. Code §127.441]****Operating permit terms and conditions.**

The permittee shall calculate the total emissions of VOCs for the entire facility on a 12-month rolling sum basis.

**IV. RECORDKEEPING REQUIREMENTS.****# 012 [25 Pa. Code §127.441]****Operating permit terms and conditions.**

The permittee shall maintain a record of all monitoring of fugitive emissions, visible emissions and odors, including those that deviate from the conditions found in this permit. The record of deviations shall contain, at a minimum, the following items:

- (a) date, time, and location of the incident(s);
- (b) the cause of the event; and
- (c) the corrective action taken, if necessary, to abate the situation and prevent future occurrences.

**# 013 [25 Pa. Code §127.441]****Operating permit terms and conditions.**

The permittee shall compile and record the total emissions of VOCs for the entire facility on a 12-month rolling sum basis.

**SECTION C. Site Level Requirements****# 014 [25 Pa. Code §127.441]****Operating permit terms and conditions.**

The permittee shall maintain records of all the facility's increases of emissions from the following categories:

- (a). De minimus increases without notification to the Department.
- (b). De minimus increases with notification to the Department, via letter.
- (c). Increases resulting from a Request for Determination (RFD) to the Department.
- (d). Increases resulting from the issuance of a plan approval and subsequent operating permit.

**V. REPORTING REQUIREMENTS.****# 015 [25 Pa. Code §127.441]****Operating permit terms and conditions.**

The permittee shall report malfunctions to the Department which result in, or may possibly result in, the emission of air contaminants in excess of the limitations specified in this permit, or regulation contained in 25 Pa. Code Article III. Malfunctions shall be reported as follows:

- (a) Any malfunction which poses an imminent danger to the public health, safety, welfare, and environment, shall be immediately reported to the Department by telephone. The telephone report of such malfunctions shall occur no later than two (2) hours after the incident. The permittee shall submit a written report of instances of such malfunctions to the Department within three (3) days of the telephone report.
- (b) Unless otherwise required by this permit, any other malfunction that is not subject to the reporting requirement of subsection (a) above, shall be reported to the Department, in writing, within five (5) days of malfunction discovery.
- (c) Telephone reports can be made to the Air Quality Program at (814) 946-7290 during normal business hours or to the Department's Emergency Hotline (866) 825-0208 at any time.
- (d) Written reports of malfunctions shall describe, at a minimum, the following:
  - (1). The malfunction(s).
  - (2). The emission(s).
  - (3). The duration.
  - (4). Any corrective action taken.

**# 016 [25 Pa. Code §127.441]****Operating permit terms and conditions.**

[Additional authority for this permit condition is also derived from 40 CFR Part 68.]

- (a). If required by Section 112(r) of the Clean Air Act, the permittee shall develop and implement an accidental release program consistent with requirements of the Clean Air Act, 40 C.F.R. Part 68 (relating to chemical accident prevention provisions) and the Federal Chemical Safety Information, Site Security and Fuels Regulatory Relief Act (P.L. 106-40).
- (b). The permittee shall prepare and implement a Risk Management Plan (RMP) which meets the requirements of Section 112(r) of the Clean Air Act, 40 C.F.R. Part 68 and the Federal Chemical Safety Information, Site Security and Fuels Regulatory Relief Act when a regulated substance listed in 40 C.F.R. § 68.130 is present in a process in more than the threshold quantity at a facility. The permittee shall submit the RMP to the federal Environmental Protection Agency according to the following schedule and requirements:
  - (1). The permittee shall submit the first RMP to a central point specified by EPA no later than the latest of the following:
    - (i). Three years after the date on which a regulated substance is first listed under 40 C.F.R. § 68.130; or,
    - (ii). The date on which a regulated substance is first present above a threshold quantity in a process.
  - (2). The permittee shall submit any additional relevant information requested by the Department or EPA concerning the RMP and shall make subsequent submissions of RMPs in accordance with 40 C.F.R. § 68.190.

**SECTION C. Site Level Requirements**

(3). The permittee shall certify that the RMP is accurate and complete in accordance with the requirements of 40 C.F.R. Part 68, including a checklist addressing the required elements of a complete RMP.

(c). As used in this permit condition, the term "process" shall be as defined in 40 C.F.R. § 68.3. The term "process" means any activity involving a regulated substance including any use, storage, manufacturing, handling, or on-site movement of such substances or any combination of these activities. For purposes of this definition, any group of vessels that are interconnected, or separate vessels that are located such that a regulated substance could be involved in a potential release, shall be considered a single process.

(d). If this facility is subject to 40 C.F.R. Part 68, as part of the certification required under this permit, the permittee shall:

(1). Submit a compliance schedule for satisfying the requirements of 40 C.F.R. Part 68 by the date specified in 40 C.F.R. § 68.10(a); or,

(2). Certify that this facility is in compliance with all requirements of 40 C.F.R. Part 68 including the registration and submission of the RMP.

(e). If this facility is subject to 40 C.F.R. Part 68, the permittee shall maintain records supporting the implementation of an accidental release program for five (5) years in accordance with 40 C.F.R. § 68.200.

(f). When this facility is subject to the accidental release program requirements of Section 112(r) of the Clean Air Act and 40 C.F.R. Part 68, appropriate enforcement action will be taken by the Department if the permittee fails to register and submit the RMP or a revised plan pursuant to 40 C.F.R. Part 68.

**# 017 [25 Pa. Code §135.3]****Reporting**

[Additional authority for this permit condition is also derived from 25 Pa. Code § 127.441.]

If the permittee has been previously advised by the Department to submit a source report, the permittee shall submit by March 1, of each year, a source report for the preceding calendar year. The report shall include information from all previously reported sources, new sources which were first operated during the preceding calendar year, and sources modified during the same period which were not previously reported, including those sources listed in the Miscellaneous Section of this permit.

The permittee may request an extension of time from the Department for the filing of a source report, and the Department may grant the extension for reasonable cause.

**VI. WORK PRACTICE REQUIREMENTS.****# 018 [25 Pa. Code §123.1]****Prohibition of certain fugitive emissions**

The permittee shall take all reasonable actions to prevent particulate matter from becoming airborne from any source specified in Section C, Condition #002(a)-(i). These actions shall include, but are not limited to, the following:

(a) Use, where possible, of water or chemicals for control of dust in the demolition of buildings or structures, construction operations, the grading of roads, or the clearing of land.

(b) Application of asphalt, oil, water, or suitable chemicals on dirt roads, material stockpiles, and other surfaces, which may give rise to airborne dusts.

(c) Paving and maintenance of roadways.

(d) Prompt removal of earth or other material from paved streets onto which earth or other material has been transported by trucking or earth moving equipment, erosion by water, or other means.

**SECTION C. Site Level Requirements****# 019 [25 Pa. Code §127.441]****Operating permit terms and conditions.**

The permittee shall immediately, upon discovery, implement measures, which may include the application for the installation of an air cleaning device(s), if necessary, to reduce the air contaminant emissions to within applicable limitations, if at any time the operation of the source(s) identified in Section A, of this permit, is causing the emission of air contaminants in excess of the limitations specified in, or established pursuant to, 25 Pa. Code Article III or any other applicable rule promulgated under the Clean Air Act.

**# 020 [25 Pa. Code §127.444]****Compliance requirements.**

The permittee shall operate and maintain all sources and any air cleaning devices identified in this operating permit in accordance with the manufacturers' recommendations/specifications, as well as in a manner consistent with good operating practices.

**VII. ADDITIONAL REQUIREMENTS.****# 021 [25 Pa. Code §127.441]****Operating permit terms and conditions.**

Nothing herein shall be construed to supersede, amend, or authorize violation of the provisions of any valid and applicable local law, ordinance, or regulation, or any court order, provided that said local law, ordinance, or regulation, or court order is not preempted by the Air Pollution Control Act, Act of January 8, 1960, P.L. 2119 (1959), as amended, 35 P.S. §4001 et seq., and the rules and regulations promulgated thereunder. It is the applicant's responsibility, separate and apart from the application process, to obtain any authorizations, permits, approvals, or licenses that the applicant might need in order to perform the construction permitted by this plan approval, including access, ownership, or lease of the subject parcel or parcels of property. The Department incurs no enforcement obligations with respect to this condition.

**# 022 [25 Pa. Code §127.441]****Operating permit terms and conditions.**

The potential fugitive plus stack emissions from this facility, after appropriate control as prescribed in this permit, have been estimated as follows: 0.07 tpy of NOx, 0.30 tpy of CO, 1.08 tpy of VOCs, 0.02 tpy of HAPs, 0.01 tpy of Methane and 137 tpy of GHGs. The Department has determined these emissions remaining after appropriate control are of minor significance with regard to causing air pollution, and will not prevent or interfere with the attainment or maintenance of an ambient air quality standard.

**VIII. COMPLIANCE CERTIFICATION.**

No additional compliance certifications exist except as provided in other sections of this permit including Section B (relating to State Only General Requirements).

**IX. COMPLIANCE SCHEDULE.**

No compliance milestones exist.

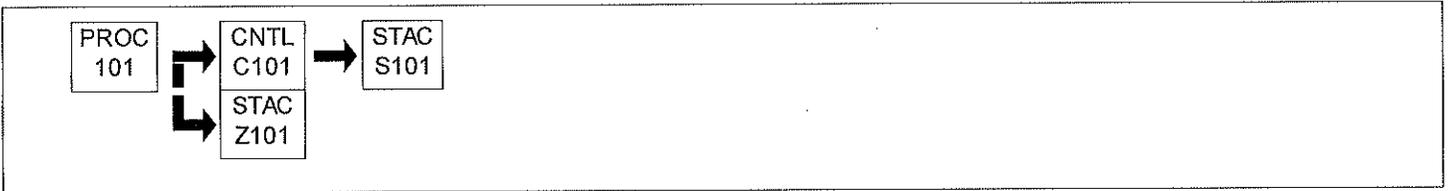
**SECTION D. Source Level Requirements**

Source ID: 101

Source Name: PUMP STATION SEAL LEAKS

Source Capacity/Throughput:

Conditions for this source occur in the following groups: GRP 01

**I. RESTRICTIONS.**

No additional requirements exist except as provided in other sections of this permit including Section B (State Only General Requirements) and/or Section E (Source Group Restrictions).

**II. TESTING REQUIREMENTS.**

No additional testing requirements exist except as provided in other sections of this permit including Section B (State Only General Requirements) and/or Section E (Source Group Restrictions).

**III. MONITORING REQUIREMENTS.**

No additional monitoring requirements exist except as provided in other sections of this permit including Section B (State Only General Requirements) and/or Section E (Source Group Restrictions).

**IV. RECORDKEEPING REQUIREMENTS.**

No additional record keeping requirements exist except as provided in other sections of this permit including Section B (State Only General Requirements) and/or Section E (Source Group Restrictions).

**V. REPORTING REQUIREMENTS.**

No additional reporting requirements exist except as provided in other sections of this permit including Section B (State Only General Requirements) and/or Section E (Source Group Restrictions).

**VI. WORK PRACTICE REQUIREMENTS.**

No additional work practice requirements exist except as provided in other sections of this permit including Section B (State Only General Requirements) and/or Section E (Source Group Restrictions).

**VII. ADDITIONAL REQUIREMENTS.**

No additional requirements exist except as provided in other sections of this permit including Section B (State Only General Requirements) and/or Section E (Source Group Restrictions).

**SECTION D. Source Level Requirements**

Source ID: 103

Source Name: MAINTENANCE OPERATIONS

Source Capacity/Throughput:

Conditions for this source occur in the following groups: GRP 01

**I. RESTRICTIONS.**

No additional requirements exist except as provided in other sections of this permit including Section B (State Only General Requirements) and/or Section E (Source Group Restrictions).

**II. TESTING REQUIREMENTS.**

No additional testing requirements exist except as provided in other sections of this permit including Section B (State Only General Requirements) and/or Section E (Source Group Restrictions).

**III. MONITORING REQUIREMENTS.**

No additional monitoring requirements exist except as provided in other sections of this permit including Section B (State Only General Requirements) and/or Section E (Source Group Restrictions).

**IV. RECORDKEEPING REQUIREMENTS.**

No additional record keeping requirements exist except as provided in other sections of this permit including Section B (State Only General Requirements) and/or Section E (Source Group Restrictions).

**V. REPORTING REQUIREMENTS.**

No additional reporting requirements exist except as provided in other sections of this permit including Section B (State Only General Requirements) and/or Section E (Source Group Restrictions).

**VI. WORK PRACTICE REQUIREMENTS.**

No additional work practice requirements exist except as provided in other sections of this permit including Section B (State Only General Requirements) and/or Section E (Source Group Restrictions).

**VII. ADDITIONAL REQUIREMENTS.**

No additional requirements exist except as provided in other sections of this permit including Section B (State Only General Requirements) and/or Section E (Source Group Restrictions).



**SECTION E. Source Group Restrictions.**

Group Name: GRP 01  
Group Description: Pump Station & Maintenance  
Sources included in this group

ID	Name
101	PUMP STATION SEAL LEAKS
103	MAINTENANCE OPERATIONS

**I. RESTRICTIONS.**

**Emission Restriction(s).**

# 001 [25 Pa. Code §127.441]  
 Operating permit terms and conditions.  
 The enclosed flare shall be operated with no visible emissions and no visible flame.

**Fuel Restriction(s).**

# 002 [25 Pa. Code §127.441]  
 Operating permit terms and conditions.  
 The permittee shall burn only propane, butane, ethane or a mixture of these in the enclosed flare.

# 003 [25 Pa. Code §127.441]  
 Operating permit terms and conditions.  
 The enclosed flare pilot light shall burn propane gas.

**II. TESTING REQUIREMENTS.**

No additional testing requirements exist except as provided in other sections of this permit including Section B (State Only General Requirements).

**III. MONITORING REQUIREMENTS.**

No additional monitoring requirements exist except as provided in other sections of this permit including Section B (State Only General Requirements).

**IV. RECORDKEEPING REQUIREMENTS.**

# 004 [25 Pa. Code §127.441]  
 Operating permit terms and conditions.  
 When the enclosed flare is not operational, the permittee shall record the downtime and the associated emissions.

# 005 [25 Pa. Code §127.441]  
 Operating permit terms and conditions.  
 The permittee shall maintain detailed records of all maintenance performed on the enclosed flare. The permittee shall retain these records for a minimum of five (5) years and shall make them available to the department upon its request.

**V. REPORTING REQUIREMENTS.**

No additional reporting requirements exist except as provided in other sections of this permit including Section B (State Only General Requirements).

**VI. WORK PRACTICE REQUIREMENTS.**

# 006 [25 Pa. Code §127.441]  
 Operating permit terms and conditions.  
 The permittee shall maintain a system to notify the operator immediately when the enclosed flare is not operational.

**SECTION E. Source Group Restrictions.****VII. ADDITIONAL REQUIREMENTS.**

No additional requirements exist except as provided in other sections of this permit including Section B (State Only General Requirements).



**SECTION F. Alternative Operation Requirements.**

No Alternative Operations exist for this State Only facility.

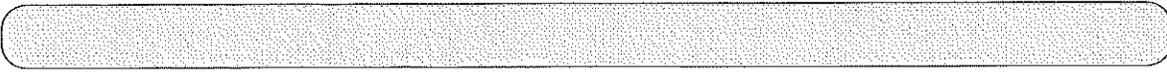


**SECTION G. Emission Restriction Summary.**

No emission restrictions listed in this section of the permit.



**SECTION H. Miscellaneous.**



\*\*\*\*\* End of Report \*\*\*\*\*