12-XXX-205

**Enbridge Energy, Limited Partnership**
1320 Grand Avenue
Superior, WI 54880
Tel 715 394 1400
Fax 715 394 1500

www.enbridgepartners.com

ENBRIDGE™

October 9, 2012

Don C. Faith III
Air Management Engineer
Wisconsin Department of Natural Resources
101 South Webster Street
Madison, WI 53707

RECEIVED
OCT 10 2012
AIR MANAGEMENT

RE: Superior Terminal Enhancement Project Permit Application

Dear Mr. Faith:

Enbridge Energy, Limited Partnership (Enbridge) is submitting the enclosed prevention of significant deterioration permit application for expedited review. Two copies of the application are enclosed and we have directly provided a copy of the permit application to the Region to the attention of Neal Baudhuin at the Superior Service Center.

The proposed Superior Terminal Enhancement Project includes the construction of two new external floating roof tanks T41 and T42, each with a maximum liquid storage capacity of 584,232 barrels (bbl) (24,537,744 gallons). The proposed project will also increase the inbound pipeline capacity of Line 67 by 120,000 barrels per day and increase the outbound pipeline capacity of Line 61 by 395,000 barrels per day. To accommodate the additional volume of crude oil being transported through the Superior Terminal and to efficiently segregate products and maintain product quality of the crude oil as it travels through the pipeline system, Enbridge is proposing the following modifications of existing pumping and piping infrastructure throughout the Terminal:

- Manifold modifications to improve connectivity, pipeline delivery flexibility, and to enhance Enbridge's ability to segregate crude oil product batches through quality pooling and minimize product quality degradation due to mixing
- Replacement of existing piping within the facility with larger diameter piping to meet increased pipeline delivery rates
- Construction of additional piping and manifold piping connections

If you have any questions or need any additional information, please contact me at 715-398-4756 or Ron Reding with Barr Engineering Company at 952-832-2673.

Sincerely,

Rhonda O'Leary

Rhonda O'Leary, P.E.
Senior Air Quality Analyst

CC: Neal Baudhuin, Air Management Program, WDNR, Superior Service Center, 1701 N. 4th St., Superior, WI 54880
Joe McGaver, Enbridge
Ron Reding, Barr Engineering Company

Enclosure: Revision Application and Application Fee ($7,500)

12-XXX-205

ENBRIDGE™

# Superior Terminal Enhancement Project

## Prevention of Significant Deterioration Permit Application

### Enbridge Energy, Limited Partnership
### Superior, Wisconsin Terminal

**October 2012**

BARR

4700 West 77th Street
Minneapolis, MN 55435-4803
Phone: (952) 832-2600
Fax: (952) 832-2601

# Superior Terminal Enhancement Project
# Prevention of Significant Deterioration
# Permit Application

## October 2012

### Table of Contents


1.0 Introduction ..... 1

1.1 Source Description ..... 1

1.2 Operating Permit Source Status ..... 2

1.3 Description of Proposed Project ..... 2

2.0 Emission Calculation Discussion ..... 4

3.0 Form 4530-100 Facility Identification ..... 7

4.0 Form 4530-101 Facility Plot Plan ..... 9

5.0 Form 4530-102 Source and Site Descriptions ..... 11

6.0 Form 4530-102A Source Description Supplemental ..... 13

7.0 Form 4530-102B Source Description Supplemental ..... 16

8.0 Form 4530-105 Storage Tanks ..... 18

9.0 Form 4530-118 Compliance Certification - Monitoring and Reporting Methods ..... 23

10.0 Form 4530-125 Recordkeeping ..... 25

11.0 Form 4530-126 Emission Unit HAP Summary ..... 27

12.0 Form 4530-127 Facility Hazardous Air Pollutant Summary ..... 29

13.0 Form 4530-128 Emission Unit Summary ..... 31

14.0 Form 4530-129 Facility Emissions Summary ..... 33

15.0 Form 4530-109 Miscellaneous Processes ..... 35

16.0 Form 4530-118 Compliance Certification - Monitoring and Reporting Methods ..... 38

17.0 Form 4530-125 Recordkeeping ..... 40

18.0 Form 4530-126 Emission Unit HAP Summary ..... 42

19.0 Form 4530-128 Emission Unit Summary ..... 44

20.0 Form 4530-134 Index of Air Pollution Permit Application Forms ..... 46

## List of Attachments

Attachment A – Figures and Drawings

Figure 1 – Facility Plot Plan

Figure 2 – Site Location Map

Attachment B – Project Prevention of Significant Deterioration (PSD) Applicability Volatile Organic Compound Emission Calculation

Table 1-1 Prevention of Significant Deterioration (PSD) Applicability Volatile Organic Compound Emission Calculation Summary

Table 1-2 Projected Actual Withdrawal Loss Calculations

Table 1-3 Capable of Being Accommodated Withdrawal Loss Calculations

Table 1-4 Baseline Actual Throughput and Volatile Organic Compound Emission Summary

Table 1-5 Project Piping Component Fugitive Volatile Organic Compound Emission Calculations

Table 1-6 Permitted Maximum Terminal Throughput Capacity Summary

Table 1-7 Project Green House Gas Emission Calculations

Attachment C – Facility-Wide Potential to Emit Calculation Summary Tables

Table 2-1 MTE/PTE Emission Calculation Summary

Table 2-2 MTE/PTE Facility-Wide Volatile Organic Compound Emissions Summary

Table 2-3 MTE/PTE Facility-wide Hazardous Air Contaminant and Hazardous Air Pollutant Emission Calculation Summary

Table 2-4 MTE/PTE Tank Roof Landing Volatile Organic Compound Emission Calculations

Table 2-5 MTE/PTE Piping Component Fugitive Volatile Organic Compound Emission Calculations

Table 2-6 MTE/PTE Crude Oil Heater Emission Calculations

Table 2-7 MTE/PTE Diesel Fuel Powered Fire Pump and Emergency Generator Emission Calculations

Table 2-8 MTE/PTE Tank Properties and Throughput Summary

Table 2-9 MTE/PTE Sump Tank Emission Calculations

Table 2-10 MTE/PTE Pigging Equipment Emission Calculations

Table 2-11 MTE/PTE Green House Gas Emissions from Storage Tanks

Attachment D – TANKS Emissions Summary Report

Attachment E – NR445 Compliance Modeling Analysis

Attachment F – 2011 Annual Compliance Certification

Attachment G – 2011 Actual Emission Calculation Summary Tables
Attachment H – PSD Permit Application BACT Analysis
Attachment I – PSD Permit Application Additional Impact Analysis

# 1.0 Introduction

Enbridge Energy, Limited Partnership (Enbridge) is proposing to increase the delivery of crude oil through its existing pipeline system to accommodate its shippers' increased transportation requirements in serving secure and reliable crude oil supplies to refineries and numerous marketing hubs throughout the United States. The increased crude oil delivery will be accomplished through the utilization of additional crude oil transportation capacity through Enbridge's pipeline system, adding additional storage capacity at the Superior Terminal, and adding/modifying additional facility piping within the Superior Terminal.

Enbridge is submitting the enclosed Prevention of Significant Deterioration (PSD) permit application for the Superior Terminal Enhancement Project. Enbridge is requesting approval to construct two new external floating roof storage tanks and to expand the total facility outbound pipeline throughput of the Superior Terminal.

## 1.1 Source Description

Enbridge operates a crude oil storage terminal located at 2800 East 21st Street, Superior, Wisconsin and consists of 40 storage tanks of varying capacity and design. The terminal's storage tanks are identified as tanks T01 through T40 (refer to the Facility Site Location Map and Plot Plan in Attachment A). Enbridge utilizes the tanks as breakout storage for crude oil arriving into the Superior Terminal from inbound pipelines prior to flow volume metering and reinjection back into the outbound pipelines for continued transportation via Enbridge's pipeline system to refineries and other market hubs.

The Superior Terminal also operates an 84.4 MMbtu-per-hour process heater that is used to heat crude oil to improve viscosity and decrease the amount of energy required to pump the oil, three fire pumps, six emergency generators, pig receiver/launchers, sump tanks, pumps, and piping components such as valves and flanges.

The Superior Terminal is classified as code 486110 in the North American Industry Classification System (NAICS) for pipeline transportation of crude oil or as code 4612 in the U.S. Standard Industrial Classification (SIC) system.

## 1.2 Operating Permit Source Status

The Superior Terminal is currently a Part 70 (major) source which operates under operation permit number 816010580-P01 and construction permit 08-DCF-313. The existing terminal is considered a major stationary source for Title V permitting and PSD purposes and is an area (minor) source for hazardous air pollutants (HAPs) (Enbridge has accepted permit limitations to remain below the major source thresholds of 25 tpy total HAP and 10 tpy of any single HAP).

Douglas County is designated attainment or unclassifiable for the National Ambient Air Quality Standards for all criteria pollutants [carbon monoxide (CO), lead, nitrogen oxides ($NO_X$), ozone, particulate matter less than 2.5 microns in diameter (PM2.5), particulate matter less than 10 microns in diameter (PM10), and sulfur dioxide ($SO_2$)].

## 1.3 Description of Proposed Project

Enbridge proposes to construct two new external floating roof tanks, each with a maximum liquid storage capacity of 584,232 barrels (bbl) (24,537,744 gallons). Each new tank will have a nominal/shell capacity of 640,000 barrels and a working capacity of approximately 504,000 barrels. The tanks, identified as tanks T41 and T42 will be 286 feet in diameter and 55.75 feet high and will be used to store crude oil. Piping equipment, including valves and flanges, will be constructed to connect the proposed tanks to the Superior Terminal's piping manifolds.

In addition, the proposed project will increase the Superior Terminal's throughput capacity to accommodate an increased inbound crude oil volume of 120,000 barrels per day (bbl/day) from Line 67 (increase from 450,000 bbl/day to 570,000 bbl/day) and an increase in outbound capacity of 395,000 bbl/day (increase from 440,000 bbl/day to 835,000 bbl/day) on Line 61. The pipeline throughput capacities are based on an annual average throughput rate. To accommodate the additional volume of crude oil being transported through the Superior Terminal and to efficiently segregate products and maintain product quality of the crude as it travels through Enbridge's system, Enbridge is proposing the following modifications of existing pumping and piping infrastructure throughout the Terminal:

- Manifold modifications to improve connectivity, pipeline delivery flexibility, and to enhance Enbridge's ability to segregate crude oil product batches through quality pooling and minimize product quality degradation due to mixing
- Replacement of existing piping within the facility with larger diameter piping to meet increased pipeline delivery rates
- Construction of additional piping and manifold piping connections

- Construction/modification/replacement of pumps and piping components (valves, flanges, etc.)

The proposed project will be constructed in phases with incremental throughput increases and piping changes being completed over a three year period. Enbridge has included all Superior Terminal throughput capacity increases that are currently anticipated within the three year period in this permit application. Enbridge is requesting that the initial term of the construction permit be 36 months to accommodate the construction schedule.

The proposed project emission increase is estimated to be 48.26 tons per year (tpy) (refer to the project emissions summary calculations in Attachment B). The proposed project emission increase is above the 40 tpy volatile organic compounds (VOC) significant emission rate for ozone as defined at 40 CFR 52.21(b) 23 and s. NR 405.02 (27)(a). As a result, Enbridge is submitting this PSD permit application for the proposed project.

The proposed project will also result in an estimated 875 tpy increase in terminal green house gas emissions (GHG) (calculated as $CO_2$ equivalents or $CO_2e$). Refer to Attachment B, Table 1-7 for a summary of the project GHG emissions. The proposed new tanks and increased pipeline throughput capacity will result in additional methane emissions which are considered a GHG. The proposed project will not debottleneck, modify or affect terminal combustion sources such as the crude heater, fire pumps or emergency generators. The crude heater is only capable of heating crude oil prior to delivery on Line 6A and the Line 6A throughput will not be debottlenecked as a result of the project. The proposed increase in GHG emissions resulting from the project are below the 75,000 tpy $CO_2e$ trigger that requires PSD review for GHG emissions.

# 2.0 Emission Calculation Discussion

Air emissions from the terminal consist primarily of VOCs from storage tank operations, piping components (i.e., valves, flanges, pump seals) and a small amount from combustion sources (crude oil heater and emergency diesel engines). Storage tank emissions are generated from standing losses (rim seal losses, deck fitting losses, and deck seam losses), withdrawal losses, and floating roof landing losses (refer to the facility-wide potential to emit calculations in Attachment C).

Storage tank emissions resulting from standing and withdrawal losses are calculated using US Environmental Protection Agency (EPA) TANKS emission calculation program. Tank emissions calculated using the TANKS program are provided in Attachment D. Internal and external floating roof landing loss emission values are calculated using the methodology described in the EPA AP-42, Chapter 7.1, Organic Liquid Storage Tanks guidance document (EPA, Compilation of Air Pollutant Emission Factors, Volume 1, 5th edition, November 2006). Refer to the roof landing emissions in Table 2-4 of the facility-wide potential to emit calculations in Attachment C.

Fugitive emissions from piping components are calculated using marketing terminal average emission factors from the Protocol for Equipment Leak Emission Estimates (EPA Office of Air Quality Planning and Standards, November 1995, EPA-453/R-95-017). Enbridge assumes that all piping components are in light liquid VOC service and operate 8,760 hours per year. Refer to the piping component fugitive emission calculations in Table 2-5 of the facility-wide potential to emit calculations in Attachment C.

Hazardous air pollutant (HAP) emissions are calculated based on crude oil chemical speciation data from two data sources. The first data source is EPA's TANKS program crude oil chemical speciation profile, the second source is an EPA EPCRA Section 313 industry guidance document for petroleum terminal and bulk storage facilities. The individual HAP speciation profiles are used to calculate the vapor weight fraction using the calculation methodology described in the API Manual of Petroleum Measurement Standards Chapter 19.4 - Recommended Practice for Speciation of Evaporative Losses, Second Edition dated September 2005. If the two HAP speciation data sources contained different speciation data for the same chemical, the higher of the two liquid or vapor weight fractions is used in the calculations. HAP emissions are calculated by multiplying the total VOC emissions for an emission unit by the HAP liquid or vapor weight fraction depending on the emission type. HAP emissions from working losses are calculated by multiplying the working loss VOC emissions by the individual HAP liquid weigh fraction. HAP emissions from all other tank emissions and other

emission units are calculated by multiplying the VOC emissions by the vapor weight fraction of the individual HAP compounds.

The terminal is subject to WDNR hazardous air contaminant (HAC) regulations per s. NR 445. Benzene is the only HAC emitted at the terminal that exceeds NR445 emissions thresholds. Enbridge has completed an air quality impacts analysis to demonstrate that HAC emissions from the Terminal comply with WDNR NR445 Control of Hazardous Pollutant regulations (refer to the NR445 Compliance Modeling Summary and summary calculations in Attachment E).

Tank throughput is bottlenecked by the maximum terminal outbound pipeline capacity, which will be 2,455,000 bbl/day after the proposed expansion of Line 61. The maximum terminal outbound pipeline capacities are summarized in Attachment B, Table 1-6. With this permit application, Enbridge is attempting to standardize the manner in which pipeline capacities are permitted. Throughputs for the pipelines that are not increasing as a result of the proposed project may differ from the capacities used in previous permit applications. The throughput that Enbridge is permitting is the maximum daily capacity on an annual average basis (noted as Maximum Annual Pipeline Capacity in bbl/day). The maximum daily pipeline design capacity is not achievable on an annual basis due to required maintenance on the pipelines. In addition to standardizing the pipeline capacities used in permitting, we have also rounded the throughputs capacities to the nearest 1000 bbl/day accuracy or three significant figures instead of additional significant figures that are a result of calculations.

Typically, the throughput for an individual tank is calculated based on the individual tanks capacity as a fraction of the total terminal storage capacity. This would result in approximately 93 turnovers per tank per year for each of the 42 tanks. However to be consistent with previous permits, emissions for tanks T01 through T34 were calculated based on 87 turnovers per year and emissions for Tanks T35 through T40 and the proposed new tanks, T41 and T42, are estimated based on 200 turnovers per tank per year, which is the estimated future potential throughput of the tanks. This method results in combined tank throughput which exceeds the terminal's maximum throughput by approximately 19% or 583,946 bbl/day and results in an over-estimation of potential emissions from the storage tanks.

The number of turnovers should not be construed as an individual tank turnover or throughput limit. This throughput is being used to estimate annual average withdrawal losses for the terminal's storage tanks. Some tanks will have a higher number of actual turnovers and some tanks will have a lower

number of actual turnovers. Refer to the project emissions calculations in Attachment B and the facility-wide emission calculations in Attachment C.

Tank emissions are calculated using crude oil with a Reid vapor pressure (RVP) of 10.2 pounds per square inch (psi) which is the representative of the worst case (highest vapor pressure) materials being stored at the Superior Terminal.

# 3.0 Form 4530-100 Facility Identification

RECEIVED

OCT 1 0 2012

AIR MANAGEMENT

12-XXX-205

State of Wisconsin
Department of Natural Resources
dnr.wi.gov

**Facility Identification**
**Air Pollution Control Permit Application**
Form 4530-100 (R 1/11)

**Notice:** Use of this form is required by the Department for any air pollution control permit application filed pursuant to ss. 285.61, 285.62 or 285.66, Wis. Stats. Completion of this form is mandatory. The Department will not consider or act upon your application unless you complete and submit this application form. You are required to submit two copies in accordance with s. NR 407.05(2), Wis. Adm. Code. Personal information collected will be used for administrative purposes and may be provided to requesters to the extent required by Wisconsin's Open Records Law [ss. 19.31-19.39, Wis. Stats.].

## Facility Information

| Facility Name | Standard Industrial Class Code (SIC) | Facility ID Number (FID) |
|---|---|---|
| Enbridge Energy, Limited Partnership | 4612 | 816010580 |

| Street Address (where pollution sources are/will be located) | | County |
|---|---|---|
| 2800 East 21 Street | ☒ City ☐ Town ☐ Village of Superior | Douglas |

| Primary Operating Activity (e.g., lead-acid battery manufacturer or sulfite paper mill) | Is the facility located in an area designated as "nonattainment"? | If yes, indicate the pollutant(s) for the nonattainment designation |
|---|---|---|
| Pipeline transportation of crude oil | ☐ Yes ☒ No (refer to instruction booklet) | |

## Applicant Information

Applicant Name (provide full business or individual's name)
Enbridge Energy, Limited Partnership

| Mailing Address | City | State | ZIP Code |
|---|---|---|---|
| 1320 Grand Ave | Superior | WI | 54880 |

Parent Corporation or Owner Name (if not wholly owned by applicant)
Enbridge Energy, Limited Partnership

| Mailing Address | City | State | ZIP Code | Country (if not U.S.) |
|---|---|---|---|---|
| 1320 Grand Ave | Superior | WI | 54880 | |

Responsible Official Name–person legally responsible for the operation of the permitted air pollution sources [see NR 400.02(80e), Wis. Adm. Code]
Mark Willoughby

| Title | Phone Number |
|---|---|
| GM, Superior Region | 7153941410 |

Permit Contact Person – to be contacted for additional information concerning air pollution sources
Rhonda O'Leary

| Title | Phone Number |
|---|---|
| Senior Air Quality Analyst | 7153984756 |

## Permit Information

**Instructions:** If applying for a construction permit (including modification, reconstruction, relocation, and replacement), you MUST also apply for an operation permit, an operation permit renewal, or an operation permit revision. Select 'Operation Permit' if you currently do not have a facility-wide operation permit. Select 'Operation Permit Renewal' if you are renewing your facility-wide operation permit in conjunction with the proposed project. Otherwise, select 'Operation Permit Revision' so that your facility-wide operation permit will be revised to reflect the proposed project.

**Permit Type:**

☒ Construction Permit

Anticipated construction start date: 05/01/13 (mm/dd/yy) Anticipated operation start date: 07/01/14 (mm/dd/yy)

☒ Initial application fee attached ($7,500)

☐ Construction Permit Exemption and Authority – List appropriate Code citation: _____

☐ Construction Permit Revision – List permit to be revised: _____

☒ Operation Permit Revision – List permit to be revised: 816010580-P01

☐ Administrative Revision

☐ Minor Revision (must be accompanied by Form 4530-137)

☐ Significant Revision

☒ Operation Permit – select type:

☐ Operation Permit Renewal – select type:

☒ Part 70 Source

☐ Synthetic Minor, Non - Part 70 Source

☐ Non - Part 70 Source

List permit to be renewed: _____

☐ Elective Operation Permit (if requesting an operation permit that is otherwise not required)

☐ Operation Permit Exemption and Authority - List appropriate Code citation: _____

**Expedited review fee:**

If expedited review requested and fulfilled within the following time periods, the construction permit application fee you will be billed will include a surcharge for this additional service:

☐ 50 days from receipt of completed application for a review not conducted under ch. NR 405 or 408 - $5,000

☒ 60 days from receipt of completed application for a review conducted under ch. NR 405 or 408 - $7,500

☐ 90 days from receipt of completed application for a review conducted under ch. NR 405 or 408 - $4,000

Is additional information attached?
☒ Yes ☐ No

Are two copies of completed form and additional information included?
☒ Yes ☐ No

# 4.0 Form 4530-101 Facility Plot Plan

State of Wisconsin
Department of Natural Resources

FACILITY PLOT PLAN
AIR POLLUTION CONTROL PERMIT APPLICATION
Form 4530-101 Rev. 12-99

Use of this form is required by the Department for any air pollution control permit application filed pursuant to ss. 285.61, 285.62 or 285.66, Wis Stats. Completion of this form is mandatory. The Department will not consider or act upon your application unless you complete and submit this form. It is not the Department's intention to use any personally identifiable information from this form for any other purpose.

In order for a comprehensive air quality analysis to be accomplished, a facility plot plan MUST be included with the permit application. If the application is for an initial operation permit, submit the elements under #2 below. If the application is for a renewal, answer #1 below first.

1. Have there been changes to the facility plot plan since the previous operation permit application was submitted?
   - ☐ No. The plot plan submitted with the original application can be used for the renewal.
   - ☒ Yes. An up-to-date plot plan is attached. **Note: See Figures 1 and 2 in Attachment A**

2. If there have been changes to the facility plot plan since the last operation permit application submittal, RESUBMIT an up-to-date plot plan which must include the following or the permit application will be deemed incomplete:

**FOR DEPARTMENT USE ONLY**

| COMPLETE | INCOMPLETE | NOT APPLICABLE | |
|---|---|---|---|
| | | | 1. A building layout (blueprint, plan view) including all buildings occupied by or located on the site of the facility. |
| | | | 2. The maximum height of each building (excluding stack height). |
| | | | 3. The location and numerical designation of each stack. Please ensure these designations correspond to the appropriate stacks listed on the other permit forms in this application. |
| | | | 4. The location of fenced property lines (if any). |
| | | | 5. Identify direction "North" on all submittals. |
| | | | 6. All drawings shall be to scale and shall have the scale graphically depicted. |
| | | | 7. An additional regional map depicting the facility location in relation to the surrounding vicinity (roads or other features) shall be included. |

Are there any outdoor storage piles on the facility site? ☒ Yes ☐ No

If so, what material does the pile(s) consist of? **Temporary contaminated soil storage piles**

Are there any dirt roads or unpaved parking lots on the facility site? ☒ Yes ☐ No

**Note: Traffic on unpaved areas at the terminal consists of mowers and maintenance vehicles in the tank farm area. Emissions from paved and unpaved areas at the terminal are considered insignificant.**

# 5.0 Form 4530-102 Source and Site Descriptions

State of Wisconsin
Department of Natural Resources

SOURCE AND SITE DESCRIPTIONS
AIR POLLUTION CONTROL PERMIT APPLICATION
Form 4530-102 Rev. 12-99 Information attached? _N_(y/n)

Use of this form is required by the Department for any air pollution control permit application filed pursuant to ss. 285.61, 285.62 or 285.66, Wis Stats. Completion of this form is mandatory. The Department will not consider or act upon your application unless you complete and submit this form. It is not the Department's intention to use any personally identifiable information from this form for any other purpose.

1. Briefly describe the proposed project or existing Unit(s) to be permitted. Attached supplemental forms as needed.

**Enbridge proposes to construct two new external floating roof tanks, each with a maximum liquid storage capacity of 584,232 barrels (bbl) (24,537,744 gallons). The tanks, identified as tanks T41 and T42 will be 286 feet in diameter and 55.75 feet high and will be used to store crude oil. Piping equipment including valves and flanges will be constructed to connect the proposed tanks to terminal piping manifolds.**

**Enbridge proposes to construct two new external floating roof tanks, each with a maximum liquid storage capacity of 584,232 barrels (bbl) (24,537,744 gallons). Each new tank will have a nominal/shell capacity of 640,000 barrels and a working capacity of approximately 504,000 barrels. The tanks, identified as tanks T41 and T42 will be 286 feet in diameter and 55.75 feet high and will be used to store crude oil. Piping equipment, including valves and flanges, will be constructed to connect the proposed tanks to the Superior Terminal's piping manifolds.**
**In addition, the proposed project will increase the Superior Terminal's throughput capacity to accommodate an increased inbound crude oil volume of 120,000 barrels per day (bbl/day) from Line 67 (increase from 450,000 bbl/day to 570,000 bbl/day) and an increase in outbound capacity of 395,000 bbl/day (increase from 440,000 bbl/day to 835,000 bbl/day) on Line 61. The pipeline throughput capacities are based on an annual average throughput rate. To accommodate the additional volume of crude oil being transported through the Superior Terminal and to efficiently segregate products and maintain product quality of the crude as it travels through Enbridge's system, Enbridge is proposing the following modifications of existing pumping and piping infrastructure throughout the Terminal:**

- **Manifold modifications to improve connectivity, pipeline delivery flexibility, and to enhance Enbridge's ability to segregate crude oil product batches through quality pooling and minimize product quality degradation due to mixing**
- **Replacement of existing piping within the facility with larger diameter piping to meet increased pipeline delivery rates**
- **Construction of additional piping and manifold piping connections**
- **Construction/modification/replacement of pumps and piping components (valves, flanges, etc.)**

For Renewal Applications: **Not applicable**

1. Were any new or modified emissions units installed/modified at the facility since the last operation permit issuance date?
   - ☐ No. Proceed to form 4530-102A.
   - ☐ Yes. Answer the following questions:

2. Briefly describe any new/modified emissions units installed at the facility since the last operation permit issuance date and include the following information. Attach supplemental forms as needed.
   **Not applicable**

   a. List the Department issued construction and/or operation permit number as applicable (identifying which units were covered by which permit if multiple permits issued).
      i. If operation permit application forms were submitted for the new emission unit(s) covered by the construction permit mentioned above, reference the date of that application.
      ii. For Part 70 Sources Only: If no operation permit application forms were submitted for the new emissions unit(s) covered by the construction permit mentioned above, complete the appropriate forms 4530-118 through 4530-125.
   b. Include the Department issued construction permit exemption number, if one was assigned, or reference the date of the letter of the exemption.

2. Site Description
**The Enbridge Superior terminal is located on 179 acres at the intersection of Bardon Avenue and 21st Street in Superior, Wisconsin. The terminal consists of 40 existing storage tanks which are operated as crude oil pipeline breakout tanks.**

# 6.0 Form 4530-102A Source Description Supplemental

State of Wisconsin
Department of Natural Resources

SOURCE DESCRIPTION - SUPPLEMENTAL
AIR POLLUTION CONTROL PERMIT APPLICATION
Form 4530-102A Rev. 12-99 Information attached? _N_ (y/n)

Use of this form is required by the Department for any air pollution control permit application filed pursuant to ss. 285.61, 285.62 or 285.66, Wis Stats. Completion of this form is mandatory. The Department will not consider or act upon your application unless you complete and submit this form. It is not the Department's intention to use any personally identifiable information from this form for any other purpose.

1. List all significant existing or proposed air pollution units, operations, and activities at the facility. A short narrative of the inventory of air pollution emissions unit (e.g., boiler, printing line, etc.) followed by equipment specifications will suffice. If the facility consists of several individual emission units, present this information in an outline format. (See instruction booklet for an example Unit description.)

**Existing Emission Units**

Process Tank T01, External floating roof tank, 16,380,000 gallon capacity
Process Tank T02, External floating roof tank, 16,380,000 gallon capacity
Process Tank T03, Domed external floating roof tank, 6,300,000 gallon capacity
Process Tank T04, Domed external floating roof tank, 6,300,000 gallon capacity
Process Tank T05, External floating roof tank, 6,300,000 gallon capacity
Process Tank T06, External floating roof tank, 6,300,000 gallon capacity
Process Tank T07, External floating roof tank, 6,300,000 gallon capacity
Process Tank T08, External floating roof tank, 6,300,000 gallon capacity
Process Tank T09, External floating roof tank, 6,300,000 gallon capacity
Process Tank T10, External floating roof tank, 6,300,000 gallon capacity
Process Tank T11, External floating roof tank, 6,300,000 gallon capacity
Process Tank T12, External floating roof tank, 6,300,000 gallon capacity
Process Tank T13, External floating roof tank, 9,114,000 gallon capacity
Process Tank T14, External floating roof tank, 9,114,000 gallon capacity
Process Tank T15, External floating roof tank, 9,114,000 gallon capacity
Process Tank T16, External floating roof tank, 9,114,000 gallon capacity
Process Tank T17, External floating roof tank, 9,114,000 gallon capacity
Process Tank T18, External floating roof tank, 9,114,000 gallon capacity
Process Tank T19, External floating roof tank, 9,114,000 gallon capacity
Process Tank T20, External floating roof tank, 9,114,000 gallon capacity
Process Tank T21, External floating roof tank, 9,114,000 gallon capacity
Process Tank T22, External floating roof tank, 9,114,000 gallon capacity
Process Tank T23, External floating roof tank, 9,114,000 gallon capacity
Process Tank T24, External floating roof tank, 9,114,000 gallon capacity
Process Tank T25, External floating roof tank, 9,114,000 gallon capacity
Process Tank T26, Domed external floating roof tank, 9,114,000 gallon capacity
Process Tank T27, External floating roof tank, 9,114,000 gallon capacity
Process Tank T28, Internal floating roof tank, 9,114,000 gallon capacity
Process Tank T29, Internal floating roof tank, 9,114,000 gallon capacity
Process Tank T30, External floating roof tank, 10,500,000 gallon capacity
Process Tank T31, External floating roof tank, 10,500,000 gallon capacity
Process Tank T32, External floating roof tank, 7,680,000 gallon capacity
Process Tank T33, External floating roof tank, 7,680,000 gallon capacity
Process Tank T34, External floating roof tank, 16,471,098 gallon capacity
Process Tank T35, External floating roof tank, 8,673,426 gallon capacity
Process Tank T36, External floating roof tank, 8,673,426 gallon capacity
Process Tank T37, External floating roof tank, 8,673,426 gallon capacity
Process Tank T38, External floating roof tank, 8,673,426 gallon capacity
Process Tank T39, External floating roof tank, 8,673,426 gallon capacity
Process Tank T40, External floating roof tank, 8,673,426 gallon capacity
Process H01 Crude Oil Heater, S01, 84.4 MMbtu natural gas heater, Excluded from operating permit requirements
Process EG1, EG2, EG3, EG4, EG5 – Diesel Engine Emergency Generators, EN1, ENG2, EN3 – Diesel Engine Water Pumps
Process EG6, Stack 11 – Laboratory Emergency Generators
Process F01, Stack S02 – Piping Component/Pumping Fugitive VOC: Process ST01- ST03: Process (sump) Tanks, and Process PG01- PG03: Pigging Equipment/ Operations

**New Emission Units**

**Process T41, External floating roof storage tank, 24,537,744 gallon capacity**
**Process T42, External floating roof storage tank, 24,537,744 gallon capacity**

For Renewal Applications: **Not applicable**

1. If there were any new or modified emissions units installed/modified at the facility since the last operation permit issuance date:
    a. If any of these new/modified units were exempt from construction permit requirements, but are significant emissions units and operation permit application(s) for the new unit(s) were submitted to the Department reference the date of those submittals.
    b. If any of the new/modified units are insignificant emissions units list them on form 4530-102B.
    c. If any of the new/modified emissions units do not fit any of the above categories, fill out the appropriate forms for each emissions unit as follows:
        i. For Part 70 Sources: Fill out the appropriate forms 4530-103 through 4530-133; OR
        ii. For Synthetic Minor Non Part-70 Sources and Non-Part 70 Sources: Fill out the appropriate forms 4530-103 through 4530-117 and 4530-126 through 4530-129.

# 7.0 Form 4530-102B Source Description Supplemental

State of Wisconsin
Department of Natural Resources

SOURCE DESCRIPTION - SUPPLEMENTAL
AIR POLLUTION CONTROL PERMIT APPLICATION
Form 4530-102B Rev. 12-99 Information attached? _N_ (y/n)

Use of this form is required by the Department for any air pollution control permit application filed pursuant to ss. 285.61, 285.62 or 285.66, Wis Stats. Completion of this form is mandatory. The Department will not consider or act upon your application unless you complete and submit this form. It is not the Department's intention to use any personally identifiable information from this form for any other purpose.

1. Mark all insignificant existing or proposed air pollution units, operations, and activities at the facility listed below. If not listed, provide a short narrative of the inventory of air pollution emissions unit (e.g., boiler, printing line, etc.) followed by equipment specifications. If the facility consists of several individual emission units, present this information in an outline format. **For Renewal Applications, identify those that are new since the last update to your application.** (See instruction booklet for an example Unit description.)

☒ Maintenance of grounds, equipment, and buildings (lawn care, painting, etc.)
☒ Maintenance activities (including lawn care, pest control, grinding. cutting, brazing, soldering, welding, sand blasting, painting, fiber glassing, woodworking, general repairs and cleaning, etc)
☒ Boiler, turbine, and HVAC system maintenance
☐ Pollution control equipment maintenance
☒ Fire control equipment
☒ Janitorial activities
☒ Office activities
☒ Convenience water heating
☒ Convenience space heating (< 5 million BTU/hr Burning Gas, Liquid, or Wood)
☒ Fuel oil storage tanks (< 10,000 gal.)
☒ Stockpiled contaminated soils
☐ Demineralization and oxygen scavenging of water for boilers
☒ Purging of natural gas lines
☒ Sanitary sewer and plumbing venting
☒ Parts cleaner
☒ Electric incinerating toilet
☒ Chemical laboratory
☒ Pipeline and storage tank hydrostatic test water discharge
☒ Pipeline pigging equipment (prior to 2007)
☒ Pipeline pig cleaning facility with oil water separator
☒ Sump tanks (prior to 2007)
☒ Pipeline pressure relief surge tank systems
☒ Pipeline drag reducing agent (DRA) totes
☒ Mobile natural gas liquid flare
☒ Internal combustion engines used for warehousing and material transport from cars, trucks, forklifts, courier vehicles, front loaders, graders, cranes, carts, hydrostatic and hydraulic testing equipment, maintenance trucks, helicopters, portable generators (engine driven) (that are moveable by hand), portable pumps, portable air compressors, portable welding machines (engine driven), and portable fuel tanks
☒ Fugitive emissions from paved and unpaved roads
☒ Vacuum tanker truck emissions
☒ Solid waste disposal containers
☒ Barbecue grills

# 8.0 Form 4530-105 Storage Tanks

Forms are included for the new external floating roof storage tanks T41 and T42 only.

State of Wisconsin
Department of Natural Resources

**STORAGE TANKS**
AIR POLLUTION CONTROL PERMIT APPLICATION
Form 4530-105 11-93 Information attached? _Y_ (y/n)

SEE ATTACHED SHEET FOR INSTRUCTIONS
**See the attached TANKS Summary Reports in Attachment C for a complete listing of the tank's physical properties.**

1.Facility Name : **Enbridge Energy, Limited Partnership**

2.Facility Identification Number: **816010580**

3.Storage Tank Number **T41**

4.Control Device Number (use number from appropriate Form(s) 4530-110, 111, 112, 113, 114, 115, 116, or 117) **Not applicable**

5.Storage Tank Capacity **24,537,744 gallons**

6.Date of Installation or Last Modification
**Construction commence in May 2013**
**Initial fill in July 2014**

7.Tank Height **55.75 feet**

8.Tank Diameter **286 feet**

9.Color of Tank (check one)
_X_ **White** __ Other_____ __ Underground

10.Is this tank equipped with a submerged fill pipe?
_X_ **Yes** __ No

11.Is this tank equipped with a pressure/vacuum conservation vent?
__ Yes _X_ **No**
If yes; at what pressure is it set? _____(psia)
at what vacuum is it set? _____(psia)

12.Type of Storage Tank (check one)
__ Open Top Tank
__ Pressurized Tank
__ Fixed Roof
_X_ **External Floating Roof**
__ Fixed Roof w/Internal Floating Roof
__ Variable Vapor Space
__ Other (specify) _____

13.For all Fixed Roof Tanks:

a.Tank Configuration (check one): __ Vertical (upright cylinder) __ Horizontal

b.Tank Roof Type (check one): __ Cone Roof - Indicate tank roof height _____(feet)
(required if vertical was selected) _ Dome Roof - Indicate tank roof height _____(feet) - Indicate tank shell radius _____(feet)

14.For all Floating Roof Tanks (both internal and external) - Shell Condition (check one):
_X_ **Light Rust** __ Dense Rust __Gunite Lined

.5.For External Floating Roof Tanks:
a.Tank Construction (check one): __**X Welded Tank** __ Riveted Tank

b.Average Wind Speed at Tank Site: **11.0 (mph)**

c.Rim Seal System Description (check one):
__ Shoe Mounted Primary
_**X Shoe Primary, Rim Secondary**
__ Shoe Primary, Shoe Secondary
__ Vapor Mounted Primary
__ Vapor Primary, Rim Secondary
__ Vapor Primary w/Weather Shield
__ Liquid Mounted Primary
__ Liquid Primary, Rim Secondary
__ Liquid Primary w/Weather Shield

d.Roof Type (check one): _X_ **Pontoon Roof** __ Double Deck Roof

e.Roof Fitting Types (indicate the number of each type):
**Refer to the TANKS emission summary reports in Attachment D for the complete list of tank deck fittings**

Access Hatches (3 are 24" diameter and 3 are 3'x 4')
_6_ Bolted cover, gasketed
____ Unbolted cover, ungasketed
____ Unbolted cover, gasketed

Unslotted guide-pole well
(8" diameter unslotted pole, 21" diameter well)
____ Ungasketed sliding cover
_1_ Gasketed sliding cover

Gauge-float well (20" diameter)
____ Unbolted cover, ungasketed
____ Unbolted cover, gasketed
____ Bolted cover, gasketed

Gauge-Hatch/sample well (8" diameter)
_9_ Weighted mechanical actuation, gasketed
____ Weighted mechanical actuation, ungasketed

Vacuum Breaker (12" diameter well)
_6_ Weighted mechanical actuation, gasketed
____ Weighted mechanical actuation, ungasketed

Roof Drain (3-inch diameter)
____ Open
____ 90% closed

Slotted guide-pole/sample well (8" diameter diameter slotted pole, 21" diameter well)
____ Ungasketed sliding cover, without float
____ Ungasketed sliding cover, with float
____ Gasketed sliding cover, without float
____ Gasketed sliding cover, with float
___ Gasketed sliding cover, with float, sleeve and wiper,
_1_ Gasketed sliding cover, sleeve and wiper, without float,

Roof leg (3" diameter)
_52_ Adjustable, pontoon area , sock
_140_ Adjustable, center area, sock
____ Adjustable, double-deck roofs
____ Fixed

Roof leg(2-1/2" diameter)
____ Adjustable, pontoon area
____ Adjustable, center area
____ Adjustable, double deck roofs
____ Fixed

Continued on following page

**See the attached TANKS Summary Reports in Attachment C for a complete listing of the tank's physical properties.**

16.For Internal Floating Roof Tanks:

a.Rim Seal System Description (check one): __ Vapor Mounted Primary __ Vapor Mounted Primary plus Secondary Seal
__ Liquid Mounted Primary __ Liquid Mounted Primary plus Secondary Seal

b.Number of Columns: _____

c.Effective Column Diameter: _____ (feet)

d.Deck Type (check one): __ Welded __ Bolted

e.Total Deck Seam Length: _____ (feet)

f.Deck Area: _____ (square feet)

g.Deck Fitting Types (indicate the number of each type):

Access Hatch (24" diameter)
____ Bolted cover, gasketed
____ Unbolted cover, gasketed
____ Unbolted cover, ungasketed

Automatic gauge float well
____ Bolted cover, gasketed
____ Unbolted cover, gasketed
____ Unbolted cover, ungasketed

Ladder Well (36" diameter)
____ Sliding cover, gasketed
____ Sliding cover, ungasketed

Column Well (24" diameter)
____ Builtup column-sliding cover, gasketed
____ Builtup column-sliding cover, ungasketed
____ Pipe column-flexible fabric sleeve seal
____ Pipe column-sliding cover, gasketed
____ Pipe column-sliding cover, ungasketed

Sample pipe or well (24" diameter)
____ Slotted pipe-sliding cover, gasketed
____ Slotted pipe-sliding cover, ungasketed
____ Sample well-slit fabric seal 10% open area
____ Stub drain (1" diameter)

Roof leg or hanger well
____ Adjustable
____ Fixed

Vacuum breaker (10" diameter)
____ Weighted mechanical actuation, gasketed
____ Weighted mechanical actuation, ungasketed

17.For Variable Vapor Space Tanks:
Volume Expansion Capacity _____N/A_____ (gallons)

18.Complete the following table for materials to be stored in this tank:

| Material Stored | Annual Throughput (gal/yr) | Daily Average Amount Stored (gallons) | Material Molecular Weight (lb/lb-mole) | Material Vapor Pressure (psia) | Storage Pressure (psia) | Average Storage Temperature (°F) | Material Liquid Density (lb/gal) |
|---|---|---|---|---|---|---|---|
| Crude Oil (RVP 10.2) | 4,907,548,800 (200 turnovers) | 18,403,308 Assumes 75% of the tank capacity | 50 | 5.68 | Atmospheric 13.98 | 42.46 | 7.1 |

19.Maximum Liquid Loading Rate of Tank:
_____60,500 (gallons/min)

20.Can this tank be loaded at the same time other tanks are loaded? _X_ **Yes** __ No

If yes, indicate which other tanks can be loaded at the same time: **Capacity exists to fill all tanks simultaneously, but event is unlikely.**

21. Describe the operations this tank will serve:
**Crude oil storage**

State of Wisconsin
Department of Natural Resources

**STORAGE TANKS**
AIR POLLUTION CONTROL PERMIT APPLICATION
Form 4530-105 11-93 Information attached? _Y_ (y/n)

SEE ATTACHED SHEET FOR INSTRUCTIONS
**See the attached TANKS Summary Reports in Attachment C for a complete listing of the tank's physical properties.**

1.Facility Name : **Enbridge Energy, Limited Partnership** 2.Facility Identification Number: **816010580** 3.Storage Tank Number **T42**

4.Control Device Number (use number from appropriate Form(s) 4530-110, 111, 112, 113, 114, 115, 116, or 117) **Not applicable**

5.Storage Tank Capacity **24,537,744 gallons**

6.Date of Installation or Last Modification
**Construction commence in May 2013**
**Initial fill in July 2014**

7.Tank Height **55.75 feet**

8.Tank Diameter **286 feet**

9.Color of Tank (check one)
_X_ **White** __ Other_____ __ Underground

10.Is this tank equipped with a submerged fill pipe?
_X_ **Yes** __ No

11.Is this tank equipped with a pressure/vacuum conservation vent?
__ Yes _X_ **No**
If yes; at what pressure is it set? _____(psia)
at what vacuum is it set? _____(psia)

12.Type of Storage Tank (check one)
__ Open Top Tank __ Fixed Roof __ Fixed Roof w/Internal Floating Roof __ Other (specify)
__ Pressurized Tank _X_ **External Floating Roof** __ Variable Vapor Space _____

13.For all Fixed Roof Tanks:

a.Tank Configuration (check one): __ Vertical (upright cylinder) __ Horizontal

b.Tank Roof Type (check one): __ Cone Roof - Indicate tank roof height _____(feet)
(required if vertical was selected) _ Dome Roof - Indicate tank roof height _____(feet) - Indicate tank shell radius _____(feet)

14.For all Floating Roof Tanks (both internal and external) - Shell Condition (check one):
_X_ **Light Rust** __ Dense Rust __Gunite Lined

15.For External Floating Roof Tanks:
a.Tank Construction (check one): __**X Welded Tank** __ Riveted Tank

b.Average Wind Speed at Tank Site: **11.0 (mph)**

c.Rim Seal System Description (check one):
__ Shoe Mounted Primary __ Vapor Mounted Primary __ Liquid Mounted Primary
_**X Shoe Primary, Rim Secondary** __ Vapor Primary, Rim Secondary __ Liquid Primary, Rim Secondary
__ Shoe Primary, Shoe Secondary __ Vapor Primary w/Weather Shield __ Liquid Primary w/Weather Shield

d.Roof Type (check one): _X_ **Pontoon Roof** __ Double Deck Roof

e.Roof Fitting Types (indicate the number of each type):
**Refer to the TANKS emission summary reports in Attachment D for the complete list of tank deck fittings**

Access Hatches (3 are 24" diameter and 3 are 3'x 4')
__6_ Bolted cover, gasketed
____ Unbolted cover, ungasketed
____ Unbolted cover, gasketed

Unslotted guide-pole well (8" diameter unslotted pole, 21" diameter well)
____ Ungasketed sliding cover
__1__ Gasketed sliding cover

Gauge-float well (20" diameter)
_____ Unbolted cover, ungasketed
____ Unbolted cover, gasketed
____ Bolted cover, gasketed

Gauge-Hatch/sample well (8" diameter)
__9__ Weighted mechanical actuation, gasketed
____ Weighted mechanical actuation, ungasketed

Vacuum Breaker (12" diameter well)
__6__ Weighted mechanical actuation, gasketed
____ Weighted mechanical actuation, ungasketed

Roof Drain (3-inch diameter)
____ Open
____ 90% closed

Slotted guide-pole/sample well (8" diameter diameter slotted pole, 21" diameter well)
____ Ungasketed sliding cover, without float
____ Ungasketed sliding cover, with float
____ Gasketed sliding cover, without float
____ Gasketed sliding cover, with float
____ Gasketed sliding cover, with float, sleeve and wiper,
_1_ Gasketed sliding cover, sleeve and wiper, without float,

Roof leg (3" diameter)
__52__ Adjustable, pontoon area , sock
__140__ Adjustable, center area, sock
____ Adjustable, double-deck roofs
____ Fixed

Roof leg(2-1/2" diameter)
____ Adjustable, pontoon area
____ Adjustable, center area
____ Adjustable, double deck roofs
____ Fixed

Continued on following page

**See the attached TANKS Summary Reports in Attachment C for a complete listing of the tank's physical properties.**

16.For Internal Floating Roof Tanks:

a.Rim Seal System Description (check one): __ Vapor Mounted Primary __ Vapor Mounted Primary plus Secondary Seal
__ Liquid Mounted Primary __ Liquid Mounted Primary plus Secondary Seal

b.Number of Columns: _____

c.Effective Column Diameter: _____ (feet)

d.Deck Type (check one): __ Welded __ Bolted

e.Total Deck Seam Length: _____ (feet)

f.Deck Area: _____ (square feet)

g.Deck Fitting Types (indicate the number of each type):

Access Hatch (24" diameter)
____ Bolted cover, gasketed
____ Unbolted cover, gasketed
____ Unbolted cover, ungasketed

Automatic gauge float well
____ Bolted cover, gasketed
____ Unbolted cover, gasketed
____ Unbolted cover, ungasketed

Ladder Well (36" diameter)
____ Sliding cover, gasketed
____ Sliding cover, ungasketed

Column Well (24" diameter)
____ Builtup column-sliding cover, gasketed
____ Builtup column-sliding cover, ungasketed
____ Pipe column-flexible fabric sleeve seal
____ Pipe column-sliding cover, gasketed
____ Pipe column-sliding cover, ungasketed

Sample pipe or well (24" diameter)
____ Slotted pipe-sliding cover, gasketed
____ Slotted pipe-sliding cover, ungasketed
____ Sample well-slit fabric seal 10% open area
____ Stub drain (1" diameter)

Roof leg or hanger well
____ Adjustable
____ Fixed

Vacuum breaker (10" diameter)
____ Weighted mechanical actuation, gasketed
____ Weighted mechanical actuation, ungasketed

17.For Variable Vapor Space Tanks:
Volume Expansion Capacity _____N/A_____ (gallons)

18.Complete the following table for materials to be stored in this tank:

| Material Stored | Annual Throughput (gal/yr) | Daily Average Amount Stored (gallons) | Material Molecular Weight (lb/lb-mole) | Material Vapor Pressure (psia) | Storage Pressure (psia) | Average Storage Temperature (°F) | Material Liquid Density (lb/gal) |
|---|---|---|---|---|---|---|---|
| Crude Oil (RVP 10.2) | 4,907,548,800 (200 turnovers) | 18,403,308 Assumes 75% of the tank capacity | 50 | 5.68 | Atmospheric 13.98 | 42.46 | 7.1 |

19.Maximum Liquid Loading Rate of Tank:
_____60,500_(gallons/min)

20.Can this tank be loaded at the same time other tanks are loaded? _X_ **Yes** __ No

If yes, indicate which other tanks can be loaded at the same time: **Capacity exists to fill all tanks simultaneously, but event is unlikely.**

21. Describe the operations this tank will serve:
**Crude oil storage**

# 9.0 Form 4530-118 Compliance Certification - Monitoring and Reporting Methods

Form is included for the new external floating roof storage tanks T41 and T42 only.

State of Wisconsin
Department of Natural Resources

COMPLIANCE CERTIFICATION - MONITORING AND REPORTING
DESCRIPTION OF METHODS USED FOR DETERMINING COMPLIANCE
Form 4530-118 11-93 Information attached? _N_ (y/n)

All applicants except non-Part 70 sources are required to certify compliance with all applicable air pollution permit requirements by including a statement within the permit application of the methods used for determining compliance (please see sec. NR 407.05(4)(i), Wis. Adm. Code.) This statement must include a description of the monitoring, recordkeeping, and reporting requirements and test methods. In addition, the application must include a schedule for compliance certification submittals during the permit term. These submittals must be no less frequent than annually, and may need to be more frequent if specified by the underlying applicable requirement or by the Department.

SEE INSTRUCTIONS ON REVERSE SIDE

| | |
|---|---|
| 1. Facility name Enbridge Energy, Limited Partnership | 2. Facility identification number: 816010580 |
| 3. Stack identification number: N/A | 4. Unit identification number: **T41 and T42** |

5. This Unit will use the following method(s) for determining compliance with the requirements of the permit (check all that apply and attach the appropriate form(s) to this form).

☐ Continuous Emission Monitoring (CEM) - Form 4530-119
Pollutant(s):

☐ Periodic Emission Monitoring Using Portable Monitors - Form 4530-120
Pollutant(s):

☐ Monitoring Control System Parameters or Operating Parameters of a Process - Form 4530-121
Pollutant(s):

☐ Monitoring Maintenance Procedures - Form 4530-122
Pollutant(s):

☐ Stack Testing - Form 4530-123
Pollutant(s):

☐ Fuel Sampling and Analysis (FSA) - Form 4530-124
Pollutant(s):

☒ Recordkeeping - Form 4530-125
Pollutant(s): VOC

☐ Other (please describe) - Form 4530-135
Pollutant(s):

6. Compliance certification reports will be submitted to the Department according to the following schedule:

Start date: **January 1, 2014**
and every __12__ months thereafter.

Compliance monitoring reports will be submitted to the Department according to the following schedule:

Start date: **January 1, 2014**
and every __12__ months thereafter.

# 10.0 Form 4530-125 Recordkeeping

Form is included for the new external floating roof storage tanks T41 and T42 only.

State of Wisconsin
Department of Natural Resources

COMPLIANCE DEMONSTRATION BY RECORDKEEPING
AIR POLLUTION CONTROL PERMIT APPLICATION
Form 4530-125 11-93

Information attached? _N_ (y/n)

Recordkeeping may be acceptable as a compliance demonstration method provided that a correlation between the parameter value recorded and the emission rate of a particular pollutant is established in the form of a curve or chart of emission rate versus parameter values. This correlation may constitute the certification of the system. It should be attached for Department approval. If it is not attached, please submit it within 60 days of the startup of the system.

SEE INSTRUCTIONS ON REVERSE SIDE

| | |
|---|---|
| 1. Facility name: **Enbridge Energy, Limited Partnership** | 2. Facility identification number: **816010580** |
| 3. Stack identification number: **N/A** | 4. Unit identification number: **T41 through T42** |
| 5. Pollutant(s) being monitored: **VOC** | 6. Material or parameter being monitored and recorded:<br>**(a)** The volatile organic liquid stored,<br>**(b)** The period of storage,<br>**(c)** Tank throughput,<br>**(d)** The maximum true vapor pressure of that volatile organic liquid during the respective storage period,<br>**(e)** The typical Reid vapor pressure of each type of petroleum liquid stored,<br>**(f)** Monthly tank emissions based on a 12 consecutive month average and,<br>**(g)** The dates on which the storage vessel is empty. |

7. Method of monitoring and recording:
**Maintain records in accordance with NR 440.285.**

8. List any EPA methods used: **N/A**

| | |
|---|---|
| 9. Is this an existing method of demonstrating compliance?<br>☒ Yes ☐ No | 10. Installation date: **December 2010** |

11. Backup system: **None**

12. Compliance shall be demonstrated: ☐ Daily ☐ Weekly ☒ Monthly ☐ Batch (not to exceed monthly)

13. Indicate by checking:

The monitoring system shall be subject to appropriate performance specifications, calibration requirements, and quality assurance procedures. ☐ A quality assurance/quality control plan for the recordkeeping system is attached for Department approval. ☒ If the plan is not attached, please submit it within 60 days of the startup of the recordkeeping program. ☐ The plan was submitted to the Department on _____.

***** The compliance records shall be available for Department inspection. The format for the compliance certification report and the excess emission report shall be approved by the Department. A proposed format for the compliance certification report and excess emission report shall be submitted at the same time as the application. *****

***** The source shall record any malfunction that causes or may cause an emission limit to be exceeded. Malfunctions shall be reported to the Department the next business day. Hazardous air spills shall be reported to the Department immediately. *****

# 11.0 Form 4530-126 Emission Unit HAP Summary

Form is included for the new external floating roof storage tanks T41 and T42 only.

State of Wisconsin
Department of Natural Resources

EMISSION UNIT HAZARDOUS AIR POLLUTANT SUMMARY
AIR POLLUTION CONTROL PERMIT APPLICATION
Form 4530-126 11-93

Information attached? Y (y/n)

SEE INSTRUCTIONS ON REVERSE SIDE

| | |
|---|---|
| 1. Facility name: **Enbridge Energy, Limited Partnership** | 2. Facility identification number: **816010580** |
| 3. Stack identification number: **N/A** | 4. Unit identification number: **T41 through T42** |

5. Unit material description: **Crude Oil**

6. Complete the following summary of hazardous air emissions from this unit. Attach sample calculations and emission factor references. Attached? **See the project emission calculation summary tables in Attachment C.**

| Pollutant CAS | Actual emissions | | Maximum theoretical emissions | | Potential to emit | |
|---|---|---|---|---|---|---|
| | | Units | | Units | | |
| **See the project emission calculation summary tables in Attachment C** | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

# 12.0 Form 4530-127 Facility Hazardous Air Pollutant Summary

State of Wisconsin
Department of Natural Resources

FACILITY HAZARDOUS AIR POLLUTANT SUMMARY
AIR POLLUTION CONTROL PERMIT APPLICATION
Form 4530-127 11-93

Information attached? **Y** (y/n)

SEE INSTRUCTIONS ON REVERSE SIDE

1. Facility name: **Enbridge Energy, Limited Partnership**

2. Facility identification number: **816010580**

3. Complete the following emissions summary for all hazardous air emissions at this facility (as defined in ch. NR 445, Wis Adm. Code, and sec. 112, 1990 Clean Air Act Amendments): **See emission calculations located in Attachment C and G.**

| Pollutant CAS | Actual emissions | | Maximum theoretical emissions | | Potential to emit | |
|---|---|---|---|---|---|---|
| | | Units | | Units | | |
| | | | | | | TPY |
| **See the facility-wide emission PTE calculation summary tables located in Attachments C and the 2011 actual Emissions summary table in Attachment G.** | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |

# 13.0 Form 4530-128 Emission Unit Summary

Form is included for the new external floating roof storage tanks T41 and T42 only.

State of Wisconsin
Department of Natural Resources

EMISSION UNIT SUMMARY
AIR POLLUTION CONTROL PERMIT APPLICATION
Form 4530-128 11-93

Information attached? Y (y/n)

SEE INSTRUCTIONS ON REVERSE SIDE

| | |
|---|---|
| 1. Facility name: **Enbridge Energy, Limited Partnership** | 2. Facility identification number: **816010580** |
| 3. Stack identification number: **N/A** | 4. Unit identification number: **T41 through T42** |

5. Complete the following emissions summary for the following pollutants. Attach sample calculations and emission factor references.

Attached? **See the project emission calculation summary tables in Attachment B and C.**

| Air pollutant | Actual | | | Maximum theoretical emissions | | | Potential to emit | | Maximum allowable | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | U | TPY | | U | TPY | | | | U | TPY |
| Particulates | | | | | | | | TPY | | | |
| Sulfur dioxide | | | | | | | | TPY | | | |
| Organic compounds | **See the project emission calculation summary tables in Attachment B and C.** | | | | | | | | | | |
| Carbon monoxide | | | | | | | | TPY | | | |
| Lead | | | | | | | | TPY | | | |
| Nitrogen oxides | | | | | | | | TPY | | | |
| Total reduced sulfur | | | | | | | | TPY | | | |
| Mercury | | | | | | | | TPY | | | |
| Asbestos | | | | | | | | TPY | | | |
| Beryllium | | | | | | | | TPY | | | |
| Vinyl chloride | | | | | | | | TPY | | | |
| | | | | | | | | TPY | | | |
| | | | | | | | | TPY | | | |
| | | | | | | | | TPY | | | |
| | | | | | | | | TPY | | | |
| | | | | | | | | TPY | | | |

Units (U) should be entered as follows:

1 = lb/hr
2 = lb/mmBTU
3 = grains/dscf
4 = lb/ gallon
5 = ppmdv
6 = other (specify)
7 = other (specify)
8 = other (specify)

# 14.0 Form 4530-129 Facility Emissions Summary

State of Wisconsin
Department of Natural Resources

FACILITY EMISSIONS SUMMARY
AIR POLLUTION CONTROL PERMIT APPLICATION
Form 4530-129 11-93 Information attached? _Y_ (y/n)

SEE INSTRUCTIONS ON REVERSE SIDE

1. Facility name: Enbridge Energy, Limited Partnership | 2. Facility identification number: **816010580**

3. Complete the following emissions summary for the listed emissions at this facility.
**See emission calculations located in Attachment C and G.**

| Air pollutant | Actual | Maximum theoretical emissions | Potential to emit | Maximum allowable |
|---|---|---|---|---|
| | TPY | TPY | TPY | TPY |
| Particulates | **See the facility-wide emission PTE calculation summary tables located in Attachments C and the 2011 actual Emissions summary table in Attachment G.** | | | |
| Sulfur dioxide | **See the facility-wide emission PTE calculation summary tables located in Attachments C and the 2011 actual Emissions summary table in Attachment G.** | | | |
| Organic compounds | **See the facility-wide emission PTE calculation summary tables located in Attachments C and the 2011 actual Emissions summary table in Attachment G.** | | | |
| Carbon monoxide | **See the facility-wide emission PTE calculation summary tables located in Attachments C and the 2011 actual Emissions summary table in Attachment G** | | | |
| Lead | **See the facility-wide emission PTE calculation summary tables located in Attachments C and the 2011 actual Emissions summary table in Attachment G.** | | | |
| Nitrogen oxides | **See the facility-wide emission PTE calculation summary tables located in Attachments C and the 2011 actual Emissions summary table in Attachment G.** | | | |
| Total reduced sulfur | | | | |
| Mercury | **See the facility-wide emission PTE calculation summary tables located in Attachments C and the 2011 actual Emissions summary table in Attachment G.** | | | |
| Asbestos | | | | |
| Beryllium | | | | |
| Vinyl chloride | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

# 15.0 Form 4530-109 Miscellaneous Processes

Form is included for the new Piping Component/Pumping Fugitives only.

State of Wisconsin
Department of Natural Resources

SEE INSTRUCTIONS ON REVERSE SIDE

MISCELLANEOUS PROCESSES
AIR POLLUTION CONTROL PERMIT APPLICATION
Form 4530-109 11-93 Information attached? **Y** (y/n)

| | |
|---|---|
| 1. Facility name: **Enbridge Energy, Limited Partnership** | 2. Facility identification number: **816010580** |
| 3. Stack identification number: **Existing Stack S02** | 4. Process number: **Existing Process F01** |

4a. Unit description: **Piping Component/Pumping Fugitives**

5. Indicate the control technology status. ☒ Uncontrolled ☐ Controlled

If the process is controlled, enter the control device number(s) from the appropriate form(s): 4530-110 ____ 4530-111 4530-112 ____ 4530-113 ____ 4530-114 ____ 4530-115 ____ 4530-116 ____ 4530-117

6. Source Classification Code (SCC): **400400151**

7. Date of construction or last modification: **May 2013**.

8. Normal operating schedule: **24** hrs./day **7** days/wk. **365** days/yr.

| | |
|---|---|
| 9. Describe this process (please attach a flow diagram of the process). **Fugitive emissions from piping components (valves, flanges, etc) and pumps** | Attached? **N/A** |

10. List the types and amounts of raw materials used in this process:

| Material | Storage/material handling process | Average usage | Units | Maximum usage | Units |
|---|---|---|---|---|---|
| Crude Oil | **Transfer for crude oil from pipeline to tanks and back to the pipeline** | **8760** | **hr/yr** | **8760** | **hr/yr** |
| Clean-up solvents | | | | | |
| Other (specify) | | | | | |

11. List the types and amounts of finished products:

| Material | Storage/material handling process | Average amount produced | Units | Maximum amount produced | Units |
|---|---|---|---|---|---|
| **Not Applicable** | | | | | |

12. Process fuel usage:

| Type of fuel | Maximum heat input to process million BTU/hr. | Average usage | Units | Maximum usage | Units |
|---|---|---|---|---|---|
| **Not Applicable** | | | | | |

| 13. Describe any fugitive emissions associated with this process, such as outdoor storage piles, unpaved roads, open conveyors, etc.: | Attached? |
|---|---|

***** For this emissions unit, identify the method(s) of compliance demonstration by completing Form 4530-118, *****

DESCRIPTION OF METHODS USED FOR DETERMINING COMPLIANCE. Attach Form 4530-118 and its attachment(s) to this form. This is not a requirement of non-Part 70 sources.

***** Please complete the Air Pollution Control Permit Application Forms 4530-126 and 4530-128 for this Unit. *****

# 16.0 Form 4530-118 Compliance Certification - Monitoring and Reporting Methods

Form is included for the new Piping Component/Pumping Fugitives only.

State of Wisconsin
Department of Natural Resources

COMPLIANCE CERTIFICATION - MONITORING AND REPORTING
DESCRIPTION OF METHODS USED FOR DETERMINING COMPLIANCE
Form 4530-118 11-93 Information attached? _N_ (y/n)

All applicants except non-Part 70 sources are required to certify compliance with all applicable air pollution permit requirements by including a statement within the permit application of the methods used for determining compliance (please see sec. NR 407.05(4)(i), Wis. Adm. Code.) This statement must include a description of the monitoring, recordkeeping, and reporting requirements and test methods. In addition, the application must include a schedule for compliance certification submittals during the permit term. These submittals must be no less frequent than annually, and may need to be more frequent if specified by the underlying applicable requirement or by the Department.

SEE INSTRUCTIONS ON REVERSE SIDE

| | |
|---|---|
| 1. Facility name **Enbridge Energy, Limited Partnership** | 2. Facility identification number: **816010580** |
| 3. Stack identification number: **Existing Stack S02** | 4. Unit identification number: **Existing Process F01** |

5. This Unit will use the following method(s) for determining compliance with the requirements of the permit (check all that apply and attach the appropriate form(s) to this form).

☐ Continuous Emission Monitoring (CEM) - Form 4530-119
Pollutant(s):

☐ Periodic Emission Monitoring Using Portable Monitors - Form 4530-120
Pollutant(s):

☐ Monitoring Control System Parameters or Operating Parameters of a Process - Form 4530-121
Pollutant(s):

☐ Monitoring Maintenance Procedures - Form 4530-122
Pollutant(s):

☐ Stack Testing - Form 4530-123
Pollutant(s):

☐ Fuel Sampling and Analysis (FSA) - Form 4530-124
Pollutant(s):

☒ Recordkeeping - Form 4530-125
Pollutant(s): VOC

☐ Other (please describe) - Form 4530-135
Pollutant(s):

6. Compliance certification reports will be submitted to the Department according to the following schedule:

Start date: **January 1, 2014**
and every **12** months thereafter.

Compliance monitoring reports will be submitted to the Department according to the following schedule:

Start date: **January 1, 2014**
and every **12** months thereafter.

# 17.0 Form 4530-125 Recordkeeping

Form is included for the new Piping Component/Pumping Fugitives only.

State of Wisconsin
Department of Natural Resources

COMPLIANCE DEMONSTRATION BY RECORDKEEPING
AIR POLLUTION CONTROL PERMIT APPLICATION
Form 4530-125 11-93

Information attached? **N** (y/n)

Recordkeeping may be acceptable as a compliance demonstration method provided that a correlation between the parameter value recorded and the emission rate of a particular pollutant is established in the form of a curve or chart of emission rate versus parameter values. This correlation may constitute the certification of the system. It should be attached for Department approval. If it is not attached, please submit it within 60 days of the startup of the system.

SEE INSTRUCTIONS ON REVERSE SIDE

| | |
|---|---|
| 1. Facility name: **Enbridge Energy, Limited Partnership** | 2. Facility identification number: **816010580** |
| 3. Stack identification number: **Existing Stack S02** | 4. Unit identification number: **Existing Process F01** |
| 5. Pollutant(s) being monitored: **VOC** | 7. Material or parameter being monitored and recorded: **(a)** Maintain records of inspection, repair, and maintenance of the piping components (e.g. fittings, flanges, valves, pumps, sampling ports, etc.) |

7. Method of monitoring and recording:
**Maintain records in accordance with NR 439.04.**

8. List any EPA methods used: **Not applicable**

| | |
|---|---|
| 9. Is this an existing method of demonstrating compliance? ☒ Yes ☐ No | 10. Installation date: **December 2010** |

11. Backup system: None

12. Compliance shall be demonstrated: ☐ Daily ☐ Weekly ☒ Monthly ☐ Batch (not to exceed monthly)

13. Indicate by checking:

The monitoring system shall be subject to appropriate performance specifications, calibration requirements, and quality assurance procedures. ☐ A quality assurance/quality control plan for the recordkeeping system is attached for Department approval. ☒ If the plan is not attached, please submit it within 60 days of the startup of the recordkeeping program. ☐ The plan was submitted to the Department on _____.

***** The compliance records shall be available for Department inspection. The format for the compliance certification report and the excess emission report shall be approved by the Department. A proposed format for the compliance certification report and excess emission report shall be submitted at the same time as the application. *****

***** The source shall record any malfunction that causes or may cause an emission limit to be exceeded. Malfunctions shall be reported to the Department the next business day. Hazardous air spills shall be reported to the Department immediately. *****

# 18.0 Form 4530-126 Emission Unit HAP Summary

Form is included for the new Piping Component/Pumping Fugitives only.

State of Wisconsin
Department of Natural Resources

EMISSION UNIT HAZARDOUS AIR POLLUTANT SUMMARY
AIR POLLUTION CONTROL PERMIT APPLICATION
Form 4530-126 11-93 Information attached? Y (y/n)

SEE INSTRUCTIONS ON REVERSE SIDE

1. Facility name: **Enbridge Energy, Limited Partnership**
2. Facility identification number: **816010580**
3. Stack identification number: **Existing Stack S02**
4. Unit identification number: **Existing Process F01**
5. Unit material description: **Crude Oil**

6. Complete the following summary of hazardous air emissions from this unit. Attach sample calculations and emission factor references. Attached? **See the project emission calculation summary tables in Attachment C.**

| Pollutant CAS | Actual emissions | | Maximum theoretical emissions | | Potential to emit | |
|---|---|---|---|---|---|---|
| | | Units | | Units | | |
| **See the project emission calculation summary tables in Attachment C** | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | TPY |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

# 19.0 Form 4530-128 Emission Unit Summary

Form is included for the new Piping Component/Pumping Fugitives only.

State of Wisconsin
Department of Natural Resources

EMISSION UNIT SUMMARY
AIR POLLUTION CONTROL PERMIT APPLICATION
Form 4530-128 11-93

Information attached? _Y_ (y/n)

SEE INSTRUCTIONS ON REVERSE SIDE

| | |
|---|---|
| 1. Facility name: **Enbridge Energy, Limited Partnership** | 2. Facility identification number: **816010580** |
| 3. Stack identification number: **Existing Stack S02** | 4. Unit identification number: **Existing Process F01** |

6. Complete the following emissions summary for the following pollutants. Attach sample calculations and emission factor references.

Attached? **See the project emission calculation summary tables in Attachment B and C.**

| Air pollutant | | | | Actual | | | Maximum theoretical emissions | | | Potential to emit | | | Maximum allowable | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | U | TPY | | U | TPY | | | | | | | | U | TPY |
| Particulates | | | | | | | | | TPY | | | | | | |
| Sulfur dioxide | | | | | | | | | TPY | | | | | | |
| Organic compounds | **See the project emission calculation summary tables in Attachment B and C.** | | | | | | | | | | | | | | |
| Carbon monoxide | | | | | | | | | TPY | | | | | | |
| Lead | | | | | | | | | TPY | | | | | | |
| Nitrogen oxides | | | | | | | | | TPY | | | | | | |
| Total reduced sulfur | | | | | | | | | TPY | | | | | | |
| Mercury | | | | | | | | | TPY | | | | | | |
| Asbestos | | | | | | | | | TPY | | | | | | |
| Beryllium | | | | | | | | | TPY | | | | | | |
| Vinyl chloride | | | | | | | | | TPY | | | | | | |
| | | | | | | | | | TPY | | | | | | |
| | | | | | | | | | TPY | | | | | | |
| | | | | | | | | | TPY | | | | | | |
| | | | | | | | | | TPY | | | | | | |
| | | | | | | | | | TPY | | | | | | |

Units (U) should be entered as follows:

1 = lb/hr
2 = lb/mmBTU
3 = grains/dscf
4 = lb/ gallon
5 = ppmdv
6 = other (specify)
7 = other (specify)
8 = other (specify)

# 20.0 Form 4530-134 Index of Air Pollution Permit Application Forms

State of Wisconsin
Department of Natural Resources

# INDEX OF AIR POLLUTION PERMIT APPLICATION FORMS

Form 4530-134 Rev. 12-99

| I.ADMINISTRATION | |
|---|---|
| This application contains the following forms: | ☒Form 4530-100, Facility Identification |
| | ☒Form 4530-101, Facility Plot Plan |
| | ☒Forms 4530-102, -102A, and -102B, Source and Site Descriptions |

| II. EMISSIONS SOURCE DESCRIPTION | | Total Number of This Form |
|---|---|---|
| This application contains the following forms (one form for each facility boiler, printing operation, etc.): | ☐Form 4530-103, Stack Identification | |
| | ☐Form 4530-104, Boiler or Furnace Operation | |
| | ☒Form 4530-105, Storage Tanks | 2 |
| | ☐Form 4530-106, Incineration | |
| | ☐Form 4530-107, Printing Operations | |
| | ☐Form 4530-108, Painting and Coating Operations | |
| | ☒Form 4530-109, Miscellaneous Processes | 1 |

| III.AIR POLLUTION CONTROL SYSTEM | | Total Number of This Form |
|---|---|---|
| This application contains the following forms: | ☐Form 4530-110, Miscellaneous | |
| | ☐Form 4530-111, Condensers | |
| | ☐Form 4530-112, Adsorbers | |
| | ☐Form 4530-113, Catalytic or Thermal Oxidation | |
| | ☐Form 4530-114, Cyclones/Settling Chambers | |
| | ☐Form 4530-115, Electrostatic Precipitators | |
| | ☐Form 4530-116, Wet Collection Systems | |
| | ☐Form 4530-117, Baghouses/Fabric Filters | |

| IV.COMPLIANCE DEMONSTRATION | | Total Number of This Form |
|---|---|---|
| This application contains the following forms (one for each facility boiler, printing operation, etc.): | ☒Form 4530-118, Compliance Certification - Monitoring and Reporting | 2 |
| | ☐Form 4530-119, Continuous Emission Monitoring | |
| | ☐Form 4530-120, Periodic Emission Monitoring Using Portable Monitors | |
| | ☐Form 4530-121, Control System Parameters or Operation Parameters of a Process | |
| | ☐Form 4530-122, Monitoring Maintenance Procedures | |

| | | |
|---|---|---|
| | ☐Form 4530-123, Stack Testing | |
| | ☐Form 4530-124, Fuel Sampling and Analysis | |
| | ☒Form 4530-125, Recordkeeping | 2 |
| V.EMISSION SUMMARY AND COMPLIANCE CERTIFICATION | | Total Number of This Form |
| This application contains the following forms quantifying emissions, certifying compliance with applicable requirements, and developing a compliance plan | ☒Form 4530-126, Emission Unit Hazardous Air Pollutant Summary | 2 |
| | ☒Form 4530-127, Facility Hazardous Air Pollutant Summary | 1 |
| | ☒Form 4530-128, Emission Unit Summary | 2 |
| | ☒Form 4530-129, Facility Emissions Summary | 1 |
| | ☐Form 4530-130, Current Emissions Requirements and Status of Unit | |
| | ☐Form 4530-131, Emission Unit Compliance Plan - Commitments and Schedule | |
| | ☒Form 4530-132, Current Emissions Requirements and Status of Facility | 1 |
| | ☐Form 4530-133, Facility Requirement Compliance Plan Commitments and Schedule | |

VI.SIGNATURE OF RESPONSIBLE OFFICIAL

A.STATEMENT OF COMPLETENESS

I have reviewed this application in its entirety and, based on information and belief formed after reasonable inquiry, I certify that the statements and information contained in this application are true, accurate and complete.

B.FOR RENEWALS ONLY

I have reviewed this application, the original operation permit application dated _____, and operation permit number _____ in their entirety and, based on information and belief formed after reasonable inquiry, I certify that the statements and information contained in this renewal application are true, accurate and complete.

C.CERTIFICATION OF FACILITY COMPLIANCE STATUS (check one box only)

THIS IS NOT A REQUIREMENT OF NON-PART 70 SOURCES.

☒ I certify that the facility described in this air pollution permit application is fully in compliance with all applicable requirements.

☐ I certify that the facility described in this air pollution permit application is fully in compliance with all applicable requirements, except for the following emissions unit(s):

(list all non-complying units)

| Printed or Typed Name | Title |
|---|---|
| **Mark Willoughby** | **General Manager, Superior Region** |
| Signature | Date Signed Oct. 9, 2012 |

SEND ALL MATERIALS TO:
WISCONSIN DEPARTMENT OF NATURAL RESOURCES
BUREAU OF AIR MANAGEMENT
OPERATION PERMIT TEAM LEADER
P.O. BOX 7921
MADISON, WI 53707-7921

State of Wisconsin
Department of Natural Resources

CURRENT EMISSIONS REQUIREMENTS AND STATUS OF FACILITY
AIR POLLUTION CONTROL PERMIT APPLICATION
Form 4530-132 11-93

Information attached? Y (y/n)

SEE INSTRUCTIONS ON REVERSE SIDE

1. Facility name: **Enbridge Energy, Limited Partnership**

2. Facility identification number: **816010580**

| 3. Pollutant | 4. Wis. Adm. Code Wis. Stats., 40 CFR | 5. State Only | 6. Threshold Value | 7. Compliance Status (in or out) |
|---|---|---|---|---|
| Refer to the 2011 Annual Compliance Certification in Attachment F for a list of emission requirements and compliance status of the terminal. | | | Various | **In** |
| Refer to the 2011 Annual Compliance Certification in Attachment F for a list of emission requirements and compliance status of the terminal. | | * | Various | **In** |
| | | | | |

8. Is this facility subject to the provisions governing prevention of accidental releases of hazardous air contaminants contained in section 112(r)(7) of the Clean Air Act?

☐ Yes ☒ No

If you answered yes, please describe how you will achieve compliance with these provisions, including the requirement to formulate a plan for preventing accidental releases (sec. 112(r)(7)(B)(ii)):

| 9. Other requirements (e.g., malfunction reporting, special operating conditions from an existing permit, etc.) | State Only | Compliance Status (in or out) |
|---|---|---|
| Refer to the 2011 Annual Compliance Certification in Attachment F for a list of emission requirements and compliance status of the terminal. | | **In** |
| Refer to the 2011 Annual Compliance Certification in Attachment F for a list of emission requirements and compliance status of the terminal. | * | **In** |
| | | |
| | | |

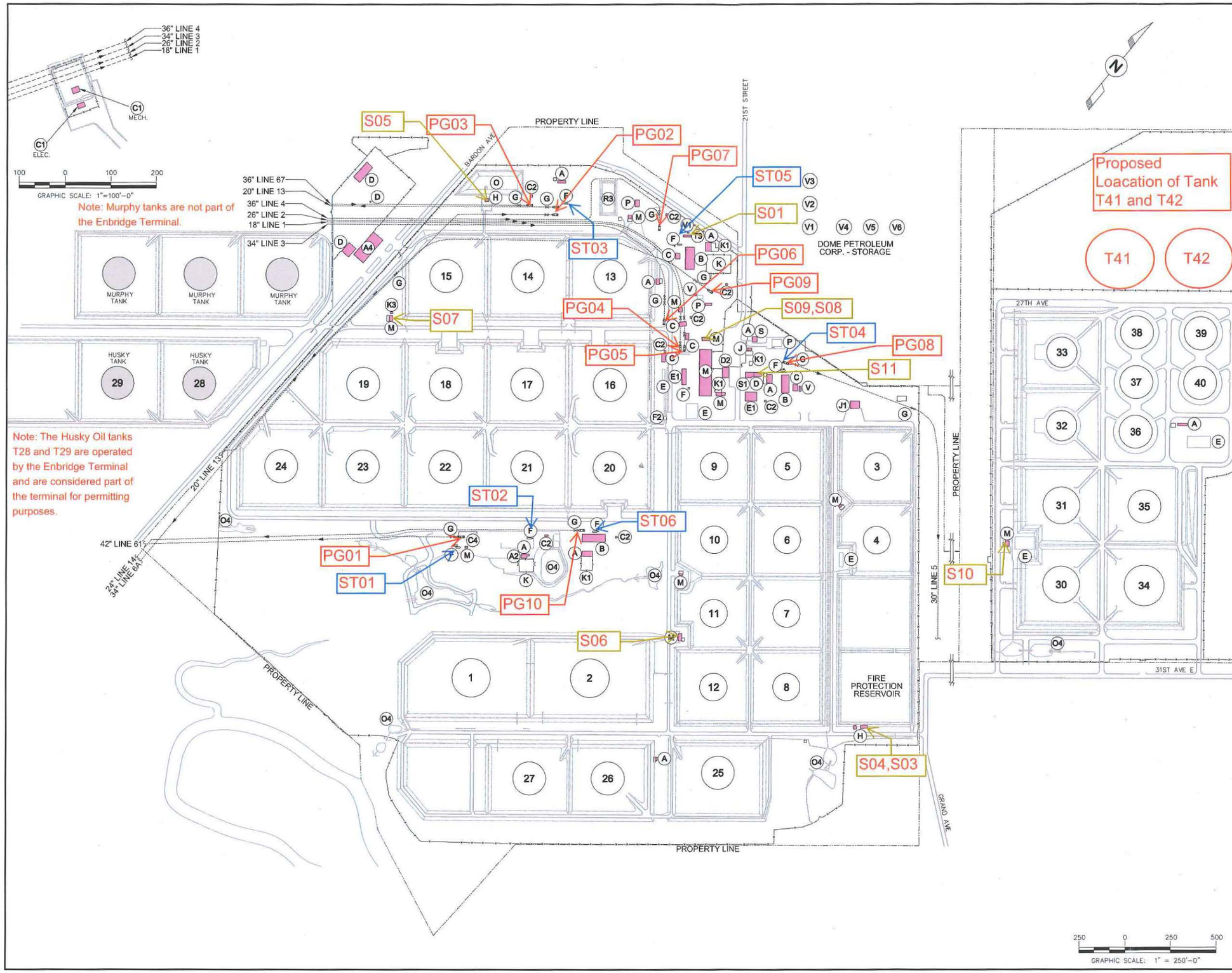
36" LINE 4
34" LINE 3
26" LINE 2
18" LINE 1
C1 MECH.
C1 ELEC.
GRAPHIC SCALE: 1"=100'-0"
Note: Murphy tanks are not part of the Enbridge Terminal.
36" LINE 67
20" LINE 13
36" LINE 4
26" LINE 2
18" LINE 1
34" LINE 3
MURPHY TANK
HUSKY TANK
Note: The Husky Oil tanks T28 and T29 are operated by the Enbridge Terminal and are considered part of the terminal for permitting purposes.
20" LINE 13
42" LINE 61
24" LINE 14
34" LINE 6A
PROPERTY LINE
BARDON AVE
21ST STREET
S05
PG03
PG02
PG07
ST05
S01
ST03
PG06
PG09
S09,S08
PG04
S07
ST04
PG08
PG05
S11
ST02
ST06
PG01
ST01
PG10
S06
S10
S04,S03
DOME PETROLEUM CORP. - STORAGE
FIRE PROTECTION RESERVOIR
30" LINE 5
27TH AVE
31ST AVE E
GRAND AVE
GRAPHIC SCALE: 1" = 250'-0"
Proposed Loacation of Tank T41 and T42
T41
T42
TO DULUTH
ENBRIDGE CITY CENTER OFFICE 1409 HAMMOND AVE
ENBRIDGE CENTRAL SQUARE 1320 GRAND AVE.
TO WEST DULUTH
BELKNAP ST.
LENROOT HWY
ENBRIDGE GREAT LAKES & REGION OFFICE 119 N 25TH ST. E
N 21ST ST.
25TH ST
LOADING DOCK
28TH ST
HAMMOND AVE
HILL AVE
BP PETROLEUM
18TH AVE.
E 11TH ST
SUPERIOR TERMINAL
MURPHY REFINERY
SUPERIOR
TOWER AVE.
24TH AVE. E (STINSON AVE.)
MURPHY & HUSKY STORAGE
BARDON AVE
NEMADJI RIVER
39TH AVE. E
42ND AVE. E
N 56TH ST.
N 58TH ST.
LAKE SUPERIOR
LOCATION PLAN
PROPERTY DESCRIPTION:
SECTION 36, T49N, R14W, SUPERIOR TOWNSHIP
DOUGLAS COUNTY, WISCONSIN
LEGEND
STATION STRUCTURE
FOREIGN OWNED
BUILDING/AREA IDENTIFICATION
A SWITCHGEAR/ESB BUILDING
A2 VFD BUILDING
A4 PLM BUILDING
B PUMPHOUSE
C PCV. ENCLOSURE
C1 EQUIPMENT BUILDING
C2 INSTURMENT SHELTER
C4 SCRAPER TRAP BUILDING
D STORAGE BUILDING
D2 UTILITY BUILDING
E MANIFOLD AREA
E1 MANIFOLD BUILDING
F SUMP PUMP & TANK
F2 TANKER UNLOADING AREA
G MAINLINE VALVE AREA
H FIRE PROTECTION PUMPHOUSE
J HAZMAT STORAGE AREA
J1 EMERGENCY RESPONSE BUILDING
K UTILITY COMPANY SUBSTATION
K1 ENBRIDGE SUBSTATION AREA
K3 GENERATOR BUILDING
M CONTROL BUILDING
O FIRE POND
O4 FLUME POND
P METERING BUILDING/AREA
R3 PRESSURE RELIEF VESSELS
S OFFICE
S1 LAB
T3 CRUDE OIL HEATER
V DRA/QUALITY SKID
V1 FUEL GAS SKID
9 ADDED TANKS; 36, 37, 38, 39 AND 40 JSL 12-15-10 SD
8 REV'D TO SHOW HUSKY/MURPHY TANKS PER TANK IDENTIFICATION REQUEST JSL 10-10-10 SD
7 REVISED CONTAINMENT PONDS AND RIVER CCT 9-29-10 SD
6 REVISED PER LSR AND AC ADDITIONS JSL 3-12-10 SD
NO REVISION BY DATE APPR
ENBRIDGE
SUPERIOR (WI) TERMINAL
Figure 1
Facility Plot Plan
SCALE: AS NOTED
DATE: 10-23-03
DRAWN: JT
CHECK: PJB
APPR: DAC
DATE: 10-23-03
APPR:
APPR: SD
D-1.2-00472-9-130

Photo: Bing Maps Image Service

N

1 Inch = 1,500 Feet

0 750 1,500 3,000

Feet

Figure 2

**SITE LOCATION MAP**
Enbridge Energy, Limited Partnership
Superior, WI

ENBRIDGE

Barr Footer: ArcGIS 10.0, 2012-09-27 11:52 File: I:\Client\Enbridge_Energy\Work_Orders\Air_Permitting\49161022\Maps\Figure_2_Superior_Location.mxd User: jlc

## Table 1-1
## Enbridge Energy, Limited Partnership - Superior, WI Terminal
## Superior Terminal Enhancement Project
## Prevention of Significant Deterioration (PSD) Applicability Volatile Organic Compound Emission Calculation Summary

| Emission Unit Description | Potential to Emit[1] (tpy) | Projected Actual Emissions[2] (tpy) | Capable of Being Accommodated Emissions[3] (tpy) | Excluded Demand Growth Emissions[4] (tpy) | Baseline Actual Emissions[5] (tpy) | Emission Increase[6] (tpy) | Notes |
|---|---|---|---|---|---|---|---|
| Tank T41 Standing and Roof Landing Loss Emissions | 6.00 | - | - | - | 0 | 6.00 | Tank T41 withdrawal losses are included as part of the withdrawal loss emissions increase calculations below. |
| Tank T42 Standing and Roof Landing Loss Emissions | 6.00 | - | - | - | 0 | 6.00 | Tank T42 withdrawal losses are included as part of the withdrawal loss emissions increase calculations below. |
| Tank Withdrawal Loss Emissions | - | 97.10 | 61.38 | 6.98 | 54.40 | 35.73 | Project withdrawal loss emissions resulting from the Line 61 throughput capacity increase. The pipeline throughput increase will not result in increased storage tank standing or roof landing loss emissions. |
| Piping Components | 0.54 | - | - | - | 0 | 0.54 | Emissions from new pumps and piping components (valves, flanges etc) constructed for the project. |
| | | | | | **PSD Project Emission Increases[7] (ton VOC/year)** | **48.26** | |

| | |
|---|---|
| **Prevention of Significant Deterioration Significant Emission Threshold (ton VOC/year)** | **40** |
| **Is total project emissions increase greater than the Prevention of Significant Deterioration Emission Threshold?** | **Yes** |

**Notes:**

1. Potential to emit for the proposed new storage tank and piping components that will be constructed as part of the proposed Superior Terminal Enhancement Project. Refer to Table 2-2 for the Tank T41 and T42 emission calculations and Table 1-5 for the piping component emission calculations.
2. Projected actual emissions calculated per NR 405.02 (25f) based on the proposed increase in the Line 61 pipeline capacity which will debottleneck the throughput capacity of the terminal. Projected actual withdrawal loss emissions are estimated based on the maximum out-bound pipeline throughput capacity of the terminal after completion of the proposed Line 61 project. Refer to the projected actual withdrawal loss emission in Table 1-2.
3. Tank withdrawal loss emissions that the terminal was capable of accommodating is calculated based on the maximum monthly terminal throughput for the years 2010 through 2011 which was 45,012,613 bbl in July 2010. Annualized throughput (maximum monthly throughput x 12 months) is equal to 1,479,867 barrels per day, refer to Table 1-3.
4. Excluded product demand growth emissions are calculated as the difference between the capable of accommodating emissions minus the baseline emissions. Calculated per the NR 405.02 (25f)(b)(2).
5. Baseline actual emissions for the 24-month period 2010 and 2011, refer to Table 1-4.
6. The proposed project includes existing and new emission units, the proposed project emission increase is calculated per the requirements specified in NR 405.025(3). Project emissions increase is calculated as the sum of the difference between the projected actual and the baseline actual emissions for existing emission units and the difference between the potential-to-emit emissions and the baseline actual emissions for new emission units.
7. Project emission increase conservatively includes additional withdrawal losses resulting from increased throughput due to debottlenecking of the terminals outbound pipeline capacity and additional piping components to connect the project to exiting storage tanks and manifolds and the proposed new storage tanks.

## Table 1-2
## Enbridge Energy, Limited Partnership - Superior, WI Terminal
## Superior Terminal Enhancement Project
## Projected Actual Withdrawal Loss Calculations[1]

| | |
|---|---|
| Existing Facility Throughput (bbl/day) | 2,060,000 |
| Projected Actual Throughput[1] (bbl/day) | 2,455,000 |
| Projected Actual Throughput[2] (bbl/yr) | 896,075,000 |
| Potential Project Throughput Increase[3] (bbl/day) | 395,000 |

| Storage Tank Number | Tank Type | Storage Tank Working Volume (bbl) | Percent of Total Terminal Working Volume | Q<br>Tank Throughput[4] (bbl/yr) | D<br>Tank Diameter (ft) | $N_C$<br>Number of fixed roof support columns | $F_C$<br>Effective column diameter | $C_S$<br>Shell Clingage factor (bbl/1000 ft$^2$) | $W_L$<br>Average organic liquid density (lb/gal) | 0.943<br>Constant (1000 ft$^3$ gal/bbl$^2$) | $L_{WD}$<br>Potential Withdrawal Losses[5] (lb VOC/yr) | Potential Withdrawal Losses (ton VOC/yr) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T01 | EFRT | 390,000 | 4.05% | 36,292,411 | 210 | - | - | 0.006 | 7.1 | 0.943 | 6,943 | 3.47 |
| T02 | EFRT | 390,000 | 4.05% | 36,292,411 | 210 | - | - | 0.006 | 7.1 | 0.943 | 6,943 | 3.47 |
| T03 | DEFRT | 150,000 | 1.56% | 13,958,619 | 150 | - | - | 0.006 | 7.1 | 0.943 | 3,738 | 1.87 |
| T04 | DEFRT | 150,000 | 1.56% | 13,958,619 | 150 | - | - | 0.006 | 7.1 | 0.943 | 3,738 | 1.87 |
| T05 | EFRT | 150,000 | 1.56% | 13,958,619 | 150 | - | - | 0.006 | 7.1 | 0.943 | 3,738 | 1.87 |
| T06 | EFRT | 150,000 | 1.56% | 13,958,619 | 150 | - | - | 0.006 | 7.1 | 0.943 | 3,738 | 1.87 |
| T07 | EFRT | 150,000 | 1.56% | 13,958,619 | 150 | - | - | 0.006 | 7.1 | 0.943 | 3,738 | 1.87 |
| T08 | EFRT | 150,000 | 1.56% | 13,958,619 | 150 | - | - | 0.006 | 7.1 | 0.943 | 3,738 | 1.87 |
| T09 | EFRT | 150,000 | 1.56% | 13,958,619 | 150 | - | - | 0.006 | 7.1 | 0.943 | 3,738 | 1.87 |
| T10 | EFRT | 150,000 | 1.56% | 13,958,619 | 150 | - | - | 0.006 | 7.1 | 0.943 | 3,738 | 1.87 |
| T11 | EFRT | 150,000 | 1.56% | 13,958,619 | 150 | - | - | 0.006 | 7.1 | 0.943 | 3,738 | 1.87 |
| T12 | EFRT | 150,000 | 1.56% | 13,958,619 | 150 | - | - | 0.006 | 7.1 | 0.943 | 3,738 | 1.87 |
| T13 | EFRT | 217,000 | 2.25% | 20,193,470 | 180 | - | - | 0.006 | 7.1 | 0.943 | 4,507 | 2.25 |
| T14 | EFRT | 217,000 | 2.25% | 20,193,470 | 180 | - | - | 0.006 | 7.1 | 0.943 | 4,507 | 2.25 |
| T15 | EFRT | 217,000 | 2.25% | 20,193,470 | 180 | - | - | 0.006 | 7.1 | 0.943 | 4,507 | 2.25 |
| T16 | EFRT | 217,000 | 2.25% | 20,193,470 | 180 | - | - | 0.006 | 7.1 | 0.943 | 4,507 | 2.25 |
| T17 | EFRT | 217,000 | 2.25% | 20,193,470 | 180 | - | - | 0.006 | 7.1 | 0.943 | 4,507 | 2.25 |
| T18 | EFRT | 217,000 | 2.25% | 20,193,470 | 180 | - | - | 0.006 | 7.1 | 0.943 | 4,507 | 2.25 |
| T19 | EFRT | 217,000 | 2.25% | 20,193,470 | 180 | - | - | 0.006 | 7.1 | 0.943 | 4,507 | 2.25 |
| T20 | EFRT | 217,000 | 2.25% | 20,193,470 | 180 | - | - | 0.006 | 7.1 | 0.943 | 4,507 | 2.25 |
| T21 | EFRT | 217,000 | 2.25% | 20,193,470 | 180 | - | - | 0.006 | 7.1 | 0.943 | 4,507 | 2.25 |
| T22 | EFRT | 217,000 | 2.25% | 20,193,470 | 180 | - | - | 0.006 | 7.1 | 0.943 | 4,507 | 2.25 |
| T23 | EFRT | 217,000 | 2.25% | 20,193,470 | 180 | - | - | 0.006 | 7.1 | 0.943 | 4,507 | 2.25 |
| T24 | EFRT | 217,000 | 2.25% | 20,193,470 | 180 | - | - | 0.006 | 7.1 | 0.943 | 4,507 | 2.25 |
| T25 | EFRT | 217,000 | 2.25% | 20,193,470 | 180 | - | - | 0.006 | 7.1 | 0.943 | 4,507 | 2.25 |
| T26 | DEFRT | 217,000 | 2.25% | 20,193,470 | 180 | - | - | 0.006 | 7.1 | 0.943 | 4,507 | 2.25 |
| T27 | EFRT | 217,000 | 2.25% | 20,193,470 | 180 | - | - | 0.006 | 7.1 | 0.943 | 4,507 | 2.25 |
| T28 | IFRT | 217,000 | 2.25% | 20,193,470 | 180 | 25 | 1 | 0.006 | 7.1 | 0.943 | 5,133 | 2.57 |
| T29 | IFRT | 217,000 | 2.25% | 20,193,470 | 180 | 25 | 1 | 0.006 | 7.1 | 0.943 | 5,133 | 2.57 |
| T30 | EFRT | 250,000 | 2.60% | 23,264,366 | 200 | - | - | 0.006 | 7.1 | 0.943 | 4,673 | 2.34 |
| T31 | EFRT | 250,000 | 2.60% | 23,264,366 | 200 | - | - | 0.006 | 7.1 | 0.943 | 4,673 | 2.34 |
| T32 | EFRT | 182,857 | 1.90% | 17,016,222 | 165 | - | - | 0.006 | 7.1 | 0.943 | 4,143 | 2.07 |
| T33 | EFRT | 182,857 | 1.90% | 17,016,222 | 165 | - | - | 0.006 | 7.1 | 0.943 | 4,143 | 2.07 |
| T34 | EFRT | 392,169 | 4.07% | 36,494,252 | 224 | - | - | 0.006 | 7.1 | 0.943 | 6,545 | 3.27 |
| T35 | EFRT | 205,653 | 2.14% | 19,137,546 | 180 | - | - | 0.006 | 7.1 | 0.943 | 4,271 | 2.14 |
| T36 | EFRT | 205,653 | 2.14% | 19,137,546 | 180 | - | - | 0.006 | 7.1 | 0.943 | 4,271 | 2.14 |
| T37 | EFRT | 205,653 | 2.14% | 19,137,546 | 180 | - | - | 0.006 | 7.1 | 0.943 | 4,271 | 2.14 |
| T38 | EFRT | 205,653 | 2.14% | 19,137,546 | 180 | - | - | 0.006 | 7.1 | 0.943 | 4,271 | 2.14 |
| T39 | EFRT | 205,653 | 2.14% | 19,137,546 | 180 | - | - | 0.006 | 7.1 | 0.943 | 4,271 | 2.14 |
| T40 | EFRT | 205,653 | 2.14% | 19,137,546 | 180 | - | - | 0.006 | 7.1 | 0.943 | 4,271 | 2.14 |
| T41 | EFRT | 584,232 | 6.07% | 54,367,148 | 286 | - | - | 0.006 | 7.1 | 0.943 | 7,636 | 3.82 |
| T42 | EFRT | 584,232 | 6.07% | 54,367,148 | 286 | - | - | 0.006 | 7.1 | 0.943 | 7,636 | 3.82 |
| | Totals | 9,629,265 | 100.00% | 896,075,000 | | | | | | | | 97.10 |

**Notes:**

1. Projected actual withdrawal loss emissions calculated based on the potential outbound pipeline capacity of 2,455,000 bbl/day after construction of the proposed Line 61 capacity expansion project. Refer to Table 1-6 for a summary of the permitted maximum terminal throughput capacity.
2. Calculated based on operation 365 days per year and maximum physical pipeline capacity.
3. Difference between the existing facility throughput at 2,020,000 bbl/day and the projected actual throughput capacity at 2,455,000 bbl/day after the proposed Line 61 pipeline throughput capacity increase. The potential outbound pipeline capacity includes a true-up of the Calumet Refinery takeoff pipeline that is not associated with the proposed Mainline Enhancement Project. Enbridge has increased the Calumet Refinery pipeline throughput capacity used in the potential terminal throughput calculations from 35,000 bbl/day (refinery throughput capacity used historically) to 95,000 bbl/day (existing pipeline/pump capacity).
4. Individual storage tank throughput is calculated using a tank volume flow weighted throughput allocation, this calculation method results in the same number of turnovers for all tanks. The individual tank throughput is calculated by multiplying the potential facility-wide throughput by the storage tank capacity and dividing by the combined terminal tank capacity.
5. Withdrawal loss formula from US Environmental Protection Agency, Compilation of Air Pollutant Emission Factors, Volume 1, 5th edition, AP-42, Chapter 7.1 Liquid Storage Tanks, November 2006, Formula 2-4.

$$L_{WD} = \frac{(0.943)QC_S W_L}{D}\left[1 + \frac{N_C F_C}{D}\right]$$

## Table 1-3
## Enbridge Energy, Limited Partnership - Superior, WI Terminal
## Superior Terminal Enhancement Project
## Capable of Being Accommodated Withdrawal Loss Calculations[1]

| | |
|---|---|
| Month with Highest Throughput[2] (bbl/month) | 45,012,613 |
| Annualized Maximum Monthly Throughput[3] (bbl/yr) | 540,151,356 |
| Capable of Being Accomodated Throughput [3] (bbl/day) | 1,479,867 |

| Storage Tank Number | Tank Type | Storage Tank Working Volume (bbl) | Percent of Total Terminal Working Volume | Tank Throughput[4] (bbl/yr) | Tank Diameter (ft) | Number of fixed roof support columns | Effective column diameter | Shell Clingage factor (bbl/1000 ft$^2$) | Average organic liquid density (lb/gal) | Constant (1000 ft$^3$ gal/bbl$^2$) | Potential Withdrawal Losses[5] (lb VOC/yr) | Potential Withdrawal Losses (ton VOC/yr) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Q | D | 2-4 Note 2 $N_C$ | 2-4 Note 3 $F_C$ | Table 7.1-10 $C_S$ | Table 7.1-2 $W_L$ | 0.943 | 2-4 $L_{WD}$ | |
| T01 | EFRT | 390,000 | 4.61% | 24,898,236 | 210 | - | - | 0.006 | 7.1 | 0.943 | 4,763 | 2.38 |
| T02 | EFRT | 390,000 | 4.61% | 24,898,236 | 210 | - | - | 0.006 | 7.1 | 0.943 | 4,763 | 2.38 |
| T03 | DEFRT | 150,000 | 1.77% | 9,576,245 | 150 | - | - | 0.006 | 7.1 | 0.943 | 2,565 | 1.28 |
| T04 | DEFRT | 150,000 | 1.77% | 9,576,245 | 150 | - | - | 0.006 | 7.1 | 0.943 | 2,565 | 1.28 |
| T05 | EFRT | 150,000 | 1.77% | 9,576,245 | 150 | - | - | 0.006 | 7.1 | 0.943 | 2,565 | 1.28 |
| T06 | EFRT | 150,000 | 1.77% | 9,576,245 | 150 | - | - | 0.006 | 7.1 | 0.943 | 2,565 | 1.28 |
| T07 | EFRT | 150,000 | 1.77% | 9,576,245 | 150 | - | - | 0.006 | 7.1 | 0.943 | 2,565 | 1.28 |
| T08 | EFRT | 150,000 | 1.77% | 9,576,245 | 150 | - | - | 0.006 | 7.1 | 0.943 | 2,565 | 1.28 |
| T09 | EFRT | 150,000 | 1.77% | 9,576,245 | 150 | - | - | 0.006 | 7.1 | 0.943 | 2,565 | 1.28 |
| T10 | EFRT | 150,000 | 1.77% | 9,576,245 | 150 | - | - | 0.006 | 7.1 | 0.943 | 2,565 | 1.28 |
| T11 | EFRT | 150,000 | 1.77% | 9,576,245 | 150 | - | - | 0.006 | 7.1 | 0.943 | 2,565 | 1.28 |
| T12 | EFRT | 150,000 | 1.77% | 9,576,245 | 150 | - | - | 0.006 | 7.1 | 0.943 | 2,565 | 1.28 |
| T13 | EFRT | 217,000 | 2.56% | 13,853,634 | 180 | - | - | 0.006 | 7.1 | 0.943 | 3,092 | 1.55 |
| T14 | EFRT | 217,000 | 2.56% | 13,853,634 | 180 | - | - | 0.006 | 7.1 | 0.943 | 3,092 | 1.55 |
| T15 | EFRT | 217,000 | 2.56% | 13,853,634 | 180 | - | - | 0.006 | 7.1 | 0.943 | 3,092 | 1.55 |
| T16 | EFRT | 217,000 | 2.56% | 13,853,634 | 180 | - | - | 0.006 | 7.1 | 0.943 | 3,092 | 1.55 |
| T17 | EFRT | 217,000 | 2.56% | 13,853,634 | 180 | - | - | 0.006 | 7.1 | 0.943 | 3,092 | 1.55 |
| T18 | EFRT | 217,000 | 2.56% | 13,853,634 | 180 | - | - | 0.006 | 7.1 | 0.943 | 3,092 | 1.55 |
| T19 | EFRT | 217,000 | 2.56% | 13,853,634 | 180 | - | - | 0.006 | 7.1 | 0.943 | 3,092 | 1.55 |
| T20 | EFRT | 217,000 | 2.56% | 13,853,634 | 180 | - | - | 0.006 | 7.1 | 0.943 | 3,092 | 1.55 |
| T21 | EFRT | 217,000 | 2.56% | 13,853,634 | 180 | - | - | 0.006 | 7.1 | 0.943 | 3,092 | 1.55 |
| T22 | EFRT | 217,000 | 2.56% | 13,853,634 | 180 | - | - | 0.006 | 7.1 | 0.943 | 3,092 | 1.55 |
| T23 | EFRT | 217,000 | 2.56% | 13,853,634 | 180 | - | - | 0.006 | 7.1 | 0.943 | 3,092 | 1.55 |
| T24 | EFRT | 217,000 | 2.56% | 13,853,634 | 180 | - | - | 0.006 | 7.1 | 0.943 | 3,092 | 1.55 |
| T25 | EFRT | 217,000 | 2.56% | 13,853,634 | 180 | - | - | 0.006 | 7.1 | 0.943 | 3,092 | 1.55 |
| T26 | DEFRT | 217,000 | 2.56% | 13,853,634 | 180 | - | - | 0.006 | 7.1 | 0.943 | 3,092 | 1.55 |
| T27 | EFRT | 217,000 | 2.56% | 13,853,634 | 180 | - | - | 0.006 | 7.1 | 0.943 | 3,092 | 1.55 |
| T28 | IFRT | 217,000 | 2.56% | 13,853,634 | 180 | 25 | 1 | 0.006 | 7.1 | 0.943 | 3,521 | 1.76 |
| T29 | IFRT | 217,000 | 2.56% | 13,853,634 | 180 | 25 | 1 | 0.006 | 7.1 | 0.943 | 3,521 | 1.76 |
| T30 | EFRT | 250,000 | 2.95% | 15,960,408 | 200 | - | - | 0.006 | 7.1 | 0.943 | 3,206 | 1.60 |
| T31 | EFRT | 250,000 | 2.95% | 15,960,408 | 200 | - | - | 0.006 | 7.1 | 0.943 | 3,206 | 1.60 |
| T32 | EFRT | 182,857 | 2.16% | 11,673,898 | 165 | - | - | 0.006 | 7.1 | 0.943 | 2,842 | 1.42 |
| T33 | EFRT | 182,857 | 2.16% | 11,673,898 | 165 | - | - | 0.006 | 7.1 | 0.943 | 2,842 | 1.42 |
| T34 | EFRT | 392,169 | 4.64% | 25,036,709 | 224 | - | - | 0.006 | 7.1 | 0.943 | 4,490 | 2.25 |
| T35 | EFRT | 205,653 | 2.43% | 13,129,223 | 180 | - | - | 0.006 | 7.1 | 0.943 | 2,930 | 1.47 |
| T36 | EFRT | 205,653 | 2.43% | 13,129,223 | 180 | - | - | 0.006 | 7.1 | 0.943 | 2,930 | 1.47 |
| T37 | EFRT | 205,653 | 2.43% | 13,129,223 | 180 | - | - | 0.006 | 7.1 | 0.943 | 2,930 | 1.47 |
| T38 | EFRT | 205,653 | 2.43% | 13,129,223 | 180 | - | - | 0.006 | 7.1 | 0.943 | 2,930 | 1.47 |
| T39 | EFRT | 205,653 | 2.43% | 13,129,223 | 180 | - | - | 0.006 | 7.1 | 0.943 | 2,930 | 1.47 |
| T40 | EFRT | 205,653 | 2.43% | 13,129,223 | 180 | - | - | 0.006 | 7.1 | 0.943 | 2,930 | 1.47 |
| | Totals | 8,460,801 | 100.00% | 540,151,356 | | | | | | | | 61.38 |

**Notes:**

1. Represents the level of throughput and associated withdrawal loss emissions that the terminal has demonstrated that it is capable of accommodating during the consecutive 24-month period used to establish the baseline emissions and that are also unrelated to the project.
2. Tank withdrawal loss emissions the terminal was capable of accommodating are calculated based on the maximum monthly terminal throughput of 45,012,613 bbl/mo. in July 2010 which was part of the 24-month period used to establish the baseline actual emissions and that are unrelated to the project.
3. Annualized accommodated throughput (maximum monthly throughput x 12 months) is equal to 540,151,356 bbl/year or 1,479,867 bpd.
4. Individual storage tank throughput is calculated using a tank volume flow weighted throughput allocation, this calculation method results in the same number of turnovers for all tanks. The individual tank throughput is calculated by multiplying the potential facility-wide throughput by the storage tank capacity and dividing by the combined terminal tank capacity.
5. Withdrawal loss formula from US Environmental Protection Agency, Compilation of Air Pollutant Emission Factors, Volume 1, 5th edition, AP-42, Chapter 7.1 Liquid Storage Tanks, November 2006, Formula 2-4.

$$L_{WD} = \frac{(0.943)QC_S W_L}{D}\left[1 + \frac{N_C F_C}{D}\right]$$

## Table 1-4
## Enbridge Energy, Limited Partnership - Superior, WI Terminal
## Superior Terminal Enhancement Project
## Baseline Actual Throughput and Volatile Organic Compound Emission Summary[1]

| Annual Emission Inventory Reporting Year | Total Facility Storage Tank Throughput (bbl/yr) | Total Facility Storage Tank Throughput (bbl/day) | Facility-wide Withdrawal Loss Emissions (tpy) | Piping Component Emissions (tpy) | Notes |
|---|---|---|---|---|---|
| 2011 | 489,778,756 | 1,341,860 | 55.00 | 6.74 | Baseline period |
| 2010 | 479,060,924 | 1,312,496 | 53.80 | 6.74 | Baseline period |
| 2009 | 475,648,224 | 1,303,146 | 52.77 | 5.95 | |
| 2008 | 478,188,349 | 1,310,105 | 53.11 | 2.65 | |
| 2007 | 429,975,442 | 1,178,015 | 48.06 | 2.27 | |
| 2006 | 420,997,537 | 1,153,418 | 47.94 | 2.27 | |
| 2005 | 344,830,149 | 944,740 | 38.91 | 2.27 | |
| 2004 | 368,812,453 | 1,010,445 | 41.48 | 2.27 | |

**Notes:**

1. Actual storage tank throughput and emissions from annual emission inventory reporting.

## Table 1-5
## Enbridge Energy, Limited Partnership - Superior, WI Terminal
## Superior Terminal Enhancement Project
## Project Piping Component Fugitive Volatile Organic Compound Emission Calculations

| Component | Count[1] | Service | Emission Factor[2] (kg/hr/source) | Emission Factor (lb/hr/source) | Emissions[3] (lb VOC/year) | Emissions (ton VOC/yr) |
|---|---|---|---|---|---|---|
| Valves | 370 | Crude/ Light Liquid | 4.30E-05 | 9.47E-05 | 307 | 0.15 |
| Flanges | 2,440 | Crude/ Light Liquid | 8.00E-06 | 1.76E-05 | 377 | 0.19 |
| Other Equipment[4] | 30 | Crude/ Light Liquid | 1.30E-04 | 2.86E-04 | 75 | 0.04 |
| Pump Seals | 30 | Crude/ Light Liquid | 5.40E-04 | 1.19E-03 | 313 | 0.16 |
| | | | | Total | 1,071 | 0.54 |

**Notes:**

1. Estimated piping component and pumps counts.
2. From *Marketing Terminal Average Emission Factors from Protocol for Equipment Leak Emission Estimates*, USEPA Office of Air Quality Planning and Standards, November 1995 (EPA-453/R-95-017), Table 2-3 Light liquid emission factors.
3. Assumes 8,760 hours of operation per year.
4. Includes orifices, sampling connections and open lines.

## Table 1-6
## Enbridge Energy, Limited Partnership - Superior, WI Terminal
## Superior Terminal Enhancement Project
## Permitted Maximum Terminal Throughput Capacity Summary[1]

| Outbound Pipeline Number | Maximum Pipeline Design Capacity ($m^3$/day) | Maximum Pipeline Design Capacity (bbl/day) | Maximum Pipeline Design Capacity (gal/day) | Notes |
|---|---|---|---|---|
| 5 | 85,844 | 540,000 | 22,680,000 | No Change |
| 6a | 106,033 | 667,000 | 28,014,000 | No Change |
| 14/64 | 50,553 | 318,000 | 13,356,000 | No Change |
| 61 | 132,740 | 835,000 | 35,070,000 | Increase from 440,000 bbl/day |
| Calumet Refinery Takeoff | 15,102 | 95,000 | 3,990,000 | No Change[2] |
| | 390,273 | 2,455,000 | 103,110,000 | |

**Notes:**

1. The terminal throughput capacity is bottlenecked by the maximum terminal outbound pipeline capacity, which will be 2,455,000 bbl/day after the proposed expansion of Line 61.
2. Historically the potential outbound capacity to the refinery was assumed to be the potential refinery throughput of 35,000 bbl/day. Enbridge reviewed the existing pipeline and pump capacity for the refinery outbound line and determined 95,000 bbl/day represents the maximum pipeline design capacity.

## Table 1-7
## Enbridge Energy, Limited Partnership - Superior, WI Terminal
## Superior Terminal Enhancement Project
## Project Green House Gas Emission Calculations

| Emission Unit ID | Potential Tanks Throughput[1] (MMgal/yr) | $CH_4$ Emission Factor[2] (lb $CH_4$/MMgal) | Potential $CH_4$ Emissions (lb/yr) | Potential $CH_4$ Emissions (tpy) | Potential $CO_2$ Equivalent Emissions[3,4] ($CO_2e$, tpy) |
|---|---|---|---|---|---|
| T41 | 4,908 | 5.25 | 25,760.21 | 12.88 | 270 |
| T42 | 4,908 | 5.25 | 25,760.21 | 12.88 | 270 |
| Project Related Throughput Increase[5] | 6,055 | 5.25 | 31,785.14 | 15.89 | 334 |
| | | | | Total[6] | 875 |

**Notes**

1. Refer to Table 2-8 for tank throughputs, assumes 200 tank turnover per year for tanks T41 and T42.
2. Methane emission factor obtained from 40 CFR 98.253 (m)(1), equation Y-22. Original value of 0.1 metric ton/MMbbl converted to 5.25 lb/MMgal.
3. Global warming potential (GWP) obtained from Table A-1 to Subpart A of Part 98 - Global Warming Potentials.
4. $CO_2e$ calculated by equation A-1 of 40 CFR 98.2, which states the total $CO_2e$ is equal to the GWP factor for $CH_4$ multiplied by the potential $CH_4$ emissions. The global warming potential for $CH_4$ is 21.
5. Potential tank throughput resulting from the 395,000 bpd increase in terminal throughput capacity.
6. The project will not debottleneck, modify or otherwise physically change the terminal's crude heater or other combustion sources. The crude heater is only used to heat crude oil delivered on Line 6A which will not be debottlenecked as a result of the proposed project.

**Table 2-1**
**Enbridge Energy, Limited Partnership - Superior, WI Terminal**
**MTE/PTE Emission Calculation Summary**

| | Emissions[1] (ton/yr) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Emission Unit ID | VOC | Total HAP | Highest Single HAP[2] (Hexane) | PM | PM10 | PM2.5 | Lead | $SO_2$ | NOx | CO | $CO_2$ | $CH_4$ | $N_2O$ | $CO_2e$ |
| T01 | 22.88 | 0.74 | 0.51 | - | - | - | - | - | - | - | - | 3.74 | - | 78.54 |
| T02 | 22.83 | 0.74 | 0.50 | - | - | - | - | - | - | - | - | 3.74 | - | 78.54 |
| T03 | 3.25 | 0.15 | 0.08 | - | - | - | - | - | - | - | - | 1.44 | - | 30.21 |
| T04 | 3.20 | 0.15 | 0.07 | - | - | - | - | - | - | - | - | 1.44 | - | 30.21 |
| T05 | 4.15 | 0.18 | 0.10 | - | - | - | - | - | - | - | - | 1.44 | - | 30.21 |
| T06 | 9.25 | 0.31 | 0.21 | - | - | - | - | - | - | - | - | 1.44 | - | 30.21 |
| T07 | 4.36 | 0.18 | 0.10 | - | - | - | - | - | - | - | - | 1.44 | - | 30.21 |
| T08 | 7.01 | 0.25 | 0.16 | - | - | - | - | - | - | - | - | 1.44 | - | 30.21 |
| T09 | 3.18 | 0.15 | 0.07 | - | - | - | - | - | - | - | - | 1.44 | - | 30.21 |
| T10 | 9.50 | 0.32 | 0.21 | - | - | - | - | - | - | - | - | 1.44 | - | 30.21 |
| T11 | 10.26 | 0.34 | 0.23 | - | - | - | - | - | - | - | - | 1.44 | - | 30.21 |
| T12 | 11.09 | 0.36 | 0.25 | - | - | - | - | - | - | - | - | 1.44 | - | 30.21 |
| T13 | 16.09 | 0.51 | 0.35 | - | - | - | - | - | - | - | - | 2.08 | - | 43.70 |
| T14 | 9.88 | 0.34 | 0.22 | - | - | - | - | - | - | - | - | 2.08 | - | 43.70 |
| T15 | 9.82 | 0.34 | 0.22 | - | - | - | - | - | - | - | - | 2.08 | - | 43.70 |
| T16 | 15.90 | 0.51 | 0.35 | - | - | - | - | - | - | - | - | 2.08 | - | 43.70 |
| T17 | 15.80 | 0.51 | 0.35 | - | - | - | - | - | - | - | - | 2.08 | - | 43.70 |
| T18 | 9.82 | 0.34 | 0.22 | - | - | - | - | - | - | - | - | 2.08 | - | 43.70 |
| T19 | 13.43 | 0.44 | 0.30 | - | - | - | - | - | - | - | - | 2.08 | - | 43.70 |
| T20 | 15.88 | 0.51 | 0.35 | - | - | - | - | - | - | - | - | 2.08 | - | 43.70 |
| T21 | 15.88 | 0.51 | 0.35 | - | - | - | - | - | - | - | - | 2.08 | - | 43.70 |
| T22 | 9.71 | 0.34 | 0.22 | - | - | - | - | - | - | - | - | 2.08 | - | 43.70 |
| T23 | 19.39 | 0.60 | 0.43 | - | - | - | - | - | - | - | - | 2.08 | - | 43.70 |
| T24 | 9.90 | 0.35 | 0.22 | - | - | - | - | - | - | - | - | 2.08 | - | 43.70 |
| T25 | 9.87 | 0.34 | 0.22 | - | - | - | - | - | - | - | - | 2.08 | - | 43.70 |
| T26 | 2.44 | 0.14 | 0.06 | - | - | - | - | - | - | - | - | 2.08 | - | 43.70 |
| T27 | 4.01 | 0.19 | 0.09 | - | - | - | - | - | - | - | - | 2.08 | - | 43.70 |
| T28 | 11.23 | 0.39 | 0.25 | - | - | - | - | - | - | - | - | 2.08 | - | 43.70 |
| T29 | 11.53 | 0.40 | 0.26 | - | - | - | - | - | - | - | - | 2.08 | - | 43.70 |
| T30 | 4.33 | 0.20 | 0.10 | - | - | - | - | - | - | - | - | 2.40 | - | 50.35 |
| T31 | 4.34 | 0.20 | 0.10 | - | - | - | - | - | - | - | - | 2.40 | - | 50.35 |
| T32 | 3.66 | 0.17 | 0.08 | - | - | - | - | - | - | - | - | 1.75 | - | 36.83 |
| T33 | 3.66 | 0.17 | 0.08 | - | - | - | - | - | - | - | - | 1.75 | - | 36.83 |
| T34 | 5.50 | 0.26 | 0.13 | - | - | - | - | - | - | - | - | 3.76 | - | 78.98 |
| T35 | 7.74 | 0.38 | 0.18 | - | - | - | - | - | - | - | - | 4.53 | - | 95.21 |
| T36 | 7.60 | 0.37 | 0.18 | - | - | - | - | - | - | - | - | 4.53 | - | 95.21 |
| T37 | 7.60 | 0.37 | 0.18 | - | - | - | - | - | - | - | - | 4.53 | - | 95.21 |
| T38 | 7.60 | 0.37 | 0.18 | - | - | - | - | - | - | - | - | 4.53 | - | 95.21 |
| T39 | 7.60 | 0.37 | 0.18 | - | - | - | - | - | - | - | - | 4.53 | - | 95.21 |
| T40 | 7.60 | 0.37 | 0.18 | - | - | - | - | - | - | - | - | 4.53 | - | 95.21 |
| T41 | 14.21 | 0.68 | 0.33 | - | - | - | - | - | - | - | - | 12.88 | - | 270.48 |
| T42 | 14.21 | 0.68 | 0.33 | - | - | - | - | - | - | - | - | 12.88 | - | 270.48 |
| ST01 | 1.02 | 0.03 | 0.02 | - | - | - | - | - | - | - | - | 0.00 | - | 0.06 |
| ST02 | 0.30 | 0.01 | 0.01 | - | - | - | - | - | - | - | - | 0.00 | - | 0.01 |
| ST03 | 0.50 | 0.01 | 0.01 | - | - | - | - | - | - | - | - | 0.00 | - | 0.01 |
| ST04 | 0.11 | 0.00 | 0.00 | - | - | - | - | - | - | - | - | 0.00 | - | 0.00 |
| ST05 | 0.30 | 0.01 | 0.01 | - | - | - | - | - | - | - | - | 0.00 | - | 0.01 |
| ST06 | 0.07 | 0.00 | 0.00 | - | - | - | - | - | - | - | - | 0.00 | - | 0.00 |
| PG01 | 0.14 | 0.00 | 0.00 | - | - | - | - | - | - | - | - | Negligible | | |
| PG02 | 0.00 | 0.00 | 0.00 | - | - | - | - | - | - | - | - | Negligible | | |
| PG03 | 0.00 | 0.00 | 0.00 | - | - | - | - | - | - | - | - | Negligible | | |
| PG04 | 0.01 | 0.00 | 0.00 | - | - | - | - | - | - | - | - | Negligible | | |
| PG05 | 0.01 | 0.00 | 0.00 | - | - | - | - | - | - | - | - | Negligible | | |
| PG06 | 0.01 | 0.00 | 0.00 | - | - | - | - | - | - | - | - | Negligible | | |
| PG07 | 0.01 | 0.00 | 0.00 | - | - | - | - | - | - | - | - | Negligible | | |
| PG08 | 0.01 | 0.00 | 0.00 | - | - | - | - | - | - | - | - | Negligible | | |
| PG09 | 0.01 | 0.00 | 0.00 | - | - | - | - | - | - | - | - | Negligible | | |
| PG10 | 0.01 | 0.00 | 0.00 | - | - | - | - | - | - | - | - | Negligible | | |
| Crude Oil Heater | 4.07 | 0.68 | 0.65 | 14.79 | 14.79 | 14.79 | 0.0002 | 0.22 | 22.18 | 14.79 | 43,209.98 | 0.81 | 0.08 | 43,252.36 |
| Area 1 Fire Pump #1 | 0.24 | 0.00 | - | 0.20 | 0.20 | 0.20 | - | 0.00 | 2.89 | 0.62 | 106.72 | 0.00 | 0.00 | 107.08 |
| Area 1 Fire Pump #2 | 0.24 | 0.00 | - | 0.20 | 0.20 | 0.20 | - | 0.00 | 2.89 | 0.62 | 106.72 | 0.00 | 0.00 | 107.08 |
| Area 2 Fire Pump | 0.24 | 0.00 | - | 0.20 | 0.20 | 0.20 | - | 0.00 | 2.89 | 0.62 | 106.72 | 0.00 | 0.00 | 107.08 |
| Area 1 Emergency Generator | 0.05 | 0.00 | - | 0.04 | 0.04 | 0.04 | - | 0.00 | 0.64 | 0.14 | 200.83 | 0.01 | 0.00 | 201.50 |
| Area 2 Emergency Generator | 0.05 | 0.00 | - | 0.04 | 0.04 | 0.04 | - | 0.00 | 0.64 | 0.14 | 200.83 | 0.01 | 0.00 | 201.50 |
| Area 3 Emergency Generator #1 | 0.05 | 0.00 | - | 0.04 | 0.04 | 0.04 | - | 0.00 | 0.64 | 0.14 | 200.83 | 0.01 | 0.00 | 201.50 |
| Area 3 Emergency Generator #2 | 0.05 | 0.00 | - | 0.04 | 0.04 | 0.04 | - | 0.00 | 0.64 | 0.14 | 200.83 | 0.01 | 0.00 | 201.50 |
| Area 4 Emergency Generator | 0.05 | 0.00 | - | 0.04 | 0.04 | 0.04 | - | 0.00 | 0.64 | 0.14 | 200.83 | 0.01 | 0.00 | 201.50 |
| Lab Area Emergency Generator | 0.01 | 0.00 | - | 0.01 | 0.01 | 0.01 | - | 0.00 | 0.22 | 0.03 | 325.01 | 0.01 | 0.00 | 326.10 |
| Piping Fugitive Emissions | 7.22 | 0.20 | 0.16 | - | - | - | - | - | - | - | - | - | - | - |
| Total Facility | 421.90 | 16.21 | 10.02 | 15.63 | 15.63 | 15.63 | 0.0002 | 0.22 | 34.25 | 17.37 | 44,859.27 | 123.16 | 0.09 | 47,474.95 |
| | VOC | Total HAP | Highest Single HAP[2] (Hexane) | PM | PM10 | PM2.5 | Lead | $SO_2$ | NOx | CO | $CO_2$ | $CH_4$ | $N_2O$ | $CO_2e$ |

**Notes:**
1. Refer to tables 2-2 through 2-11 for supporting calculations.
2. The terminal is not a major source, permit limitation I.ZZZ.1.a.(1) limits actual individual HAP emissions below major source thresholds.

**Table 2-2**
**Enbridge Energy, Limited Partnership - Superior, WI Terminal**
**MTE/PTE Emission Calculations**
**Facility-Wide Volatile Organic Compound Emissions Summary**

| Emission Unit ID | Annual Tank Throughput[1] (bbl/yr) | Annual Tank Withdrawal (gal/yr) | Tank Turnovers[1] | Standing Loss[2] (lb VOC/yr) | Withdrawal/ Working Loss[2] (lb VOC/yr) | Roof Landing Loss[3] (lb VOC/yr) | Total Loss (ton VOC/yr) | Standing Loss[2] (ton VOC/yr) | Withdrawal/ Working Loss[2] (ton VOC/yr) | Roof Landing Loss[3] (ton VOC/yr) | Total Loss (ton VOC/yr) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Storage Tanks** | | | | | | | | | | | |
| T01 | 33,930,000 | 1,425,060,000 | 87 | 24,164 | 6,491 | 15,110 | 45,765 | 12.08 | 3.25 | 7.56 | 22.88 |
| T02 | 33,930,000 | 1,425,060,000 | 87 | 24,051 | 6,491 | 15,110 | 45,652 | 12.03 | 3.25 | 7.56 | 22.83 |
| T03 | 13,050,000 | 548,100,000 | 87 | 3,004 | 3,495 | - | 6,498 | 1.50 | 1.75 | - | 3.25 |
| T04 | 13,050,000 | 548,100,000 | 87 | 2,903 | 3,495 | - | 6,398 | 1.45 | 1.75 | - | 3.20 |
| T05 | 13,050,000 | 548,100,000 | 87 | 2,865 | 3,495 | 1,943 | 8,303 | 1.43 | 1.75 | 0.97 | 4.15 |
| T06 | 13,050,000 | 548,100,000 | 87 | 14,999 | 3,495 | - | 18,494 | 7.50 | 1.75 | - | 9.25 |
| T07 | 13,050,000 | 548,100,000 | 87 | 5,226 | 3,495 | - | 8,721 | 2.61 | 1.75 | - | 4.36 |
| T08 | 13,050,000 | 548,100,000 | 87 | 10,521 | 3,495 | - | 14,016 | 5.26 | 1.75 | - | 7.01 |
| T09 | 13,050,000 | 548,100,000 | 87 | 2,857 | 3,495 | - | 6,351 | 1.43 | 1.75 | - | 3.18 |
| T10 | 13,050,000 | 548,100,000 | 87 | 15,505 | 3,495 | - | 19,000 | 7.75 | 1.75 | - | 9.50 |
| T11 | 13,050,000 | 548,100,000 | 87 | 17,017 | 3,495 | - | 20,512 | 8.51 | 1.75 | - | 10.26 |
| T12 | 13,050,000 | 548,100,000 | 87 | 18,684 | 3,495 | - | 22,179 | 9.34 | 1.75 | - | 11.09 |
| T13 | 18,879,000 | 792,918,000 | 87 | 16,177 | 4,213 | 11,790 | 32,181 | 8.09 | 2.11 | 5.90 | 16.09 |
| T14 | 18,879,000 | 792,918,000 | 87 | 3,758 | 4,213 | 11,790 | 19,762 | 1.88 | 2.11 | 5.90 | 9.88 |
| T15 | 18,879,000 | 792,918,000 | 87 | 3,643 | 4,213 | 11,790 | 19,647 | 1.82 | 2.11 | 5.90 | 9.82 |
| T16 | 18,879,000 | 792,918,000 | 87 | 15,792 | 4,213 | 11,790 | 31,796 | 7.90 | 2.11 | 5.90 | 15.90 |
| T17 | 18,879,000 | 792,918,000 | 87 | 15,597 | 4,213 | 11,790 | 31,601 | 7.80 | 2.11 | 5.90 | 15.80 |
| T18 | 18,879,000 | 792,918,000 | 87 | 3,643 | 4,213 | 11,790 | 19,647 | 1.82 | 2.11 | 5.90 | 9.82 |
| T19 | 18,879,000 | 792,918,000 | 87 | 10,858 | 4,213 | 11,790 | 26,862 | 5.43 | 2.11 | 5.90 | 13.43 |
| T20 | 18,879,000 | 792,918,000 | 87 | 15,761 | 4,213 | 11,790 | 31,765 | 7.88 | 2.11 | 5.90 | 15.88 |
| T21 | 18,879,000 | 792,918,000 | 87 | 15,750 | 4,213 | 11,790 | 31,754 | 7.87 | 2.11 | 5.90 | 15.88 |
| T22 | 18,879,000 | 792,918,000 | 87 | 3,425 | 4,213 | 11,790 | 19,428 | 1.71 | 2.11 | 5.90 | 9.71 |
| T23 | 18,879,000 | 792,918,000 | 87 | 22,774 | 4,213 | 11,790 | 38,778 | 11.39 | 2.11 | 5.90 | 19.39 |
| T24 | 18,879,000 | 792,918,000 | 87 | 3,792 | 4,213 | 11,790 | 19,796 | 1.90 | 2.11 | 5.90 | 9.90 |
| T25 | 18,879,000 | 792,918,000 | 87 | 3,737 | 4,213 | 11,790 | 19,740 | 1.87 | 2.11 | 5.90 | 9.87 |
| T26 | 18,879,000 | 792,918,000 | 87 | 660 | 4,213 | - | 4,873 | 0.33 | 2.11 | - | 2.44 |
| T27 | 18,879,000 | 792,918,000 | 87 | 3,807 | 4,213 | - | 8,020 | 1.90 | 2.11 | - | 4.01 |
| T28 | 18,879,000 | 792,918,000 | 87 | 6,767 | 4,799 | 10,904 | 22,470 | 3.38 | 2.40 | 5.45 | 11.23 |
| T29 | 18,879,000 | 792,918,000 | 87 | 7,355 | 4,799 | 10,904 | 23,057 | 3.68 | 2.40 | 5.45 | 11.53 |
| T30 | 21,750,000 | 913,500,000 | 87 | 4,287 | 4,369 | - | 8,656 | 2.14 | 2.18 | - | 4.33 |
| T31 | 21,750,000 | 913,500,000 | 87 | 4,307 | 4,369 | - | 8,676 | 2.15 | 2.18 | - | 4.34 |
| T32 | 15,908,571 | 668,160,000 | 87 | 3,442 | 3,873 | - | 7,315 | 1.72 | 1.94 | - | 3.66 |
| T33 | 15,908,571 | 668,160,000 | 87 | 3,442 | 3,873 | - | 7,315 | 1.72 | 1.94 | - | 3.66 |
| T34 | 34,118,703 | 1,432,985,526 | 87 | 4,873 | 6,119 | - | 10,992 | 2.44 | 3.06 | - | 5.50 |
| T35 | 41,130,600 | 1,727,485,200 | 200 | 3,496 | 9,179 | 2,798 | 15,473 | 1.75 | 4.59 | 1.40 | 7.74 |
| T36 | 41,130,600 | 1,727,485,200 | 200 | 3,218 | 9,179 | 2,798 | 15,195 | 1.61 | 4.59 | 1.40 | 7.60 |
| T37 | 41,130,600 | 1,727,485,200 | 200 | 3,218 | 9,179 | 2,798 | 15,195 | 1.61 | 4.59 | 1.40 | 7.60 |
| T38 | 41,130,600 | 1,727,485,200 | 200 | 3,218 | 9,179 | 2,798 | 15,195 | 1.61 | 4.59 | 1.40 | 7.60 |
| T39 | 41,130,600 | 1,727,485,200 | 200 | 3,218 | 9,179 | 2,798 | 15,195 | 1.61 | 4.59 | 1.40 | 7.60 |
| T40 | 41,130,600 | 1,727,485,200 | 200 | 3,218 | 9,179 | 2,798 | 15,195 | 1.61 | 4.59 | 1.40 | 7.60 |
| T41 | 116,846,400 | 4,907,548,800 | 200 | 4,937 | 16,412 | 7,064 | 28,413 | 2.47 | 8.21 | 3.53 | 14.21 |
| T42 | 116,846,400 | 4,907,548,800 | 200 | 4,937 | 16,412 | 7,064 | 28,413 | 2.47 | 8.21 | 3.53 | 14.21 |
| **Piping Fugitive Emissions[4]** | | | | | | | 14,443 | | | | 7.22 |
| **Sump Tank Emissions[5]** | | | | | | | | | | | |
| ST01 | 25,018 | 1,050,774 | 131 | - | 2,044 | | 2,044 | - | 1.02 | - | 1.02 |
| ST02 | 2,857 | 120,000 | 30 | - | 591 | | 591 | - | 0.30 | - | 0.30 |
| ST03 | 2,857 | 120,000 | 30 | - | 1,003 | | 1,003 | - | 0.50 | - | 0.50 |
| ST04 | 1,071 | 45,000 | 11 | - | 222 | | 222 | - | 0.11 | - | 0.11 |
| ST05 | 2,857 | 120,000 | 30 | - | 591 | | 591 | - | 0.30 | - | 0.30 |
| ST06 | 714 | 30,000 | 8 | - | 148 | | 148 | - | 0.07 | - | 0.07 |
| **Pigging Equipment Emissions[6]** | | | | | | | | | | | |
| PG01 | | | | | | | 287 | | | | 0.144 |
| PG02 | | | | | | | 1.0 | | | | 0.0005 |
| PG03 | | | | | | | 2.5 | | | | 0.0013 |
| PG04 | | | | | | | 12 | | | | 0.006 |
| PG05 | | | | | | | 12 | | | | 0.006 |
| PG06 | | | | | | | 12 | | | | 0.006 |
| PG07 | | | | | | | 12 | | | | 0.006 |
| PG08 | | | | | | | 12 | | | | 0.006 |
| PG09 | | | | | | | 12 | | | | 0.006 |
| PG10 | | | | | | | 12 | | | | 0.006 |
| **Combustion Sources[7]** | | | | | | | | | | | |
| Crude Oil Heater | | | | | | | 8,133 | | | | 4.07 |
| Area 1 Fire Pump #1 | | | | | | | 471 | | | | 0.24 |
| Area 1 Fire Pump #2 | | | | | | | 471 | | | | 0.24 |
| Area 2 Fire Pump | | | | | | | 471 | | | | 0.24 |
| Area 1 Emergency Generator | | | | | | | 104 | | | | 0.05 |
| Area 2 Emergency Generator | | | | | | | 104 | | | | 0.05 |
| Area 3 Emergency Generator #1 | | | | | | | 104 | | | | 0.05 |
| Area 3 Emergency Generator #2 | | | | | | | 104 | | | | 0.05 |
| Area 4 Emergency Generator | | | | | | | 104 | | | | 0.05 |
| Lab Area Emergency Generator | | | | | | | 15 | | | | 0.01 |
| | | | Total | 344,899 | 235,830 | 238,165 | 843,796 | 172.45 | 117.92 | 119.08 | 421.90 |

Notes:

1. Previous PTE calculations for tanks T01 through T34 were based on the maximum terminal throughput which was equal to approximately 87 turnovers per tank per year. The PTE for tanks T35 through T42 are based on a maximum number of 200 turnovers per year. These same maximum turnovers of 87 per tank for T01 through T34 are used here in calculating the facility-wide PTE. As a result, the facility-wide tank throughput is conservatively higher (3,038,946 bbl/day) than the potential throughput the terminal is physically capable of accommodating after the Superior Terminal Enhancement Project (2,455,000 bbl/day) which also makes the total VOC per year conservatively higher.
2. Calculated using US Environmental Protection Agency, TANKS program version 4.0.9d.

3. See Table 2-4 MTE/PTE Tank Roof Landing Emission Calculations. All storage tanks may have roof landing emissions. Enbridge has accepted permit limits on roof landing emissions for tanks T35 through T40 and a 103 tpy roof landing emission limit for the other terminal storage tanks combined. Roof landing emission summarized in this table include tanks T35 through T42 and eighteen other tanks with the highest potential roof landing emissions are also included so that the total roof landing emissions from these eighteen tanks is equal to the 103 tpy permit limit.
4. See Table 2-5 Piping Component Fugitive Volatile Organic Compound Emission Calculations
5. See Table 2-9 MTE/PTE Sump Tank Emission Calculations
6. See Table 2-10 MTE/PTE Pigging Emission Calculations
7. See Tables 2-6 and 2-7 for the heater, fire pumps, and emergency generators VOC emission calculations.

**Table 2-3**
**Enbridge Energy, Limited Partnership - Superior, WI Terminal**
**MTE/PTE Emission Calculations**
**Facility-wide Hazardous Air Contaminant and Hazardous Air Pollutant Emission Calculation Summary**

**Table 2-3 Continued**

| | | | | Potential HAP Emissions (lb/yr) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1,2,4-Trimethylbenzene | Benzene | Cumene/1-sopropyl benzene | Cyclohexane | Ethylbenzene | n-Hexane | Toluene | Xylenes | Isooctane/2,2,4-Trimethylpentane | Biphenyl | Naphthalene | Phenol | Acetaldehyde | Acrolein | Ammonia | Barium | 1,3-Butadiene | Cadmium | Chromium | Cobalt | Copper | Formaldehyde | Lead | Manganese | Mercury | Molybdenum | Nickel |
| Chemical ---> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Crude Oil Liquid Weight Fraction(1) ---> | | | | 3.30E-03 | 6.00E-03 | 1.00E-03 | 7.00E-03 | 4.00E-03 | 2.46E-02 | 1.00E-02 | 1.42E-02 | 1.00E-03 | 6.00E-04 | 2.19E-03 | 3.23E-03 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 6.00E-06 | N/A | N/A |
| Crude Oil Vapor Weight Fraction(2) ---> | | | | 2.41E-05 | 3.12E-03 | 1.80E-05 | 3.82E-03 | 1.63E-04 | 2.17E-02 | 1.39E-03 | 5.00E-04 | 2.60E-04 | 3.99E-08 | 1.45E-06 | 2.52E-06 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 4.00E-11 | N/A | N/A |
| Diluent Liquid Weight Fraction(1) ---> | | | | N/A | 1.25E-02 | N/A | N/A | 2.08E-02 | 4.16E-02 | 8.33E-03 | 2.08E-02 | N/A | N/A | 8.33E-04 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Diluent Vapor Weight Fraction(2) ---> | | | | N/A | 2.34E-03 | N/A | N/A | 3.08E-04 | 1.32E-02 | 4.15E-04 | 2.64E-04 | N/A | N/A | 1.89E-07 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Emission Unit Description | Total Standing Loss (lb VOC/yr) | Total Withdrawal Working Loss (lb VOC/yr) | Roof Landing Loss (lb VOC/yr) | Total Loss (lb VOC/yr) | HAC | HAP | HAP | | HAP | HAP | HAP | HAP | HAP | HAP | HAP | | HAP | HAP | HAC | HAC | HAP | HAP | HAP | HAP | HAC | HAP | HAP | HAP | | HAC | HAP |
| **Tanks** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T01 | 34,164 | 8,491 | 15,110 | 45,765 | 22.36 | 161.67 | 7.20 | 155.54 | 32.38 | 1,010.70 | 119.93 | 111.52 | 16.71 | 3.90 | 14.27 | 21.06 | | | | | | | | | | | | | 0.04 | | |
| T02 | 24,051 | 8,491 | 15,110 | 46,652 | 22.36 | 161.32 | 7.20 | 155.11 | 32.36 | 1,008.25 | 119.17 | 111.17 | 16.68 | 3.90 | 14.27 | 21.06 | | | | | | | | | | | | | 0.04 | | |
| T03 | 3,004 | 3,495 | - | 6,499 | 11.61 | 30.36 | 3.55 | 35.94 | 14.47 | 151.15 | 39.11 | 51.13 | 4.28 | 2.10 | 7.66 | 11.30 | | | | | | | | | | | | | 0.02 | | |
| T04 | 2,903 | 3,495 | - | 6,398 | 11.60 | 30.04 | 3.55 | 35.56 | 14.45 | 149.98 | 38.97 | 51.08 | 4.25 | 2.10 | 7.66 | 11.30 | | | | | | | | | | | | | 0.02 | | |
| T05 | 2,805 | 3,495 | 1,943 | 8,303 | 11.60 | 35.98 | 3.58 | 42.84 | 14.77 | 190.24 | 41.61 | 52.03 | 4.75 | 2.10 | 7.66 | 11.30 | | | | | | | | | | | | | 0.02 | | |
| T06 | 14,999 | 3,495 | - | 18,494 | 11.69 | 57.84 | 3.76 | 81.79 | 16.43 | 411.02 | 59.73 | 57.13 | 7.40 | 2.10 | 7.66 | 11.33 | | | | | | | | | | | | | 0.02 | | |
| T07 | 3,230 | 3,495 | - | 6,721 | 11.66 | 37.30 | 3.58 | 44.44 | 14.83 | 159.31 | 42.19 | 52.24 | 4.85 | 2.10 | 7.66 | 11.30 | | | | | | | | | | | | | 0.03 | | |
| T08 | 10,521 | 3,495 | - | 14,016 | 11.79 | 53.85 | 3.68 | 64.68 | 15.70 | 314.01 | 49.53 | 54.89 | 6.23 | 2.10 | 7.67 | 11.32 | | | | | | | | | | | | | 0.02 | | |
| T09 | 2,857 | 3,495 | - | 6,351 | 11.60 | 29.50 | 3.55 | 35.38 | 14.45 | 147.06 | 38.91 | 51.08 | 4.24 | 2.10 | 7.66 | 11.30 | | | | | | | | | | | | | 0.02 | | |
| T10 | 15,505 | 3,495 | - | 19,000 | 11.91 | 68.42 | 3.77 | 83.73 | 16.51 | 421.98 | 56.44 | 57.39 | 7.53 | 2.10 | 7.68 | 11.33 | | | | | | | | | | | | | 0.02 | | |
| T11 | 17,017 | 3,495 | - | 20,512 | 11.94 | 74.15 | 3.89 | 89.91 | 16.76 | 454.74 | 58.53 | 58.14 | 7.92 | 2.10 | 7.68 | 11.33 | | | | | | | | | | | | | 0.02 | | |
| T12 | 18,684 | 3,495 | - | 22,179 | 11.98 | 79.35 | 3.83 | 95.88 | 17.03 | 490.85 | 60.84 | 58.98 | 8.36 | 2.10 | 7.68 | 11.34 | | | | | | | | | | | | | 0.02 | | |
| T13 | 16,177 | 4,213 | 11,790 | 32,181 | 14.56 | 132.67 | 4.72 | 136.39 | 21.42 | 709.68 | 83.89 | 73.83 | 11.49 | 2.53 | 9.27 | 13.68 | | | | | | | | | | | | | 0.03 | | |
| T14 | 3,758 | 4,213 | 11,790 | 19,762 | 14.26 | 73.87 | 4.49 | 88.52 | 19.39 | 440.61 | 53.68 | 67.61 | 8.26 | 2.53 | 9.25 | 13.65 | | | | | | | | | | | | | 0.03 | | |
| T15 | 3,643 | 4,213 | 11,790 | 19,647 | 14.26 | 73.51 | 4.49 | 88.48 | 19.38 | 438.13 | 53.52 | 67.55 | 8.23 | 2.53 | 9.25 | 13.65 | | | | | | | | | | | | | 0.03 | | |
| T16 | 15,792 | 4,213 | 11,790 | 31,796 | 14.57 | 111.47 | 4.71 | 134.92 | 21.36 | 701.32 | 80.36 | 73.03 | 11.39 | 2.53 | 9.27 | 13.68 | | | | | | | | | | | | | 0.03 | | |
| T17 | 15,597 | 4,213 | 11,790 | 31,601 | 14.56 | 110.86 | 4.71 | 134.17 | 21.33 | 697.09 | 80.09 | 73.34 | 11.34 | 2.53 | 9.27 | 13.68 | | | | | | | | | | | | | 0.03 | | |
| T18 | 3,643 | 4,213 | 11,790 | 19,647 | 14.26 | 73.51 | 4.49 | 88.48 | 19.38 | 438.13 | 53.52 | 67.55 | 8.23 | 2.53 | 9.25 | 13.65 | | | | | | | | | | | | | 0.03 | | |
| T19 | 10,858 | 4,213 | 11,790 | 26,862 | 14.45 | 95.05 | 4.67 | 116.06 | 20.56 | 594.44 | 73.52 | 71.15 | 10.11 | 2.53 | 9.26 | 13.67 | | | | | | | | | | | | | 0.03 | | |
| T20 | 15,761 | 4,213 | 11,790 | 31,765 | 14.57 | 111.37 | 4.71 | 134.80 | 21.36 | 700.65 | 80.31 | 73.52 | 11.38 | 2.53 | 9.27 | 13.68 | | | | | | | | | | | | | 0.03 | | |
| T21 | 15,750 | 4,213 | 11,790 | 31,754 | 14.57 | 111.34 | 4.71 | 134.76 | 21.35 | 700.41 | 80.30 | 73.61 | 11.38 | 2.53 | 9.27 | 13.68 | | | | | | | | | | | | | 0.03 | | |
| T22 | 3,405 | 4,213 | 11,790 | 19,408 | 14.27 | 72.83 | 4.49 | 87.65 | 19.34 | 433.39 | 53.22 | 67.44 | 8.17 | 2.53 | 9.25 | 13.65 | | | | | | | | | | | | | 0.03 | | |
| T23 | 22,779 | 4,213 | 11,790 | 38,782 | 14.74 | 133.29 | 4.84 | 161.60 | 22.50 | 852.58 | 90.03 | 77.13 | 13.21 | 2.53 | 9.28 | 13.70 | | | | | | | | | | | | | 0.03 | | |
| T24 | 3,782 | 4,213 | 11,790 | 19,785 | 14.26 | 73.87 | 4.49 | 88.65 | 19.40 | 441.36 | 53.73 | 67.63 | 8.27 | 2.53 | 9.25 | 13.65 | | | | | | | | | | | | | 0.03 | | |
| T25 | 3,737 | 4,213 | 11,700 | 19,740 | 14.28 | 73.80 | 4.49 | 88.84 | 19.39 | 440.15 | 53.65 | 67.60 | 8.25 | 2.53 | 9.26 | 13.65 | | | | | | | | | | | | | 0.03 | | |
| T26 | 660 | 4,213 | - | 4,873 | 13.90 | 27.34 | 4.23 | 32.92 | 16.96 | 176.97 | 43.05 | 60.16 | 4.39 | 2.53 | 9.23 | 13.61 | | | | | | | | | | | | | 0.03 | | |
| T27 | 3,807 | 4,213 | - | 8,020 | 14.00 | 37.18 | 4.26 | 44.06 | 17.48 | 186.24 | 47.41 | 61.73 | 5.20 | 2.53 | 9.23 | 13.62 | | | | | | | | | | | | | 0.03 | | |
| T28 | 6,767 | 4,785 | 10,604 | 22,470 | 16.26 | 84.01 | 5.12 | 101.13 | 22.08 | 521.02 | 72.47 | 76.38 | 9.40 | 2.88 | 10.53 | 15.54 | | | | | | | | | | | | | 0.03 | | |
| T29 | 7,355 | 4,786 | 10,904 | 23,047 | 16.27 | 85.85 | 5.13 | 103.38 | 22.18 | 513.74 | 73.29 | 77.28 | 9.55 | 2.88 | 10.54 | 15.55 | | | | | | | | | | | | | 0.03 | | |
| T30 | 4,297 | 4,369 | - | 8,666 | 14.52 | 39.61 | 4.45 | 46.97 | 18.18 | 200.48 | 49.63 | 64.18 | 5.48 | 2.62 | 9.57 | 14.12 | | | | | | | | | | | | | 0.03 | | |
| T31 | 4,307 | 4,369 | - | 8,676 | 14.52 | 39.67 | 4.45 | 47.04 | 18.18 | 200.91 | 49.68 | 64.19 | 5.49 | 2.62 | 9.57 | 14.12 | | | | | | | | | | | | | 0.03 | | |
| T32 | 3,442 | 3,873 | - | 7,315 | 12.86 | 33.99 | 3.94 | 40.27 | 16.06 | 169.98 | 43.50 | 56.72 | 4.77 | 2.32 | 8.49 | 12.52 | | | | | | | | | | | | | 0.02 | | |
| T33 | 3,442 | 3,873 | - | 7,315 | 12.86 | 33.99 | 3.94 | 40.27 | 16.06 | 169.98 | 43.50 | 56.72 | 4.77 | 2.32 | 8.49 | 12.52 | | | | | | | | | | | | | 0.02 | | |
| T34 | 4,873 | 6,119 | - | 10,992 | 20.31 | 51.94 | 6.21 | 61.45 | 25.27 | 256.27 | 67.94 | 88.33 | 7.39 | 3.67 | 13.41 | 19.75 | | | | | | | | | | | | | 0.04 | | |
| T35 | 3,456 | 9,175 | 2,798 | 15,429 | 30.44 | 74.74 | 9.29 | 88.31 | 37.73 | 382.44 | 100.52 | 133.50 | 10.82 | 5.51 | 20.11 | 29.67 | | | | | | | | | | | | | 0.06 | | |
| T36 | 3,218 | 9,175 | 2,798 | 15,196 | 30.44 | 73.88 | 9.29 | 87.25 | 37.70 | 356.42 | 100.13 | 133.36 | 10.74 | 5.51 | 20.11 | 29.66 | | | | | | | | | | | | | 0.06 | | |
| T37 | 3,218 | 9,175 | 2,798 | 15,195 | 30.44 | 73.88 | 9.29 | 87.25 | 37.70 | 356.42 | 100.13 | 133.36 | 10.74 | 5.51 | 20.11 | 29.66 | | | | | | | | | | | | | 0.06 | | |
| T38 | 3,218 | 9,175 | 2,798 | 15,196 | 30.44 | 73.88 | 9.29 | 87.25 | 37.70 | 356.42 | 100.13 | 133.36 | 10.74 | 5.51 | 20.11 | 29.66 | | | | | | | | | | | | | 0.06 | | |
| T39 | 3,218 | 9,175 | 2,798 | 15,195 | 30.44 | 73.88 | 9.29 | 87.25 | 37.70 | 356.42 | 100.13 | 133.36 | 10.74 | 5.51 | 20.11 | 29.66 | | | | | | | | | | | | | 0.06 | | |
| T40 | 3,218 | 9,175 | 2,798 | 15,195 | 30.44 | 73.88 | 9.29 | 87.25 | 37.70 | 356.42 | 100.13 | 133.36 | 10.74 | 5.51 | 20.11 | 29.66 | | | | | | | | | | | | | 0.06 | | |
| T41 | 4,937 | 16,412 | 7,064 | 28,413 | 54.45 | 135.97 | 16.63 | 160.75 | 67.61 | 664.22 | 180.75 | 239.06 | 19.53 | 9.85 | 35.96 | 53.04 | | | | | | | | | | | | | 0.10 | | |
| T42 | 4,937 | 16,412 | 7,064 | 28,413 | 54.45 | 135.97 | 16.63 | 160.75 | 67.61 | 664.22 | 180.75 | 239.06 | 19.53 | 9.85 | 35.96 | 53.04 | | | | | | | | | | | | | 0.10 | | |
| **Piping Fugitive Emissions** | | | | 14,442 | 0.35 | 45.13 | 0.25 | 55.20 | 2.38 | 312.90 | 20.02 | 7.23 | 3.76 | 0.00 | 0.02 | 0.04 | | | | | | | | | | | | | 0.00 | | |
| **Sump Tank Emissions** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ST01 | - | 2,044 | | 2,044 | 0.05 | 6.39 | 0.04 | 7.61 | 0.33 | 44.29 | 2.83 | 1.02 | 0.53 | 0.00 | 0.02 | 0.01 | | | | | | | | | | | | | 0.00 | | |
| ST02 | - | 591 | | 591 | 0.01 | 1.85 | 0.01 | 2.28 | 0.10 | 12.80 | 0.82 | 0.30 | 0.15 | 0.00 | 0.00 | 0.00 | | | | | | | | | | | | | 0.00 | | |
| ST03 | - | 1,003 | | 1,003 | | 2.35 | | | 0.31 | 13.22 | 0.42 | 0.26 | | | 0.00 | | | | | | | | | | | | | | | | |
| ST04 | - | 222 | | 222 | 0.01 | 0.69 | 0.00 | 0.85 | 0.04 | 4.80 | 0.31 | 0.11 | 0.06 | 0.00 | 0.00 | 0.00 | | | | | | | | | | | | | 0.00 | | |
| ST05 | - | 591 | | 591 | 0.01 | 1.85 | 0.01 | 2.28 | 0.10 | 12.80 | 0.82 | 0.30 | 0.15 | 0.00 | 0.00 | 0.00 | | | | | | | | | | | | | 0.00 | | |
| ST06 | - | 148 | | 148 | 0.00 | 0.46 | 0.00 | 0.56 | 0.02 | 3.20 | 0.20 | 0.07 | 0.04 | 0.00 | 0.00 | 0.00 | | | | | | | | | | | | | 0.00 | | |
| **Pigging Emissions** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PG01 | | | | 287.2 | 0.01 | 0.90 | 0.01 | 1.10 | 0.05 | 6.22 | 0.40 | 0.14 | 0.07 | 0.00 | 0.00 | 0.00 | | | | | | | | | | | | | 0.00 | | |
| PG02 | | | | 1.0 | | 0.00 | | | 0.00 | 0.01 | 0.00 | 0.00 | | | 0.00 | | | | | | | | | | | | | | | | |
| PG03 | | | | 2.3 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | | | | | | | | | 0.00 | | |
| PG04 | | | | 12.1 | 0.00 | 0.04 | 0.00 | 0.05 | 0.00 | 0.26 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | | | | | | | | | 0.00 | | |
| PG05 | | | | 12.1 | 0.00 | 0.04 | 0.00 | 0.05 | 0.00 | 0.26 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | | | | | | | | | 0.00 | | |
| PG06 | | | | 12.1 | 0.00 | 0.04 | 0.00 | 0.05 | 0.00 | 0.26 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | | | | | | | | | 0.00 | | |
| PG07 | | | | 12.1 | 0.00 | 0.04 | 0.00 | 0.05 | 0.00 | 0.26 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | | | | | | | | | 0.00 | | |
| PG08 | | | | 12.1 | 0.00 | 0.04 | 0.00 | 0.05 | 0.00 | 0.26 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | | | | | | | | | 0.00 | | |
| PG09 | | | | 12.1 | 0.00 | 0.04 | 0.00 | 0.05 | 0.00 | 0.26 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | | | | | | | | | 0.00 | | |
| PG10 | | | | 12.1 | 0.00 | 0.04 | 0.00 | 0.05 | 0.00 | 0.26 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | | | | | | | | | 0.00 | | |
| **Combustion Sources** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Crude Oil Heater | | | | 8,133 | | 1.52 | | | | 1,364.71 | 2.46 | | | | | | | 355.17 | 3.19 | | 0.80 | 1.01 | 0.06 | 0.62 | 54.36 | 0.36 | 0.28 | 0.19 | 0.80 | 1.52 |
| Area 1 Fire Pump #1 | | | | 471 | | 1.22 | | | | | 0.54 | 0.37 | | | 0.11 | | 1.00 | | | 0.05 | | | | | 1.54 | | | | | |
| Area 1 Fire Pump #2 | | | | 471 | | 1.22 | | | | | 0.54 | 0.37 | | | 0.11 | | 1.00 | | | 0.05 | | | | | 1.54 | | | | | |
| Area 2 Fire Pump | | | | 471 | | 1.22 | | | | | 0.54 | 0.37 | | | 0.11 | | 1.00 | | | 0.05 | | | | | 1.54 | | | | | |
| Area 1 Emergency Generator | | | | 104 | | 0.27 | | | | | 0.12 | 0.08 | | | 0.02 | | 0.22 | | | 0.01 | | | | | 0.34 | | | | | |
| Area 2 Emergency Generator | | | | 104 | | 0.27 | | | | | 0.12 | 0.08 | | | 0.02 | | 0.22 | | | 0.01 | | | | | 0.34 | | | | | |
| Area 3 Emergency Generator #1 | | | | 104 | | 0.27 | | | | | 0.12 | 0.08 | | | 0.02 | | 0.22 | | | 0.01 | | | | | 0.34 | | | | | |
| Area 3 Emergency Generator #2 | | | | 104 | | 0.27 | | | | | 0.12 | 0.08 | | | 0.02 | | 0.22 | | | 0.01 | | | | | 0.34 | | | | | |
| Area 4 Emergency Generator | | | | 104 | | 0.27 | | | | | 0.12 | 0.08 | | | 0.02 | | 0.22 | | | 0.01 | | | | | 0.34 | | | | | |
| Lab Area Emergency Generator | | | | 15 | | 0.44 | | | | | 0.19 | 0.13 | | | 0.04 | | 0.36 | | | 0.02 | | | | | 0.55 | | | | | |
| Total (lb) | 344,889 | 235,830 | 238,165.22 | 843,796 | 777.55 | 3,278.25 | 242.05 | 3,917.55 | 1,023.54 | 20,043.56 | 3,151.09 | 3,565.44 | 367.72 | 138.78 | 507.77 | 748.39 | 4.48 | 0.54 | 355.17 | 3.19 | 0.23 | 0.80 | 1.01 | 0.06 | 0.62 | 54.36 | 0.36 | 0.28 | 1.58 | 0.80 | 1.52 |
| Total (ton) | 172 | 118 | 119 | 422 | 0.39 | 1.64 | 0.12 | 1.96 | 0.51 | 10.02 | 1.58 | 1.78 | 0.18 | 0.07 | 0.25 | 0.37 | 0.00 | 0.00 | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Notes:**

1. Calculated per API Manual of Petroleum Measurement Standards Chapter 19.4 - Recommended Practice for Speciation of Evaporative Losses Second Edition, September 2005.
2. See the tables below for the crude oil and diluent speciation vapor weight fraction calculations.

**Facility-wide HAP Emissions Summary**

| | Lb/yr | Ton/yr | |
|---|---|---|---|
| Total HAPS | 32,426 | 16.21 | Less than major source thresholds |
| Individual HAP with the Highest Emissions: n-Hexane | 20,044 | 10.02 | Greater than major source thresholds |

**Note: The Terminal is not a major source, permit limitation 1.ZZZ.1.a.(1) limits actual individual HAP emissions below major source thresholds.**

**Table 2-3 Continued**

**HAP Speciation Vapor Weight Fraction Calculations**

**Crude Oil**

Data Source: TANKS 4.0.9d

| | $Z_{Li}$ | $M_i$ | | $x_i$ | P | $P_i$ | $y_i$ | $M_v$ | $Z_{Vi}$ |
|---|---|---|---|---|---|---|---|---|---|
| **Chemical Component** | **Liquid Weight Percent** | **Mole Weight** | **Moles** | **Liquid Mole Fraction** | **True Vapor Pressure** | **Partial Pressure** | **Vapor Mole Fraction** | **Vapor Mole Weight** | **Vapor Weight Fraction** |
| n-Hexane | 0.40% | 86.18 | 0.0033 | 0.0096 | 1.2074 | 0.0116 | 0.0020 | | 3.52E-03 |
| Benzene | 0.60% | 78.11 | 0.0001 | 0.0159 | 0.7149 | 0.0114 | 0.0020 | | 3.12E-03 |
| Isooctane/2,2,4-Trimethylpentane | 0.10% | 114.23 | 0.0000 | 0.0018 | 0.3571 | 0.0006 | 0.0001 | | 2.60E-04 |
| Toluene | 1.00% | 92.14 | 0.0001 | 0.0225 | 0.1902 | 0.0043 | 0.0008 | | 1.39E-03 |
| Ethylbenzene | 0.40% | 106.17 | 0.0000 | 0.0078 | 0.0561 | 0.0004 | 0.0001 | | 1.63E-04 |
| Xylenes | 1.40% | 106.17 | 0.0001 | 0.0273 | 0.0484 | 0.0013 | 0.0002 | | 4.93E-04 |
| Cumene/Isopropyl Benzene | 0.10% | 120.19 | 0.0000 | 0.0017 | 0.0247 | 0.0000 | 0.0000 | | 1.50E-05 |
| 1,2,4-Trimethylbenzene | 0.35% | 120.19 | 0.0000 | 0.0057 | 0.0100 | 0.0001 | 0.0000 | | 2.41E-05 |
| Cyclohexane | 0.70% | 84.16 | 0.0001 | 0.0172 | 0.7495 | 0.0129 | 0.0023 | | 3.82E-03 |
| Crude Oil - Unspeciated | | 207.00 | | | 5.6831 | | | 50 | |
| Totals | 0.05 | | | | | | | | 0.01 |

Data Source: EPCRA Section 313 Industry Guide Petroleum Terminal and Bulk Storage Facilities Table 3-4

| **Chemical Component** | **Liquid Weight Percent** | **Mole Weight** | **Moles** | **Liquid Mole Fraction** | **True Vapor Pressure** | **Partial Pressure** | **Vapor Mole Fraction** | **Vapor Mole Weight** | **Vapor Weight Fraction** |
|---|---|---|---|---|---|---|---|---|---|
| Benzene | 0.446% | 78.11 | 0.0001 | 0.0118 | 0.7149 | 0.0084 | 0.0015 | | 2.37E-03 |
| Biphenyl | 0.002% | 154.21 | 0.0000 | 0.0000 | 0.0001 | 0.0000 | 0.0000 | | 3.09E-06 |
| Cyclohexane | 0.700% | 84.16 | 0.0001 | 0.0172 | 0.7495 | 0.0129 | 0.0023 | | 3.82E-03 |
| Ethylbenzene | 0.346% | 106.17 | 0.0000 | 0.0067 | 0.0561 | 0.0004 | 0.0001 | | 1.41E-04 |
| n-Hexane | 2.453% | 86.18 | 0.0003 | 0.0592 | 1.2074 | 0.0714 | 0.0126 | | 2.17E-02 |
| Naphthalene | 0.219% | 128.17 | 0.0000 | 0.0035 | 0.0009 | 0.0000 | 0.0000 | | 1.45E-05 |
| Phenol | 0.323% | 94.11 | 0.0000 | 0.0071 | 0.0011 | 0.0000 | 0.0000 | | 2.32E-05 |
| Toluene | 0.578% | 92.14 | 0.0001 | 0.0197 | 0.1902 | 0.0038 | 0.0007 | | 1.22E-03 |
| 1,2,4-Trimethylbenzene | 0.328% | 120.19 | 0.0000 | 0.0056 | 0.0100 | 0.0001 | 0.0000 | | 2.38E-05 |
| Xylenes | 1.420% | 106.17 | 0.0001 | 0.0277 | 0.0484 | 0.0013 | 0.0002 | | 5.00E-04 |
| Mercury | 0.00060% | 200.59 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 4.93E-11 |
| Crude Oil - Unspeciated | | 207.00 | | | 5.6831 | | | 50 | |
| Totals | 0.07 | | | | | | | | 2.07E-02 |

**Diluent**

Data Source: Enbridge Diluent MSDS dated 11/09/07. Liquid weight percent represents the high range concentration of each component, normalized to 100%

| **Chemical Component** | **Liquid Weight Percent Normalized** | **Mole Weight** | **Moles** | **Liquid Mole Fraction** | **True Vapor Pressure** | **Partial Pressure** | **Vapor Mole Fraction** | **Vapor Mole Weight** | **Vapor Weight Fraction** |
|---|---|---|---|---|---|---|---|---|---|
| Benzene | 1.25% | 78.11 | 0.0032 | 0.0147 | 0.7149 | 0.0105 | 0.0018 | | 2.34E-03 |
| Ethylbenzene | 2.08% | 106.17 | 0.0002 | 0.0180 | 0.0561 | 0.0010 | 0.0002 | | 3.05E-04 |
| Naphthalene | 0.05% | 128.17 | 0.0000 | 0.0005 | 0.0009 | 0.0000 | 0.0000 | | 1.99E-07 |
| n-Hexane | 4.16% | 86.18 | 0.0005 | 0.0444 | 1.2074 | 0.0537 | 0.0092 | | 1.32E-02 |
| Toluene | 2.85% | 92.14 | 0.0001 | 0.0083 | 0.1902 | 0.0016 | 0.0003 | | 4.15E-04 |
| Xylenes | 2.08% | 106.17 | 0.0002 | 0.0190 | 0.0484 | 0.0009 | 0.0001 | | 2.64E-04 |
| Diluent - Unspeciated | | 92.00 | | | 5.6470 | | | 60 | |
| **Totals** | 0.10 | | | | | | | | 1.65E-02 |

**Liquid Surface Temperature for TVP Calculation**

$T = T_{LA}$

| | |
|---|---|
| Daily Liquid Surface Temperature, °R = | 502.13 |
| Daily Liquid Surface Temperature, °F = | 42.46 |
| Daily Liquid Surface Temperature, °C = | 5.81 |
| Crude Oil RVP, psia = | 10.20 |
| Diluent RVP, psia = | 15.00 |
| Diluent Distillation Slope = | 3.00 |

| **Chemical** | **Antoine's coefficients[1]** | | | **True Vapor Pressure at Daily Average Liquid Surface Temperature (psia)** | **Liquid Molecular Weight** | **Vapor Molecular Weight** | **Notes** |
|---|---|---|---|---|---|---|---|
| | A | B | C | | | | |
| 1,2,4-Trimethylbenzene | 7.04363 | 1573.267 | 208.564 | 0.0100 | 120.1908 | | |
| Benzene | 6.00505 | 1211.033 | 220.79 | 0.7149 | 78.1134 | | |
| Cumene/Isopropyl benzene | 6.93066 | 1460.793 | 207.777 | 0.0247 | 120.1908 | | |
| Cyclohexane | 6.8413 | 1201.531 | 222.647 | 0.7495 | 84.1608 | | |
| Ethylbenzene | 6.95719 | 1424.255 | 213.206 | 0.0561 | 106.167 | | |
| Naphthalene | 7.01005 | 1733.71 | 201.850 | 0.0009 | 128.1732 | | |
| n-Hexane | 6.87024 | 1168.72 | 224.21 | 1.2074 | 86.1766 | | |
| Toluene | 6.95464 | 1344.8 | 219.482 | 0.1902 | 92.1402 | | |
| Xylenes | 7.00908 | 1462.266 | 215.105 | 0.0484 | 106.167 | | |
| Biphenyl | 7.2454 | 1869.72 | 202.74 | 0.0001 | 154.211 | | |
| Phenol | 7.1345 | 1516.07 | 174.57 | 0.0011 | 94.1126 | | |
| Isooctane/2,2,4-Trimethylpentane | 6.81189 | 1257.840 | 220.735 | 0.3571 | 114.2302 | | |
| Mercury | 5.45792 | 3001.314 | 259.5542 | 9.15209E-06 | 200.59 | | |
| Diluent - Unspeciated | 11.5999 | 4937.951 | | 5.65 | 92 | 60 | AP-42 Table 7.1-2 and Figure 7.1-15 |
| Crude Oil - Unspeciated | 10.57 | 4436.88 | | 5.68 | 207 | 50 | AP-42 Table 7.1-2 and Figure 7.1-16 |

Notes:

1) Source of data: Yaws and Yang (Yaws, C. L. and Yang, H. C., "To estimate vapor pressure easily"*Hydrocarbon Processing*, October, 1989, page 65.)

# Table 2-4
## Enbridge Energy, Limited Partnership - Superior, WI Terminal
## MTE/PTE Emission Calculations
### Tank Roof Landing Volatile Organic Compound Emission Calculations[1]

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Tank Information:** | | | | | | | | | | | | | |
| | Tank Number | T01 | T02 | T03 | T04 | T05 | T06 | T07 | T08 | T09 | T10 | T11 | T12 |
| | Tank Color | White/White, Good | White/White, Good | White/White, Good | White/White, Good | White/White, Good | White/White, Good | White/White, Good | White/White, Good | White/White Good | White/White, Good | White/White, Good | White/White, Good |
| | Tank Type | EFRT | EFRT | Drain Dry | Drain Dry | Drain Dry | EFRT | EFRT | EFRT | EFRT | EFRT | EFRT | EFRT |
| $n_d$ | Total Number of Days on Roof Legs without Refilling, days | 5 | 5 | | | | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| D | Tank Diameter, ft | 210 | 210 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 |
| $H_d$ | Height of the deck above the tank bottom, ft | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 |
| $H_{Le}$ | Height of the liquid above the tank bottom, ft | 0.5 | 0.5 | 0.0 | 0.0 | 0.0 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| $H_{vo}$ | Height of the vapor space, ft | 5.0 | 5.0 | 5.5 | 5.5 | 5.5 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| **Stored Product Information:** | | | | | | | | | | | | | |
| | Product Name | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil |
| RVP | Reid Vapor Pressure of Product, psia | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 |
| Mv | Vapor Molecular Weight lb/lbmole | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| $W_l$ | Liquid Density, lb/gal | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 |
| A | Vapor Pressure Coefficient, dimensionless | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 |
| B | Vapor Pressure Coefficient, dimensionless | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 |
| $P_{VA}$ | Vapor Pressure at Daily Ave. Surface Temp, psia | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 |
| **Refilled Product Information:** | | | | | | | | | | | | | |
| | Product Name | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil |
| RVP | Reid Vapor Pressure of Product, psia | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 |
| Mv | Vapor Molecular Weight, lb/lbmole | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| $W_l$ | Liquid Density, lb/gal | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 |
| A | Vapor Pressure Coefficient, dimensionless | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 |
| B | Vapor Pressure Coefficient, dimensionless | 4,437 | 4,437 | 4,437 | 4,437 | 4,437 | 4,437 | 4,437 | 4,437 | 4,437 | 4,437 | 4,437 | 4,437 |
| $P_{VA,refill}$ | Vapor Pressure at Daily Ave. Surface Temp, psia | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 |
| $T_{refill}$ | Temperature of the Liquid Refilling, degrees F. | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 |
| $T_{refill}$ | Temperature of the Liquid Refilling, degrees R | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 |
| **Meteorological Information:** | | | | | | | | | | | | | |
| | Month | July | July | July | July | July | July | July | July | July | July | July | July |
| Delta Tv | Daily Vapor Temperature Range, degrees R | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 |
| $T_{AA}$ | Daily Average Ambient Temperature, degrees R | 526 | 526 | 526 | 526 | 526 | 526 | 526 | 526 | 526 | 526 | 526 | 526 |
| $T_{AX}$ | Daily Maximum Average Ambient Temp, degrees F | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 |
| $T_{AN}$ | Daily Minimum Average Ambient Temp degrees F | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 |
| Delta $T_A$ | Daily Ambient Temperature Range, degrees R | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 |
| Pa | Atmospheric Pressure, psia | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 |
| I | Daily Total Solar Insulation Factor, BTU/ft²*d | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 |
| alpha | Tank Paint Solar Absorptance, dimensionless | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 |
| **Standing Loss Calculation:** | | | | | | | | | | | | | |
| $L_{SL}$ | Standing Idle Losses per day, lb/day | 1380 | 1380 | 790 | 790 | 790 | 986 | 986 | 986 | 986 | 986 | 986 | 986 |
| $K_E$ | Vapor space expansion factor, dimensionless | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 |
| $P_{VA}$ | True Vapor Pressure of the stock liquid, psia | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 |
| Vv | Vapor Space Volume, ft³ | 173,180 | 173,180 | 97,193 | 97,193 | 97,193 | 88,357 | 88,357 | 88,357 | 88,357 | 88,357 | 88,357 | 88,357 |
| R | Ideal Gas Constant, psia*ft³/lbmole*R | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 |
| $T_S$ | Average Monthly Stock Temperature, degrees R | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 |
| Mv | Vapor Molecular Weight, lb/lbmole | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Ks | Vented vapor saturation factor, dimensionless | 0.31 | 0.31 | 0.15 | 0.15 | 0.15 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 |
| $H_{VO}$ | Height of Vapor Space under Floating Roof, ft | 5.00 | 5.00 | 5.50 | 5.50 | 5.50 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| P* | Vapor pressure function | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 |
| $C_S$ | Clingage Factor, bbl/1,000 ft² | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| $L_{SL\,max}$ | Limit on standing losses, lb/event | 923,675 | 923,675 | 4,396 | 4,396 | 4,396 | 471,263 | 471,263 | 471,263 | 471,263 | 471,263 | 471,263 | 471,263 |
| **Refilling Loss Calculation:** | | | | | | | | | | | | | |
| $L_{FL}$ | Filling Losses per episode, lb | 8,210 | 8,210 | 1,153 | 1,153 | 1,153 | 3,929 | 3,929 | 3,929 | 3,929 | 3,929 | 3,929 | 3,929 |
| $P_{VA,refill}$ | True Vapor Pressure Liquid Refilling, psia | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 |
| Vv | Vapor Space Volume, ft³ | 173,180 | 173,180 | 97,193 | 97,193 | 97,193 | 88,357 | 88,357 | 88,357 | 88,357 | 88,357 | 88,357 | 88,357 |
| $H_{VO}$ | Height of Vapor Space under Floating Roof, ft | 5.00 | 5.00 | 5.50 | 5.50 | 5.50 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| D | Tank Diameter, ft | 210 | 210 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 |
| R | Ideal Gas Constant, psia*ft³/lbmole*R | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 |
| $T_{refill}$ | Temperature of the Liquid Refilling, degrees R | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 |
| Mv | Vapor Molecular Weight, lb/lbmole | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| S | Refilling Saturation Factor, dimensionless | 0.60 | 0.60 | 0.15 | 0.15 | 0.15 | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 |
| $K_E$ | Vapor space expansion factor, dimensionless | 0.37 | 0.37 | | | | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 |
| $K_s$ | Vented vapor saturation factor, dimensionless | 0.30 | 0.30 | | | | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| $C_{sf}$ | Filling saturation correction factor | 0.999 | 0.999 | | | | 0.937 | 0.937 | 0.937 | 0.937 | 0.937 | 0.937 | 0.937 |
| $C_{sf}$ times S | $C_{sf}$ S ≥ 0.15 | 0.60 | 0.60 | | | | 0.56 | 0.56 | 0.56 | 0.56 | 0.56 | 0.56 | 0.56 |
| $L_{s\,wind}$ | Standing loss associated with wind, calculated for $C_{sf}$ | 1,508 | 1,508 | | | | 1,077 | 1,077 | 1,077 | 1,077 | 1,077 | 1,077 | 1,077 |
| P* | Vapor pressure function | 0.2519 | 0.2519 | | | | 0.2519 | 0.2519 | 0.2519 | 0.2519 | 0.2519 | 0.2519 | 0.2519 |
| Ls | Standing loss calculated for $C_{sf}$, lb/day | 1,501 | 1,501 | | | | 766 | 766 | 766 | 766 | 766 | 766 | 766 |
| $L_f$ | Filling loss calculated for $C_{sf}$, lb | 8,216 | 8,216 | | | | 4,192 | 4,192 | 4,192 | 4,192 | 4,192 | 4,192 | 4,192 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Tank Information:** | | | | | | | | | | | | |
| | Tank Number | T13 | T14 | T15 | T16 | T17 | T18 | T19 | T20 | T21 | T22 | T23 |
| | Tank Color | White/White, Good | White/White, Good | White/White, Good | White/White, Good | White/White, Good | White/White, Good | White/White, Good | White/White, Good | White/White, Good | White/White, Good | White/White, Good |
| | Tank Type | EFRT | EFRT | EFRT | EFRT | EFRT | EFRT | EFRT | EFRT | EFRT | EFRT | EFRT |
| $n_d$ | Total Number of Days on Roof Legs without Refilling, days | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| D | Tank Diameter, ft | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 |
| $H_d$ | Height of the deck above the tank bottom, ft | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 |
| $H_{Le}$ | Height of the liquid above the tank bottom, ft | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| $H_{vo}$ | Height of the vapor space, ft | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| **Stored Product Information:** | | | | | | | | | | | | |
| | Product Name | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil |
| RVP | Reid Vapor Pressure of Product, psia | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 |
| Mv | Vapor Molecular Weight lb/lbmole | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| $W_l$ | Liquid Density, lb/gal | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 |
| A | Vapor Pressure Coefficient, dimensionless | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 |
| B | Vapor Pressure Coefficient, dimensionless | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 |
| $P_{VA}$ | Vapor Pressure at Daily Ave. Surface Temp, psia | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 |
| **Refilled Product Information:** | | | | | | | | | | | | |
| | Product Name | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil |
| RVP | Reid Vapor Pressure of Product, psia | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 |
| Mv | Vapor Molecular Weight, lb/lbmole | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| $W_l$ | Liquid Density, lb/gal | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 |
| A | Vapor Pressure Coefficient, dimensionless | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 |
| B | Vapor Pressure Coefficient, dimensionless | 4,437 | 4,437 | 4,437 | 4,437 | 4,437 | 4,437 | 4,437 | 4,437 | 4,437 | 4,437 | 4,437 |
| $P_{VA,refill}$ | Vapor Pressure at Daily Ave. Surface Temp, psia | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 |
| $T_{refill}$ | Temperature of the Liquid Refilling, degrees F. | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 |
| $T_{refill}$ | Temperature of the Liquid Refilling, degrees R | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 |
| **Meteorological Information:** | | | | | | | | | | | | |
| | Month | July | July | July | July | July | July | July | July | July | July | July |
| Delta Tv | Daily Vapor Temperature Range, degrees R | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 |
| $T_{AA}$ | Daily Average Ambient Temperature, degrees R | 526 | 526 | 526 | 526 | 526 | 526 | 526 | 526 | 526 | 526 | 526 |
| $T_{AX}$ | Daily Maximum Average Ambient Temp, degrees F | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 |
| $T_{AN}$ | Daily Minimum Average Ambient Temp degrees F | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 |
| Delta $T_A$ | Daily Ambient Temperature Range, degrees R | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 |
| Pa | Atmospheric Pressure, psia | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 |
| I | Daily Total Solar Insulation Factor, BTU/ft²*d | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 |
| alpha | Tank Paint Solar Absorptance, dimensionless | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 |
| **Standing Loss Calculation:** | | | | | | | | | | | | |
| $L_{SL}$ | Standing Idle Losses per day, lb/day | 1183 | 1183 | 1183 | 1183 | 1183 | 1183 | 1183 | 1183 | 1183 | 1183 | 1183 |
| $K_E$ | Vapor space expansion factor, dimensionless | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 |
| $P_{VA}$ | True Vapor Pressure of the stock liquid, psia | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 |
| Vv | Vapor Space Volume, ft³ | 127,235 | 127,235 | 127,235 | 127,235 | 127,235 | 127,235 | 127,235 | 127,235 | 127,235 | 127,235 | 127,235 |
| R | Ideal Gas Constant, psia*ft³/lbmole*R | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 |
| $T_S$ | Average Monthly Stock Temperature, degrees R | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 |
| Mv | Vapor Molecular Weight, lb/lbmole | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Ks | Vented vapor saturation factor, dimensionless | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 |
| $H_{VO}$ | Height of Vapor Space under Floating Roof, ft | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| P* | Vapor pressure function | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 |
| $C_S$ | Clingage Factor, bbl/1,000 ft² | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| $L_{SL\,max}$ | Limit on standing losses, lb/event | 678,618 | 678,618 | 678,618 | 678,618 | 678,618 | 678,618 | 678,618 | 678,618 | 678,618 | 678,618 | 678,618 |
| **Refilling Loss Calculation:** | | | | | | | | | | | | |
| $L_{FL}$ | Filling Losses per episode, lb | 5,876 | 5,876 | 5,876 | 5,876 | 5,876 | 5,876 | 5,876 | 5,876 | 5,876 | 5,876 | 5,876 |
| $P_{VA,refill}$ | True Vapor Pressure Liquid Refilling, psia | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 |
| Vv | Vapor Space Volume, ft³ | 127,235 | 127,235 | 127,235 | 127,235 | 127,235 | 127,235 | 127,235 | 127,235 | 127,235 | 127,235 | 127,235 |
| $H_{VO}$ | Height of Vapor Space under Floating Roof, ft | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| D | Tank Diameter, ft | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 |
| R | Ideal Gas Constant, psia*ft³/lbmole*R | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 |
| $T_{refill}$ | Temperature of the Liquid Refilling, degrees R | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 |
| Mv | Vapor Molecular Weight, lb/lbmole | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| S | Refilling Saturation Factor, dimensionless | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 |
| $K_E$ | Vapor space expansion factor, dimensionless | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 |
| $K_s$ | Vented vapor saturation factor, dimensionless | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| $C_{sf}$ | Filling saturation correction factor | 0.973 | 0.973 | 0.973 | 0.973 | 0.973 | 0.973 | 0.973 | 0.973 | 0.973 | 0.973 | 0.973 |
| $C_{sf}$ times S | $C_{sf}$ S ≥ 0.15 | 0.58 | 0.58 | 0.58 | 0.58 | 0.58 | 0.58 | 0.58 | 0.58 | 0.58 | 0.58 | 0.58 |
| $L_{s\,wind}$ | Standing loss associated with wind, calculated for $C_{sf}$ | 1,292 | 1,292 | 1,292 | 1,292 | 1,292 | 1,292 | 1,292 | 1,292 | 1,292 | 1,292 | 1,292 |
| P* | Vapor pressure function | 0.2519 | 0.2519 | 0.2519 | 0.2519 | 0.2519 | 0.2519 | 0.2519 | 0.2519 | 0.2519 | 0.2519 | 0.2519 |
| Ls | Standing loss calculated for $C_{sf}$, lb/day | 1,103 | 1,103 | 1,103 | 1,103 | 1,103 | 1,103 | 1,103 | 1,103 | 1,103 | 1,103 | 1,103 |
| $L_f$ | Filling loss calculated for $C_{sf}$, lb | 6,036 | 6,036 | 6,036 | 6,036 | 6,036 | 6,036 | 6,036 | 6,036 | 6,036 | 6,036 | 6,036 |

**Summary of Tank Landing Losses:**

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Tank Number | T01 | T02 | T03 | T04 | T05 | T06 | T07 | T08 | T09 | T10 | T11 | T12 |
| | Tank Type | EFRT | EFRT | Drain Dry | Drain Dry | Drain Dry | EFRT | EFRT | EFRT | EFRT | EFRT | EFRT | EFRT |
| | Stored Product | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil |
| | Refill Product | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil |
| | Month of Landing | July | July | July | July | July | July | July | July | July | July | July | July |
| $L_{SL}$ | Standing Idle Losses per episode, lb | 6,900 | 6,900 | 790 | 790 | 790 | 4,929 | 4,929 | 4,929 | 4,929 | 4,929 | 4,929 | 4,929 |
| $L_{FL}$ | Filling losses per episode, lb | 8,210 | 8,210 | 1,153 | 1,153 | 1,153 | 3,929 | 3,929 | 3,929 | 3,929 | 3,929 | 3,929 | 3,929 |
| $L_{TL}$ | Total Landing Loss per episode, lb | 15,110 | 15,110 | 1,943 | 1,943 | 1,943 | 8,857 | 8,857 | 8,857 | 8,857 | 8,857 | 8,857 | 8,857 |
| | Total Landing Loss per episode, ton | 7.56 | 7.56 | 0.97 | 0.97 | 0.97 | 4.43 | 4.43 | 4.43 | 4.43 | 4.43 | 4.43 | 4.43 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Tank Number | T13 | T14 | T15 | T16 | T17 | T18 | T19 | T20 | T21 | T22 | T23 |
| | Tank Type | EFRT | EFRT | EFRT | EFRT | EFRT | EFRT | EFRT | EFRT | EFRT | EFRT | EFRT |
| | Stored Product | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil |
| | Refill Product | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil |
| | Month of Landing | July | July | July | July | July | July | July | July | July | July | July |
| $L_{SL}$ | Standing Idle Losses per episode, lb | 5,915 | 5,915 | 5,915 | 5,915 | 5,915 | 5,915 | 5,915 | 5,915 | 5,915 | 5,915 | 5,915 |
| $L_{FL}$ | Filling losses per episode, lb | 5,876 | 5,876 | 5,876 | 5,876 | 5,876 | 5,876 | 5,876 | 5,876 | 5,876 | 5,876 | 5,876 |
| $L_{TL}$ | Total Landing Loss per episode, lb | 11,790 | 11,790 | 11,790 | 11,790 | 11,790 | 11,790 | 11,790 | 11,790 | 11,790 | 11,790 | 11,790 |
| | Total Landing Loss per episode, ton | 5.90 | 5.90 | 5.90 | 5.90 | 5.90 | 5.90 | 5.90 | 5.90 | 5.90 | 5.90 | 5.90 |

Total Potential Tank Landing Events per Year: 42
Total Potential Landing Losses[2] (lb/yr): 325,595
Total Potential Landing Losses[2] (ton/yr): 152.80

Permit Limited Losses for Tanks T35 through T42[3] (ton/yr): 15.46 — Permit limit allows an average of 6 roof landings per year for tank T35-T40 per Permit Number 08-DCF-313, Condition I.C.1.a.(4)(b) and 2 roof landings for tanks T41 and T42.
Existing Unmodified Tank Emissions Limit[3] (ton/yr): 103.10 — Permit Number 06-DCF-313, Condition I.ZZZ.1.2.a.(3)
Total Limited Landing Losses[3] (ton/yr): 118.56

**Notes:**

1. Tank landing emissions calculated using AP-42, Fifth Edition, Volume I Chapter 7.1, November 2006
2. Roof landing emissions are conservatively calculated based on one roof landing event per year and the roof landing at a height of 5.5 feet. Generally, the tank roofs are only landed for API inspections which occur on a 10-year cycle. However, a roof may also be landed for tank maintenance activities or for product service changes. Typically maintenance and service change landing occur while the tank roof and vacuum breakers are set on 3.25 foot low leg setting. As a result, most roof landing events occur when the roof height reaches 3.25 feet resulting in reduced vapor space and lower emissions
3. Consistent with current limitations in permit 08-DCF-313, Enbridge is requesting the following roof landing loss limitations:
   - 8 roof landing events per year combined for storage Tanks T35 through T42 consistent with existing permit requirement, and
   - Combined annual roof landing emissions 103.1 tons of volatile organic compounds (VOC) per year for existing unmodified tanks (T01, T02, T03, T04, T05, T06, T07, T08, T09, T10, T11, T12, T13, T14, T15, T16, T17, T18, T19, T20, T21, T22, T23, T24, T25, T26, T27, T28, T29, T30, T31, T32, T33, T34), upon commencing construction of tanks T35 – T40. The monthly landing losses for the remaining terminal storage tanks listed above (Tanks T36 – T42) is limited to 15.46 tons of VOC per month calculated on a 12-month rolling average.

**Roof landing losses are calculated based on the following formulas:**

Internal Floating Roof Tank

IFRT Standing Loss $L_{SL} = n_d\ K_E\ (P_{VA}\ V_V / R\ T)\ M_V\ K_S$ (Maximum standing loss can not exceed $L_S$ max = 5.9 $D^2$ $h_{le}$ $W_l$)

IFRT Filling Loss $L_{FL} = (P_{VA,refill}\ V_V / R\ T_{refill})\ M_V\ S$

External Floating Roof Tank

EFRT Standing Loss $L_{SL} = 0.57\ n_d\ D\ P^*\ Mv$ (Maximum standing loss can not exceed LS max = 5.9 $D^2$ $h_{le}$ $W_l$)

EFRT Filling Loss $L_{FL} = (P_{VA,refill}\ V_V / R\ T_{refill})\ Mv\ (C_{sf}\ S)$

Drain-Dry Tanks (Tank with a bottom that slopes to a sump where there is no liquid heel)

Drain-Dry Standing Loss $L_{SL} = 42\ C_S\ W_l\ (\pi D^2 / 4)$ (Maximum standing loss can not exceed LS max = 0.60 $(P_{VA}\ V_V / R\ T)$ Mv)

Drain-Dry Filling Loss $L_{FL} = (P_{VA,refill}\ V_V / R\ T_{refill})\ Mv\ S$

**Table 2-4 Continued**

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Tank Information:** | | | | | | | | | | | | | | | | | | | | | | **Notes** |
| | Tank Number | 124 | 125 | 126 | 127 | 128 | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 | 141 | 142 | | |
| | Tank Color | White/White, Good | White/White, Good | White/White, Good | White/White, Good | White/White, Good | White/White, Good | White/White, Good | White/White, Good | White/White, Good | White/White, Good | White/White, Good | White/White, Good | White/White, Good | White/White, Good | White/White, Good | White/White, Good | White/White, Good | White/White, Good | White/White, Good | | |
| | Tank Type | IFRT | IFRT | Drain Dry | Drain Dry | IFRT | IFRT | Drain Dry | Drain Dry | Drain Dry | Drain Dry | Drain Dry | Drain Dry | Drain Dry | Drain Dry | Drain Dry | Drain Dry | Drain Dry | Drain Dry | Drain Dry | | |
| $n_d$ | Total Number of Days on Roof Legs without Refilling, days | 5 | 5 | | | 5 | 5 | | | | | | | | | | | | | | | Enter the number of days roof was on Legs |
| D | Tank Diameter, ft | 180 | 180 | 120 | 120 | 180 | 180 | 200 | 200 | 165 | 165 | 224 | 180 | 180 | 180 | 180 | 180 | 180 | 286 | 286 | | |
| $H_R$ | Height of the deck above the tank bottom, ft | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | | Conservatively assumes the roof leg height is 5.5 feet. See Note 2 below |
| $H_L$ | Height of the liquid above the tank bottom, ft | 0.5 | 0.5 | 0.0 | 0.0 | 0.5 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | Enter the height of liquid remaining in the tank, based on low level alarm setting |
| $H_{VO}$ | Height of the vapor space, ft | 5.0 | 5.0 | 5.5 | 5.5 | 5.0 | 5.0 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | | AP-42, Chapter 7.1, Formula 1-15 |
| **Stored Product Information:** | | | | | | | | | | | | | | | | | | | | | | |
| | Product Name | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | | Choose product name from drop down menu |
| RVP | Reid Vapor Pressure of Product, psia | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | | Enter crude oil RVP |
| Mv | Vapor Molecular Weight, lb/lbmole | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | | |
| $W_l$ | Liquid Density, lb/gal | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | | |
| A | Vapor Pressure Coefficient, dimensionless | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | 10.6 | | AP-42, Chapter 7.1, Figures 7.1-15, 7.1-16 and Table 7.1-5 |
| B | Vapor Pressure Coefficient, dimensionless | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | | AP-42, Chapter 7.1, Figures 7.1-15, 7.1-16 and Table 7.1-5 |
| $P_{VA}$ | Vapor Pressure at Daily Ave. Surface Temp, psia | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | | Calculated using Antoine's equation, where T = average stock temperature $T_B$ |
| **Refilled Product Information:** | | | | | | | | | | | | | | | | | | | | | | |
| | Product Name | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | | Choose Product Name from drop down menu |
| RVP | Reid Vapor Pressure of Product, psia | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | | Enter crude oil RVP |
| Mv | Vapor Molecular Weight, lb/lbmole | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | | |
| $W_l$ | Liquid Density, lb/gal | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | | |
| A | Vapor Pressure Coefficient, dimensionless | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | 10.574 | | AP-42, Chapter 7.1, Figures 7.1-15, 7.1-16 and Table 7.1-5 |
| B | Vapor Pressure Coefficient, dimensionless | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | 4437 | | AP-42, Chapter 7.1, Figures 7.1-15, 7.1-16 and Table 7.1-5 |
| $P_{VA,refill}$ | Vapor Pressure at Daily Ave. Surface Temp, psia | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | | Calculated using Antoine's equation, with T = Temperate of refill liquid |
| $T_{refill}$ | Temperature of the Liquid Refilling, degrees F | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | | Enter product refill temperature or assume 70 °F |
| $T_{refill}$ | Temperature of the Liquid Refilling, degrees R | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | | $T_{refill}$ +459.6 |
| **Meteorological Information:** | | | | | | | | | | | | | | | | | | | | | | |
| | Month | July | July | July | July | July | July | July | July | July | July | July | July | July | July | July | July | July | July | July | | Month the tank landed |
| Delta Tv | Daily Vapor Temperature Range, degrees R | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | | AP-42, Chapter 7.1, Formula 1-5 |
| $T_{AA}$ | Daily Average Ambient Temperature, degrees R | 526 | 526 | 526 | 526 | 526 | 526 | 526 | 526 | 526 | 526 | 526 | 526 | 526 | 526 | 526 | 526 | 526 | 526 | 526 | | AP-42, Chapter 7.1, Formula 1-27 |
| $T_{AX}$ | Daily Maximum Average Ambient Temp, degrees F | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | 76.2 | | Tanks 4.0d Meteorological Data |
| $T_{AN}$ | Daily Minimum Average Ambient Temp, degrees F | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | | Tanks 4.0d Meteorological Data |
| Delta $T_A$ | Daily Ambient Temperature Range, degrees R | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | | AP-42, Chapter 7.1, Formula 1-12 |
| $P_A$ | Atmospheric Pressure, psia | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | | Tanks 4.0d Meteorological Data |
| I | Daily Total Solar Insulation Factor, BTU/ft²d | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | 1,922.7 | | Tanks 4.0d Meteorological Data |
| alpha | Tank Paint Solar Absorptance, dimensionless | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | | AP-42, Chapter 7.1, Table 7.1-6 |
| **Standing Loss Calculation:** | | | | | | | | | | | | | | | | | | | | | | |
| $L_{SL}$ | Standing Idle Losses per day, lb/day | 1183 | 1183 | 1135 | 1135 | 974 | 974 | 1405 | 1405 | 956 | 956 | 1763 | 1135 | 1138 | 1138 | 1138 | 1135 | 1138 | 2874 | 2874 | | AP-42, Chapter 7.1, IFRT Formula 2-16, EFRT Formula 2-19, Drain Dry Formula 2-20. |
| $K_E$ | Vapor space expansion factor, dimensionless | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | 0.330 | | AP-42, Chapter 7.1, Formula 2-31 |
| $P_{VA}$ | True Vapor Pressure of the stock liquid, psia | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | 8.51 | | |
| Vv | Vapor Space Volume, ft³ | 127,235 | 127,235 | 139,958 | 139,958 | 127,235 | 127,235 | 172,788 | 172,788 | 117,604 | 117,604 | 216,745 | 139,958 | 139,958 | 139,958 | 139,958 | 139,958 | 139,958 | 353,333 | 353,333 | | AP-42, Chapter 7.1, Formula 2-32 |
| R | Ideal Gas Constant, psia*ft³/lbmole*R | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | | |
| $T_B$ | Average Monthly Stock Temperature, degrees R | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | 526.2 | | AP-42, Formula 2-3, Note 3 |
| Mv | Vapor Molecular Weight, lb/lbmole | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | | |
| $K_S$ | Vented vapor saturation factor, dimensionless | 0.31 | 0.31 | 0.15 | 0.15 | 0.31 | 0.31 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | | AP-42, Chapter 7.1, Formula 1-20. For IFRT must be < Saturation factor, S |
| $H_{VO}$ | Height of Vapor Space under Floating Roof, ft | 5.00 | 5.00 | 5.50 | 5.50 | 5.00 | 5.00 | 5.50 | 5.50 | 5.50 | 5.50 | 5.50 | 5.50 | 5.50 | 5.50 | 5.50 | 5.50 | 5.50 | 5.50 | 5.50 | | AP-42, Chapter 7.1, Formula 1-15 |
| $P^*$ | Vapor pressure function | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | 0.23059 | | AP-42, Chapter 7.1, Formula 2-18 |
| $C_S$ | Clingas Factor, bbl/1,000 ft² | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | | Default Value - AP-42, Table 7.1-10, Product: Gasoline, Shell Condition: Shuttle Lining |
| $L_{SL,max}$ | Limit on standing losses, lb/event | 678,618 | 678,618 | 6,331 | 6,331 | 678,618 | 678,618 | 7,816 | 7,816 | 5,319 | 5,319 | 9,804 | 6,331 | 6,331 | 6,331 | 6,331 | 6,331 | 6,331 | 15,982 | 15,982 | | AP-42, Chapter 7.1, IFRT and EFRT Formula 2-13, Drain Dry Formula 2-23 |
| **Refilling Loss Calculation:** | | | | | | | | | | | | | | | | | | | | | | |
| $L_{RL}$ | Filling Losses per episode, lb | 5,876 | 5,876 | 1,660 | 1,660 | 6,036 | 6,036 | 2,049 | 2,049 | 1,305 | 1,305 | 2,571 | 1,660 | 1,660 | 1,660 | 1,660 | 1,660 | 1,660 | 4,101 | 4,101 | | AP-42, Chapter 7.1, IFRT Formula 2-26, EFRT Formula 2-27, Drain Dry Formula 2-28. |
| $P_{VA,refill}$ | True Vapor Pressure Liquid Refilling, psia | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | 8.987 | | Calculated using Antoine's equation, with T = Temperate of refill liquid |
| $V_V$ | Vapor Space Volume, ft³ | 127,235 | 127,235 | 139,958 | 139,958 | 127,235 | 127,235 | 172,788 | 172,788 | 117,604 | 117,604 | 216,745 | 139,958 | 139,958 | 139,958 | 139,958 | 139,958 | 139,958 | 353,333 | 353,333 | | AP-42, Chapter 7.1, Formula 2-32 |
| $H_{VO}$ | Height of Vapor Space under Floating Roof, ft | 5.00 | 5.00 | 5.50 | 5.50 | 5.00 | 5.00 | 5.50 | 5.50 | 5.50 | 5.50 | 5.50 | 5.50 | 5.50 | 5.50 | 5.50 | 5.50 | 5.50 | 5.50 | 5.50 | | AP-42, Chapter 7.1, Formula 1-15 |
| D | Tank Diameter, ft | 180 | 180 | 180 | 180 | 180 | 180 | 200 | 200 | 165 | 165 | 224 | 180 | 180 | 180 | 180 | 180 | 180 | 286 | 286 | | |
| R | Ideal Gas Constant, psia*ft³/lbmole*R | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | 10.731 | | |
| $T_{LRFR}$ | Temperature of the Liquid Refilling, degrees R | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | | |
| $M_V$ | Vapor Molecular Weight, lb/lbmole | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | | |
| S | Refilling Saturation Factor, dimensionless | 0.60 | 0.60 | 0.15 | 0.15 | 0.60 | 0.60 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | | Defaults: IFRT = 0.60, EFRT = 0.60, Drain Dry = 0.15 |
| $K_E$ | Vapor space expansion factor, dimensionless | 0.37 | 0.37 | | | | | | | | | | | | | | | | | | | AP-42, Chapter 7.1, Formula 2-31 |
| $K_S$ | Vented vapor saturation factor, dimensionless | 0.30 | 0.30 | | | | | | | | | | | | | | | | | | | AP-42, Chapter 7.1, Formula 1-20. For IFRT must be < Saturation factor, S |
| $C_F$ | Filling saturation correction factor | 0.973 | 0.973 | | | | | | | | | | | | | | | | | | | AP-42, Chapter 7.1, Formula 2-29 |
| $C_F$ times S | $C_F$ & S is 0.15 | 0.58 | 0.58 | | | | | | | | | | | | | | | | | | | AP-42, Chapter 7.1, Table 7.1-18. |
| $L_{standl}$ | Standing loss associated with wind, calculated for $C_F$ | 1,292 | 1,292 | | | | | | | | | | | | | | | | | | | AP-42, Chapter 7.1, Formula 2-19. Calculated with $n_d$ = 1 |
| $P^*$ | Vapor pressure function | 0.2519 | 0.2519 | | | | | | | | | | | | | | | | | | | AP-42, Chapter 7.1, Formula 2-18 |
| Ls | Standing loss calculated for $C_F$, lb/day | 1,103 | 1,103 | | | | | | | | | | | | | | | | | | | AP-42, Chapter 7.1, Formula 2-10. Calculated with $n_d$ = 1 |
| $L_F$ | Filling loss calculated for $C_F$, lb | 6,036 | 6,036 | | | | | | | | | | | | | | | | | | | AP-42, Chapter 7.1, Formula 2-26 |

**Summary of Tank Landing Losses:**

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Tank Number | 124 | 125 | 126 | 127 | 128 | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 | 141 | 142 | |
| | Tank Type | EFRT | EFRT | Drain Dry | Drain Dry | IFRT | IFRT | Drain Dry | Drain Dry | Drain Dry | Drain Dry | Drain Dry | Drain Dry | Drain Dry | Drain Dry | Drain Dry | Drain Dry | Drain Dry | Drain Dry | Drain Dry | |
| | Stored Product | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | |
| | Refill Product | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | Crude Oil | |
| | Month of Landing | July | July | July | July | July | July | July | July | July | July | July | July | July | July | July | July | July | July | July | |
| $L_{SL}$ | Standing Idle Losses per episode, lb | 5,915 | 5,915 | 1,135 | 1,135 | 4,868 | 4,868 | 1,405 | 1,405 | 956 | 956 | 1,763 | 1,138 | 1,138 | 1,138 | 1,138 | 1,135 | 1,138 | 2,874 | 2,874 | |
| $L_{RL}$ | Filling losses per episode, lb | 5,876 | 5,876 | 1,660 | 1,660 | 6,036 | 6,036 | 2,049 | 2,049 | 1,305 | 1,305 | 2,571 | 1,660 | 1,660 | 1,660 | 1,660 | 1,660 | 1,660 | 4,101 | 4,101 | |
| $L_{TL}$ | Total Landing Loss per episode, lb | 11,790 | 11,790 | 2,798 | 2,798 | 10,904 | 10,904 | 3,455 | 3,455 | 2,261 | 2,261 | 4,333 | 2,798 | 2,798 | 2,798 | 2,798 | 2,795 | 2,798 | 6,984 | 6,984 | |
| | Total Landing Loss per episode, ton | 5.90 | 5.90 | 1.40 | 1.40 | 5.45 | 5.45 | 1.73 | 1.73 | 1.18 | 1.18 | 2.17 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 3.53 | 3.53 | |

## Table 2-5
## Enbridge Energy, Limited Partnership - Superior, WI Terminal
## MTE/PTE Emission Calculations
## Facility-wide Piping Component Fugitive Volatile Organic Compound Emission Calculations

**Existing piping component counts before project[1]**

| Component | Count | Service | Emission Factor[2] (kg/hr/source) | Emission Factor (lb/hr/source) | Emissions[3] (lb VOC/year) | Emissions (ton VOC/yr) |
|---|---|---|---|---|---|---|
| Valves | 6,086 | Crude/ Light Liquid | 4.30E-05 | 9.47E-05 | 5,049 | 2.52 |
| Flanges | 29,028 | Crude/ Light Liquid | 8.00E-06 | 1.76E-05 | 4,481 | 2.24 |
| Other Equipment[4] | 1,000 | Crude/ Light Liquid | 1.30E-04 | 2.86E-04 | 2,508 | 1.25 |
| Pump Seals | 128 | Crude/ Light Liquid | 5.40E-04 | 1.19E-03 | 1,334 | 0.67 |
| | | | | Total | 13,372 | 6.69 |

**Superior Terminal Enhancement Project[5]**

| Component | Count | Service | Emission Factor[2] (kg/hr/source) | Emission Factor (lb/hr/source) | Emissions[3] (lb VOC/year) | Emissions (ton VOC/yr) |
|---|---|---|---|---|---|---|
| Valves | 370 | Crude/ Light Liquid | 4.30E-05 | 9.47E-05 | 307 | 0.15 |
| Flanges | 2,440 | Crude/ Light Liquid | 8.00E-06 | 1.76E-05 | 377 | 0.19 |
| Other Equipment[4] | 30 | Crude/ Light Liquid | 1.30E-04 | 2.86E-04 | 75 | 0.04 |
| Pump Seals | 30 | Crude/ Light Liquid | 5.40E-04 | 1.19E-03 | 313 | 0.16 |
| | | | | Total | 1,071 | 0.54 |

**Total Facility component counts after project**

| Component | Count | Service | Emission Factor[2] (kg/hr/source) | Emission Factor (lb/hr/source) | Emissions[3] (lb VOC/year) | Emissions (ton VOC/yr) |
|---|---|---|---|---|---|---|
| Valves | 6,456 | Crude/ Light Liquid | 4.30E-05 | 9.47E-05 | 5,356 | 2.68 |
| Flanges | 31,468 | Crude/ Light Liquid | 8.00E-06 | 1.76E-05 | 4,857 | 2.43 |
| Other Equipment[4] | 1,030 | Crude/ Light Liquid | 1.30E-04 | 2.86E-04 | 2,584 | 1.29 |
| Pump Seals | 158 | Crude/ Light Liquid | 5.40E-04 | 1.19E-03 | 1,646 | 0.82 |
| | | | | Total | 14,443 | 7.22 |

**Notes:**

1. Estimated piping component and pumps counts (from Permit 08-DCF-313 Revision Application)
2. From *Marketing Terminal Average Emission Factors from Protocol for Equipment Leak Emission Estimates* , USEPA Office of Air Quality Planning and Standards, November 1995 (EPA-453/R-95-017), Table 2-3 Light liquid emission factors.
3. Assumes 8,760 hours of operation per year.
4. Includes orifices, sampling connections and open lines.
5. Estimated project piping component and pumps counts.

## Table 2-6
## Enbridge Energy, Limited Partnership - Superior, WI Terminal
## MTE/PTE Emission Calculations
## Crude Oil Heater Emission Calculations

Emission Unit Description: Line 6 Heater - Natural Gas
Emission Unit ID: H01
Heater Rating: 84.40 MMBtu/hr

| Pollutant | Annual MTE/PTE Natural Gas Throughput(1) (MMBtu) | Annual MTE/PTE Natural Gas Throughput(2) (MMscf) | Natural Gas Emission Factors | Natural Gas Emission Factor Units | MTE/PTE Emissions (lb/hr) | MTE/PTE Emissions (lb/yr) | MTE/PTE Emissions (ton/yr) | Emission Factor Notes |
|---|---|---|---|---|---|---|---|---|
| PM | 739,333 | 724.84 | 0.04 | lb/MMBtu | 3.38 | 29,573 | 14.79 | See Note 3 |
| PM2.5 | 739,333 | 724.84 | 0.04 | lb/MMBtu | 3.38 | 29,573 | 14.79 | See Note 3 |
| PM10 | 739,333 | 724.84 | 0.04 | lb/MMBtu | 3.38 | 29,573 | 14.79 | See Note 3 |
| SO2 | 739,333 | 724.84 | 0.6 | lb/MMscf | 0.05 | 435 | 0.22 | See Note 4 |
| NOx | 739,333 | 724.84 | 0.06 | lb/MMBtu | 5.06 | 44,360 | 22.18 | See Note 5 |
| VOC | 739,333 | 724.84 | 0.011 | lb/MMBtu | 0.93 | 8,133 | 4.07 | See Note 5 |
| CO | 739,333 | 724.84 | 0.04 | lb/MMBtu | 3.38 | 29,573 | 14.79 | See Note 5 |
| Lead | 739,333 | 724.84 | 0.0005 | lb/MMscf | 4.1E-05 | 3.6E-01 | 1.8E-04 | See Note 4 |
| Ammonia | 739,333 | 724.84 | 0.49 | lb/MMscf | 0.04 | 355 | 0.18 | See Note 6 |
| $CO_2$ | 739,333 | 724.84 | 116.89 | lb/MMBtu | 9,865.29 | 86,419,959 | 43,209.98 | See Note 7 |
| $CH_4$ | 739,333 | 724.84 | 2.2E-03 | lb/MMBtu | 0.19 | 1,630 | 0.81 | See Note 7 |
| $N_2O$ | 739,333 | 724.84 | 2.2E-04 | lb/MMBtu | 0.02 | 163 | 0.08 | See Note 7 |
| 2-Methylnaphthalene | 739,333 | 724.84 | 2.4E-05 | lb/MMscf | 2.0E-06 | 1.7E-02 | 8.7E-06 | See Note 8 |
| Benzene | 739,333 | 724.84 | 2.1E-03 | lb/MMscf | 1.7E-04 | 1.5E+00 | 7.6E-04 | See Note 8 |
| n-Hexane | 739,333 | 724.84 | 1.8E+00 | lb/MMscf | 1.5E-01 | 1.3E+03 | 6.5E-01 | See Note 8 |
| Formaldehyde | 739,333 | 724.84 | 7.5E-02 | lb/MMscf | 6.2E-03 | 5.4E+01 | 2.7E-02 | See Note 8 |
| Phenanathrene | 739,333 | 724.84 | 1.7E-05 | lb/MMscf | 1.4E-06 | 1.2E-02 | 6.2E-06 | See Note 8 |
| Toluene | 739,333 | 724.84 | 3.4E-03 | lb/MMscf | 2.8E-04 | 2.5E+00 | 1.2E-03 | See Note 8 |
| Barium | 739,333 | 724.84 | 4.4E-03 | lb/MMscf | 3.6E-04 | 3.2E+00 | 1.6E-03 | See Note 8 |
| Cadmium | 739,333 | 724.84 | 1.1E-03 | lb/MMscf | 9.1E-05 | 8.0E-01 | 4.0E-04 | See Note 8 |
| Chromium | 739,333 | 724.84 | 1.4E-03 | lb/MMscf | 1.2E-04 | 1.0E+00 | 5.1E-04 | See Note 8 |
| Cobalt | 739,333 | 724.84 | 8.4E-05 | lb/MMscf | 7.0E-06 | 6.1E-02 | 3.0E-05 | See Note 8 |
| Copper | 739,333 | 724.84 | 8.5E-04 | lb/MMscf | 7.0E-05 | 6.2E-01 | 3.1E-04 | See Note 8 |
| Manganese | 739,333 | 724.84 | 3.8E-04 | lb/MMscf | 3.1E-05 | 2.8E-01 | 1.4E-04 | See Note 8 |
| Mercury | 739,333 | 724.84 | 2.6E-04 | lb/MMscf | 2.2E-05 | 1.9E-01 | 9.4E-05 | See Note 8 |
| Molybdenum | 739,333 | 724.84 | 1.1E-03 | lb/MMscf | 9.1E-05 | 8.0E-01 | 4.0E-04 | See Note 8 |
| Nickel | 739,333 | 724.84 | 2.1E-03 | lb/MMscf | 1.7E-04 | 1.5E+00 | 7.6E-04 | See Note 8 |
| Vanadium | 739,333 | 724.84 | 2.3E-03 | lb/MMscf | 1.9E-04 | 1.7E+00 | 8.3E-04 | See Note 8 |

**Notes:**
1. Assumes 8,760 hours per year.
2. Conversion assumes 1020 Btu per cubic foot of natural gas, EPA AP-42, Chapter 1, Section 1.4. Table 1.4-1, July 1998.
3. Maximum allowable PM emissions rate to not constitute a significant emissions increase under s. NR 405.
4. EPA AP-42, Chapter 1, Section 1.4. Tables 1.4-1 & 1.4-2, July 1998.
5. Manufacture's guaranteed or predicted emission rate.
6. Ammonia emission factor from: *Development and Selection of Ammonia Emission Factors - Final Report*. R. Battye, W. Battye, C. Overcash, and S. Fudge; EC/R Incorporated; Durham, NC. Report prepared for USEPA Office of Research and Development; August, 1994.
7. Emission factors for natural gas were obtained from 40 CFR 98 Subpart C, Tables C-1 and C-2.
8. EPA AP-42, Chapter 1, Section 1.4. Tables 1.4-3 & 1.4-4, July 1998, include pollutant emission factors with an emissions factor rating of "D" or better.

## Table 2-7
## Enbridge Energy, Limited Partnership - Superior, WI Terminal
## MTE/PTE Emission Calculations
## Diesel Fuel Powered Fire Pump and Emergency Generator Emission Calculations

**Fire Pumps - The terminal has three fire pumps**

| Pollutant | Individual Pump Horse Power Rating | Diesel Fuel Emission Factor[1] (lb/hp-hr) (power output) | Diesel Fuel Emission Factors (lb/MMBtu) (fuel input) | Emission Factor Notes | MTE/PTE Emissions (lb/hr) | MTE/PTE Emissions[2] (lb/yr) | MTE/PTE Emissions (ton/yr) | Number of Pumps | Combined Emissions (ton/yr) |
|---|---|---|---|---|---|---|---|---|---|
| $NO_X$ | 110.0 | 3.09E-02 | 4.41 | See Note 3 | 3.40 | 5,772.69 | 2.89 | 3 | 8.66 |
| CO | 110.0 | 6.65E-03 | 0.95 | See Note 3 | 0.73 | 1,243.55 | 0.62 | 3 | 1.87 |
| $SO_2$ | 110.0 | 1.09E-05 | 0.002 | See Note 4 | 0.00 | 2.03 | 0.00 | 3 | 3.05E-03 |
| PM10 | 110.0 | 2.17E-03 | 0.31 | See Note 3 | 0.24 | 405.79 | 0.20 | 3 | 0.61 |
| VOC | 110.0 | 2.52E-03 | 0.36 | See Note 3 | 0.28 | 471.24 | 0.24 | 3 | 0.71 |
| $CO_2$ | 110.0 | 1.14E+00 | 163.05 | See Note 5 | 125.55 | 213,437.57 | 106.72 | 3 | 320.16 |
| $CH_4$ | 110.0 | 4.63E-05 | 0.01 | See Note 5 | 0.01 | 8.66 | 0.00 | 3 | 0.01 |
| $N_2O$ | 110.0 | 9.26E-06 | 0.00 | See Note 5 | 0.00 | 1.73 | 0.00 | 3 | 0.00 |
| Benzene | 110.0 | 6.53E-06 | 9.33E-04 | See Note 6 | 7.18E-04 | 1.22 | 6.11E-04 | 3 | 1.83E-03 |
| Toluene | 110.0 | 2.86E-06 | 4.09E-04 | See Note 6 | 3.15E-04 | 0.54 | 2.68E-04 | 3 | 8.03E-04 |
| Xylenes | 110.0 | 2.00E-06 | 2.85E-04 | See Note 6 | 2.19E-04 | 0.37 | 1.87E-04 | 3 | 5.60E-04 |
| 1,3-Butadiene | 110.0 | 2.74E-07 | 3.91E-05 | See Note 6 | 3.01E-05 | 0.05 | 2.56E-05 | 3 | 7.68E-05 |
| Formaldehyde | 110.0 | 8.26E-06 | 1.18E-03 | See Note 6 | 9.09E-04 | 1.54 | 7.72E-04 | 3 | 2.32E-03 |
| Acetaldehyde | 110.0 | 5.37E-06 | 7.67E-04 | See Note 6 | 5.91E-04 | 1.00 | 5.02E-04 | 3 | 1.51E-03 |
| Acrolein | 110.0 | 6.48E-07 | 9.25E-05 | See Note 6 | 7.12E-05 | 0.12 | 6.05E-05 | 3 | 1.82E-04 |
| Naphthalene | 110.0 | 5.94E-07 | 8.48E-05 | See Note 6 | 6.53E-05 | 0.11 | 5.55E-05 | 3 | 1.67E-04 |

**Notes:**
1. Calculated emissions factor from horse power rating and lb/MMBtu emission factor, assumes 7,000 Btu/hp-hr.
2. Assumes 1,700 hours per year, diesel fuel limit of 10,000 gallons per year divided by 5.62 gallons fuel used per hour.
3. EPA AP-42, Chapter 3.3, Table 3.3-1, October 1996.
4. Emission Factor calculated from the current actual sulfur content of #2 Fuel oil, 15 ppm sulfur, see Table 2-6D below.
5. Emission factors from 40 CFR 98, Subpart C Table C-1 for Distillate Fuel Oil No. 2. and Table C-2 for Petroleum (All fuel types in Table C--1).
6. EPA AP-42, Chapter 3.3, Table 3.3-2, October 1996.

**Areas 1, 2, 3, and 4 Emergency Electric Generators[1]**

| Pollutant | Individual Generator Horse Power Rating | Diesel Fuel Emission Factor[2] (lb/hp-hr) (power output) | Diesel Fuel Emission Factors (lb/MMBtu) (fuel input) | Emission Factor Notes | MTE/PTE Emissions (lb/hr) | MTE/PTE Emissions[3] (lb/yr) | MTE/PTE Emissions (ton/yr) | Number of Generators | Combined Emissions (ton/yr) |
|---|---|---|---|---|---|---|---|---|---|
| NOx | 207.0 | 3.09E-02 | 4.41 | See Note 4 | 6.39 | 1,278 | 0.64 | 5 | 3.20 |
| CO | 207.0 | 6.65E-03 | 0.95 | See Note 4 | 1.38 | 275 | 0.14 | 5 | 0.69 |
| SO2 | 207.0 | 1.12E-05 | 0.002 | See Note 5 | 0.00 | 0 | 0.00 | 5 | 1.16E-03 |
| PM10 | 207.0 | 2.17E-03 | 0.31 | See Note 4 | 0.45 | 90 | 0.04 | 5 | 0.22 |
| VOC | 207.0 | 2.52E-03 | 0.36 | See Note 4 | 0.52 | 104 | 0.05 | 5 | 0.26 |
| $CO_2$ | 207.0 | 1.14E+00 | 163.05 | See Note 6 | 236.27 | 401,650.70 | 200.83 | 5 | 1,004.13 |
| $CH_4$ | 207.0 | 4.63E-05 | 0.01 | See Note 6 | 0.01 | 16.29 | 0.01 | 5 | 0.04 |
| $N_2O$ | 207.0 | 9.26E-06 | 0.00 | See Note 6 | 0.00 | 3.26 | 0.00 | 5 | 0.01 |
| Benzene | 207.0 | 6.53E-06 | 9.33E-04 | See Note 7 | 1.35E-03 | 2.70E-01 | 1.35E-04 | 5 | 6.76E-04 |
| Toluene | 207.0 | 2.86E-06 | 4.09E-04 | See Note 7 | 5.93E-04 | 1.19E-01 | 5.93E-05 | 5 | 2.96E-04 |
| Xylenes | 207.0 | 2.00E-06 | 2.85E-04 | See Note 7 | 4.13E-04 | 8.26E-02 | 4.13E-05 | 5 | 2.06E-04 |
| 1,3-Butadiene | 207.0 | 2.74E-07 | 3.91E-05 | See Note 7 | 5.67E-05 | 1.13E-02 | 5.67E-06 | 5 | 2.83E-05 |
| Formaldehyde | 207.0 | 8.26E-06 | 1.18E-03 | See Note 7 | 1.71E-03 | 3.42E-01 | 1.71E-04 | 5 | 8.55E-04 |
| Acetaldehyde | 207.0 | 5.37E-06 | 7.67E-04 | See Note 7 | 1.11E-03 | 2.22E-01 | 1.11E-04 | 5 | 5.56E-04 |
| Acrolein | 207.0 | 6.48E-07 | 9.25E-05 | See Note 7 | 1.34E-04 | 2.68E-02 | 1.34E-05 | 5 | 6.70E-05 |
| Naphthalene | 207.0 | 5.94E-07 | 8.48E-05 | See Note 7 | 1.23E-04 | 2.46E-02 | 1.23E-05 | 5 | 6.14E-05 |

**Notes:**
1. The emergency electric generators will be operated less than 200 hours per year and output is less than 3,000 kilowatts per unit.
2. Calculated emissions factor from horse power rating and lb/MMBtu emission factor, assumes 7,000 Btu/hp-hr.
3. Assumes 200 hours per year.
4. EPA AP-42, Chapter 3.3, Table 3.3-1, October 1996.
5. Emission Factor calculated from the current actual sulfur content of #2 Fuel oil, 15 ppm sulfur, see Table 2-6D below.
6. Emission factors from 40 CFR 98, Subpart C Table C-1 for Distillate Fuel Oil No. 2. and Table C-2 for Petroleum (All fuel types in Table C--1).
7. EPA AP-42, Chapter 3.3, Table 3.3-2, October 1996.

**Lab Area Emergency Electric Generator**

| Pollutant | Generator Horse Power Rating | Diesel Fuel Emission Factor[3] (lb/hp-hr) (power output) | Diesel Fuel Emission Factors (lb/MMBtu) (fuel input) | Emission Factor Notes | MTE/PTE Emissions (lb/hr) | MTE/PTE Emissions[4] (lb/yr) | MTE/PTE Emissions (ton/yr) | Number of Generators | Combined Emissions (ton/yr) |
|---|---|---|---|---|---|---|---|---|---|
| NOx | 335 | 6.59E-03 | 0.94 | See Note 5 | 2.21 | 442 | 0.22 | 1 | 0.22 |
| CO | 335 | 7.94E-04 | 0.11 | See Note 5 | 0.27 | 53 | 0.03 | 1 | 0.03 |
| SO2 | 335 | 1.23E-05 | 0.002 | See Note 6 | 0.00 | 1 | 0.00 | 1 | 4.13E-04 |
| PM10 | 335 | 1.76E-04 | 0.03 | See Note 5 | 0.06 | 12 | 0.01 | 1 | 0.01 |
| VOC | 335 | 2.20E-04 | 0.03 | See Note 5 | 0.07 | 15 | 0.01 | 1 | 0.01 |
| $CO_2$ | 335 | 1.14E+00 | 163.05 | See Note 7 | 382.36 | 650,014.42 | 325.01 | 1 | 325.01 |
| $CH_4$ | 335 | 4.63E-05 | 0.01 | See Note 7 | 0.02 | 26.37 | 0.01 | 1 | 0.01 |
| $N_2O$ | 335 | 9.26E-06 | 0.001 | See Note 7 | 0.003 | 5.27 | 0.003 | 1 | 0.003 |
| Benzene | 335 | 6.53E-06 | 9.33E-04 | See Note 8 | 2.19E-03 | 4.38E-01 | 2.19E-04 | 1 | 2.19E-04 |
| Toluene | 335 | 2.86E-06 | 4.09E-04 | See Note 8 | 9.59E-04 | 1.92E-01 | 9.59E-05 | 1 | 9.59E-05 |
| Xylenes | 335 | 2.00E-06 | 2.85E-04 | See Note 8 | 6.68E-04 | 1.34E-01 | 6.68E-05 | 1 | 6.68E-05 |
| 1,3-Butadiene | 335 | 2.74E-07 | 3.91E-05 | See Note 8 | 9.17E-05 | 1.83E-02 | 9.17E-06 | 1 | 9.17E-06 |
| Formaldehyde | 335 | 8.26E-06 | 1.18E-03 | See Note 8 | 2.77E-03 | 5.53E-01 | 2.77E-04 | 1 | 2.77E-04 |
| Acetaldehyde | 335 | 5.37E-06 | 7.67E-04 | See Note 8 | 1.80E-03 | 3.60E-01 | 1.80E-04 | 1 | 1.80E-04 |
| Acrolein | 335 | 6.48E-07 | 9.25E-05 | See Note 8 | 2.17E-04 | 4.34E-02 | 2.17E-05 | 1 | 2.17E-05 |
| Naphthalene | 335 | 5.94E-07 | 8.48E-05 | See Note 8 | 1.99E-04 | 3.96E-02 | 1.99E-05 | 1 | 1.99E-05 |

**Notes:**
1. This unit is exempt from construction permitting requirements per s. NR 406.04(1)(w)
2. The emergency electric generator will be operated less than 200 hours per year and output is less than 3,000 kilowatts.
3. Calculated emissions factor from horse power rating and lb/MMBtu emission factor, assumes 7,000 Btu/hp-hr.
4. Assumes 200 hours per year.
5. Manufacture's guaranteed emission factors.
6. Emission Factor calculated from the current actual sulfur content of #2 Fuel oil, 15 ppm sulfur, see the diesel fuel sulfur emission factor calculations below.
7. Emission factors from 40 CFR 98, Subpart C Table C-1 for Distillate Fuel Oil No. 2. and Table C-2 for Petroleum (All fuel types in Table C--1).
8. EPA AP-42, Chapter 3.3, Table 3.3-2, October 1996.

**Diesel Fuel Sulfur Emission Factor Calculations**

| Sulfur Concentration[1] (ppm) | Percent Sulfur (%) | Calculated Fuel Input (gal/hr) | Distillate FO #2 Density (lb/gal) | Mole Weight of Sulfur (lb/lb-mole) | Mole Weight of Sulfur dioxide (lb/lb-mole) | Emission Rate (lb SO2/hr) | Emission Rate (lb/hp-hr SO2/hr) | Emission Rate (lb SO2/MMBtu) (fuel input) |
|---|---|---|---|---|---|---|---|---|
| **Fire Pumps** | | | | | | | | |
| 15 | 0.0015% | 5.62 | 7.1 | 32.07 | 64.07 | 0.001 | 1.09E-05 | 1.55E-03 |
| **Emergency Electric Generators** | | | | | | | | |
| 15 | 0.0015% | 10.90 | 7.1 | 32.07 | 64.07 | 0.002 | 1.12E-05 | 1.60E-03 |
| **Lab Area Emergency Electric Generator[2]** | | | | | | | | |
| 15 | 0.0015% | 19.40 | 7.1 | 32.07 | 64.07 | 0.004 | 1.23E-05 | 1.76E-03 |

**Notes:**
1. #2 Fuel oil used in the fire pumps and emergency generators contains a maximum sulfur content of 15 ppm.
2. Per 40 CFR 60 Subpart IIII, Beginning June 1, 2010 diesel fuel used in the emergency generator is subject to a maximum of 15 ppm sulfur per gallon standard.

## Table 2-8
## Enbridge Energy, Limited Partnership - Superior, WI Terminal
## MTE/PTE Emission Calculations
## Tank Properties and Throughput Summary

| | | |
|---|---|---|
| Annual Throughput (bbl/yr) | 896,075,000 | Maximum throughput through tankage after project; limited by outbound pipeline throughput capacity |
| Daily Throughput (bbl/day) | 2,455,000 | Maximum throughput through tankage after project; limited by outbound pipeline throughput capacity |
| Crude Oil RVP (psia) | 10.2 | Represents the maximum monthly volume weighted crude oil RVP stored at the Superior Terminal. |
| Crude Oil Density | 7.1 | |

| Tank Number | Product | RVP (psia) | Tank Diameter (ft) | Tank Height (ft) | Tank Volume (bbl) | Tank Volume (gal) | Fraction of Total Terminal Tank Volume | MTE/PTE Throughput[1] (bbl/yr) | MTE/PTE Throughput (gal/yr) | MTE/PTE Annual Tank Turnovers[2] |
|---|---|---|---|---|---|---|---|---|---|---|
| T01 | Crude Oil | 10.2 | 210 | 64 | 390,000 | 16,380,000 | 4% | 33,930,000 | 1,425,060,000 | 87 |
| T02 | Crude Oil | 10.2 | 210 | 64 | 390,000 | 16,380,000 | 4% | 33,930,000 | 1,425,060,000 | 87 |
| T03 | Crude Oil | 10.2 | 150 | 48 | 150,000 | 6,300,000 | 2% | 13,050,000 | 548,100,000 | 87 |
| T04 | Crude Oil | 10.2 | 150 | 48 | 150,000 | 6,300,000 | 2% | 13,050,000 | 548,100,000 | 87 |
| T05 | Crude Oil | 10.2 | 150 | 48 | 150,000 | 6,300,000 | 2% | 13,050,000 | 548,100,000 | 87 |
| T06 | Crude Oil | 10.2 | 150 | 48 | 150,000 | 6,300,000 | 2% | 13,050,000 | 548,100,000 | 87 |
| T07 | Crude Oil | 10.2 | 150 | 48 | 150,000 | 6,300,000 | 2% | 13,050,000 | 548,100,000 | 87 |
| T08 | Crude Oil | 10.2 | 150 | 48 | 150,000 | 6,300,000 | 2% | 13,050,000 | 548,100,000 | 87 |
| T09 | Crude Oil | 10.2 | 150 | 48 | 150,000 | 6,300,000 | 2% | 13,050,000 | 548,100,000 | 87 |
| T10 | Crude Oil | 10.2 | 150 | 48 | 150,000 | 6,300,000 | 2% | 13,050,000 | 548,100,000 | 87 |
| T11 | Crude Oil | 10.2 | 150 | 48 | 150,000 | 6,300,000 | 2% | 13,050,000 | 548,100,000 | 87 |
| T12 | Crude Oil | 10.2 | 150 | 48 | 150,000 | 6,300,000 | 2% | 13,050,000 | 548,100,000 | 87 |
| T13 | Crude Oil | 10.2 | 180 | 48 | 217,000 | 9,114,000 | 2% | 18,879,000 | 792,918,000 | 87 |
| T14 | Crude Oil | 10.2 | 180 | 48 | 217,000 | 9,114,000 | 2% | 18,879,000 | 792,918,000 | 87 |
| T15 | Crude Oil | 10.2 | 180 | 48 | 217,000 | 9,114,000 | 2% | 18,879,000 | 792,918,000 | 87 |
| T16 | Crude Oil | 10.2 | 180 | 48 | 217,000 | 9,114,000 | 2% | 18,879,000 | 792,918,000 | 87 |
| T17 | Crude Oil | 10.2 | 180 | 48 | 217,000 | 9,114,000 | 2% | 18,879,000 | 792,918,000 | 87 |
| T18 | Crude Oil | 10.2 | 180 | 48 | 217,000 | 9,114,000 | 2% | 18,879,000 | 792,918,000 | 87 |
| T19 | Crude Oil | 10.2 | 180 | 48 | 217,000 | 9,114,000 | 2% | 18,879,000 | 792,918,000 | 87 |
| T20 | Crude Oil | 10.2 | 180 | 48 | 217,000 | 9,114,000 | 2% | 18,879,000 | 792,918,000 | 87 |
| T21 | Crude Oil | 10.2 | 180 | 48 | 217,000 | 9,114,000 | 2% | 18,879,000 | 792,918,000 | 87 |
| T22 | Crude Oil | 10.2 | 180 | 48 | 217,000 | 9,114,000 | 2% | 18,879,000 | 792,918,000 | 87 |
| T23 | Crude Oil | 10.2 | 180 | 48 | 217,000 | 9,114,000 | 2% | 18,879,000 | 792,918,000 | 87 |
| T24 | Crude Oil | 10.2 | 180 | 48 | 217,000 | 9,114,000 | 2% | 18,879,000 | 792,918,000 | 87 |
| T25 | Crude Oil | 10.2 | 180 | 48 | 217,000 | 9,114,000 | 2% | 18,879,000 | 792,918,000 | 87 |
| T26 | Crude Oil | 10.2 | 180 | 48 | 217,000 | 9,114,000 | 2% | 18,879,000 | 792,918,000 | 87 |
| T27 | Crude Oil | 10.2 | 180 | 48 | 217,000 | 9,114,000 | 2% | 18,879,000 | 792,918,000 | 87 |
| T28 | Crude Oil | 10.2 | 180 | 48 | 217,000 | 9,114,000 | 2% | 18,879,000 | 792,918,000 | 87 |
| T29 | Crude Oil | 10.2 | 180 | 48 | 217,000 | 9,114,000 | 2% | 18,879,000 | 792,918,000 | 87 |
| T30 | Crude Oil | 10.2 | 200 | 48 | 250,000 | 10,500,000 | 3% | 21,750,000 | 913,500,000 | 87 |
| T31 | Crude Oil | 10.2 | 200 | 48 | 250,000 | 10,500,000 | 3% | 21,750,000 | 913,500,000 | 87 |
| T32 | Crude Oil | 10.2 | 165 | 49 | 182,857 | 7,680,000 | 2% | 15,908,571 | 668,160,000 | 87 |
| T33 | Crude Oil | 10.2 | 165 | 49 | 182,857 | 7,680,000 | 2% | 15,908,571 | 668,160,000 | 87 |
| T34 | Crude Oil | 10.2 | 224 | 56 | 392,169 | 16,471,098 | 4% | 34,118,703 | 1,432,985,526 | 87 |
| T35 | Crude Oil | 10.2 | 180 | 56 | 205,653 | 8,637,426 | 2% | 41,130,600 | 1,727,485,200 | 200 |
| T36 | Crude Oil | 10.2 | 180 | 56 | 205,653 | 8,637,426 | 2% | 41,130,600 | 1,727,485,200 | 200 |
| T37 | Crude Oil | 10.2 | 180 | 56 | 205,653 | 8,637,426 | 2% | 41,130,600 | 1,727,485,200 | 200 |
| T38 | Crude Oil | 10.2 | 180 | 56 | 205,653 | 8,637,426 | 2% | 41,130,600 | 1,727,485,200 | 200 |
| T39 | Crude Oil | 10.2 | 180 | 56 | 205,653 | 8,637,426 | 2% | 41,130,600 | 1,727,485,200 | 200 |
| T40 | Crude Oil | 10.2 | 180 | 56 | 205,653 | 8,637,426 | 2% | 41,130,600 | 1,727,485,200 | 200 |
| T41 | Crude Oil | 10.2 | 286 | 56 | 584,232 | 24,537,744 | 6% | 116,846,400 | 4,907,548,800 | 200 |
| T42 | Crude Oil | 10.2 | 286 | 56 | 584,232 | 24,537,744 | 6% | 116,846,400 | 4,907,548,800 | 200 |
| | | | | Total | 9,629,265 | 404,429,142 | | 1,109,215,246 | 36,771,942,726 | |

Total Throughput used for PTE Calculations (bbl/day) 3,038,946

**Notes:**

1. Facility-wide throughput capacity includes the Line 61, Line 5 and Line 67 pipeline projects permitted under permits 07-DCF-050, 08-DCF-082 and 08-DCF-102 and 08-DCF-313 and the proposed increases on Line 61 and Line 67 in the current permit application.

2. PTE calculations for tanks T01 through T34 were based on the maximum terminal throughput prior to this proposed project which was equal to approximately 87 turnovers per tank per year. The PTE for tanks T35 through T42 are based on a maximum number of 200 turnovers per year. As a result, the facility-wide tank throughput is conservatively higher than the potential throughput the terminal is physically capable of accommodating.

## Table 2-9
## Enbridge Energy, Limited Partnership - Superior, WI Terminal
## MTE/PTE Emission Calculations
## Sump Tank Emission Calculations[1]

**Description of Activity:**

Sump tanks may be used for any of the following:

a. To collect any material (e.g. drips) from equipment such as pumps that might be released during a malfunction or process upset

b. To collect material from spill cleanups

c. To collect crude oil from pigging operations and maintenance activities

| Emission Unit ID | Sump Tank Description | Sump Tank Diameter[1] (ft) | Sump Tank Length[2] (ft) | Sump Tank Volume[3] (gal) | Maximum Annual Throughput (gal/yr) | Maximum Annual Throughput Notes | Annual Number of Tank Pumping Events[4] | Standing Loss[5] (lb VOC/yr) | Working Loss[5] (lb VOC/yr) | Total Loss (lb VOC/yr) |
|---|---|---|---|---|---|---|---|---|---|---|
| ST01 | Line 61 Pig Launcher Sump Tank | 8.0 | 26.04 | 8,000 | 1,050,774 | See Note 6 | 131 | - | 2,044 | 2,044 |
| ST02 | Line 61 Station Sump Tank | 6.0 | 18.90 | 4,000 | 120,000 | See Note 7 | 40 | - | 591 | 591 |
| ST03 | Line 13 Sump Tank | 6.0 | 18.90 | 4,000 | 120,000 | See Note 7 | 40 | - | 1,003 | 1,003 |
| ST04 | Station 5 Sump Tank | 6.0 | 18.90 | 4,000 | 45,000 | See Note 8 | 15 | - | 222 | 222 |
| ST05 | Station 6 Sump Tank | 6.0 | 18.90 | 4,000 | 120,000 | See Note 9 | 40 | - | 591 | 591 |
| ST06 | Line 14/64 Sump Tank | 6.0 | 18.90 | 4,000 | 30,000 | See Note 10 | 10 | - | 148 | 148 |
| | | | | | | | | | **Total (lb VOC/yr)** | ***4,599*** |
| | | | | | | | | | **Total (tpy)** | ***2.30*** |

**Notes:**

1. Diameter from Enbridge drawings.
2. Length was estimated so the calculated volume* is approximately equal to 4,000 gal, which is the volume of the tank specified in the drawing. **calculated volume = the volume of the tank at specified diameter and assuming the tank has flat ends*
3. Tank volume from Enbridge drawings.
4. Number of times the sump tanks are emptied, assumes that the sump tanks are emptied once the liquid level reaches 75% of storage capacity.
5. Emissions are calculated with US EPA TANKS version 4.0.9d, using the horizontal fixed roof tank configuration. Since the tanks are underground, there are no standing losses.
6. Throughput is based on the assumption that the entire volume of the Line 61 pig launcher is emptied into the sump tank once per day. Refer to Table 2-10 Pigging Emissions worksheet for pig launcher trap dimensions.
7. Conservatively assumes that the tanks are emptied 40 times per year and that the level of the tank is at 75% of capacity when emptied.
8. In 2008, the sump tank ST04 was emptied 7 times. For maximum potential emissions, conservatively assumes that the tank is emptied 15 times per year and that the level of the tank is at 75% of capacity when emptied.
9. In 2008, the sump tank ST05 was emptied 19 times. For maximum potential emissions, conservatively assumes that the tank is emptied 40 times per year and that the level of the tank is at 75% of capacity when emptied.
10. In 2008, the sump tank ST06 was emptied 4 times. For maximum potential emissions, conservatively assumes that the tank is emptied 10 times per year and that the level of the tank is at 75% of capacity when emptied.

## Table 2-10
## Enbridge Energy, Limited Partnership - Superior, WI Terminal
## MTE/PTE Emission Calculations
## Pigging Equipment Emission Calculations[1]

**Description of Activity:**

A pig is a device inserted into the pipeline used for either:

a. Physical separation between different liquids being transported in pipelines

b. Internal cleaning of pipelines

c. Inspection of the condition of pipeline walls

Sections of liquid service pipelines are drained in order to launch and receive pigs. After draining, the section is opened to the atmosphere, which can result in emissions from vapors in the volume opened to the atmosphere or evaporation of remaining liquid that clings to the pipe and pig.

| Emission Unit ID | Pipeline Pig Trap Name | Internal Diameter of Pipe[2] (in) | Length of Pipe Vented[2] (ft) | Surface Area Inside of Pipe ($ft^2$) | Density[3] (lb/gal) | Clingage Factor[4] (bbl/1000 $ft^2$) | Emissions per Pigging Event (lb VOC/event) | Number of Events per Year | Number of Events per Year Notes | Maximum Annual Emissions (lb VOC/year) |
|---|---|---|---|---|---|---|---|---|---|---|
| PG01 | Line 61 Pig Launcher | 42 | 40 | 440 | 7.1 | 0.006 | 0.79 | 365 | See Note 7 | 287.23 |
| PG02 | Line 13 Pig Launcher and Receiver | 36 | 30 | 283 | 5.6 | 0.0015 | 0.10 | 10 | See Note 6 | 1.00 |
| PG03 | Line 67 Pig Receiver | 36 | 30 | 283 | 7.1 | 0.006 | 0.51 | 5 | See Note 6 | 2.53 |
| PG04 | Line 1 Pig Receiver | 36 | 30 | 283 | 7.1 | 0.006 | 0.51 | 24 | See Note 5 | 12.14 |
| PG05 | Line 2 Pig Receiver | 36 | 30 | 283 | 7.1 | 0.006 | 0.51 | 24 | See Note 5 | 12.14 |
| PG06 | Line 3 Pig Receiver | 36 | 30 | 283 | 7.1 | 0.006 | 0.51 | 24 | See Note 5 | 12.14 |
| PG07 | Line 4 Pig Receiver | 36 | 30 | 283 | 7.1 | 0.006 | 0.51 | 24 | See Note 5 | 12.14 |
| PG08 | Line 5 Pig Launcher | 36 | 30 | 283 | 7.1 | 0.006 | 0.51 | 24 | See Note 5 | 12.14 |
| PG09 | Line 6a Pig Launcher | 36 | 30 | 283 | 7.1 | 0.006 | 0.51 | 24 | See Note 5 | 12.14 |
| PG10 | Line 14/64 Pig Launcher | 36 | 30 | 283 | 7.1 | 0.006 | 0.51 | 24 | See Note 5 | 12.14 |
| | | | | | | | | | ***Total Emissions (lb VOC/yr)*** | ***375.75*** |
| | | | | | | | | | ***Total Emissions (tpy)*** | ***0.19*** |

**Notes:**

1. Emissions are calculated using the clingage method, a portion of crude oil clings to the inside of the pigging launcher or receiver after it has been drained.
2. Conservatively assumes that each receiver or launcher (except for Line 61) is 36 inches in diameter and 30 feet of pipe is vented to the atmosphere. Line 61 assumes the line is 42 inches in diameter and 40 feet of pipe is vented to the atmosphere.
3. USEPA, AP-42, Fifth Edition Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, Chapter 7.1, Organic Storage Tanks, Table 7.1-2, November 2006.
4. USEPA, AP-42, Fifth Edition Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, Chapter 7.1, Organic Storage Tanks, Table 7.1-10, November 2006. The Line 13 pig launcher and receiver clingage factors assume to be equivalent to gasoline with a light rust shell condition and the other pigging equipment is in crude oil service with a light rust shell condition.
5. Conservatively assumes 24 pigging events per year.
6. Conservatively assumes 5 pigging events per year each for the Line 13 pig launcher, Line 13 pig receiver and the Line 67 pig receiver.
7. This launcher is capable of handling multiple pigs at one time. The launcher may be opened up to one time per day.

## Table 2-11
## Enbridge Energy, Limited Partnership - Superior, WI Terminal
## MTE/PTE Emission Calculations
## Green House Gas Emissions from Storage Tanks

| Emission Unit ID | Potential Tanks Throughput[1] (MMgal/yr) | $CH_4$ Emission Factor[2] (lb $CH_4$/MMgal) | Potential $CH_4$ Emissions (lb/yr) | Potential $CH_4$ Emissions (tpy) | Potential $CO_2$ Equivalent Emissions[3,4] ($CO_2e$, tpy) |
|---|---|---|---|---|---|
| T01 | 1,425.06 | 5.25 | 7,480.28 | 3.74 | 78.54 |
| T02 | 1,425.06 | 5.25 | 7,480.28 | 3.74 | 78.54 |
| T03 | 548.10 | 5.25 | 2,877.03 | 1.44 | 30.21 |
| T04 | 548.10 | 5.25 | 2,877.03 | 1.44 | 30.21 |
| T05 | 548.10 | 5.25 | 2,877.03 | 1.44 | 30.21 |
| T06 | 548.10 | 5.25 | 2,877.03 | 1.44 | 30.21 |
| T07 | 548.10 | 5.25 | 2,877.03 | 1.44 | 30.21 |
| T08 | 548.10 | 5.25 | 2,877.03 | 1.44 | 30.21 |
| T09 | 548.10 | 5.25 | 2,877.03 | 1.44 | 30.21 |
| T10 | 548.10 | 5.25 | 2,877.03 | 1.44 | 30.21 |
| T11 | 548.10 | 5.25 | 2,877.03 | 1.44 | 30.21 |
| T12 | 548.10 | 5.25 | 2,877.03 | 1.44 | 30.21 |
| T13 | 792.92 | 5.25 | 4,162.11 | 2.08 | 43.70 |
| T14 | 792.92 | 5.25 | 4,162.11 | 2.08 | 43.70 |
| T15 | 792.92 | 5.25 | 4,162.11 | 2.08 | 43.70 |
| T16 | 792.92 | 5.25 | 4,162.11 | 2.08 | 43.70 |
| T17 | 792.92 | 5.25 | 4,162.11 | 2.08 | 43.70 |
| T18 | 792.92 | 5.25 | 4,162.11 | 2.08 | 43.70 |
| T19 | 792.92 | 5.25 | 4,162.11 | 2.08 | 43.70 |
| T20 | 792.92 | 5.25 | 4,162.11 | 2.08 | 43.70 |
| T21 | 792.92 | 5.25 | 4,162.11 | 2.08 | 43.70 |
| T22 | 792.92 | 5.25 | 4,162.11 | 2.08 | 43.70 |
| T23 | 792.92 | 5.25 | 4,162.11 | 2.08 | 43.70 |
| T24 | 792.92 | 5.25 | 4,162.11 | 2.08 | 43.70 |
| T25 | 792.92 | 5.25 | 4,162.11 | 2.08 | 43.70 |
| T26 | 792.92 | 5.25 | 4,162.11 | 2.08 | 43.70 |
| T27 | 792.92 | 5.25 | 4,162.11 | 2.08 | 43.70 |
| T28 | 792.92 | 5.25 | 4,162.11 | 2.08 | 43.70 |
| T29 | 792.92 | 5.25 | 4,162.11 | 2.08 | 43.70 |
| T30 | 913.50 | 5.25 | 4,795.05 | 2.40 | 50.35 |
| T31 | 913.50 | 5.25 | 4,795.05 | 2.40 | 50.35 |
| T32 | 668.16 | 5.25 | 3,507.24 | 1.75 | 36.83 |
| T33 | 668.16 | 5.25 | 3,507.24 | 1.75 | 36.83 |
| T34 | 1,432.99 | 5.25 | 7,521.88 | 3.76 | 78.98 |
| T35 | 1,727.49 | 5.25 | 9,067.74 | 4.53 | 95.21 |
| T36 | 1,727.49 | 5.25 | 9,067.74 | 4.53 | 95.21 |
| T37 | 1,727.49 | 5.25 | 9,067.74 | 4.53 | 95.21 |
| T38 | 1,727.49 | 5.25 | 9,067.74 | 4.53 | 95.21 |
| T39 | 1,727.49 | 5.25 | 9,067.74 | 4.53 | 95.21 |
| T40 | 1,727.49 | 5.25 | 9,067.74 | 4.53 | 95.21 |
| T41 | 4,907.55 | 5.25 | 25,760.21 | 12.88 | 270.48 |
| T42 | 4,907.55 | 5.25 | 25,760.21 | 12.88 | 270.48 |
| ST01 | 1.05 | 5.25 | 5.52 | 0.00 | 0.06 |
| ST02 | 0.12 | 5.25 | 0.63 | 0.00 | 0.01 |
| ST03 | 0.12 | 5.25 | 0.63 | 0.00 | 0.01 |
| ST04 | 0.05 | 5.25 | 0.24 | 0.00 | 0.00 |
| ST05 | 0.12 | 5.25 | 0.63 | 0.00 | 0.01 |
| ST06 | 0.03 | 5.25 | 0.16 | 0.00 | 0.00 |
| | | | | Total | 2,567.75 |

**Notes**

1. Refer to Table 2-8 and Table 2-9 for tank throughputs.
2. Methane emission factor obtained from 40 CFR 98.253 (m)(1), equation Y-22. Original value of 0.1 metric ton/MMbbl converted to 5.25 lb/MMgal.
3. Global warming potential (GWP) obtained from Table A-1 to Subpart A of Part 98 - Global Warming Potentials.
4. $CO_2e$ calculated by equation A-1 of 40 CFR 98.2, which states the total $CO_2e$ is equal to the GWP factor for $CH_4$ multiplied by the potential $CH_4$ emissions. The global warming potential for $CH_4$ is 21.