# Construction Permit
# Source Analysis & Technical Review

| | | | |
|---|---|---|---|
| Company | **Annova LNG Common Infrastructure LLC** | Permit Number | **144829** |
| City | **Brownsville** | Project Number | **263902** |
| County | **Cameron** | Regulated Entity Number | **RN109614727** |
| Project Type | **Initial** | Customer Reference Number | **CN605297415** |
| Project Reviewer | **Marc Sturdivant & Sean O'Brien** | | |
| Site Name | **Annova LNG Common Infrastructure** | | |

**Project Overview**

Annova LNG Common Infrastructure LLC, (Annova) proposes to construct a natural gas liquefaction facility and liquefied natural gas (LNG) export terminal (Terminal) in Cameron County along the South Texas Gulf Coast for exporting natural gas to international markets.

Annova will construct the Project on approximately 731 acres of land at mile marker 8.2 on the Brownsville Ship Channel (BSC), which is available to Annova through a real estate lease option agreement with the Brownsville Navigation District (BND). The Project includes two principal parts: the LNG facilities and the associated marine transfer facilities.

**Emission Summary**

| Air Contaminant | Proposed Allowable Emission Rates (tpy) | Change in Allowable Emission Rates (tpy) |
|---|---|---|
| PM | 15.79 | 0.00 |
| $PM_{10}$ | 15.79 | 0.00 |
| $PM_{2.5}$ | 15.79 | 0.00 |
| VOC | 51.00 | 0.00 |
| $NO_X$ | 82.33 | 0.00 |
| CO | 134.67 | 0.00 |
| $SO_2$ | 83.02 | 0.00 |
| $H_2SO_4$ | 6.7 | 0.00 |
| HAPs | 5.04 | 0.00 |

**Compliance History Evaluation - 30 TAC Chapter 60 Rules**

| | |
|---|---|
| A compliance history report was reviewed on: | **August 27, 2018** |
| Site rating & classification: | **N/A** |
| Company rating & classification: | **N/A** |
| If the rating is 50<RATING<55, what was the outcome, if any, based on the findings in the formal report: | **N/A** |
| Has the permit changed on the basis of the compliance history or rating? | **N/A** |

**Public Notice Information - 30 TAC Chapter 39 Rules**

| Rule Citation | Requirement | |
|---|---|---|
| 39.403 | Date Application Received: | **January 11, 2017** |
| | Date Administratively Complete: | **January 25, 2017** |
| | Small Business Source? | **No** |
| | Date Leg Letters mailed: | **January 25, 2017** |
| 39.603 | Date Published: | **February 14, 2017** |
| | Publication Name: | ***Brownsville Herald*** |

| Rule Citation | Requirement | |
|---|---|---|
| | Pollutants: | **carbon monoxide, hazardous air pollutants, nitrogen oxides, organic compounds, particulate matter including particulate matter with diameters of 10 microns or less and 2.5 microns or less, sulfur dioxide, and sulfuric acid mist.** |
| | Date Affidavits/Copies Received: | **March 1, 2017** |
| | Is bilingual notice required? | **Yes** |
| | Language: | **Spanish** |
| | Date Published: | **February 14, 2017** |
| | Publication Name: | ***El Nuevo Heraldo*** |
| | Date Affidavits/Copies Received: | **March 1, 2017** |
| | Date Certification of Sign Posting / Application Availability Received: | **March 27, 2017** |
| 39.604 | Public Comments Received? | **Yes** |
| | Hearing Requested? | **Yes** |
| | Meeting Request? | **Yes** |
| | Date Meeting Held: | **February 5, 2019** |
| | Date Response to Comments sent to OCC: | **December 16, 2019** |
| | Request(s) withdrawn? | **No** |
| | Date Withdrawn: | **N/A** |
| | Consideration of Comments: | |
| | Is 2nd Public Notice required? | **Yes** |
| 39.602(c) | Date SB 709 Legislative Notification Sent: | **February 5, 2018**<br>**December 14, 2018** |
| 39.419 | Date 2nd Public Notice/Preliminary Decision Letter Mailed: | **January 18, 2019** |
| 39.413 | Date Cnty Judge, Mayor, and COG letters mailed: | **January 18, 2019** |
| | Date Federal Land Manager letter mailed: | **N/A** |
| 39.605 | Date affected states letter mailed: | **N/A** |
| 39.603 | Date Published: | **January 24, 2019** |
| | Publication Name: | ***Brownsville Herald*** |
| | Pollutants: | **carbon monoxide, hazardous air pollutants, nitrogen oxides, organic compounds, particulate matter including particulate matter with diameters of 10 microns or less and 2.5 microns or less, sulfur dioxide, and sulfuric acid mist.** |
| | Date Affidavits/Copies Received: | **February 7, 2019** |
| | Is bilingual notice required? | **Yes** |
| | Language: | **Spanish** |
| | Date Published: | **January 24, 2019** |
| | Publication Name: | ***El Nuevo Heraldo*** |
| | Date Affidavits/Copies Received: | **February 7, 2019** |
| | Date Certification of Sign Posting / Application Availability Received: | **March 11, 2019** |
| | Public Comments Received? | **Yes** |

| Rule Citation | Requirement | |
|---|---|---|
| | Meeting Request? | **Yes** |
| | Date Meeting Held: | **February 5, 2019** |
| | Hearing Request? | **Yes** |
| | Date Hearing Held: | **N/A** |
| | Request(s) withdrawn? | **No** |
| | Date Withdrawn: | **N/A** |
| | Consideration of Comments: | **Yes** |
| 39.421 | Date RTC, Technical Review & Draft Permit Conditions sent to OCC: | **December 16, 2019** |
| | Request for Reconsideration Received? | **Yes** |
| | Final Action: | **Issuance** |
| | Are letters Enclosed? | **No** |

**Construction Permit & Amendment Requirements - 30 TAC Chapter 116 Rules**

| Rule Citation | Requirement | |
|---|---|---|
| 116.111(a)(2)(G) | Is the facility expected to perform as represented in the application? | **Yes** |
| 116.111(a)(2)(A)(i) | Are emissions from this facility expected to comply with all TCEQ air quality Rules & Regulations, and the intent of the Texas Clean Air Act? | **Yes** |
| 116.111(a)(2)(B) | Emissions will be measured using the following method: | **Thermal oxidizer outlet temperature and O2 will be monitored. Initial stack testing required for heaters and thermal oxidizers. Engines will have run time meters. Flares will have flow meters. Fuel sulfur analysis to calculate SO2 emissions. Fuel usage records will be used to calculate emissions not measured with CEMS or equivalent.** |
| | Comments on emission verification: | **N/A** |
| 116.111(a)(2)(D) | Subject to NSPS? | **Yes** |
| | Subparts **A, Db, Kb, IIII,** & **JJJJ** | |
| 116.111(a)(2)(E) | Subject to NESHAP? | **No** |
| | Subparts & | |
| 116.111(a)(2)(F) | Subject to NESHAP (MACT) for source categories? | **Yes** |
| | Subparts **A** & **ZZZZ** | |
| 116.111(a)(2)(H) | Is nonattainment review required? | **No, facility is not located in a nonattainment county.** |
| 116.111(a)(2)(I) | Is PSD applicable? | **No, Facility is an un-named source, no pollutant exceeds the 250 tpy threshold. Therefore, PSD review does not apply.** |
| 116.111(a)(2)(L) | Is Mass Emissions Cap and Trade applicable to the new or modified facilities? | **No** |
| | If yes, did the proposed facility, group of facilities, or account obtain allowances to operate: | **N/A** |
| 116.140 - 141 | Permit Fee: $ **75,000** Fee certification: | **M714230** |
| | Applicable Outstanding Fees: | **No** |

**Title V Applicability - 30 TAC Chapter 122 Rules**

| Rule Citation | Requirement |
|---|---|
| 122.10(13) | **Title V applicability:**<br>Site will be subject to Title V because the proposed emissions rates from the site are greater than 100 tpy for at least one pollutant. A Title V permit will be obtained prior to the start of operation of the proposed facilities. |
| 122.602 | **Periodic Monitoring (PM) applicability:**<br>Periodic monitoring is applicable because the site will be a major source subject to 30TAC Chapter 122.<br>Each heater shall be monitored for average hourly fuel consumption, a fuel flow meter shall be install and maintained according to manufacturer's instructions. Thermal oxidizers will have outlet exhaust temperature and oxygen monitors. Visibility / opacity observations will be required for the heaters and thermal oxidizers exhaust. Quarterly sulfur content analysis of gas stream prior to the first acid gas treatment device and gas sulfur content after the last acid gas treatment device will be required. Engines will have run-time meters. |
| 122.604 | **Compliance Assurance Monitoring (CAM) applicability:**<br>CAM is applicable because the site will be a major source and facilities will be equipped with control devices. Heaters will have fuel flow meters install. Thermal oxidizers will have outlet exhaust temperature and oxygen monitors. The flare pilot flame will be continuously monitored by a thermocouple, flame-ionization rod, acoustical monitor or an infrared monitor to indicate the control device is functioning. |

**Request for Comments**

| Received From | Program/Area Name | Reviewed By/Date | Comments |
|---|---|---|---|
| Region: | **15** | **Lupe Garcia/November 9, 2018** | **Correct grammatical errors** |
| City: | **Brownsville** | **N/A** | |
| County: | **Cameron** | **N/A** | |
| ADMT: | | **Justin Cherry/October 11, 2017** | **AQA is acceptable for all review types and pollutants.** |
| EB&T: | | **N/A** | |
| Toxicology: | | **N/A** | |
| Compliance: | | **N/A** | |
| Legal: | | **N/A** | |
| Comment resolution and/or unresolved issues: | **Made corrections.** | | |

**Process/Project Description**

The Project includes two principal parts: the LNG facility and the associated marine transfer facilities. The LNG facility will be designed to receive 0.9 billion cubic feet per day of feed gas via pipeline and liquefy it using the Black & Veatch Poly Refrigerant Integrated Cycle Operation (PRICO®) technology. The natural gas delivered to the site via the feed gas pipeline will be treated, liquefied, and stored on-site in two single-containment LNG storage tanks, each with a net capacity of approximately 160,000 cubic meters ($m^3$). The LNG will be pumped from the storage tanks to the marine transfer facilities. The marine transfer facilities will load LNG carriers at the berthing dock using cryogenic piping and associated equipment for mooring the carrier.

The facilities for the Project include the following major components:

- Gas pretreatment facilities;
- Liquefaction facilities (comprising six liquefaction trains and six approximately 72,000 horsepower (hp) electric motor-driven compressors);
- LNG storage tanks;
- Boil-off gas (BOG) handling system;
- Flare system;
- Marine transfer facilities;
- Control, administration, and support buildings;
- Access road; and
- Utilities (power, water, and communication, etc.).

**Pollution Prevention, Sources, Controls and BACT- [30 TAC 116.111(a)(2)(C)]**

BACT Summary for Emission Sources at Annova LNG Brownsville

| Emission Source | Emission Point Number (EPN) | Pollutant(s) | BACT Control Description |
|---|---|---|---|
| Fired Heaters | HTR-1, HTR-2, HTR-3 | $NO_X$<br>CO<br>PM | • 0.035 lb/MMBtu w/cost analysis<br>• Ultra-Low $NO_X$ burners<br>• 50 ppmv CO corrected to 3% $O_2$<br>• Natural Gas fuel<br>• Good combustion practices<br>• Less than 5% opacity |
| Acid Gas Removal Unit | -- | -- | • Emissions to Thermal Oxidizer |
| Thermal Oxidizer | TO-1 | VOC<br>H2S | • 99.9% DRE or 10 ppmv at 3% oxygen on exhaust VOC<br>• Initial source test<br>• Solid adsorbent SRU to reduce sulfur in acid gas prior to combustion in the thermal oxidizer.<br>• Monitor chamber exit temperature |
| Natural Gas Generators | GEN-1, GEN-2, GEN-3, GEN-4, GEN-5, GEN-6 | $NO_X$<br>CO<br>VOC<br>PM | • 0.5 g/bhp-hp ($NO_X$)<br>• 3.0 g/bhp-hp (CO)<br>• g/bhp-hr (VOC)<br>• Natural gas fuel<br>• Limited hours of operation<br>• Good combustion practices<br>• Less than 5% opacity |
| Diesel Generator/Firewater Pumps | DGEN-1, FWP-1, FWP-2, FWP-3 | Products of Combustion | • Ultra-low sulfur diesel fuel<br>• Good combustion practices<br>• Limited hours of operation<br>• Comply with NSPS Subpart IIII emission limits |
| Liquefaction Unit | -- | -- | • Emissions to Flare |
| Marine Loading | -- | -- | • Emissions to Flare |
| Flares | FLR-1, FLR-2 | VOCs | • Control efficiency of 99% for VOC and H2S<br>• Not flaring halogenated compounds<br>• Operating a flow monitor<br>• Operating a continuous pilot flame (monitored) |
| Condensate Tank | TNK-1 | VOC | • Internal floating roof tank<br>• Submerged fill pipe. |
| Fugitive Equipment | | VOCs | • 28M leak detection and repair program |

BACT Summary for Emission Sources at Annova LNG Brownsville

| Emission Source | Emission Point Number (EPN) | Pollutant(s) | BACT Control Description |
|---|---|---|---|
| Leaks | | | |

Key:
MMBTU = million British Thermal Units
ppmv = parts per million by volume
DRE = destruction/removal efficiency
Bhp-hr = brake horsepower hour
NSPS = New Source Performance Standard
SRU = sulfur recovery unit

**Impacts Evaluation - 30 TAC 116.111(a)(2)(J)**

| | |
|---|---|
| Was modeling conducted? **Yes** Type of Modeling: **AERMOD** | |
| Will GLC of any air contaminant cause violation of NAAQS? | **No** |
| Is this a sensitive location with respect to nuisance? | **No** |
| [§116.111(a)(2)(A)(ii)] Is the site within 3000 feet of any school? | **No** |
| Additional site/land use information: | |

**Summary of Modeling Results**

The air quality analysis was reviewed by the Air Dispersion Modeling Team and is deemed acceptable for all review types and pollutants. Additional details may be found in the modeling audit memo (GroupWise document no 591695), and the results are summarized below

**A. Minor Source NSR and Air Toxics Analysis**

**Table 1. Project-Related Modeling Results for State Property Line**

| Pollutant | Averaging Time | GLCmax (µg/m$^3$) | De Minimis (µg/m$^3$) |
|---|---|---|---|
| $SO_2$ | 1-hr | 4 | 20.4 |
| $H_2SO_4$ | 1-hr | 0.4 | 1 |
| $H_2SO_4$ | 24-hr | 0.1 | 0.3 |

The GLCmax for 1-hr $SO_2$ and $H_2SO_4$ are located on-property. This is conservative.

**Table 2. Modeling Results for Minor NSR De Minimis**

| Pollutant | Averaging Time | GLCmax (µg/m$^3$) | De Minimis (µg/m$^3$) |
|---|---|---|---|
| $SO_2$ | 1-hr | 4.3 | 7.8 |
| $SO_2$ | 3-hr | 3.6 | 25 |

| Pollutant | Averaging Time | GLCmax (µg/m$^3$) | De Minimis (µg/m$^3$) |
|---|---|---|---|
| $SO_2$ | 24-hr | 1.7 | 5 |
| $SO_2$ | Annual | 0.3 | 1 |
| $PM_{10}$ | 24-hr | 0.4 | 5 |
| $PM_{2.5}$ | 24-hr | 0.4 | 1.2 |
| $PM_{2.5}$ | Annual | 0.1 | 0.3 |
| $NO_2$ | 1-hr | 3.8 | 7.5 |
| $NO_2$ | Annual | 0.3 | 1 |
| CO | 1-hr | 291 | 2000 |
| CO | 8-hr | 132 | 500 |

**Permit Concurrence and Related Authorization Actions**

| | |
|---|---|
| Is the applicant in agreement with special conditions? | **Yes** |
| Company representative(s): | **Janine Whitken** |
| Contacted Via: | **Email** |
| Date of contact: | **November 11, 2018** |
| Other permit(s) or permits by rule affected by this action: | **No** |
| List permit and/or PBR number(s) and actions required or taken: | **N/A** |

| | | | |
|---|---|---|---|
| | 4/2/2020 | | 4/2/2020 |
| Project Reviewer<br>Marc Sturdivant | Date | Team Leader<br>Lillian Hayes | Date |