Preliminary Determination Summary
The Dow Chemical Company
Permit Numbers 153106 and N268

I. Applicant

The Dow Chemical Company
332 Hwy 332 E APB 2A2
Lake Jackson, TX 77566-5044

II. Project Location

Polyethylene 7 Facility
2301 N Brazosport Blvd
Brazoria County
Freeport, Texas 77541

III. Project Description

On August 13, 2018, The Dow Chemical Company submitted an application for a permit to authorize construction of a new low pressure polyethylene production facility to be used for the high-density (HDPE) and linear low-density (LLDPE) polyethylene manufacturing. The facility will be identified as Polyethylene 7 and located at their existing Freeport site in Brazoria County. The application included a Nonattainment New Source Review (NNSR) permit application based on the project increases.

Sources of emission covered by the permit include an 84.27 MMBtu/hr furnace; a flare; new process area and common area piping, valves, pumps, and similar components which are included as fugitive emission sources; a cooling tower; a wastewater loading rack; a pellet spin dryer; product blending tanks with bag house control of emissions; and product loading rack with vent filters.

The permit specifies control requirements and work practice standards for all planned maintenance, startup, and shutdown (MSS) activities.

Construction of the Polyethylene 7 facility is a major modification to the existing major source which will increase VOC (ozone precursor) by significant amounts. Lowest Achievable Emission Rate (LAER) will be applied for VOC emissions and project increases will be offset at a ratio of 1.15:1.

IV. Emissions

Air Contaminant	Proposed Allowable Emission Rates (tpy)
VOC	53.51
NO_x	15.42

Air Contaminant	Proposed Allowable Emission Rates (tpy)
SO_2	0.30
CO	71.08
PM	4.33
PM_{10}	3.88
$PM_{2.5}$	3.66

V. Federal Applicability

The site is located in Brazoria County in the HGB non-attainment area that is currently designated as “moderate” nonattainment for the 2008 ozone standard and “marginal” nonattainment for the 2015 ozone standard. The site is an existing major source of VOC and NO_X.

The following chart illustrates the annual project emissions for each pollutant and whether this pollutant triggers PSD or Nonattainment (NA) review.

Pollutant	Project Emissions (tpy)	Major Mod Trigger (tpy)	NA Triggered Y/N	PSD Triggered Y/N
VOC	55.37	40 for NA 40 for PSD	Y	N [1]
NO_x	16.78	40 for NA 40 for PSD	N	N
SO_2	0.32	40	N	N
CO	82.70	100	N	N
PM	4.33	25	N	N
PM_{10}	3.88	15	N	N
$PM_{2.5}$	3.66	10	N	N

[1] VOC does not trigger PSD in a nonattainment area for ozone; all other pollutants are below significant thresholds for PSD.

VI. Control Technology Review

The draft permit requires controls (detailed below) consistent with nonattainment LAER for all facilities proposed to emit emissions of VOC. The RACT, BACT, LAER Clearinghouse database was reviewed to establish LAER technologies for the facilities. All other pollutants are being evaluated for BACT. Control technologies are described below.

Furnace (EPN B94H7510)
The furnace will have a maximum capacity of 84.27 million British thermal units per hour (MMBtu/hr). Combustion air to the furnace will include vent gas from the polyethylene pellet holdup hoppers, blenders, and silos. The furnace will ensure 99.5% DRE of the VOC in the vent gas.

The furnace will adhere to CO of 50 parts per million by volume (ppmv) to 3% O_2, and 0.02 lb/MMBtu annual average for NO_X. Fuel usage is monitored continuously.

Good combustion practices will be used to reduce VOC; including (1) maintaining proper air-to-fuel ratio; and (2) necessary residence time, temperature, and turbulence.

Flare (EPN B94F1)
The flare is authorized for normal and MSS produced waste gas or off-gas. The flare will meet 40 CFR § 60.18 specifications. The flare will be equipped with a continuous flow monitor and composition analyzer and will maintain a DRE of 98-percent.

Cooling Tower (EPN B94CT1)
The cooling tower is equipped with drift eliminators with a drift less than 0.001%. VOC in the cooling water is sampled monthly. TDS or conductivity if a correlation factor is established is monitored daily.

Wastewater Loading Rack
Wastewater that has been in contact with solvent used in the process will be loaded into trucks for transporting to a treatment facility. The loading rack will have all emissions for the truck loading activity routed to the flare for control. Tank trucks that are pressure rated greater than 15 psig and comply with Department of Transportation (DOT) 49 CFR 180.407 for leak checking and certified annual will be used. This ensures 100% collection efficiency to control.

HDPE and LLDPE Plants

Process Vents (controlled)
Process vents are recycled to the process or routed to the fuel gas header (via ethylene recycle unit) to recover their heating value. Other process vents are controlled through the shared vent system. All process vents upstream of the pellet dryer are controlled. Continuous process vents containing waste gas primarily consists of spent purging gas with low heat content. Intermittent process vents containing waste gas consists primarily of reactor purges that must be conducted during polymer grade changes.

Resin residual VOC (EPNs B94VSDA and B94BH7912)
Residual VOC in the resin will be emitted from process vents in the pellet handling section of the plant and at loadout. The pellets must be degassed to such an extent that the total VOC emissions from the extruded pellets does not exceed 30 lb per million pounds of pellets produced. Compliance must be determined by taking samples of the resin at the first accessible uncontrolled vent and at the final product loading station. Since the first accessible uncontrolled vent is after the spin dryer; emissions from the spin dryer will be determined and added to the difference in the first accessible uncontrolled vent and the final product loading station. The residual VOC of the samples is determined using headspace analysis.

Solids Handling (EPNs B94BH7410, B94BH7411, B94FL7990A, B94FL7990B, B94FL7990C, B94FL7990D, B94FL7991A, B94FL7991B, B94FL7991C, B94FL7991D, B94FL7992A, B94FL7992B, B94FL7992C, and B94FL7992D)
Baghouses and fabric filters are used to control dust emissions from catalyst handling, compounding, and pellet handling operations. The pellet dryer vent does not require control as it is inherently low dust loading and high water content. All particulate control devices must reduce the outlet grain loading of their exhaust to 0.01 grain per dry standard cubic foot (dscf) of air or less for the baghouses controlling the blending tanks and 0.005 grain per dscf of air or less for the fabric filters used to control loading activities. Baghouses must be continuously monitored for pressure drop and fabric filters which have nearly the same pressure at the inlet and outlet will be inspected daily for holes, cracks, and other conditions that would reduce the collection efficiency.

Fugitives (EPN B94FU1 and B93FU2)
Fugitives will be monitored via 28 LAER fugitives program.

Maintenance, Startup, and Shutdown (MSS)

Opening equipment for MSS (EPN B94MEFU1)
The permit specifies control requirements for vessel maintenance and cleaning activities undertaken during process turnarounds. All equipment will be vented to control during MSS activities until the VOC concentration is less than 10,000 ppmv. Tank V-7812 will be vented to control until the VOC concentration is less than 7,000 ppmv and Tank V-7816 will be vented to control until the VOC concentration is less than 5,000 ppmv. After the VOC concentration is less than the specified level, the equipment may be opened to the atmosphere for MSS purposes.

Inherently low emitting MSS activities (EPN B94MEAFU1)
Activities including filter changes, instrument replacement, analyzer maintenance, and aerosol can usage emissions have been represented and the activities are recognized as inherently low emitting. Emission calculations will be validated annual.

All facilities satisfy BACT and LAER requirements.

VII. Air Quality Analysis

The air quality analysis (AQA) is acceptable for all review types and pollutants. The results are summarized below.

A. Minor Source NSR and Air Toxics Review

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	1	20.4

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	1	7.8
SO_2	3-hr	1	25
SO_2	24-hr	0.7	5
SO_2	Annual	0.001	1

Pollutant	Averaging Time	GLCmax ($\mu g/m^3$)	De Minimis ($\mu g/m^3$)
PM_{10}	24-hr	1	5
$PM_{2.5}$	24-hr	0.99	1.2
$PM_{2.5}$	Annual	0.05	0.2
NO_2	1-hr	5	7.5
NO_2	Annual	0.08	1
CO	1-hr	24	2000
CO	8-hr	22	500

The 1-hr and annual GLCmax for all pollutants are the maximum predicted concentrations associated with one year of meteorological data. The applicant derived the 3-hr, 8-hr, and 24-hr maximum predicted concentrations by multiplying the 1-hr maximum predicted concentrations by 1, 0.9, and 0.6, respectively.

The justification for selecting the EPA's interim 1-hr NO_2 and 1-hr SO_2 De Minimis levels was based on the assumptions underlying EPA's development of the 1-hr NO_2 and 1-hr SO_2 De Minimis levels. As explained in EPA guidance memoranda[1,2], the EPA believes it is reasonable as an interim approach to use a De Minimis level that represents 4% of the 1-hr NO_2 and 1-hr SO_2 NAAQS.

The $PM_{2.5}$ De Minimis levels are the EPA recommended De Minimis levels. The use of the EPA recommended De Minimis levels is sufficient to conclude that a proposed source will not cause or contribute to a violation of a $PM_{2.5}$ NAAQS based on the analyses documented in EPA guidance and policy memorandums[3].

[1] www.epa.gov/sites/production/files/2015-07/documents/appwso2.pdf
[2] www.tceq.texas.gov/assets/public/permitting/air/memos/guidance_1hr_no2naaqs.pdf
[3] www.tceq.texas.gov/permitting/air/modeling/epa-mod-guidance.html

To evaluate secondary $PM_{2.5}$ impacts, the applicant provided an analysis based on a Tier 1 demonstration approach consistent with the EPA's Guideline on Air Quality Models. Specifically, the applicant used a Tier 1 demonstration tool developed by the EPA referred to as Modeled Emission Rates for Precursors (MERPs). The basic idea behind the MERPs is to use technically credible air quality modeling to relate precursor emissions and peak secondary pollutants impacts from a source. Using data associated with worst-case hypothetical source, the applicant estimated 24-hr and annual secondary $PM_{2.5}$ concentrations of 0.01 $\mu g/m^3$ and 0.0005 $\mu g/m^3$, respectively. When these estimates are added to the GLCmax listed in the table above, the results are less than the De Minimis levels.

Table 3. Generic Modeling Results

Source ID	1-hr GLCmax ($\mu g/m^3$ per lb/hr)	Annual GLCmax ($\mu g/m^3$ per lb/hr)
B94H7510	0.34	0.03
B94F1	0.11	0.01
B94CT1_1	0.44	0.04
B94CT1_2	0.44	0.04
B94BH410	6.85	0.21
B94BH411	6.85	0.21
B94FL90A	9.44	0.30
B94FL90B	9.38	0.30
B94FL90C	9.30	0.30
B94FU1	7.52	0.21
B93FU2	9.54	0.36
B94MEFU	8.00	0.20
B94MEAFU	8.00	0.20
B94FL90D	9.25	0.29
B94FL91A	9.48	0.30

Source ID	1-hr GLCmax ($\mu g/m^3$ per lb/hr)	Annual GLCmax ($\mu g/m^3$ per lb/hr)
B94FL91B	9.43	0.30
B94FL91C	9.34	0.30
B94FL91D	9.29	0.30
B94FL92A	9.49	0.31
B94FL92B	9.44	0.30
B94FL92C	9.36	0.30
B94FL92D	9.31	0.30
B94VSDA	6.03	0.18
B94F1M	0.11	0.01
B94F1M_1	0.11	0.01

The applicant conducted modeling to generate unit impacts for each applicable source. All health effects pollutants screened out at step 3 of the MERA guidance document. See section 3 for additional details.

1. Model Used and Modeling Techniques

AERMOD (Version 18081) was used in a refined screening mode.

A unitized emission rate of 1 lb/hr was used to predict a generic short-term and long-term impact for each source. The generic impact was multiplied by the proposed pollutant specific emission rates to calculate a maximum predicted concentration for each source. The maximum predicted concentration for each source was summed to get a total predicted concentration for each pollutant.

For the 1-hr NO_2 analysis, the MSS flaring activity “ethylene purge” (model ID B94F1M_1) will not occur simultaneously with flare FS-7801 routine operations (model ID B94F1). However, several other MSS flaring activities (model ID B94F1M) could occur simultaneously with routine flare operations. The applicant evaluated two scenarios to represent the operational scenario. Scenario 1 represents the routine furnace, routine flare, and MSS flare NO_2 emissions except for the ethylene purge activity (model IDs B94H7510, B94F1, and

B94F1M, respectively). Scenario 2 represents the routine furnace, MSS flare without ethylene purge, and MSS flare ethylene purge NO_2 emissions (model ID B94H7510, B94F1M, and B94F1M_1, respectively). The predicted concentrations associated with the worst-case scenario was reported in Table 2 above. For the annual averaging time, all applicable sources were evaluated.

A. Land Use

Medium roughness and elevated terrain were used in the modeling analysis. These selections are consistent with the AERSURFACE analysis, topographic map, DEMs, and aerial photography. The selection of medium roughness is reasonable.

B. Meteorological Data

Surface Station and ID: Angleton, TX (Station #: 12976)
Upper Air Station and ID: Lake Charles, LA (Station #: 3937)
Meteorological Dataset: 2012
Profile Base Elevation: 7.3 meters

C. Receptor Grid

The grid modeled was sufficient in density and spatial coverage to capture representative maximum ground-level concentrations.

A single property line designation (SPLD) exists between The Dow Chemical Company, Huntsman Petrochemical Corporation (RN100225945), Freeport Energy Company (RN100225945), Air Liquide America Corporation (RN100215334), Hydrochlor LLC (RN106090483), and Blue Cube Operations LLC (RN108772245). The SPLD boundary was used in the modeling demonstration for the property line receptors, as well as all other parts of The Dow Chemical Company property.

D. Building Wake Effects (Downwash)

Input data to Building Profile Input Program Prime (Version 04274) are consistent with the aerial photography and modeling report.

Several process areas and the associated piping components were included as downwash structures. These areas will not cause a significant obstruction to the wind flow and should not be considered for downwash. However, the modeled sources are outside the region of influence of these areas and will not be affected.

2. Modeling Emissions Inventory

The modeled emission point and volume source parameters and rates were consistent with the modeling report. The source characterizations used to represent the sources were appropriate.

The computation of the effective stack diameters for the flares is consistent with TCEQ modeling guidance.

A NO_x to NO_2 conversion factor of 0.9, based on ARM2, was applied to the modeled 1-hr NO_x concentrations. This is reasonable.

The applicant assumed full conversion of NO_x to NO_2 for the annual averaging time, which is conservative.

For the 24-hr $PM_{2.5}$ and PM_{10} analyses, average emission rates were used for source ID B94MEAFU1. The average emission rates were based on the use of only six cans (six total hours) in any 24-hr period.

With the exception noted above, the maximum allowable hourly emission rates were used for the short-term averaging time analyses, and annual average emission rates were used for the annual averaging time analyses.

VIII. Offsets

The applicant will provide offsets at a ratio of 1.15 to 1.0 prior to the start of operations of the facility for the project increase in VOC emissions.

IX. Conclusion

As described above, the applicant has demonstrated that the project meets all applicable rules, regulations and requirements of the Texas and Federal Clean Air Acts. The Executive Director's preliminary determination is that the permits should be issued.